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THE GENUS COLUTEA L.
A MONOGRAPH

WARSZAWA

W dniu 13 lutego 1963 r. zmarł w wieku 87 lat Prof. Dr Bolesław Hryniewiecki, emerytowany profesor Uniwersytetu Warszawskiego i jego rektor w latach 1927—1928, były dyrektor Ogrodu Botanicznego Uniw. Warsz., członek rzeczywisty Polskiej Akademii Nauk, jeden z założycieli Polskiego Towarzystwa Botanicznego i jego honorowy członek, redaktor „Monographiae Botanicae", autor licznych rozpraw i prac z zakresu systematyki, geografii i anatomii roślin oraz historii botaniki w Polsce.

W osobie prof. B. Hryniewieckiego traci Polskie Towarzystwo Botaniczne i nauka polska uczonego o szerokich horyzontach myślowych i wielkim osobistym uroku.

Bolesław Hryniewiecki, emeritus Professor of the University in Warsaw, and a Member of the Polish Academy of Science passed away on 13 February 1963 at the age of 87 years. He was the Director of the Botanical Garden of the University in Warsaw, one of the founders of the Polish Botanical Society, its President in years 1922—1927, 1945—1953 and a Honorary Member, Editor of the "Monographiae Botanicae", author of many papers which concern anatomy, taxonomy, phytogeography, history of botany in Poland, and other branches of plant science.

The Polish Botanical Society has lost one of its most eminent members, a man with a deep knowledge, and an inestimable personal charm.

In memory of the late K. K. Shaparenko
(1908—1941)

PREFACE

It was about ten years ago that my interest in the genus *Colutea* was aroused. While I was busy with the problems of acclimatisation of trees and shrubs of foreign origin in Poland, I met species of this genus again and again, but their determination caused a lot of difficulty. Seedlings grown from seeds sent under different names used to represent only *C. arborescens* and *C.* × *media*, very seldom *C. orientalis*. After reading a lot of literature concerned with the genus *Colutea*, I became aware that all these erroneous determinations were caused by diverse and contradictory opinions of the taxonomic value of a number of taxa within the genus.

Profound studies were begun in 1959 when thanks to the help of the Polish Academy of Sciences I was able to study first the herbarium collections and to work in the library of the Royal Botanic Gardens in Kew and Edinburgh and then in 1960 of the Botanical Institute of V. Komarov of the USSR Academy of Sciences in Leningrad and of the University in Moscow. During the last two years I have revised the herbarium specimens kindly sent by the directors and curators of a number of institutes. In many cases I have even got types, so that most species could be examined on specimens cited in the first diagnoses. The number of revised sheets amounted to about 3.500. Not all of them have been mentioned in the lists accompanying the descriptions of species because it was often impossible to read the place of gathering from the labels; with a few exceptions cultivated specimens have not been mentioned here. Localities of the species read from the labels were plotted on maps of areas shown in this work.

All the herbarium specimens came from the following 36 Herbaria (abbreviations acc. to the Index Herbariorum, ed. 4.):

AL Laboratoire de Botanique de la Faculté des Sciences, Université d'Alger.
B. Botanisches Museum, Berlin—Dahlem.
BG Universitetes Botaniske Museum, Bergen.
BM British Museum (Natural History), London.

BP	Museum of Natural History, Budapest.
C	Botanical Museum and Herbarium, Copenhagen.
CAL	Indian Botanic Garden, Calcutta.
CGE	Botany School, University of Cambridge.
E	Royal Botanic Garden, Edinburgh.
ERE	Botanical Institute of the Academy of Sciences of the Armenian SSR, Erevan.
FI	Herbarium Universitatis Florentinae, Instituto Botanico, Firenze.
G	Conservatoire et Jardin Botaniques, Genève.
GB	Göteborgs Botaniska Trädgard, Göteborg.
GZU	Botanisches Institut, Graz.
HUJ	Department of Botany, Hebrew University, Jerusalem.
JE	Institut für Spezielle Botanik und Herbarium Haussknecht, Jena.
K	Royal Botanic Gardens, Kew, Richmond.
KRA	Herbarium Instituti Botanici Academiae Scientiarum Polonae, Kraków.
KUN	Kunming Station of the Botanical Institute, Kunming.
LE	Herbarium of the Department of Systematics and Plant geography of the Botanical Institute of the Academy of Sciences of the USSR, Leningrad.
MW	Department of Botany of the Lomonosov State University, Moscow.
P	Museum National d'Histoire Naturelle, Paris.
POZ	Zakład Systematyki i Geografii Roślin Uniwersytetu im. A. Mickiewicza, Poznań.
PR	Botanical Department of the National Museum, Praha.
PRC	Institutum botanicum Universitatis Carolinae, Praha.
RO	Instituto Botanico, Roma.
RUEB	Geobotanisches Forschungsinstitut Rübel, Zürich.
SARA	Biološki Institut, Sarajevo.
SOM	Botanical Institute of the Bulgarian Academy of Sciences, Sofia.
TAD	Botanical Institute of the Academy of Sciences of the Tadzhik. SSR, Duschanbe (Stalinabad)
TAK	University Herbarium of Middle Asia, Tashkent.
W	Naturhistorisches Museum, Wien.
WA	Zakład Systematyki i Geografii Roślin Uniwersytetu Warszawskiego, Warszawa.
WRL	Instytut Botaniczny Uniwersytetu Wrocławskiego, Wrocław.
WU	Botanisches Institut und Botanischer Garten der Universität, Wien.

I owe a special gratitude to Dr. G. Taylor for his generosity and helpfulness during my stay at Kew, and to Prof. Dr. E. Bobrov, Leningrad, for his encouragement and help in getting herbarium material from Middle Asia and the Caucasus. I am greatly indebted to Prof. Dr. K. H. Rechinger, Vienna, through whose magnanimity his valuable collections from Greece, Iran and Afghanistan, and types of the species — *C. rostrata,* described by A. Gilli, have been made available to me. Dr. G. Moggi, Florence, has helped me to complete specimens of *C. abyssinica* from the region of Ethiopia and Eritrea, which has enabled me to characterize precisely this species recorded erroneously in literature, and to define its important role in the evolution of the whole genus.

It is a pleasure to express my sincere thanks to Miss D. Hillcoat, British Museum, London, for the copy of the map drawn by K. K. Shaparenko in 1938 and showing the area of the genus *Colutea.* Mr. J. B. Gillett, Kew, generously placed at my disposal his unpublished manuscript on *C. abyssinica* he had prepared for "Flora of Tropical East Africa", and so did Prof. Dr. P. Fukarek, Sarajevo, sending me the

unpublished map of distribution of *C. arborescens* in Yugoslavia. My thanks are also due to Mrs. I. P. Mandenova, Botanical Institute, Tbilisi, who sent me a photograph of the type of *C. komarovii*. Special gratitude is expressed to Dr. P. H. Davis, Edinburgh, who defined the position of localities of *C. melanocalyx* in Turkey, and to Prof. Dr. T. T. Yü, Botanic Gardens, Peking, who described the position of localities of *C. delavayi* in China. I gratefully acknowledge the list of herbarium specimens of *C. delavayi* from the Herbarium of the Kunming Botanical Institute (Academia Sinica) sent me by its Director, Dr Wü Cheng Yi.

The Latin diagnoses of new taxa have been kindly verified by N. Zabinkova and M. Kirpicznikov, Botanical Institute, Leningrad. Photographs of herbarium specimens were made by my friend K. Jakusz, Kórnik, and the translation into English was done by Mrs. W. Gąsiorowska, teacher of English at Poznań University.

The whole work has been discussed with Prof. Dr. Z. Czubiński, Chair of Taxonomy and Geography of Plants, Poznań University; he has never tired of helping me with counsel and assistance, and has aided me with valuable suggestions. Particular thanks are due to Prof. Dr. S. Białobok, Director of the Institute of Dendrology and Kórnik Arboretum of the Polish Academy of Sciences at Kórnik, for facilities for writing this work.

Finally, I wish to express my sincere thanks to all numerous friends and collegues, whose names have not been mention here, and who have helped me in the preparation of this monograph with their encouragement and advice.

K. Browicz

HISTORICAL REVIEW

The name of the genus *Colutea* used by Linnaeus in 1753 in his "Species Plantarum" had been known much earlier. For the first time it had been mentioned in ancient Greece by Theophrastus in his "Historia Plantarum" where it had been spelled in two ways "koloitea" (I. 11,2 and III. 17,3) and "koloutea" (III. 14,4 and III. 17,2). We are not sure what Theophrastus meant by them, but it is likely that neither referred to any species of the genus *Colutea*. This matter was discussed by a great many authors, especially during the 16th and 17th centuries. Later K. Koch (Die Bäume und Sträucher des Alten Griechenlandes, 1884) and B. Bubani (Fl. Pyrenaea, 1900) referred to it, too. According to Koch the descriptions given by Theophrastus show a certain similarity to such species as: *Gleditsia caspica, Laburnum anagyroides* or *L. alpinum,* and even *Salix cinerea* and *S. alba.* Theophrastus himself in one of his descriptions mentioned that "koloutea" was similar to *Trigonella.* In the 16th century one species of *Trigonella, T. foenum-graecum,* was very often compared to *Colutea.*

Since Theophrastus *Colutea* was only once mentioned in the ancient world, namely in Rome, by T. M. Plautus. In his comedy "Persa" one of the heroes, Toxilus Servos, utters the following words (I.3:7-8):

> "Commisce mulsum: struthea, colutea appara,
> Bene ut in scutris concaleant: et calamum inice."

In this case, too, it is difficult to guess what "colutea" meant; it certainly cannot be *Colutea arborescens,* because in Toxilus' monologue it refers to a tasty dish.

No other references to *Colutea* can be found in writers of ancient Greece and Rome. It was not, however, until over 1.500 years later that one species, *Colutea arborescens,* was mentioned again.

The first writer in the 16th c. that used the name "*Colutea*" was Ruellius (De natura stirpium libri tres, 1537). In the chapter "*Colycea* et *Colutea*" (Cap. LXX, 146—147) referring to Theophrastus in

his considerations, he identifies *"Colutea"* with *"Sena" (Cassia),* similarly to what H. Bock — Tragus did later (New Kreütter Buch, 1539). Ruellius, however, states that *Colutea* grows in a wild state in France, where it is known under the name "baguenaulde". So this is the first reference to *Colutea arborescens* growing in Europe. The name cited by Ruellius has been used up to recent times, though, in a slightly changed form, "baguenaudier" in order to determine this species in France. Bubani (l.c.) considered Ruellius' information very important. Stating that plants named *"Colutea"* by Theophrastus have nothing in common with the recent meaning of the genus *Colutea,* he proposed a new name for the genus, namely *"Baguenaudiera",* and for *C. arborescens* — *"Baguenaudiera arborea* (Ruellii) Bubani".

In his work Ruellius did not give any illustrations that would confirm the identity of his "baguenaulde" with *C. arborescens.* The first illustrations appeared as late as 1543 in L. Fuchs's "New Kreuterbuch" (fig. CCL., as "Welsch Linsen"). It shows a whole shrub with roots, leafy shoots, single flowers and fruits. Leaves are small, with 2—4 pairs of elliptic or obovate leaflets. The flowers are not very well drawn, but the shape of fruits, one of which is broadly open, with visible seeds, makes clear that Fuchs's illustration portrays *C. arborescens.* The small size of leaves and only 2—4 pairs of leaflets seem to prove that it is a subspecies, namely *C. arborescens* ssp. *gallica* (compare below). According to Fuchs *C. arborescens* was in cultivation in gardens of that time (Fig. 1).

A much better and accurate illustration of *C. arborescens* was given by Matthiolus (1565) and later by Lobelius (Plantarum seu stirpium historia, 1576). It represents a whole shrub with roots, too, but the leaves are composed of 4—5 pairs of leaflets, and the inflorescences of several flowers, while the standard and keel can be distinguished in the flowers. This illustration was copied many a time in the 16th and 17th centuries, occasionally in a slightly changed form (e.g. Bauhinus, Historia Plantarum Universalis, 1650; Jonston, Dendroghraphias, 1662).

In all botany books of the 16th c. in regard to the name *"Colutea"* a certain confusion of ideas can be met, and this name is identified with *"Sena"* or *"Senna"* (cf. Tabernemontanus, Kreuterbuch, 1591). This confusion was caused by the use of these plants (*Sena = Cassia obovata or C. angustifolia*) in medicine as purgatives, it must be stressed, however, that *C. arborescens* is a much weaker medicine.

All this confusion was discussed by Bauhinus (l.c.), and he described *C. arborescens* under the binary name *"Colutea vesicaria".* Later

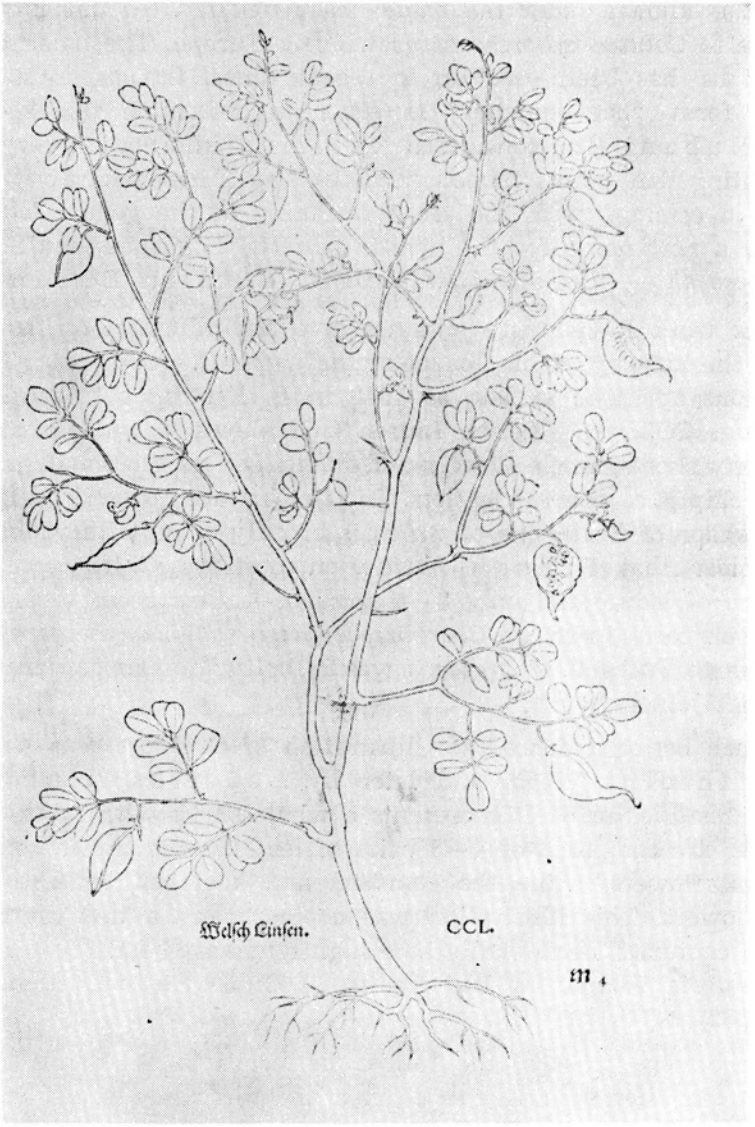

Fig. 1. Oldest illustration of *Colutea arborescens* (L. Fuchs — New Kreuterbuch, 1543).

he gathered all synonyms of this species in his "Pinax Theatri Botanici" (p. 386) in 1671. At that time *C. arborescens* was already a well-known shrub, commonly planted in gardens, in Germany (Fuchs, Lobelius), in France, Italy and England (Lobelius), and even in Belgium (Dodonaeus) and Poland (Jonston). It was also known that it was occurring wild in Europe, and Bauhinus (l.c.) records one of its localities: "iuxta Castellum Sponeck ad Rhenum" (p. 381). The best proof that Bauhinus' descriptions of *"C. vesicaria"* are conformable to *C. arborescens* is his herbarium specimen (A. P. de Candolle — L'Herbier de Gaspard Bauhin, Bull. Herb. Boiss., ser. 2, 4).

In 1700, for the first time, J. P. Tournefort (Institutiones rei herbariae, p. 649) gave a short diagnosis of the genus *Colutea,* based on features of flower and fruit, and he added some very good illustrations of flower, calyx with pistil, closed and open fruits, and seeds (Tabl. 418). This diagnosis was only developed by Linnaeus in his "Genera Plantarum" (p. 224, 1737). Tournefort beside *"C. vesicaria"* mentions still another species, at present reckoned among the genus *Colutea,* viz. *"C. orientalis"* (Corollarium Institutionem Rei Herbariae, p. 44). Particularly noticeable is the fact that Linnaeus does not mention it in his "Species Plantarum" and writes only of 3 species: *C. arborescens, C. frutescens* and *C. herbacea* — the two latter, however, belong to other genera: *Sutherlandia* and *Lessertia.*

In the 18th c. only two other species, beside *C. arborescens,* got a description which was based on cultivated plants. They are mentioned by Ph. Miller in "The Gardener's Dictionary" (1768); these are *C. istria* and *C. orientalis* — for the latter Miller gave the same diagnosis as Tournefort.

Lamarck (1773) in the "Encyclopédie méthodique, Botanique" (1; 352—354) described as many as 7 species of *Colutea,* but only three really belong to this genus: *C. arborescens, C. orientalis* and *C. halepica* (at present a synonym of *C. istria*). The last name caused later a lot of confusion, when *Colutea* from East Africa and the Near East was determined. A still greater number of species of *Colutea,* as many as 19, were published by J. L. Poiret in the Supplement to Lamarck's Encyclopedia, yet 16 species were erroneously ranked (genera: *Lessertia, Astragalus, Sphaerophysa* and *Sesbania*). Similarly C. P. Thunberg (1794) incorrectly included several species of the genus *Lessertia* from South Africa to the genus *Colutea* (Prodromus plantarum Capensium, 134—135).

A great number of species belonging to other genera and counted in the *Colutea,* and a lot of synonyms which had appeared at the end

of the 18th and beginning of the 19th centuries had to be critically valued, and this was done by E. G. Steudel (Nomenclator Botanicus). He collected over 40 names of *Colutea* and their synonyms. To the species already known to Lamarck Steudel includes two others in his list: *C.* × *media* and *C. nepalensis.* Just as in the case of Miller's species their descriptions were founded on cultivated shrubs: *C.* × *media* as a hybrid between *C. arborescens* and *C. orientalis* was described by Willdenow in 1809, and *C. nepalensis* by Sims in 1826.

Since then the number of species has been quickly growing, especially thanks to Boissier's works. In 1845 Boissier gives the diagnosis of a new species from south Iran naming it *C. persica.* This species has given a lot of trouble to all botanists interested in the species of *Colutea* from Middle and Central Asia. Three further species from Turkey: *C. cilicica, C. melanocalyx* and *C. armena* were described by Boissier in 1849. The first two were often wrongly interpreted and incorrectly located on the Balkan peninsula. Two years earlier, in 1847, the diagnosis of the only species of *Colutea* from East Africa was published; it was called *C. abyssinica* by Kunth and Bouché; this name was, however, forgotten for many years and only reminded by Schneider (1907) and Gillett (m.s., ined.).

In 1861 J. Lange, on the basis of herbarium specimens collected in France, and of shrubs in cultivation (Botanical Garden in Copenhagen) separated a new species: *C. brevialata,* regarded later as a variety of *C. arborescens* (Dippel, 1893).

E. Boissier in 1872 (Fl. Or. 2) was the first to try a systematic work on the species of *Colutea* in Europe and West Asia. He divided the genus *Colutea* into two sections: *Eucolutea* with 7 species and *Oreophysa* with one species, *C. triphylla;* the latter section has been separated by J. Bornmüller into a different genus *Oreophysa* (Kew Bulletin, 16, 3, 1962). Within *C. persica* Boissier formed a new variety, *C. persica* var. *Buhsei.*

Boissier's work exerted an immense influence on a number of taxonomists, who had incorrectly determined specimens of *Colutea* from East Africa as *C. halepica,* those from Caucasus, Crimea and west Turkey as *C. arborescens,* and from Middle Asia as *C. orientalis.* The herbarium specimens cited by Boissier with the diagnosis for *C. arborescens* form a diverse material and represent as many as 4 species: *C. arborescens, C. cilicica, C. davisiana* and *C. insularis* (the last two have been described by the author).

Since the time the "Flora Orientalis" was published up to the end of the 19th c. three further species were separated, namely; in 1885

C. uniflora from north Iran by Beck; in 1889 *C. delavayi* from Yunnan by Franchet; in 1891 *C. armata* from Pakistan by Hemsley and Lace. Until the beginning of the 20th c. 14 species, including one hybrid, were known.

In 1904 J. Freyn described two species of *Colutea*, one from Kopet-Dagh, — *C. gracilis*, the other from Pamir — *C. paulsenii*. Discussing their affinity with other species he stressed the similarity of all species of this genus to one another, and the necessity of their minute analysis in order to establish criteria for discerning one from the other. Three years later (1907) E. Koehne published his description of *C. longialata*, based on a cultivated shrub in the Botanical Garden in Berlin. Koehne supposed that it came from the Balkans or Asia Minor. This species wholly corresponds in its features to *C. cilicica* described earlier. Koehne paid attention to the essential feature when distinguishing species of *Colutea*, namely the relation of wing length to keel; I accept this feature as one of great importance.

The same year C. K. Schneider introduced the first and till recent times the only critical revision of the whole genus *Colutea*. It was based on a careful analysis of herbarium specimens (cf. labels in the herbaria of Geneva, Vienna and others). Schneider (Illustriertes Handbuch der Laubgeholzkunde) made a first key to determine species and inserted a number of drawings of leaves, flowers and fruits; however, without adding the division into sections. As Boissier had done it, Schneider divided all species into two "groups": one having indehiscent fruits after ripening, the other dehiscent ones at the top. This feature, as shown below, is not sufficient for a taxonomic division, and Schneider's "groups" connect species with various degrees of affinity. In a number of critical remarks Schneider paid attention to several complicated problems of taxonomy of the genus *Colutea*, particularly of such species as: *C. arborescens*, *C. cilicica* and *C. brevialata*. These problems were later examined by Ascherson and Graebner in 1908 (Synopsis der Mitteleuropäischen Flora), yet instead of explaining them they got much more confused.

In 1910 V. I. Lipsky (Materiały dla flory Sriedniej Azii, Act. Hort. Petr., 26) analysed herbarium specimens of the genus *Colutea* from Middle Asia, found, mainly in Russian herbaria and criticised Freyn's newly described species: *C. gracilis* and *C. paulsenii*. He included them into *C. persica* var. *Buhsei*. Those incorrect opinions of Lipsky exerted a great influence on Russian botanists, and were only cleared up by Shaparenko.

Since the time of publication of Freyn's diagnosis till 1940 only

one species, *C. atabajevii,* was described by B. Fedtschenko (1937), but herbarium collections were enlarged, while many references to discoveries of new localities (esp. J. Bornmüller) published together with critical remarks, completed in a marked degree the information about the geographical distribution of separate species. During that time descriptions of several new varieties were published: *C. istria* var. *macrophysa* from Ethiopia, *C. arborescens* var. *macedonica* from the Balkans, and *C. arborescens* var. *brevidentata,* var. *atrocalyx,* var. *parvifolia* and var. *longeracemosa* from Africa. My opinion on some of these varieties has been rather critical, some had to be transferred to another species. Very interesting are H. Czeczott's remarks (A contribution to the Knowledge of the Flora and Vegetation of Turkey, 1939) referring to the way of distinguishing closely allied species: *C. cilicica* and *C. arborescens,* and to the value of some morphological features in the taxonomy of *Colutea.*

A new species of *Colutea, C. komarovii,* was described in 1940 by Takhtadzhian from Caucasus. It was only once collected and in a few specimens, all of them flowerless, but other features show its affinity with *C. uniflora* and *C. armata.*

A critical analysis of species of *Colutea* growing in the area of USSR was done by K. K. Shaparenko, and its results were published in vol. 11 of Flora URSS*. He separated 4 new species: *C. canescens, C. hybrida, C. jarmolenkoi* and *C. acutifolia;* Boissier's variety *C. persica* var. *Buhsei* was raised to the rank of species. He showed that Freyn's forgotten species, *C. paulsenii,* was very common in Middle Asia, and he explained that *C. arborescens* was erroneously recorded from Crimea and the Caucasus instead of *C. cilicica.* Shaparenko wished to write a monograph on the whole genus *Colutea* and therefore, in the years 1937—38, he analysed herbarium specimens from Kew, Edinburgh and Leningrad (a great many labels with his determinations). Shaparenko mentions his plans twice: in 1940 in a paper: "Fossil *Leguminosae* and some questions concerning the classification of paleobotanical findings" (Journ. Bot. URSS 25, 2: 102—121), and in his: "Istorija Salwinij" (Paleobotanika, 2: 13, 1956) published after his death. In the latter work Shaparenko hints that thanks to fossil data he divided the genus into 3 sections, but gives only the names of two: 1. *Ovalifoliatae* with the species: *C. multiflora, C. istria, C. melanocalyx, C. cilicica, C. arborescens,* and 2. *Rotundifoliatae — C. kopetdaghensis, C. nepalensis,*

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* For the first time vol. 11. appeared in 1941 during the siege of Leningrad (acc. to Prof. Bobrov's information).

C. buhsei, C. gracilis, C. armena, C. persica, C. uniflora, C. hybrida, C. canescens, C. paulsenii, C. mesantha and *C. jarmolenkoi,* without publishing the diagnoses of these sections. As we can see Shaparenko was impressed by the fossil remains described under the name *Colutea* and the division into sections was based on the shape of leaflets. It was wrong, because the shape of leaflets (cf. below) in many species of *Colutea* is variable, even so in one individual, and therefore it is rather impossible to reckon species among sections based on this feature.

Shaparenko prepared also a map showing the distribution of species, and, at the same time, the whole genus *Colutea.* This map has never been published, and it can be found in the collections of the British Museum (Natural History) in London.

In the course of the last 20 years the genus *Colutea* has been still enlarged by several further new species; the herbarium collections increased immensely, particularly as regards areas known little, as Iran, Afghanistan, Irak, Jordan and East Africa. Having in this way, quite a thorough material at my disposal, I am not always inclined to accept Shaparenko's views, nevertheless I have made use of his determinations (labels) and the map mentioned above.

At the same time as Shaparenko's work, was published the paper of G. P. Sumnievicz (1941) in which the author gave the diagnoses of 3 new species from Middle Asia: *C. orbicularis, C. brachyptera* and *C. rostrata.* After a detailed analysis of Sumnievicz's types it turned out that two were identical with species described by Shaparenko (*C. hybrida and C. jarmolenkoi*); the third species corresponds in its features to *C. paulsenii* separated so much earlier. As the publication of Shaparenko's and Sumnievicz's diagnoses occurred the same year it is rather difficult to decide the matter of priority. In this work Shaparenko's names have been used as they were distinguished in the Leningrad herbarium already in 1937.

In 1947 in the Kew Bulletin, A. Parsa published the description of a new species from north Iran, which he called *C. gifana.* It is an endemic species collected, so far, only in one locality. Next, in 1959 A. Gilli described still another species from Afghanistan, and he used the same name as Sumnievicz had done in 1941: *C. rostrata.* This species, cannot be accepted, because the herbarium specimens cited by Gilli, represent two species already known: *C. nepalensis* and *C. paulsenii.*

The same year as Gilli, S. I. Ali published in Botaniska Notiser two further species of *Colutea: C. multiflora* and *C. mesantha* from the

Indo-Pakistan Subcontinent. They were separated on the basis of herbarium specimens (Kew, Edinburgh, British Museum), known already to Shaparenko and determined by him on the labels.

As a result of an analysis of specimens, borrowed from a great many herbaria, I have described 5 new species: *C. afghanica, C. atlantica, C. davisiana, C. insularis* and *C.* × *variabilis*, and several subspecies or varieties: *C. arborescens* ssp. *gallica, C. cilicica* var. *shaparenkoi, C. abyssinica* var. *gillettii, C. hybrida* var. *longestipitata, C. jarmolenkoi* var. *hirsuta* and *C. buhsei* var. *densiflora*. The division into sections and subsections is also new. Besides several species have been cancelled and others reduced either to varieties (*C. canescens, C. mesantha*) or even to forms (*C. brevialata*). In this way, in my opinion, there are at present 26 species and 2 hybrids within the genus *Colutea*, a number exceeding any known up to recent time. Such authors as G. Hegi and A. Rehder gave about 10, while S. I. Ali and S. J. Sokolov 15; Shaparenko alone (map) assumed that the genus *Colutea* counted 21 species.

Apart from those taxonomic and geographical works, species belonging to the genus *Colutea* have been the object of different kinds of investigations, though in a lesser degree.

Some authors have been interested in the morphology of seedlings of several species. They were: R. H. Compton (*C. orientalis* and *C. arborescens* — Journ. Linn. Soc. Bot. 41: 1—122, 1912—1913) and I. T. Vassilczenko (*C. arborescens* — Flora et Syst. Plant. Vasc., 4, 1937; *C. atabajevii* — Fl. et Syst. Plant. Vasc., 9, 1950; *C. arborescens, C. atabajevii, C. persica* — Wschody dierewiew i kustarnikow, 1960).

Anatomical investigations were carried out, among others by J. Weyland (Bull. Herb. Boiss., app. 3: 1—74, 1893), M. Firala (Pharmazeut. Post, 52: 519—520, 1919), M. Fucskó (Flora, 106, 1914), and lately by P. Greguss (The Identification of Central-European Dicotyledonous Trees and Shrubs Based on Xylotomy, 1945).

Some information on the biology of flowers of *Colutea* is given by O. Kirchner (Als Programm zur 72 Jahrefeier der k. würtem. Landwirtschaftl. Akademie Hohenheim, 73, 1890), Moench. (Bot. Centralbl. Beih., 1911) and S. Vogel (Blütenbiologische Typen als Elemente der Sippengliederung, 1954).

Cytological studies have concerned only one species; they were performed by W. Tschechow (Planta, 9: 673, 1930), who stated that *C. arborescens* possessed $2n = 16$ chromosomes. Embryological works have been rather scanty, too. The development of the embryo has been examined on one species, *C. arborescens,* only (P. Crété, Compt. Rend., 1951).

Works concerned with chemical investigations form a separate group. Most attention has been given to the chemical composition of gas found in the inflated pods, esp. of *C. arborescens*. S. C. Titius (De aere in *Coluteae* leguminibus contento, Prolusio 1) already in 1800, and next Calvert and Ferraud (Compt. Rend., 1843), Erdmann and Baudrimont (Compt. Rend. 1855), Bender (Ann. Chem. Pharm. 1875), C. Saint-Pierre and L. Magnien (Compt. Rend. 1876), and Lubimienko (Compt. Rend. 1908) were interested in this problem. It has been proven that the gas in *C. arborescens* contains about 2 percent CO_2, 18—19 percent O and 78—79 percent N, and this ratio changes somewhat during day time and night. The chemical composition of seeds of *C. arborescens* was shown by Jones (Mitt. Technol. Gewerbe-Museums, Wien, 1903), of leaves by Malaquin (Bull. Scienc. Pharm., 1910). Lately R. Paris separated a new glucoside out of fresh leaves and flowers of *C. arborescens,* and he named it "colutéoside" (Compt. Rend., 1958).

So far as I know no works on the morphology of the pollen of *Colutea* have been published yet.

CHARACTERS OF *COLUTEA*

Nearly all species of *Colutea* are, at first sight, so similar to one another that their distinction has often caused a lot of difficulty, further complicated by their variability (e.g. *C. arborescens, C. paulsenii*), by the occurrence of transitional forms and maybe also of hybrids. No wonder that a number of herbarium specimens have been incorrectly determined and that there are a lot of controversial references in literature as to the taxonomic value of some taxa (e.g. *C. buhsei, C. gracilis, C. melanocalyx, C. arborescens* var. *melanotricha*), the result being an abundant synonymy.

While analysing herbarium specimens I tried my best to find such essential characters as would allow to divide the genus into taxa of lower rank and to demarcate the species quite clearly. These characters have been ranged according to their utility and have been discussed below in order of precedence. It must be stressed, however, that none of these characters taken individually can mark out the line between species; most important is the combination of features (e.g. discrimination between. *C. atlantica* and *C. arborescens*).

I based my work only on herbarium specimens. Therefore in the intraspecific division I usually confined myself to "variety", exceptionally new "forms" were described. Thus the term "form" has been used here

mostly in non-nomenclatured sense. It has been applied to specimens occurring within the same population, differing in rather indistinct features. This way of proceeding is, I think, right when we consider the remarkable likeness between species.

As it has been already mentioned in the preceding chapter the genus *Colutea* has not been so far divided into sections, subsections or series. All the species were, however, ranged according to a certain relation of features; most important in these classifications were the dehiscency or non-dehiscency of ripe fruits (Boissier, 1872; Schneider, 1907; Rehder, 1927, 1940). In my opinion this feature is quite unreliable, especially in the case when dry specimens have to be determined; it leads into many mistakes. Inflated pods of *Colutea,* with thin papery walls may burst along the ventral suture when pressed while being dried. As I had no opportunity to state the constancy of this feature within the species on living material I ignored it in keys; in descriptions of species I mention it exclusively when basing myself on other authors.

C. K. Schneider (1907), as well as Ascherson and Graebner (1908), mentions in his key to species of *Colutea* the presence of small nipple-shaped projections on leaflets as one of the more important features. However, all these authors belive that the presence of such projections may vary exceedingly within the species. This feature seems to be very variable and it depends, above all, on conditions of environment, as can be assumed from herbarium specimens and localities where they were collected, — i.e. it will be met to a much higher degree in individuals growing in dry conditions (various degree of rugosity on leaflets). This feature has also been disregarded in keys and descriptions of species.

In order to determine correctly sections, subsections and species, sixteen features should be taken into account, the first nine (particularly characters of flowers) being of basic importance. They are:

1. Spinescence of shoots.
2. Termination of the keel top.
3. Pubescence of ovary.
4. Shape and length of wings.
5. Length of flowers.
6. Colour of flowers.
7. Number of flowers in inflorescence.
8. Length of calyx teeth and kind of incisions between them.
9. Number of pairs of leaflets.
10. Size and shape of leaflets.
11. Pubescence of leaflets.
12. Arrangement of leaves.

13. Way of peeling of bark.
14. Length of fruit stipe.
15. Termination of fruit apex.
16. Colour of calyx hairs.

1. Spinescence of shoots. Most species of *Colutea* have unarmed shoots, only 3 species taken out into a separate section *Armata* are furnished with short, thin spines. Besides, in this group of species the rachis of leaf often persists on shoots after the leaflets have fallen off, and becomes hard.

2. Termination of the keel top. The keel may be rounded on the top or furnished with a beak sometimes strongly elongated and bent (*C. nepalensis*). This character helps to divide all species of *Colutea* into two distinct groups. Among the one with a rounded keel two sections are classed: *Colutea* and *Multiflora,* and among the other having a keel furnished with a beak two sections also: *Rostrata* and *Armata.* The geographical distribution of species with a beak-like keel is held in the narrow belt running from Eastern Caucasus (*C. orientalis*) up to the Western Himalayas (*C. paulsenii* var. *mesantha* and *C. nepalensis*).

3. Pubescence of ovary. Within the species it is a constant feature and only exceptionally in *C. arborescens* and *C. jarmolenkoi* some deviations can be found. The pubescence is, as a rule, dense, silvery, covering the whole surface of walls. It keeps for a long time and is still visible on ripe fruits. In several species it is rather loose: *C. melanocalyx, C. davisiana.* In *C. arborescens* the pubescence of ovary varies with different parts of the area decreasing from west to east. The appearance of individuals with traces of pubescence of ovary in the overlapping zone of two species, one having a wholly glabrous and the other a tomentose ovary, may be a proof of their crossing (e.g. *C. cilicica* and *C. armena*).

4. Shape of wings and their length. Wings in *Colutea* are quite free and are composed of two parts: the blade and claw. The claw is, as a rule, well developed, narrow and does not exsert from the calyx. The blade at its base passes into a characteristic auricle, which sometimes touches the claw with its top. The length and breadth of the auricle are very variable, as is the degree of bending; this is true both within the species and the individual; therefore it has no taxonomic value.

The blade of the wing may be: 1) more or less lineary and clearly geniculate, 2) more or less linear and falcate, without breaking, 3) broad, similar in shape to keel, without breaking, either. The first type of blade is most common, the second is met only in the subsections: *Orientales, Africanae* and *Acutifoliae,* and the third is very uncommon, specific

only for the section *Multiflora* and for *C. armata*. The geniculation usually occurs at about one-third of the wing's length (from base); the length of the wing was measured from its top to the end of the claw. In place of bending the outer margin of the wing may be rounded, acute or furnished with an acute projection — the spur. Usually the stronger the breaking the better marked the acuteness of the margin and the more often the spur appears. The presence of the spur may be, a constant and, from the diagnostic point of view, an important feature in some species (e.g. *C. cilicica, C. buhsei*), and a variable feature in others (*C. arborescens*). The blade of the wing is mostly flat, but occasionally its margins are more or less convolute (*C. cilicica, C. gracilis*).

The absolute length of the wing or of blade and claw, is of no avail, but the relation of wing length to keel length matters a lot. In some cases not only species but also subsections and sections (*Multiflora*) may be separated on this ground. The wing is longer than the keel (e.g. *C. cilicica, C. buhsei*), equal to it (*C. insularis*), or shorter (*C. orientalis, C. delavayi*). In some species there are rather remarkable differences, as e.g. in *C. arborescens*. Occasionally the wings are exceptionally short, nearly twice as short as the keel (*C. acutifolia, C. arborescens* ssp. *gallica* f. *brevialata*).

5. The length of flowers is measured from the base of the calyx to the top of the keel, the beak excepted. Within the genus it ranges from 10 to 25 mm, within the species these differences are smaller, and in several species the length of flowers is a feature constant so far that allied species (*C. gracilis, C. istria*), or varieties and forms (*C. abyssinica* var. *macrophysa, C. arborescens* ssp. *gallica* f. *brevialata*), and even subsections (*Orientales, Africanae, Acutifoliae*) and sections (*Multiflora*) may be distinguished by means of it.

6. Colour of flowers. It is difficult to settle the colour (especially the difference between yellow and orange), when only herbarium specimens are available. In most cases flowers are yellow, usually with a slightly lighter spot at the base of the standard and with darker veins. A few species have, however, a remarkably different colouring, as: *C. abyssinica* — dark brown, almost black flowers; *C. orientalis, C. acutifolia* and *C.* × *media* — orange-red; *C. delavayi* f. *olivacea* — greenish yellow. In the latter species the colour of petals is not uniform, lighter in the lower part and more intense in the upper part of the keel and wings.

7. Number of flowers in inflorescence. A feature constant on the whole, but in some species differences are rather big (e.g. *C. arborescens*). The smallest number of flowers is found in species of the section *Armata*, i.e. 1—2 flowers, and the largest one in the section *Multiflora*, up to 30; most often the inflorescences are 3—5 flowered. The length of

inflorescences is usually connected with this feature; they may be either shorter than the leaves supporting them, equal to them or longer.

8. Length of calyx teeth and kind of incisions between them. As with wings the absolute length of teeth does not matter; important is its relation to the length of calyx tube. Very seldom the teeth length equals that of the tube, being usually three or more times as short as the latter is. This feature enables to discriminate *C. buhsei* from *C. paulsenii* and *C. nepalensis*. The incisions between teeth are mostly rounded, with three species excepted, *C. melanocalyx*, *C. davisiana*, and *C. gifana*, where they are acute. On this basis the above species are easily separable from others, close related to them.

9. Number of pairs of leaflets. As in the instance of feature 7 the differences are large within the genus, from 1 (*C. atabajevii*) to 12 pairs (*C. delavayi*) but in individual species, with the exception of *C. arborescens*, the limits are rather narrow. This feature served to form a new variety: *C. cilicica* var. *shaparenkoi*. The most common number of pairs of leaflets is 4—5.

10. Size and shape of leaflets. These are very variable features in a great many species, yet occasionally they help to differentiate, e.g. *C. armena* — leaflets large and almost round; *C. armata* and *C. komarovii* — leaflets very small, 3—8 mm long. The greatest variability as regards these features is met in subsection *Arborescentes* (section *Colutea*) and *Centralasiaticae* (section *Rostrata*).

11. Pubescence of leaflets. All species have leaflets covered with appressed hairs below (hairs simple) and the degree of pubescence varies. However, a few species have leaflets pubescent on both sides and then this is a very important taxonomic feature (*C. delavayi*, all species of the section *Armata*).

12. Arrangement of leaves. In the genus *Colutea* leaves are alternate, single. Yet in two subsections: *Graciles* (sect. *Colutea*) and *Centralasiaticae* (sect. *Rostrata*) the internodes are shortened so that the leaves are fascicled. This feature is best developed in *C. gracilis*.

13. Way of peeling of bark. This feature is noticeably correlated with the preceding one. In the subsections mentioned above the bark peels in a very remarkable way forming broad fibres equal in length to the length of the annual growth. After peeling the shoots are lustrous, red-brown, violet-brown or brown. In all the other species the bark peels in narrow and rather short fibres or flakes, while the shoots are opaque (exc. sect. *Armata*), mostly grey after peeling.

14. Length of fruit stipe. Here, too, the absolute length of the stipe does not matter so much as its relation to the length of the calyx. In

most species the stipe exserts out of the calyx, and may be, sometimes, over twice as long. The stipe hidden in the calyx is found only in a few species.

15. Termination of fruit top. Most species have a fruit acutely terminated, with the top gradually narrowing. In some species the legume is almost obtuse or only very shortly acute at the top: *C. armata, C. nepalensis, C. persica.* A strongly elongated, acute top, has become the basis for separation of a new variety: *C. paulsenii* var. *mesantha.*

16. Colour of calyx hairs. This feature is very variable in all species. Beside forms with black or white hairs we can find forms (most common) with hairs mixed in different ratios. We know only few species where the colour of hairs both outside the calyx teeth and inside is the same and constant (*C. melanocalyx* — hairs black, and *C. gifana* and *C. insularis* — hairs white). Besides in some species one colour of hairs may prevail, as for instance white in *C. armena, C. hybrida, C. paulsenii,* and black in *C. abyssinica, C. istria, C. atlantica.* As a rule hairs of the same colour as on the calyx are found on the pedicels and bractlets; on the rachis of the inflorescence they are nearly always white.

The colour of hairs of the calyx has been considered a very important feature, but has caused a lot of differences of opinion and led to a number of mistakes (cf. discussion on *C. arborescens* and *C. cilicica*). Therefore in all descriptions of species, in order to stress the variability of this feature, the colour of hairs, both of calyx and of other organs, is always mentioned.

All other features, as size and shape of stipules, bracts and bractlets, length of petiolules and pedicels, length of leaves, pubescence of shoots, of rachides of leaves and inflorescences, the colour of fruits, and shape, colour and size of seeds are accessory features, usually quite insignificant. They have no importance at all in the determination of species, yet I tried to take them into account in the diagnoses. I disregarded only such features as habit and height of shrubs (exceptionally given on the ground of literature), because they cannot be estimated on herbarium specimens. It seems that species from section *Colutea,* subsections *Arborescentes* and *Africanae* are distinguished from others by their richer growth. Therefore to all those that will be able to observe species of *Colutea* growing wild I wish to bring these features to mind.

Apart from morphologic features a great help in determining herbarium specimens devoid of flowers and fruits may be the knowledge of geographical distribution of species and the limits of their area. Though occasionally the areas are not very precisely assigned, as there are hardly any data, we possess sufficient information about most of them (see maps).

Colutea Linnaeus, Sp. Pl., 723 (1753)

Syn.: *Baguenaudiera Bubani*, Fl. Pyrenaea, 2: 513 (1900).

Deciduous, unarmed or, more rarely, spiny shrubs, occasionally small trees. Young shoots glabrous or variously pubescent. Shoots two years old, and older, with a fibrous and flaky bark. Winterbuds small, globose-ovoid, covered with 2—4 outer scales. Stipules small. Leaves alternate, imparipinnate, exceptionally composed of only 3 leaflets; in some species internodes of young shoots so shortened that leaves fascicled. Leaflets entire, small, opposite, sometimes subalternate, smooth or rugose and then nerves invisible, usually with appressed hairs beneath, sometimes on both sides, ovate, elliptic, obovate to roundish. Rachis sometimes hardens and remains on shoots when leaflets fall off. Flowers peduncled, 10—25 mm long, mostly yellow. Inflorescence a raceme more or less equal in length to supporting leaves. Bracts small, pubescent like pedicels. Standard roundish, obtuse or retuse at the top, turned up on the margin, with two small swellings above the claw. Wings mostly nearly linear, falcate or geniculate, obtuse or with a small spur in place of breaking, with a short claw and distinct auricles; occasionally wings shaped like keel. Keel broad, its claw longer than calyx, with two auricles

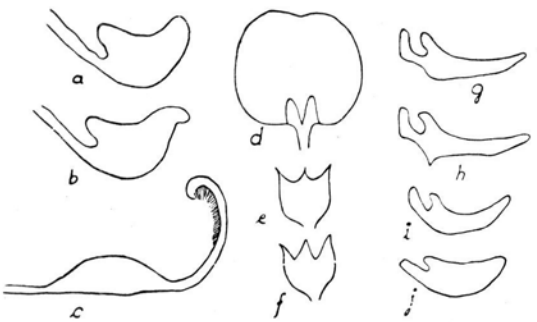

Fig. 2. Morfology of flower of *Colutea*.
a-b — two fundamental types of keel: *a* — rounded at the top; *b* — terminated with a beak; *c* — pistil with bent style pubescent inside; *d* — standard with two characteristic swellings; *e-f* — two basic types of calyx: *e* — with rounded incisions between teeth; *f* — with acute incisions; *g-j* — different types of wings: *g* — wing more or less linear, geniculate; *h* — as above, but with spur; *i* — wing falcate; *j* — wing broad similar to keel

at the base, rounded or with beak at the top. Stamens 9 united, and upper stamen free. Ovary stipitate, many-ovulate. Style incurved, bearded inside towards the top. Stigma large, placed on inside part of bent style, surrounded with hairs. Disc absent. Calyx with 5 more or less equal teeth, or with 2 upper ones slightly shorter than the lower, pubescent.

Calyx teeth shorter than, or exceptionally equal in length to the tube, tomentose inside. Legume inflated, with papery walls, on stipe, acute or acuminate at the top, indehiscent or splitting near the top only, glabrous or pubescent. Seeds kidney shaped numerous, about as long as wide, smooth, funicled (Fig. 2).

Distribution: 26 species growing in southern Europe, northwestern and eastern Africa, in western and Central Asia, — from Turkey, Israel and Egypt to China.

Type species: *Colutea arborescens* Linnaeus.

CONSPECTUS OF SUBDIVISIONS AND SPECIES

COLUTEA

Section *Colutea*

Subsection *Arborescentes*

1. *C. atlantica,* 2. *C. arborescens,* 3. *C. cilicica,* 4. *C. melanocalyx,* 5. *C. davisiana,* 6. *C. insularis,* 7. *C. armena.*

Subsection *Acutifoliae*

1. *C. acutifolia*

Subsection *Africanae*

1. *C. abyssinica*

Subsection *Graciles*

1. *C. istria,* 2. *C. gracilis,* 3. *C. persica,* 4. *C. hybrida*

Section *Multiflora*

1. *C. multiflora, C. delavayi*

Section *Rostrata*

Subsection *Orientales*

1. *C. orientalis,* 2. *C. jarmolenkoi,* 3. *C. atabajevi*

Subsection *Centralasiaticae*

1. *C. buhsei,* 2. *C. gifana,* 3. *C. afghanica,* 4. *C. paulsenii,* 5. *C. nepalensis*

Section *Armata*

1. *C. uniflora,* 2. *C. armata,* 3. *C. komarovii*

KEY TO THE SECTIONS

1. Shrubs spinescent. Flowers small, single or by twos sect. **4.** *Armata*
Shrubs unarmed. Inflorescence with a larger number of flowers **2**

2. Keel terminated in a beak sect. **3.** *Rostrata*
Keel without beak, rounded at the top **3**

3. Inflorescence 5—30 flowered. Leaves with 4—12 pairs of leaflets. Wings broad, related to keel in shape sect. **2.** *Multiflora*
Inflorescence (1)3—5(9) flowered. Leaves with (2)3—5(7) pairs of leaflets. Wings ± linear sect. **1.** *Colutea.*

SECTION 1. *COLUTEA*

Syn.: Sect. 1. *Eucolutea* Boiss., Fl. Or., 2: 194 (1872) p.max.p.

Shrubs unarmed. Leaves with 2—6 (7) pairs of leaflets. Inflorescence mostly equal to or shorter than supporting leaves, usually with 3—5 flowers. Flowers most frequently over 15 mm long. Keel rounded at the top, without beak. Wings ± linear.

Type species: *Colutea arborescens* L i n n a e u s.

KEY TO THE SPECIES OF THE SECTION *COLUTEA*

1. Ovary glabrous **2**
Ovary more or less pubescent **6**
2. Flowers yellow, wings geniculate **3**
Flowers of another colour (dark), wings without or with scarcely marked geniculate breaking **5**
3. Leaflets broadly obovate. Leaves with 2 to 3 pairs of leaflets. Calyx teeth about 5 times as short as the tube **12.** *C. persica*
Leaves with 3—7 pairs of leaflets. Leaflets mostly elliptic. Calyx teeth about three times as short as the tube **4**
4. Wings as long or shorter than keel; sometimes slightly longer, but then without spur **2.** *C. arborescens* ssp. *arborescens*
Wings longer than keel, with spur; margins usually convolute towards their apices **3.** *C. cilicica*
5. Inflorescence 3—5 flowered, flowers orange-red **8.** *C. acutifolia*
Inflorescence 1—3 flowered, flowers dark brown, occasionally almost black **9.** *C. abyssinica*
6. Incisions between calyx teeth acute **7**
Incisions between calyx teeth rounded **8**
7. Calyx teeth narrowly triangular, up to 3 mm long. Calyx and pedicels tomentose, hairs black, somewhat erect **4.** *C. melanocalyx*
Calyx teeth broadly triangular, up to 1.5 mm long. Hairs on calyx and pedicel appressed, mixed (white and black) **5.** *C. davisiana*
8. Leaves fasciculate, several or over ten. Bark on older shoots red or reddish-brown, lustrous **9**
Leaves single. Bark on older shoots grey-brown, opaque **11**
9. Leaves with 2—3 pairs of leaflets. Leaflets broadly obovate, over 10 mm long **13.** *C. hybrida*
Leaves with 3—6 pairs of leaflets. Leaflets up to 10 mm long at the most **10**

10. Flowers small, up to 16 mm long. Calyx teeth 4—5 times shorter than tube **11.** *C. gracilis*
Flowers large, 18—20 mm long. Calyx teeth up to 3 times as short as tube **10.** *C. istria*

11. Leaflets round or round-obovate **7.** *C. armena*
Leaflets elliptic, more rarely slightly obovate or ovate **12**

12. Flowers 20—25 mm long. Wings equal to keel. Fruit on short stipe only slightly exserted from calyx **6.** *C. insularis*
Flowers usually not larger than 20 mm. Wings as long or shorter than keel. Fruit on stipe 2—3 times longer than calyx **13**

13. Ovary tomentose in such a way that its walls not visible. Young shoots tomentose, their hairs still visible the second year.
Leaflets elliptic, very regular **1.** *C. atlantica*
Ovary pubescent, its walls visible. Pubescence of shoots visible only the first year. Leaflets variable, irregular: elliptic, obovate or ovate **2a.** *C. arborescens* ssp. *gallica*

Subsection 1. *Arborescentes* Browicz

Flowers mostly yellow. Wings geniculately breaking. Leaflets large, mostly elliptic or broad-elliptic. Shoots finely, short peeling, after peeling grey or grey-brown, opaque.

Type species: *Colutea arborescens* Linnaeus.

1. *Colutea atlantica* Browicz.

Syn.: *Colutea affinis* Pomel (nomen nudum), Nouv. mater. fl. atlant., 491 (1874); Battandier, Trabut, Fl. analit. synopt. Alg. Tunis, 423 (1902) pro syn. *C. arborescens* L.

Colutea arborescens auct. non L., Munby, Fl. Alger., 79 (1847); Ball, Jour. Linn. Soc. Bot. 16 (1878); Bonnet in Segonzac Voyage au Maroc (1903); Jahandiez, Mém. Soc. Scien. Nat. Maroc, 3, 1 (1923); Maire, Mém. Soc. Scien. Nat. Maroc, 7: 175 (1924); Lindberg, Itin. Mediterr., Ac. Soc. Bot. Fenn. ser. B., 1, 2 (1932); Sennen, Mauricio, Catal. Fl. Rif Orient., 36 (1933).

Colutea arborescens var. *affinis* (Pomel.) Batt., in sched.

Colutea arborescens var. *atrocalyx* Maire, Bull. Soc. Hist. Nat. Afr. Nord, 20: 21 (1929); Jahandiez, Maire, Catal. Pl. Maroc., 2: 405 (1932); Sennen, Mauricio, Catal. Fl. Rif Orient., 36 (1933); Andreánszky, Ind. Hort. Bot. Univ. Budap., 3: 50 (1933); Faure, Bull. Soc. Hist. Nat. Afr. Nord, 20, 7—9: 190 (1940); Emberger, Maire, Cat. Pl. Maroc, 4, supp. 1—3: 1045 (1941).

Colutea arborescens var. *brevidentata* Murbeck, Lund. Univ. Arsskr. NF. Avd. 2, bd. 18, 3: 63 (1922); Jahandiez, Maire, Catal. Pl. Maroc, 2: 405 (1932).

Colutea arborescens var. *parvifolia* Faure et Maire, Bull. Soc. Hist. Nat. Afr. Nord, 22, 1: 43 (1931).

Colutea mauretanica Shaparenko, in sched.

Type: Algeria. Province d'Oran, Djebel Aïssa, versant E., 1.750 m., 19.5.1901, c.fl. et fr, Hochreutiner, 340 (G.). — with photo.

Shrub. Young shoots tomentose, hairs short, greyish-white; brownish-

grey, still covered with hairs the second year. Older shoots dark grey, peeling finely. Stipules triangular-ovate, 1.5 to 2 mm long, pubescent. Leaves 3 to 6 (7), usually 3 to 5 cm long, composed of 3 to 5 (6), mostly 4, pairs of leaflets. Rachis, as well as petiolules, tomentose, hairs short, white. Leaflets very regular, elliptic, up to 15 mm long by 9 mm broad, generally smaller (10 × 7 mm), exceptionally slightly larger, slightly rugose and glabrous above, with distinctly marked lateral nerves beneath, tomentose (hairs white, closely pressed), rounded at the base or slightly cuneate, apex rounded, with a very short, scarcely visible appendage of the midrib (mucro); sometimes leaflets obovate. Petiolules to 1 mm long. Inflorescence composed of 1 to 3 (4) flowers, 3 to 5 (6) cm long, shorter than leaves supporting them or of the same length. Rachis with loose, appressed hairs; hairs usually white, some being black or brown. Pedicels 6 to 10 mm long with black or brown, occasionally mixed with a few white hairs. Bracts 1.5 to 2 mm long, ovate- lanceolate, pubescent like pedicels. Flowers 17 to 20 (22) mm long, yellow. Keel rounded at the top. Wings as long or shorter than, the keel, open at an angle of 120—130° sometimes furnished with a tiny spur in place of breaking. Ovary silverish, tomentose. Calyx campanulate, 5 to 7 mm long, tomentose, hairs brown or black occasionally mixed with white ones. Calyx teeth sharp, to 2 mm long, inside tomentose, hairs black; now and then calyx teeth very short, less than 1 mm (f. *brevidentata* (Murbeck) comb. nov.). Bractlets ovate, to 1 mm long, pubescent like calyx. Legume 5 to 6 long, 2.5 to 2.8 cm wide, distinctly pubescent, especially at the base and top, on a distinct stipe, twice or 3 times longer than the tube, probably dehiscent at the top. Seeds 4 mm long by 3 mm broad. Flowers III—VI, again in autumn and winter (Fig. 5, II a—h, Pl. I).

Distribution: North-western Africa: Morocco, Algeria (Anti Atlas, Rifain Atlas, High Atlas, Middle Atlas and Saharan Atlas); south-eastern Spain, between 500 and 2500 m a.s.l., mostly between 1000 and 1500 m. In thickets and light open pine (*Pinus halepensis*) and oak woods, as well as on rocky plains, on limestones and sandstones. Andreánszky (l.c.) mentions it in the Beni Snassen mountains from *Cistus*-macchie and R. Nègre (Trav. Inst. Scien. Chérif., ser. Bot., 13. 1959) in the region of Sidi-Ahmed-Ben Brahim from the association *Asparagineto-Lentiscetum* R. Nègre 1953. According to W. Rauh (Vegetationstudien im Hohen Atlas und dessem Vorland, 1952) *Colutea* belongs to the association: *Quercus ilex* — *Pistacia lentiscus* in the West Atlas (Reraia and Mizzane-Tal) (Fig. 3).

Specimens examined:

Morocco. Environs de Taforalt, 950 m, 16. 1931 c.fl. et fr., A. Faure, (B. G. GB.); In ditione Beni-Snassen: in dumetis prope Taforalt, 500 m, 2.5.1925 c.fl., R. Maire

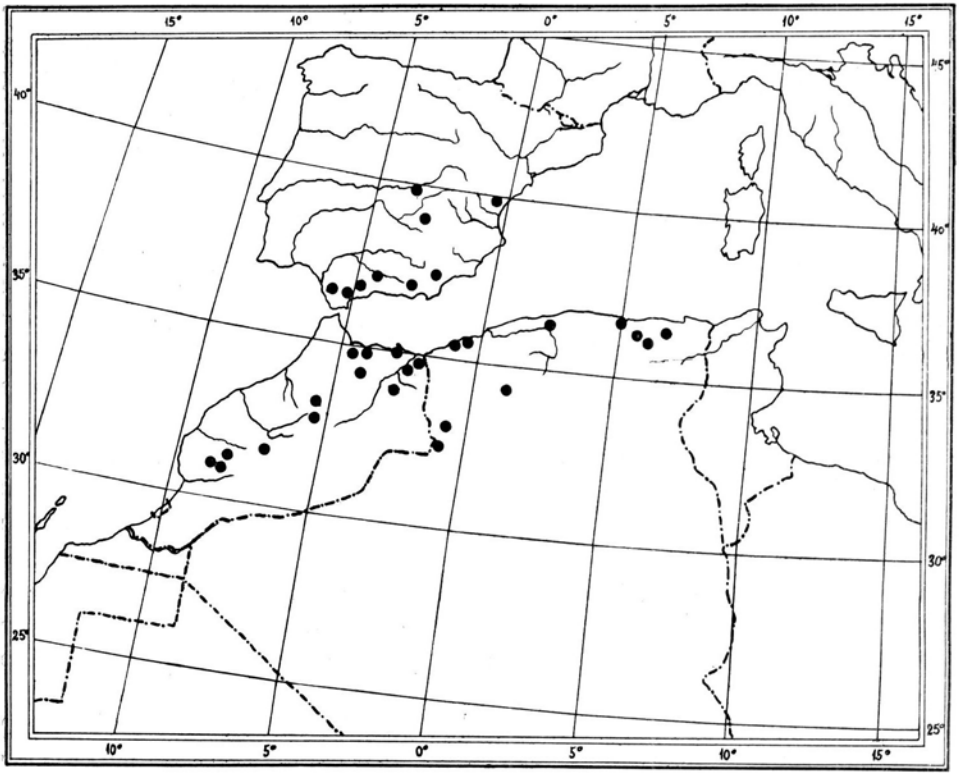

Fig. 3. Distribution of *C. atlantica* (subsect. *Arborescentes*, sect. *Colutea*).

(AL. G.); Massif des Beni-Snassen. 500—700 m, 22.4.1928 c.fl. et fr., J. Briquet, 1256 (G.); Environs de Taforalt, 950 m, 26.4.1930 c.fl., 26.5.1931 c.fr., A. Faure (E. FI. G. K. PR.); Beni-Snassen — vallee de l'oued Guedjane sous Tamzirt, 25.4.1928 c.fl. et fr., E. Wilczek, D. Dutoit, 1647 (G.); Metalza, djebel Tendri, 1.500 m, 27.5.1933 c.fr., Sennen, Mauricio, 8771 (BM. BP. G.); Reraia, 4—5.000′, 5. 1871 c.fl. et fr., Hooker (K. W.); W. Reraia, 12.5.1871 c.fr., G. Maw (LE.); Les Charfas d'Ifrane, 1.300 m., 26.5.1924 c.fr., E. Jahandiez, 449 (BM. E. G.); Tizi n'Test, 22.4.1936 c.fl., Garnett, 196 (BM. E.); In declivibus schistosis infra Targuist, 1.000 m, 1.6.1927 c.fl. et fr., Font Quer, 321 (B. BM. G.); Menezla, 4.6.1888 c.fr., Ibrahim (FI. G. LE.); Peninsula de Tres Forcas, kabila de Los Santos, 14.5.1931 c.fl., Sennen, Mauricio (BM.); Melilla, kabila de Los Santos, 3.3.1933 c.fl. et fr., Mauricio, 8770 (BM. BP. G. W.); Itzer, c.fl., R. Maire, 432 (AL.); Tagadirt N'Bourd, 1.200 m., 28.4.1931 c.fl. et fr., Jahandiez, 237 (BM. G.); Djebel Gaballate, prov. de Demnat, 10.7.1881 c.fl. et fr., Ibrahim (K.); Vallee de l'oued Ger, près le Marabout, 6.1849 c.fr., Romain (BM.W.); Fontaine Noire, 5.1849 c.fl., Romain (BM.); ex regione inferiori Atlantis Majoris, in convalle Aït Mesan, 1.200—1.400 m., 12—17.5.1871, c.fr., J. Ball (BM. FI.); O. Gueret, 4. 1903 c.fr., M. Gandoger (G.); Debdou: entre le Camp Roumens et El Bent, 800—900 m, 7.4.1928 c.fl., J. Briquet, 359 (G.); Tizi n'Test, 6.500′, 25.6.1936., c.fl., E. K. Balls, 2907 (K.); Debdou: rarius dans la garrigue au N. du Bastion Labourdette, c. 1.000 m., 7.4.1928 c.fl., Wilczek, Dutoit (K.); Taforalt, in montibus Beni Snassen, in fruticetis, ad alt. ca. 900 m, 9.5.1930 c.fl. et fr., G. Andreánszky (BP.).

Algeria: Bord des ravins avoisinant Miserghin, 19.12.1852. c.fl., B. Balansa, 378 (AL.); Miserghin, 3.1868 c.fl., Herb. Munby (LE.); Environs de Bossuet (Oran), 1.200 m., 25.5.1926 c.fl. et fr., A. Faure (AL. BM.); Environs de Bossuet (Oran), 1.200 m, 17.6.1930 c.fl. et fr., A. Faure (B. K.); Aïn-Aïssa, 22.4.1888 c.fl., E. Bonnet, P. Maury (P.); Environs de Bossuet, 1.200 m., 7.6.1927 c.fl. et fr., A. Faure (K. W.); Coteaux á Sebgague, Djebel Ameur, 31.5.1888 c.fl., Clary (AL.); Oran, 26.2.1921 c.fr., Herb. Pomel (AL.); Oued Djer, 24.3.1919 c.fl., Maire (AL.); Oued Djer, 24.3.1924 c.fl., Maire (AL.); Bords de l'oued Djer, 30.5.1861 c.fl., J. Lefebvre, 199 (BM. W.); Prov. de Constantine, bois entre la Mechta Berbega et le Hammam El Beid, 30.4.1888 c.fl., E. Cosson, Cl. Duval (P.); Djebel Tougour près Batna, proxime Constatntine, 25.6.1853, c.fr., B. Balansa (FI. LE. W.); Montagne des Bhirah, près Médeah, 9.5.1872 c.fl., Chabert (FI.); Oran, 2.1848 c.fl., Munby (FI.); Algerian Herbarium, 1855 c.fl. Munby (K.); Algerian Herbarium, 1854 c.fr., Munby (K.); Bou Taleb et Madids, 6.1873 c.fl. et fr., Olivier, Reboud, 944 (FI.).

Spain: Sierra Nevada, dans la région chaude, au dessus du Cortijo de la Vibora, 28.6.1852, c.fl. et fr., E. Bourgeau, 1125 (CGE. E. FI. G. LE.); Blanco, prov. de Jean, 1849, c.fl., Crujala, 65 (E. FI. G. WRL.); Serrania de Ronda, 1849 c.fl., Boissier, Reuter (LE. W.); Grazalema, 18.5. and 15.6.1890 c.fl. et fr., E. Reverchon (E. G.); Grazalema, 20.5 and 10.7.1890 c.fl. et fr., E. Reverchon (G. PRC.); Andalousie: Ronda, 6.8.1899 c.fr., E. Reverchon (G. WU.); Prov. d'Almeria, Velez-Rubio, 500 m, 5. 1899 c.fl., E. Reverchon (P. WU.); In montibus prope Alcala, c.fl. et fr., Herb. Castellanum (CGE.); Nevada, 16.6.1873 c.fl. et fr., M. Winkler (WRL.); Nevada, 14.6.1873 c.fl. et fr., R. Fritze (WRL.); Prov. de Valence, Segorbe, 350 m, 6.1891 c.fl. et fr., E. Reverchon (G.); Segorbe, 5. 1910 c.fl., G. Pau (G. GB.); Alhambra, 6. 1846 c.fr., Willkomm, 48 (PRC. W.); Cerro de Guttaron, près Aranjuez, 10.6.1854 c.fl. et fr., E. Bourgeau, 2159 (C. CGE. E. FI. K. LE. PRC. RUEB. W.).

Discussion: C. K. Schneider (Ill. Hand. Laubh. 2.87.1907) paid attention to the peculiarity of the North African and Spanish specimens of *Colutea*, but he did not separate them into a new species for lack of sufficient herbarium material. Still earlier, in 1874, A. Pomel (l.c.) mentioned that in his herbarium he had created a new species from Africa naming it *C. affinis*, but he did not give its diagnosis. In 1922 S. Murbeck described a new variety *C. arborescens* var. *brevidentata* from Morocco. It has been found, after examining a great number of herbarium specimens from Africa, that the length of calyx teeth varies, often, in the same individual; besides short teeth appear both in the type species *(C. atlantica)* and in its variety "var. *longeracemosa*" (Maire, Djebel Beni-Smir). Therefore the rank "form" seems to be more proper in this case (f. *brevidentata* (Murbeck) *comb. nov.*).

Two varieties: *C. arborescens* var. *atrocalyx* and *C. arborescens* var. *parvifolia* — the authors when describing them do not mention the pubescence of the ovary — can be easily placed among the *C. atlantica*, and the separation into distinct varieties seems hardly justified, because the size both of flowers and leaflets varies greatly and is likely dependent on the conditions of environment. When choosing the name of the new species the variety name of Maire "*atrocalyx*" has been omitted

because of its similarity to the name "*Colutea melanocalyx*"; determination of species and varieties based on the colour of the calyx hairs has only led to misunderstandings in the taxonomy of the genus *Colutea*.

Spanish specimens of *C. atlantica* differ from North African ones in less pubescent shoots, leaflets beneath, and ripe fruits; tomentose ovary, however, being very characteristic. An insufficient number of herbarium specimens from Spain does not allow to state how far the areas of *C. atlantica* and *C. arborescens* ssp. *gallica* cover each other; it seems likely that the two species are here represented by a number of transitional forms (e.g. Cerro de Guttaron, Bourgeau; Alhambra, Willkomm). Further investigations will be necessary.

On the basis of accsessible herbarium material I have stated that *C. arborescens* (or its subspecies), though mentioned many a time as occurring in North Africa, is not met in this region at all — it stands for *C. atlantica*. All data in literature attributed to *Colutea* from Morocco and Algeria, refer, without doubt, to the latter species.

1a. *Colutea atlantica* var. *longeracemosa* (S e n n e n) combinatio nova.

Syn.: *C. arborescens* var. *longeracemosa* Sennen, Sennen et Mauricio, Catal. Fl. Rif Orient., 36 (1933); Emberger et Maire, Catal. Pl. Maroc., 4, supp. 1—3: 1045 (1941).

T y p e : Morocco: Atlas Rifain: Targuist, à Bab-Izufar, 1.250 m, 20.6.1933 c.fl. et fr., Sennen, Mauricio, 8769 (BM. BP. G.).

It differs from the typical species in longer inflorescence (to 10 cm), as long or longer than, the supporting leaves. Flowers 3 to 9. Leaves 7 to 11 cm long with 4 to 6 pairs of leaflets. Leaflets to 22 mm long by 13 mm broad. The current season's shoots, and the leaflets on the lower surface, are less pubescent.

D i s t r i b u t i o n : Algeria, northern Morocco.

S p e c i m e n s e x a m i n e d :

A l g e r i a. Djebel Beni-Smir, Dar Mohammed-on-Ali, 1.600—1.700 m, 2.6.1918 c.fl., Maire (AL.); près Constantine: Dj. Ouach, 5.1889 c.fl. et fr., Giroud (G.); George de Kerrata, Dep. de Constantine, 29.4.1933, Dubuis (AL.); Mauritania (dispersa) c.fl., Font Quer, Herb. Gavioli, 13081 (FI.).

D i s c u s s i o n : A very characteristic variety deserving, perhaps, to be separated into a distinct species, but for lack of a sufficient herbarium material is not. It probably occurs also in Spain, as shown by a specimen in a Cambridge herbarium (collect. Jos. Pavon), but it has not been localized.

2. *Colutea arborescens* L i n n a e u s ssp. *arborescens*.

Syn. *Colutea rubra* Medicus, Bot. Beaobacht., 359 (1783)?
Sp. Pl., 723 (1753); auct. mult. Fl. Europ.

Colutea hirsuta Roth, Tent. Fl. Gernm., 1: 305 (1788).

Colutea florida Salisbury, Prodr. Stirp., 337 (1796).

Colutea crocea hort., ex Petzold et Kirchner, Arb. Muscav., 381 (1864).

Colutea aurantiaca hort., Handl. Trees Shrubs Kew, 1: 121 (1894).

Colutea melanocalyx auct. non Boiss. et Heldr., Velenovsky, Fl. Bulgar., 86 (1898); Halácsy, Consp. Fl. Graec., 1: 426 (1901); Hayek, Prodr. Fl. Pen. Balc., 1: 771 (1927); Nyárády, Fl. Rep. Pop. Romine, 5: 251 (1957).

Baguenaudiera arborea Bubani, Fl. Pyrenaea, 2: 513 (1900).

Colutea arborescens A. *euarborescens* Ascherson et Graebner, Syn.: Mitteleur. Fl., 6, 2: 730 (1908).

Colutea arborescens B. *cilicica* Ascherson et Graebner, Syn.: Mitteleur. Fl., 6, 2: 731 (1908) p.p.; Degen, Fl. Veleb., 2: 346 (1937) "var".

Colutea arborea Rydberg, N. Am. Fl., 24: 250 (1924), sphalm.

Colutea arborescens var. *melanotricha* sensu Bornmüller non Freyn et Sint., Fedde Rep., 25: 199 (1928).

Colutea arborescens var. *melanocalyx* (Boiss.) Stoj. et Steff., Fl. Byłg., 678 (1948).

Type. Herbarium of Linnaeus (LINN., n.v.).

A copiously branched shrub up to 3—5 m, according to A. Gismondi (Prospetto della flora Ligustica, 494, 1950) even to 6 m high. Young shoots puberulous, glabrescent, later occasionally glabrate. Two year old shoots with bark grey-brown, peeling. Older shoots grey-brown or dark-brown. Stipules ovate or ovate-lanceolate, about 3 mm long, with single white hairs, especially on the margin. Leaves 5—13 (15) cm long, with 3—6 (7) pairs of leaflets, mostly 4—5 pairs. Rachis with single appressed hairs. Leaflets broadly elliptic, more rarely obovate or ovate, up to 30 (40) mm long by 20 (25) mm broad, rounded or retuse at apex, with a short, acute appendage of midrib, glabrous, with a well seen venation above, of a brighter hue, with appressed, loose hairs, glabrescent below. Inflorescence 3—8 flowered (mostly 5), up to 10 (12) cm long, shorter than, supporting leaves, or equal to them. Rachis puberulous, hairs white at first, later gradually glabrescent and glabrate. Pedicels 5—15 mm long, with white, black or mixed hairs according to the colour of hairs on calyx. Bracts ovate or ovate-lanceolate, 2—3 mm long, with similar hairs to pedicels. Flowers (16) 17—19 (20) mm long, yellow. Standard with reddish veins. Wings flat, acute or obtuse on the top, usually without spur, as long or shorter than keel, rarely slightly longer, but then always without spur, spreading at an angle about 130—150°; a spur occurs mostly in wings broken at a smaller angle. Ovary quite glabrous or very slightly pubescent, at the most, and exclusively along the ventral suture. Calyx campanulate or broadly campanulate, 6—7 (8) mm long, short pubescent; hairs white, black or brown, mostly mixed. Calyx teeth 3 or more times as short as tube, acute, mostly broadly-triangular, usually with dark hairs inside; white hairs inside occur only (not always) in specimens with calyx covered exclusively with white hairs outside. Bractlets lanceolate, 1—1.5 mm long, similarly pubescent as calyx. Fruits 5—7 (8) cm

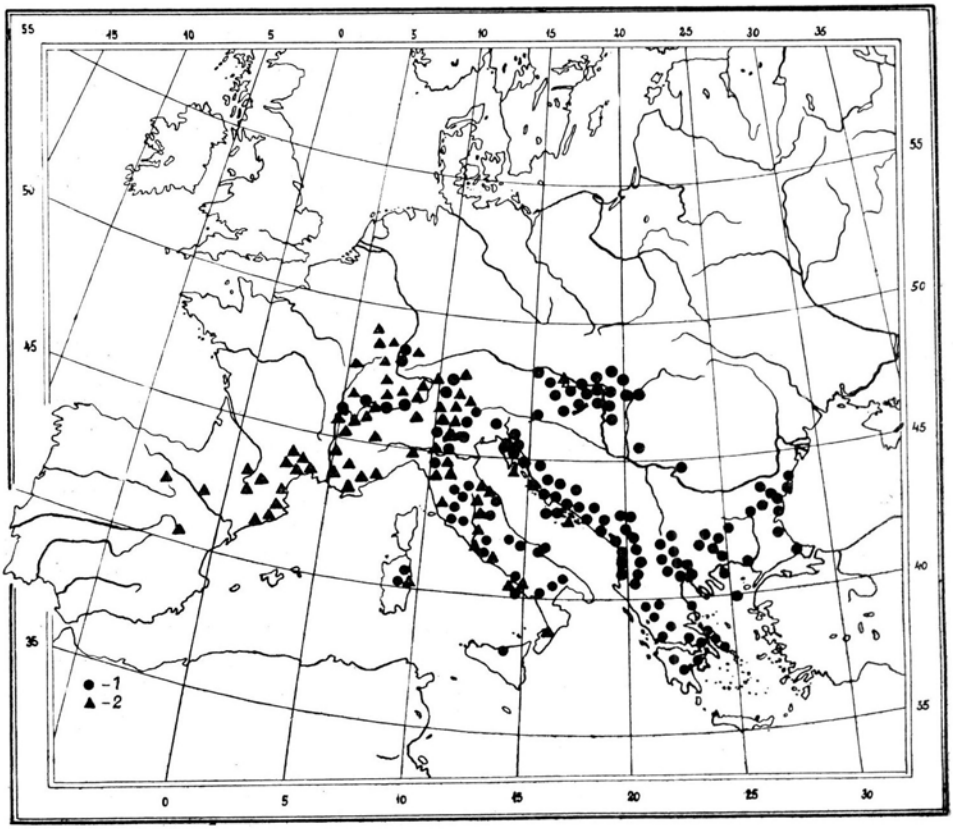

Fig. 4. Distribution of *C. arborescens* ssp. *arborescens* (*1*) and: *C. arborescens* ssp. *gallica* (2) (subsect. *Arborescentes*, sect. *Colutea*).

long up to 3 cm wide, acute at the top, on a stipe up to twice as long as calyx, glabrous, brown-yellow or dirty yellow, indehiscent. Seeds up to 4 mm long by 3.5 mm broad. Flowers V—IX (Fig. 5, IV a—l).

Distribution: Southern Europe, from Spain to Turkey. At the northern limit of the area, probably in many places only semi-wild. It grows in open, deciduous or pine woods, and in brushwood communities, in dry, warm places, especially on lime, from sea-coasts to more than 1.000 m a.s.l., mostly only to 900 m. The highest localities are recorded by: J. Braun-Blanquet and E. Rübel (Fl. der Graubünden, 1934) from Münstertal — 1.250 m a.s.l., and O. Gavioli (Nuovo. Gior. Bot. Ital., 41. 1934) from monte S. Bernardo — 1.320 m. According to G. Bonnier (Fl. Comp. France. Suisse, Belgique, 3. 1914) *C. arborescens* grows in higher localities, up to 1.500 m a.s.l., and according to G. Hegi (Ill. Fl. v. Mittel-Eur., 4,3) even up to about 1.600 m (Tyrol).

In Yugoslavia (acc. to F. Fukarek's information) it occurs mainly in associations from the alliance *Orneto-Ostryon* Tomasić and *Quercion ilicis* Br.-Bl. J. Braun-Blanquet (Les Groupements Végétaux de la France Méditerranéenne, 1951) takes it as a species characteristic for the association *Querceto-Buxetum* Br.-Bl. from the alliance *Quercion pubescenti-sessiliflorae* Br.-Bl., while S. R. Goday (Ann. Inst. Bot. Cavanilles, 13. 1954) as a species characteristic for the association *Quercus lusitanica-Acer monspessulanum-granatense* R. Goday (a lime variant). In Switzerland *C. arborescens* grows in open, bushy woods of *Quercus sessiliflora* (Braun-Blanquet, Rübel, l.c.), and in Hungary in thickets composed of: *Quercus lanuginosa, Fraxinus ornus, Acer tataricum, A. campestre, Cornus mas, Sorbus torminalis* and others (Z. Karpatí, Index Hort. Bot. Univ. Bud., 1. 1932).

In literature it is very often recorded that *C. arborescens* occurs not only in Europe, but also in North-Western Africa, Asia Minor and Western Asia (e.g. G. Hegi, Ill. Fl. v. Mittel.-Eur., 4,3; Post, Fl. Syr. Palest. Sinai, 1896); Bouloumoy, Fl. Lib., 1930; Krause, Ankarian Fl., 1934; Thiébaut, Fl. Lib.-Syr., 1940; Parsa, Fl. Iran, 1948; Rechinger, Symb. Bot. Ups., 11. 1952, and others). All these data refer, without doubt, to other species, above all, to *C. cilicica*. I have not seen any herbarium specimen that would confirm these data (Fig. 4).

Specimens examined:

France. Villevert en face de Neuville (Rhone), le long de la route de St. Germain au Mt. d'Or, 26.8.1918 c.fl., Saint-Lager (G. LE.); Florimont, au-dessus de Gex, au bord de la route de la Faucille, 15.6.1934 c.fl., Becherer (G.);

Germany. Kaiserstuhl, 8. 1887 c.fl. et fr., Lörh (JE.); Bodensee: Insel Reichenau, 16.7.1925 c.fl., O. Fiedler (WU.); Kaiserstuhl, 6. 1883 c.fl., A. Thumb, (JE.); Sponeck b. Kaiserstuhl, b. Freiburg Baden, 8. 1920 c.fr., A. Meebold (K.);

Switzerland. Sierre, Valais, 25.7.1897 c.fl. et fr., Linton (CGE.); Rochers au bord du lac de Neuchatel, près de Gerrieres, 18. 5. c.fl., 21.7.1870 c.fr., Lerch (W.); Sierre, 21.7.1924 c.fr., Gregor (K.); Aigle-Vaud, c.fl. et fr., herb. Cavin (G.); In collibus apricis valleseae helvet., Sion, c.fl., herb. Daenen (G.); près Sierre, 3.9.1895 c.fl., Kohler (G.); Castione (Tessin), 4.9.1945 c.fl., Thommen (G.); links der Strasse Sierre-Chippis, 4.9.1946 c.fr., Kilcher (G.); Sierre, ébouils de glacier vers Chippis, 2.9.1911 c.fr., herb. Rohrer (G.); environs de Sierre, 19.7.1900 c.fl. et fr., Beauverd (G.); Sous Corin (chemin de Sierre à'Lens) 700 m., 30.9.1901 c.fl. et fr., Beauverd (G.); à Aigle, 460 m, 9 et 30.6.1914 c.fl. et fr., Jaccard (RUEB.); Sion, 5. 1872 c.fl. et fr., E. O. Wolf (BP.); Rohan Schanze, Malans, 525 m, 9. 1910 c.fl. et fr., Thomas (BP.);

Italy. Monte Spaccato bei Triest, c.fl. et fr., Solla (WU.); Corso teregestin: in tractu montium "Spaccato" super vallem Cologna, 22.10.1904 c.fr., Evers, 489 (WU.); Aemilia-Bolonia, in silvis collium prope pagum Barbianello, 260, 22. 5 c.fl., 10.6.1904 c.fr., Fiori, 106 (BP. E. FI.RO.RUEB. WU.); Bozen, auf der Anschemmung am Aisackdamm, 10.7.1896 c.fl. et fr., V. et R. Schulz (WU.); Waidbruck: Felshänge am Weg gegen Kastelruth unterhalb des Tunnels, 26.7.1907 c.fl. et fr., Beger (WU.);

Nemi, c.fl., Bornemann (PR.); in declivibus montis Spaccato super Guardiella, 26.6.1902 c.fl. et fr., Evers (GZU. WU.); près Florence, c.fl., Van Heurck (P. WRL.); Puglie, nei presti di Vico, 1893 c.fl., Martelli (FI.); Vesuvie, 17.8.1891 c.fl. et fr., Martelli (FI.); Capri, Mt. Solaro, 21.8.1891 c.fr., Martelli (FI.); Gargano, peno Vieste, 26.7.1902 c.fr., Bégnier (FI.); in monte Vesuvio, prope Observatorium, 17.8.1891 c.fl., Sommier (FI.); Monte Alburno, 16.8.1936 c.fl., Philippis (FI.); Difesa di Sagliano (?) c.fr., Groves (FI.); San Demetro, ad merid. urbis Aquila, 14.7.1882 c.fr., Levier (FI. GZU.); Vulcani Laziale, 20.5.1902 c.fl., Vaccari (FI.); bosco sul lago di Castel-Gandolfo, 1882 c.fl., Tanfani (FI.); Perrugia, 1.6.1898 c.fr., Palomba (FI.); Rep. S. Marino, 22.6.1939 c.fl., Bettini (FI.); Avellana, 23.8.1947 c.fr., Bettini (FI.); Oratovecchio, 1864 c.fr., Parlatore (FI.); lungo l'Arno alle Cascine di Firenze, 5. 1903 c.fl., A. Fiori (FI.); Montebonelli sul Serchio c.fl., Fantozzi (FI.); alta valle Tiberina, 10.6.1937 c.fl. et fr., Pichi-Sermolli (FI.); Camaldoli, 990 m, 1915 c.fl. et fr., Venerosi-Pesciolini (FI.); Rep. di S. Marino, Penarotta, 1912 c.fr., Pampanini (FI.); Prov. di Forli, predappio Nuova a M. Velbe, 450 m. 1933 c.fl. et fr., Fiori (FI.); Trieste: Monte Spaccato, 8. 1877 c.fl. et fr., Marchesetti (FI.): in nemoribus prope Pigozzo, 8. 1888 c.fr., Gorian (FI.); Lombardia: ad rupes Burmis prox. 1230 m., 6. 1893 c.fl. et fr., Longa (FI.); Coll. del Mantovano, 1842 c.fl., Barberi (FI.); Roma: Varco Sabino, c.fl. 5.6.1901, Pappi (FI.); Monte Morio, c.fl. et fr., Sanguinetti (RO.); Macchio Palazzuolo, 11.6.1878 c.fr., Cuboni (RO.); Bosco delle Carceri (Umbria) 1886 c.f. et fr.? (RO.); Ischia, near Naples, 1855 c.fl. et fr., Wolf (K.); Haies de Dorgali, Sardigne c.fl. et fr., Bojean (G.); Sardinia, 1850 c.fl., Morris (FI. G.); Parma c.fl. et fr., Reichenbach (W.); Verona, c.fl. et fr., I. Niepl, 929 (W.); Rocca di Montefalcone c.fl. et fr., herb. Wulfen (W.); Tramin, im Walde unter Graun, c.fl., Morundell (W.); Albano bei Rom, 1867 c.fl., Alioth, 258 (G.); Monte Maggiore, Abhänge der Veli Goliu, ca. 100 m., 17.9.1908 c.fr., Ginzberger (W.); ex Monte S. Angeli, prope Neapolim, 6. 1841 c.fl., J. Ball (E.); ad radices Monti Vesuvii, 5. 1842, J. Ball (E.); Triest: Rossandrathal bei Draga, ca. 180 m., 7. 1899 c.fl. et fr., C. Steurer (E.); Triest c.fl. et fr., Rehman (KRA.); Abruzzen, c.fl., Rabenhorst, 325 (KRA); Trento, 7.6.1899 c.fl. et fr., J. Bubela (PRC.); Sicilia, Palermo, 1926 c.fl., K. Ptacovsky (SLO.); Luconia-Potenza, 900 m., 21.6.1922 c.fr., Gavioli (FI.); Abruzzo, Ajelle, 30.5.1903 c.fl., Vaccari (FI.); Titignano, 26—28.7.1910 c.fr., Sommier (FI.); M. Falterone — valle di San Godenzo (Toscana), 500 m., 1952 c.fr., Forasassi (FI.); prope Florentiam Lungo l'Arno fuori la Barriera di San Nicolo, 21.5.1897 c.fl., ? (FI.); "Cascine" de Florence, bois, 29.5.1871 c.fl. et fr., Sommier (FI.); Serchio Valley below Borgo, 27.6.1873 c.fl. et fr., Duthie (FI.); Cascine pr. Florence, au bord de l'Arno, 14.5.1869 c.fl., Levier (FI. GZU.); In collibus prope Drecimo Valdi Serchio, 1873 c.fl. et fr., Duthie (FI.); Valle Tiberina, 1875 c.fl. et fr. ? (FI.); presso Marignolle (Toscana) 28.7.1897 c.fl., herb. Baroni (FI.); Emilia, Forli, in sylvis, 11.6.1877 c.fl. et fr., Sommier (FI.); S. Marino, M. Carlo, 1913 c.fl. et fr., Pampanini (FI.); S. Marino, M. Cerreto, 1912 c.fr., Pampanini (FI.); S. Marino, Borgo l.d. Ornella, 1912 c.fl. et fr., Pampanini (FI.); S. Marino, S. Mustiola, 7.9.1920, Pampanini (FI.); Istria, Lungo la stada Capodistria a Isola, 8. 1871, c.fr., Marchesetti (FI.);

Austria. Burgeland: Jungerberg, 25.5.1924 c.fl., Rechinger (GB.); Kalksburg bei Wien, 11.6.1874 c.fl. et fr., Wagner (BP.); Eichkogel bei Mödling, 6.1908 c.fl., J. Nevole (GZU.); bei Gumpoldskirchen, 300 m., 21.2.1902 c.fl. et fr., Preissmann (W.); bei Gumpoldskirchen, 22.6.1902 c.fl. et fr., Hayek (GB.); Graz, Schlossberg, 26.6.1947 c.fl. et fr., Hamburger, 909 (GZU.); bei Gumpoldskirchen, 3.6.1918 c.fl., R. Korb (W.); Steinige, buschige Abhänge bei Dürnstein a.D., 9.9.1919 c.fr., H. Zerny (W.); Buschige Orte bei Rodaun, 6.6.1908 c.fl., H. Zerny (W.); nächst dem Neuhof bei Untersieben-

brunn, 22.6.1919 c.fl., Korb (W.); in einem alten Steinbruch bei Rodaun, 19.9.1919 c.fl. et fr., Korb (W.); Voralberg: Montikel der Bludenz, 10.8.1910 c.fl., Handel-Mazzetti (W.); Briel bei Wien, In montibus calcareis, c.fl. et fr., Kováts (BP.); in decliv. austr. orient. montium Anninger versus pagum Pfaffstätten ab urbe Vindobona, 6.1957 c.fl., Patzak (FI.); Kalenderberg bei Mödling, 6.7.1879 c.fl., Beck (PRC.); Leitha gebirge, 8.6.1879 c.fl. Beck (PRC.);

Yugoslavia. in fruticetis ad pp. Blace et Kožlje, 12.5.1926 c.fl. et fr., Kosanin et Cernjavski (K.); prope Hrunica ad flumen, 12.4.1910 c.fl., K. Maly (K.); Dečanska George, Priklatyje, 6.7.1956, 3.000', c.fl., Guymer, 429 (K.); Distr. Hoti: Ackerrande bei Kolcekaj, 6.5.1914 c.fl., Dörfler, 82 (GB. W. WU.); In silvis montis Nanos ad viam inter Wippach et sacellum S. Nicolai, 350 m., c.fl. et fr., Mulley, 317 (BP. GB. GZU. W. WU.); Galičan bei Prilep, 30.7.1923 c.fl., Vandas (BP.); Goleš, Šachdani, 900 m., 18.9.1954 c.fr., Nitzelius (GB.); Percovic Station, Dalmatia, 16.5.1905 c.fl. et fr. ? (E.); Insula Lesina, 1844—45 c.fl. et fr. ? (W.); Dalmatia, Salona, c.fl., herb. Pittoni (W.); zwischen Gesträuchen und in Wäldchen bei Buccari, 25.5.1883 c.fl., herb. Preissmann (W.); Mostar, in mont. calc., 4.6.1886 c.fl., J. Bornmüller (W.); Ragusa, c.fr., Adamović (PRC. W.); in submontanis ad Ivanjica, 7.1907 c.fl. et fr., Adamović (W.); nicht sonst um Baška nova, Insel Krk (Veglia), 18.6.1914 c.fl. et fr., Wołoszczak (W.); Pirot, 6.1892 c.fl., G. Jovanović (W.); in dumetis pagi Medun, 24.7.1866 c.fl. et fr., Szyszyłowicz (KRA. W.); Cattaro, 7.5.1905 c.fl., herb. Schneider (W.); Abhänge des Monte Ossero, auf Lussina, 21.5.1887 c.fl., herb. Fritsch (GZU.); Spalato, ad sepes circa Castelvecchio, 4.6.1901 c.fl. et fr., Krebs (GZU.); Istrien, Hecken bei Lupoglava, 22.5.1899 c.fl., Untsch (GZU.); ad oppidum Bakar, ca. 60 m., 18.5.1933 c.fl., Dolsak, 5001 (PR.); in vale rivi Doljanka prope Neretvam ad pagum Jablonica, 250—300 m., 14.7.1933 c.fr., Sillinger, Deyl (PR. PRC.); in decl. dumosis ca. Peč, 600 m., 8.1914, Vandas (PR.); Glogovo pl., 7.1899 c.fr., Vandas (PR.); Cattaro, 7. 1897 c.fl., Sagorski (JE.); Fiume, 1869 c.fr. ? (WU.); Drežnicathal nördl. v. Mostar, ca. 600 m., 1890 c.fl., Simonovič (WU.); Insel Lissa, Umgebung von Comisa, 3.5.1911 c.fl., Ginzberger, Teyher (WU.); Üsküb ad margines vinetorum pr. Gornja-Voda, 12.7.1890 c.fl. et fr., Dörfler (WU.); Split: Sonnige Südhänge am Marjan, 4.5.1937 c.fl., Fiedler (B.); Toca: Sutjeska Schlucht, 23.7.1904 c.fl., Lehmann (B.); Galicitza, 7.1908 c.fl. et fr., Dimonie (W. WU.); Treska Gorge, 500 m., 8.6.1935 c.fl., Thompson, 544 (K.); Ivan planina, 19.9.1868 c.fl. et fr., Blau, 92 (K.); ad Njegusi, 7. 1901 c.fr., Rohlena (PR. PRC.); Dalmatia: Rogosnica, 24.5.1887 c.fl., ? (GZU.); circa Cviat, 7.1897 c.fl., Adamović (W.); Insel Ceskoica bei Stragi piccolo, c.fl., ? (W.); Sansego, 1879 c.fl., Marchesetti (FI.); Istria, Fianona, 1906, Marchesetti (FI.); Is. Lissa, 1877 c.fr., Marchesetti (FI.); Solona, 5. 1878 c.fl. et fr., Letourneux (P.); Ins. Lesina, 6. 1884 c.fl. et fr., Baylon (W.); Salona près Spalato, 3.5.1869 c.fl., Marteni (G.); Biograd (Zaravecchia), pr. pag. Vrana, 19.5.1928 c.fl., Cufodontis, 126 (W.); Jankov vrch, 1908 c.fl., Zahlbruckner (W.); Cattaro: Vermac, 7.1902 c.fr., Vierhapper (W.); Östlicher Scoglio Stupa, südlich von Orebić (Halbinsel Peljesac) 17.5.1930 c.fl., Ginzberger (W.); In dumetis ad Krstac, 7.1905 c.fl. et fr., Adamović (BP. LE.); presso Lukovo tra Dibra e Struga, 700 m., 1941 c.fl. et fr., Sermolli, 614 (FI.); Istria, Isola, 24.9.1913 c.fr., Żmuda, 397 (KRA.); ad pedem montis Ruma, proc. vic. Vel. Mikulici, 1.000 m., 15.7.1930 c.fr., Dostal, 2081 (PRC); in vicinitate pag. Borkovica, ad ripam fl. Pura, 1905 c.fl., Rohlena (PRC.); bei Konjica, 26.7.1888 c.fl. et fr., Beck (PRC.); abhänge der Prenj-Bjelasnica, 26.7.1888 c.fl., Beck (PRC.); in montibus Kapela ad pagum Mordus, 27.7.1890 c.fl., herb. Rossi (PRC.); Abhänge bei Obcina nächst Triest, 16.6.1886 c.fl., Beck (PRC.); non procul ab Castelnuovo, 5.5.1910 c.fl., Celakovsky (PRC.); bei Vir, 21.5.1894 c.fl. et fr., Beck

(PRC.); in declivibus saxosis, supra Malo polje, 7.1922, Domin, 535 (PRC.); Omiš, ad ripam fluminis Cetina, 3.8.1913 c.fl., Celakovsky (PRC.); in saxosis calcareis montis Kosa, supra angustis Sutorman, 1.000 m., 8.7.1930, Dostal, 2083 (PRC.); ad vic. Limljani, procul op. Virpazar, 430 m., 6.7.1930 c.fl., Dostal, 2082 (PRC.); Heisse felsen an Doljankathales, 21.7.1889 c.fl., ? (PRC.); non procul Ercog Novi, 5.5.1910 c.fl., Celakovsky (PRC.); Užice, 11.6.1929 c.fl., Paczoski (POZ.); Mostar, 11.7.1929 c.fr., Paczoski (POZ.); Bosonska Jagodina prope pag. Visegrad, 8.8.1929, Paczoski (POZ.); Rakitnice inter pag. Lukomir et Krnjic, ca. 1.350 m., 22.7.1934 c. u dole Saviny u Ercog Novi, 5.5.1910 c.fl., Celakovsky (PRC.); Užice, 11.6.1929 c.fl., Paczoski (POZ.); Mostar, 11.7.1929 c.fr., Paczoski (POZ.); Bosonska Jagodina koło Visegradu, 8.8.1929, Paczoski (POZ.); U gudurama Rakitnice kod Lukomira — prez Krnjic, ca. 1.350 m., 22.7.1934 c.fl. et fr., Ritter (SARA.); Strmica ad Lim, 12.4.1910 c.fl. et fr., Maly (SARA.); Bijelo pole bei Mostar, 24.5.1908 c.fl., Maly (SARA.); Karstheide bei Han Osman, 7.7.1907 c.fl. et fr., Maly (SARA.); Rama-Schlucht, Bez. Prozor, 17.7.1910, Maly, (SARA.); nächst Pribilje am Abhang der Visocica pl., 7.8.1908 c.fr., Maly (SAR.); in faucibus Narontis prope Grabovica, 7.8.1908 c.fl. et fr., Maly (SARA.); Plasa pl., untere Wald. region, 23.7.1889, c.fl., Fiala (SARA.); in fauce Neretva prope Drežnica, 26.10.1907 c.fl., Maly (SARA.); am "Grad" in Lubuski, 7.6.1890 c.fl., Fiala (PRC. SARA.); sub m. Retinje prope Godjeno (distr. Foča), 480 m., 5.7.1937, Maly (SARA.); fauce Prača prope Ustiprača, 30.8.1911 c.fl. et fr., Maly (SARA.); Tovarnica pl., Warthaus Rama, 21.7.1889 c.fl., Fiala (SARA.); Travnik, 6.1886 c.fl. et fr., ? (SARA.); in declivibus m. Gradac prope Mihanići, 27.5.1928 c.fl., Maly (SARA.); Mt. St. Sergio b. Gravosa, 18.6.1907 c.fl. et fr., Reiser (SARA.); in dumetis ad Dibra, 6.1908 c.fl. Dimonie (SARA.); in dumetis ad Ochrida, 6.1908 c.fl. et. fr., Dimonie (SARA.); Torcola bei Lesina, 19.6.1909, c.fr., Bmalović (SARA.); Prokuplje, c.fl. et fr., Ilić (SARA.); Sutorman-Pap, 22.6.1895 c.fl. et fr., Reiser (SARA.); Slana voda bei Ušküb, 10.6.1906 c.fl. et fr., ? (SARA.); Serpentinen bei Cattaro, 4.10.1909 c.fl. et fr., Maly (SARA);

Albania. Ad sepes terr. Vraka, distr. Scutari, 20.6.1897 c.fl. et fr., Baldacci, 269 (G. LE. WU.); Elbasan, 1917 c.fl. et fr., V. Stöhr (PR.); Isola tra il padule di Alessio ed il mare, 24.4.1941 c.fl., Pichi-Sermolli (FI.); versus opp. Djakora extensis: Montes Hekurave ad pag. Margegaj, 450 m., 29.8.1918 c.fl., Jávorka (BP.); inter opp. Prizren et Debra jacentis, 400—600 m., 1.7.1918 c.fl. et fr., J. B. Kümmerle (BP.); in declivibus meridionalibus montium Dajti prope Tirana, 200—300 m., 2.7.1934 c.fl., Hruby, Jirásek, Martiniec (PRC.);

Czechoslovakia. Kovačovske Kopce, 16.6.1956 c.fl., Futak (SLO.), 22.5.1953 c.fl., Futak (SLO.); Kovačov-Helemba, 3.7.1930, Domin (PRC.); Filakovo, 500 m., 9.5.1933 c.fl., Domin, Sillinger (PRC.); Kopce mezi Slovenskyi Darmoty a Shlabinou, 11.5.1933 c.fl., Domin, Sillinger (PRC.); Sturovo, Darmotskie kopce, 15.6.1955 c.fl., A. Scepka (SLO.); Kohitscher Sauerbrunn, 6.1875, A. Sztechloy (BP.);

Hungary. Adlerberg bei Ofen, 17.7.1881 c.fl. et fr., W. Steinitz (GB. PR. WU.); in nemorosis prope Budam, 5—7. 1872 c.fl., Richter, 247 (BP. FI. G. JE. P. PRC. SARA. W. WRL. WU.); in declivibus montis Gellérthegy, 200 m., 5.6.1913 c.fl., 244, Timkó (BP. C. E. FI. G. GB. GZU. LE. PR. PRC. SARA. W.); in nemorosis circa Pesthinum, c.fl., P. de Loriol (G.); insula danubialis Csepel, declivibus arenosis prope pag. Tököl, 6.1870 c.fl. et fr., Tauscher (BP. G. PRC.); in apricis prope Budam, c.fl., Lange (CGE.); ex colle Blocksberg prope Budam, 9.1843 c.fr., J. Ball (E.); Budapest: Farkasvögly, 24.5.1914, Szabó (GB); Com. Pest: Kis' Cnkovar pr. Ponraz, 1910 c.fl. et fr., Degen (WRL.); In vineis ad Budafok, prope Budapest, 12.6.1904 c.fl., Filarzky (BP. LE. WRL.); Blockberge bei Ofen, 18.6. et 20.7.1880 c.fl. et fr., Steinitz

(BP. WRL.); Ofen, margine vinetarum, 7. 1878 c.fl. et fr., Richter (W. WRL.); Hegyama: Tokaj, buschige Abhänge unterhalb der Weingärten, ca. 100 m., 8.1894 c.fl. et fr., Weberbauer (WRL.); Inter vineas, in sylvis, pratis montanis etc. Budae, c.fl. et fr., Reichenbach (W.); in montibus Budae, 7.9.1887 c.fl. et fr., Borbás (W.); Gran, Pilisberg, 6.1859 c.fl., Seuthinger (W.); Adlersberg bei Budapest, 12.5.1906 c.fl., Janchen (W.); in valle Stara Voda, prope Szent-Endre, 7.6.1925 c.fl., Degen (SARA.); nad Balatonem, 26.9.1957, c.fr., Futak (SLO.); Kerepes, 1896 c.fl., Bernati (BP.); in monte Pilishegy, 17.8.1875 c.fl., Sztechly (BP.); Balatonaracs, 6.1956 c.fl. Szujkó (BP.); in dumetis montani Budae c.fl. et fr., Sadler (BP.); Agria: in monte "Nagy Eged" — Comit. Heves, 1.6.1870 c.fr., Vrabélyi (BP.); ex sylvar. marg. Vacii, c. fl. et fr. herb. Haynald (BP.); in monte Pismányhegy ad p. Szt.-Endre, 1.8.1907 c.fr., Kümmerle (BP.); Dorog, Esztergom, 7.1903 c.fl., Jávorka (BP.); Hegyallya: Gebüsche am Tokajer Berge, 110 m., 12.8.1894 c.fl. et fr., Pax (BP.); Matra, Nagy Egett hegy bei Erlau, Trachyt, 400 m., 29.8.1895 c.fr. ? (BP.); Comit. Venprém: ad p. Araćs, 5.6.1904 c.fl. et fr., Kümmerle (BP.); Nagyszál Vácz, 22.8.1901 c.fl., Filarzky (BP.); in fruticetis ad Margitliget, 8.6. et 30.7.1902 c.fl. et fr., Simonkai (BP.); Balatonfured: im monte Taméshegy, 7.7.1923 c.fl., Jávorka (BP.); pr. opp. Esztergom. In decl. mer., inter montes: "Vaskapu" et "Tölgyes-hegy", 12.6.1952 c.fl. et fr., T. Pocs (BP.); M. Bakony, Burokvolgy supra Várpalota, 16.6.1948, Jávorka, Baksay (BP.); in declivibus m. Naszal, supra opp. Vác, 12.6.1944, c.fl., Jávorka (BP.); Mátra-Salgć, 324 m., 14.8.1940 c.fr., Hulják (BP.); in monte "Várhegy": ad oppiudm Torna, 30.7.1908 c.fl. et fr., Thaisz (BP.); in dumetis montis Szczocshegy, supra opp. Arać, 22.6.1911, Jávorka et Timkó (BP.); Comit. Fehér: In calcareis montis Iszkahegy, ad pag. Csór, 20.5.1927 c.fl., Filarzky et Kümmerle (BP.); in silva "Város erdeje", prope opp. Kishunhalas, ad conf. com. Bács-Bodrog, 150 m., 21.7.1919 c.fr., Boros (BP.); Huvosvolgy, 25.7.1921 c.fr., Koszilkov (BP.); Versecz, Ördögárok, 16.6.1898 c.fl., Sztankovits (BP.); ad Kautrida, 6.7.1887 c.fl. et fr., Simonkai (BP.); Gellerthegy, 4.6.1879 c.fl., Staub (BP.);

Romania. In motibus prope Szvinicza, 21.5.1910 c.fl., Richter (G. GB.); Banat, c.fl. ? (WU.); Oltenia, distr. Mehediti. In declivibus saxosis et graminosis, penes viam publicam inter pagos Varciorova et Gura Vaii, ca. 70 m., 30.5.1923 c.fl. et fr., Borza et Nyárády, 1276 (BP. C. G. GB. K. KRA. PRC. W.WA.); in fruticetis infra pagum Svinicza, 21.5.1874 c.fl., Kovics (BP.); in declivibus circa Szvinicza ad Danubium in Banato, 3.6.1856 c.fl., herb. Heuffel (BP.); Dobrogea: Balcic-Cavarana-Capul Calicara — Mangalia-Agigea-Constanta, 13.7.1931 c.fl., Domin, Krajina, 2681 (PRC.); in valle fluminis Danubii prope Orsova-Varciorova, 3.7.1931 c.fl., Domin, 2087 (PRC.);

Bulgaria. Ad Stanimaka, 5.1894 c.fl. Střibrný (K. W.); in saxosis supra Stanimaka, 16.6.1895 c.fl. et fr., Střibrný (B. E. GB. LE. P. PR. RUEB. SARA. SOM. W. WRL.); ad Stanimaka, 26.5.1900 c.fl., Střibrný (B. G. GZU. PRC.); supra Stanimaka, 1896 c.fl., Střibrný 8801 (BP. G. GZU. JE. PRC. WU.); in collinis ad Stanimaka, 6.1909 c.fl. et fr., Střibrný (BP. FI. G. JE. PR. W.); in nemorosis supra Stanimaka, 5.1903 c.fl. et fr., Střibrný (RUEB.); Stanimaka, 13.5.1893 c.fl. Střibrný (G.); prope Varna, in vinetis ad Salata, 22.5.1907 c.fl., Schneider, 244 (K. SARA. W.); in dumetis submontanis mt. Rhodope, 5. 1906 c.fl., Adamović (G. K. RUEB. SARA. W. WU.); in fruticetis inter Lemunaro et Matunci, 8.5.1931 c.fl., Wiśniewski, 1585 (K. WA.); in dumetis supra pagum Stanimaka, 6.1892 c.fl. et fr., Wagner, 45 (JE. W. WU.); in fruticetis prope urbem Balčik, ad ca. 30 m., 28.6.1953 c.fl. et fr., Vihodzevssky, 164 (JE. KRA. SOM. W.); in apricis submontanis ad Stanimaka, 6.1907 c.fl., Adamović (WU.); in silvaticis montis Kortiać, 5. 1907 c.fl., Adamović (WU.); in vinetis supra pagum Stanimaka, 3.7.1892 c.fr.,

Wagner (G. PRC.); prope Sliven, in vinetis, 25.7.1907 c.fr., Schneider, 699 (W.); ad Belovo, 1910 c.fl. et fr., Urumoff, 255 (GB.); la hutte "Slavei", 14.6.1959 c.fr., Konjucharov (K.); Sveti Vrač, 2—300 m., 1.7.1938 c.fl., ? (BP.); Umgebung von Varna, 6.1890 c.fl. et fr., Reiser (BP.); in rupibus supra Stanimaka, Rhodope cent., 26.6.1931 c.fl., Wiśniewski, 1582 (WA.); in fruticetis prope Kolarewo, 12.5.1931 c.fl., Wiśniewski, 1583 (WA.); in fruticetis ad Sali-Aga, Kresna Derbend, 5.10.1931 c.fl., Wiśniewski, 1584 (WA.); Balcic-Ecrene, 12.7.1931 c.fl., Domin, Krajina, 2472 (PRC.); in rupestribus ad Dupnica, 1905 c.fl., Urumoff (PRC. SOM.); supra Sliven, 7.1886, Velenovský (PRC.); ad Varnam, 6.1897 c.fl., Velenovský (PRC.); Warna, 29.7.1931, Paczoski (POZ.); in montibus Rhodope, prope Stanimaka, 19.8.1930 c.fr., Paczoski (POZ.); "šiblak", prope Sliven, 31.8.1930 c.fr., Paczoski (POZ.); Rila, in montibus, 25.8.1930, Paczoski (POZ.); Warna-Salata, 29.7.1931 c.fl., Paczoski (POZ.); Varvaza, 26. 7., c.fr., Paczoski (POZ.); Kirdżali, in montibus Rhodope, 29.7.1932 c.fr., Paczoski (POZ.); In urb. Stalin, 25.7.1952 c.fl., Żelezowa, (SOM.); Kyrdżali, 480 m., 13.6.1953 c.fl. et fr., Stojanov, Kitanov, Welczew (SOM.); supra ripas Ponti ad urbem Var, 9.6.1921 c.fl. et fr., Davidoff (SOM.); in rupestribus ad Provadia, 1902 c.fl., Urumov (SOM.); in silvaticis mt. Deli-Orman: "Batovata", 23.5.1921 c.fl., Davidoff (SOM.); in Phillireaetis mediae supra pagum Gorno Spančevo, distr. Sandanski, 400 m., 7.5.1952 c.fl. et fr., Stojanov (SOM.); in dumetis siccis Deli-Orman, supra stationem Nevša, 18.5.1921 c.fl., Davidoff (SOM.); ad urben Dede-Agač, 16.5.1914 c.fl., Davidoff (SOM.); in rupestribus dumosis Provadijska-Trapeza supra pagum Kaspičan, 17.5.1915 c.fl., Davidoff (SOM.); in dumetis, Kryszewo, Gen. Toszewsko, 3.7.1952 c.fl. et fr., Stojanov, Kitanov (SOM.); in declivibus siccis supra pag. Konjovs, solo porphyr., 790 m., 1.6.1938 c.fl., Achtarov, 3759 (SOM.); Małkija Kożuch, Pietriczko, 4.5.1955 c.fl., Ganczev (SOM.); in montibus Konjovska, in vinetis Skakovica-Rždavica, 7.1904 c.fr., Mrkvička (SOM.); Błagojewgrad, 550 m., 16.6.1931 c.fr., Fenenko (SOM.); Asenovgrad, 22.7.1913 c.fr., Mrkvička (SOM.); in graminosis mt. Rhodope occid.: Pestera-Batak, 650 m., 18.6.1926, c.fl., Davidoff (SOM.); Achmakbair ad urbem Stara-Sagora, 20.4.1910 c.fl., Achtarov (SOM.); pagum Gorno Arbanasi ad urbem Tirnovo, 1900 c.fl., Toschev (SOM.); Rila austr.: Oranowsk, 400 m., 29.5.1930 c.fr., Fenenko (SOM.); ad pag. Bjała (Pontus Euxinus), 23.7.1930 c.fl., Trifonov (SOM.); ad urb. Stara Zagora, in declivibus "Ajzamoto" boreale, 23.5.1943 c.fl. et fr., Jurkowskij (SOM.); Warna, non procul "Złati pjaski", 10.6.1960 c.fl., Żelezowa (SOM.); Sozopol, 8.6.1960 c.fl. et fr., Żelezowa (SOM.).

Greece. Xanthie, 300', 8.5.1930 c.fl. et fr., Tedd, 246 (K.); Thasos, 3—4.6.1932 c.fl., Cyrén (GB.); in dumetis mt. Gül-tepe, pag. Kereci-köj prope Thessalonicam, 300 m., 5.1909 c.fl., Dimonie (GB. G. SARA. W.); Kalabaka, 7.6.1926 c.fl., Cyrén (GB.); in monte Malevo Laconiae prope Platanos, 4.5.1857, Orphanides, 617 (CGE. E. FI. G. JE. K. LE. PRC. W.); Lurica, foothills S. of Struma Plain. 24.5.1914 c.fl. et fr., Turill 310 (K.); 3 km. S-E. of Orljak, south of Struma Plain, 20.4.1914 c.fl. Turill, (K.); in rupestribus collis insula Thasos, 300 m., 1909 c.fl. Dimonie (PRC.); Karamanhügel bei Vodena, 23.5.1905 c.fl., Adamović, 332 (WU.); Pelion, c.fl. Heldreich (JE.); Pindus Tymphaeus prope Klinowo, 24.7.1885 c.fr., Hausknecht (JE.); Athens, c.fl., Rogers, 390 (K.); Klissura nördlich v. Aetoliko Wald, 27.5.1926 c.fl., Mattfeld (K.); Mountains of Euboea, c.fl., J. S. Mill (CGE.); Insula Euboea septentr. Inter Limni et Strophylia, 200—400 m., 29.5.1955 c.fl. et fr., Rechinger, 16532 (G. W.); Insula Euboea septentr. In jugo inter Paschna et Achmet Aga (Prokopion), prope Hagios, 550 m., 27.5.1955 c.fl., Rechinger, 16420 (G. W.); Insula Euboea merid.: Montes Ocha, infra Hagios Dimitrios, 300—600 m., 22—23.5.1955 c.fl., Rechinger, 16951 (W.); In valle inter stationes Lignitrochion et Potamos prope Alexandrupolis,

29.5.1934 c.fr., K. H. et F. Rechinger, 6099 (W.); in monte Vermion prope Naussa, reg. querc., 500 m., 30.5.—1.6.1936 c.fl. K. H. et F. Rechinger, 8892 (W.); in fauce fluvii Nestos (Mesta) prope Toxotai (Oktschilar), 60—100 m., 12.6.1936 c.fl., Rechinger, 9411 (W.); in montosi Peloponesi, 1842 c.fl. et fr., Sartori, 182 (W.); Parnes, Attica, 5.1852 c.fl. et fr., Heldreich, 2610 (FI. LE. W.); pr. Phile, 5.1853 c.fr., Heldreich (FI.); mt. Hymettus, 6.1933 c.fr., Pinatzi (PR.); in fruticetis prope Mestovo, Epirus, 31.7.1936 c.fr., Regel (G.); in fruticetis prope flumen Kalamas, Epirus 30.7.1938 c.fr., Regel (G.); Epidauro, 30.4.1893 c.fl., Grampini (RO.); in dumetis ad Vodena 6. 1903 c.fl. et fr., Adamović (W.); Kassida, 17.6.1933 c.fl. et fr., Cyrén (GB.); Insula Thasos, Limenas, 29.5.1891 c.fl., Sintenis et Bornmüller, 614 (G.); Attica, Mt. Parnes, 5. 1933 c.fl., Guiol, 73 (BP. FI.); Mt. Parnes-Mt. Kliston, 10.5.1928 c.fl. Guiol, 15 (KRA.); Turkey. In collinis ad Tekir, 6.1906 c.fl. et fr., Střibrný (BP. E. FI. RUEB.).

Discussion: *Colutea arborescens,* thanks to its medical properties was already well known in the XVI c, and probably also in the Antiquity, in Greece and Rome. Its area, occupying almost the whole south of Europe, belongs to the largest within the genus. In spite of what G. Hegi writes it is a species exceedingly variable and that is why it has been often erronously determined. Its variability is expressed in size and shape of leaflets, degree of pubescence of shoots and leaflets, size of flowers, pubescence of ovary, as well as in length of wings, colour of hairs covering calyx and in length of calyx teeth. Several varieties and forms of *C. arborescens* have been described and they should be fully discussed.

Features that have been mostly stressed are the colour of hairs covering the calyx and the length of wings. It is striking that the variability of those characters has been discussed almost exclusively on specimens from the Balkan peninsula (Schneider, Ascherson and Graebner, Bornmüller, l.c.) and specimens from other areas have been completely neglected.

Velenovsky (l.c.) was already interested in the colour of hairs of calyx in *C. arborescens*. He recorded, on the basis of herbarium specimens of Střibrny from Bulgaria (Stanimaka) which really have dark hairs of calyx, that *C. melanocalyx* grows on the Balkans. Owing to this suggestion, also other specimens from this region were determined in this way (among others e.g. Adamović).

According, to Schneider (l.c.) in Hungary and on the Balkans instead of the typical *C. arborescens* there occur forms with wings slightly longer than the keel, and they are an intermediate species between *C. arborescens* and *C. melanocalyx* and *C. cilicica*. Schneider identifies these forms with the variety described by Freyn: *C. arborescens* var. *melanotricha*. It must be stressed, however, that Freyn's variety corresponds to *C. cilicica* and not to *C. arborescens* in its characters, therefore such an identification is wrong. Schneider, however, states that the forms discussed by him, though they have black hairs of

calyx, are distinguished by quite a glabrous ovary, therefore they cannot be connected with *C. melanocalyx*. In his collections from the Balkan peninsula (Iter balcanicum, 1907, No. 244) Schneider gave those forms a new name: *C. arborescens* var. *balcanicum*, but he did not publish its diagnosis.

The next to be interested in forms of *Colutea* from the Balkan peninsula, that have dark coloured hairs of calyx was J. Bornmüller who, comparing them with *C. cilicica* and *C. melanocalyx*, came to the conclusion that they should be reckoned among *C. arborescens*. As Freyn's determination: *C. arborescens* var. *melanotricha* refers to *C. cilicica*, and Schneider's variety (var. *balcanicum*) was (wrongly) included by Ascherson and Graebner (l.c.) to the same species Bornmüller created a new name: *C. arborescens* var. *macedonica*. In the diagnosis of the variety (Bot. Jahrb. Engler, 59, 1925) Bornmüller draws attention both to the colour of hairs and short calyx teeth. The colour of hairs, as I shall show later, can not be, by any means, an essential character serving to separate a variety, therefore the value of another character — shortness of calyx teeth — must be discussed. In fact, in Bornmüller's typical specimens (from Üsküb) the calyx teeth are exceedingly short and resemble the teeth of *C. atlantica* f. *brevidentata*. As such specimens are very rare, and their geographical distribution is not very clear, therefore the rank "form" is much more suitable than "varietas".

Colutea arborescens ssp. *arborescens* f. *macedonica* (Bornmüller), gradus novus.

Syn.: *Colutea arborescens* var. *macedonica* Bornmüller, Bot. Jahrb. Engler, 59: 483 (1925); Hayek, Prodr. Fl. Pen. Balc., 1: 771 (1927); Stojanoff, Thracishe u. Macedonische Herbarmaterialen des verstorbenen Prof. Dr Theodor Nikoloff, 120 (1928). ?.

Calyx teeth are about 5 times as short as tube. (Fig. 5, IV m).

Specimens examined:

Yugoslavia: Dittionis oppidi Üsküb (Skoplje): In declivitatus aridis orient. montis Wodno (Üsküb-dagh), 600 m., ad Neresi, 24.5.1917 c.fl. et fr., Bornmüller, 712 (BP. PRC.); In montis Wodno, vinetis ad Gorn. Wodno (dit. Üsküb), c. 600 m., 28.5.1918 c.fl., Bornmüller, 3002 (JE.); Distr. lac. Doiran; ad Kalutschowa, in decliv., 150—200 m., 30.6.1917 c.fr., Bornmüller, 713 b. (JE.).

That the colour of calyx-hairs in *Colutea* cannot be an important diagnostic character was for the first time stressed by H. Czeczott (Fedde. Rep., 107. 1939). She notes that forms of *C. arborescens* with dark hairs are known not only from the Balkan peninsula, but also from France, near Lyons. As Czeczot was interested in *C. cilicica* occurring in Turkey, and not in *C. arborescens*, she did not analyse a larger amount of specimens of *C. arborescens* from Western Europe. The example given

by her may be treated as casual. After examining some hundred herbarium specimens of *C. arborescens* from the whole area (though only a few from Spain) I came to the following conclusion.

Specimens of *C. arborescens* with black and white hairs are dispersed over the whole area both on the Balkans and in Western Europe, though in some regions one of them can dominate. So for instance, forms with white hairs are most common in Yugoslavia and Italy; in Dalmatia they probably prevail. Much more common than forms with pure white hairs (on both sides of calyx) or with pure black hairs are different kinds of transitional forms, as e.g. forms with a calyx covered with white hairs outside, and dark ones inside, forms where white hairs are mixed with black ones (in various ratios), forms with black hairs gathered exclusively on the margin of the calyx etc. The number of such combinations is very large, so that the calyx walls may be greenish, greenish-brown, or even dark brown, and nearly black. All this shows that the value of the feature "colour of calyx hairs" is rather insufficient in order to separate lower taxa within the species. Only specimens with a homogenous colour of hairs of calyx could be ranked "form". I have not done, so however, as I have not been able to observe living specimens of *C. arborescens*, in natural conditions and cannot state whether the colour of hairs of the calyx in a given individual is constant or whether it changes during the vegetation period. I suppose that there can be some deviations as differences in the colour of hairs have been observed by me in some herbarium specimens with flowers variously developed and in ones with unripe and ripe fruits, this, however, must be examined on living material.

The variability in size and shape of calyx teeth is similar. Teeth broadly triangular, about 1/3 as long as tube, prevail, but longer and narrower ones are more common in the west of the area, broader in the centre. Also this feature cannot be taken into account in order to separate varieties, except when correlated with others, but I have failed to state such a correlation.

The shape and size of leaflets varies within wide limits. Most common are leaflets about 15—20 mm long, and it seems that, as in the case of pubescence of young shoots and leaflets beneath, local conditions of environment play an important role; in drier conditions leaflets are smaller and pubescence is stronger. The shape of leaflets is variable and even so in the same individual; though leaflets are mostly broad-elliptic and more or less rounded on both ends, yet beside this, on one branchlet, leaflets slightly obovate or broad-ovate can be seen. As there is no geographic concentration it is impossible to separate varieties; forms, at the most, can be. A few such forms have been described up to now.

a. native forms

Colutea arborescens ssp. *arborescens* f. *microphylla* Tommasini.

Verhandl. K. K. Zool.-Bot. Gesell. Wien., 12: 818, tabl. 15 (1862); Visiani, Fl. Dalmac., Supp. 1: 145 (1872) "var."; Ascherson u. Graebner, Syn. Mitteleur. Fl., 6, 2: 730 (1908); Beck-Mannagetta, Fl. Bosn. Herceg., 3: 277 (1927); Hayek, Prodr. Fl. Pen. Balc., 1: 771 (1927).

Leaflets small about 5—6 (8) mm long with stronger pubescence.

Specimens examined:

In insula Sansego, c.fl., Sendter (E. K. W.); Hum, Mostar, 28.5.1911 c.fl., Herb. Schneider (W.).

Found only 4 times; the first time on the isle of Sansego in Dalmatia. Probably only an ecological form.

Colutea arborescens ssp. *arborescens* f. *nummulifera* G. Beck.

Beck-Mannagetta, Fl. Bosn. Herceg., 3: 277 (1927).

Leaflets 1—1.5 cm long, round or nearly round.

Specimens examined:

Am Hum bei Mostar, 15.6.1894 c.fl. et fr., Herb. Beck (PRC.); In dumetis ad Njeguši, loco "Božoviča rudina", 7. 1937, c.fl. et fr., Pejovič (PR.).

Form described only from two localities in Yugoslavia.

Colutea arborescens ssp. *arborescens* f. *monophylla* Jávorka.

Magy. fl., 632 (1925); Nyárády, Fl. Rep. Pop. Romine, 5: 251 (1957).

Leaves reduced to only one terminal leaflet, more rarely three. Leaflests broad-elliptic up to 4 cm long by 3 cm wide, on a petiolule up to 1 cm long (Pl. II).

Specimens examined:

In dumetis ultra montem Tamáshegy, ad balneas, 9.7.1923, S. Jávorka (BP.).

Found in Hungary, recorded also from Roumania. Probably a teratologic form.

b. garden forms (as "cultivar")

Colutea arborescens 'crispa'.

Petzold u. Kirchner, Arb. Muscav., 381 (1864); Schneider, Ill. Hand. Laubh., 2: 88 (1907); Ascherson u. Greabner, Syn. Mitteleur. Fl., 6, 2: 730 (1908); (Nicholson) Handlist Trees Shrubs Kew, 121 (1894) "var."; Sokolov, Dier. Kust. SSSR, 4: 166 (1958); Krussman, Hand. Laubgeh., 1: 339 (1960).

Low shrub with leaflets creased on the margin.

Colutea arborescens 'bullata'.

(Nicholson) Handlist Trees Shrubs Kew, ed. 2., 189 (1902) "var."; Rehder, Mitt. Deutsch. Dendr. Ges., 256 (1913); Bean, Trees Shrubs Brit. Isl., 1: 378 (1914); Sokolov, Dier. Kust. SSSR, 4: 166 (1958); Krüssmann, Hand. Laubgeh., 1: 339 (1960).

Low compact shrub. Leaves smaller 2.5—4 cm long, with 5—7 leaflets. Leaflets obovate or roundish, slightly bullate.

Ascherson and Graebner (l.c.) also mention forms with variegated leaflets but I have not found their description anywhere.

Forms of *C. arborescens* with different length of wings show, a greater regularity in geographical distribution than forms with various pubescence of calyx, or with various size and shape of leaflets and calyx teeth. Specimens with wings shorter than keel are more common in the west of area, and with wings equal or even slightly longer in the east, especially on the Balkan peninsula. As regards the spur on wings it is met rather rarely in the whole area (dispersed). The value of both features in distinguishing *C. arborescens* from *C. cilicica* has been mentioned in the discussion referring to the latter.

One of the most valuable features that shows a distinctly geographical variability is the pubescence of ovary and consequently of fruit, too. Very little attention has been given to this character. Boissier (Fl. Or., 2. 1872) in his diagnosis of *C. arborescens* records: "leguminibus glabris vel sparsim hirtulis"; Schneider (l.c.): "Fruchtknoten mässig behaart", and G. Hegi (l.c.): "kahl oder schwach behaart". Rehder (Man. Trees Shrubs, 1940) assumes that the ovary is thinly pubescent, and Shaparenko (Fl. URSS, 1941) writes that it is mostly glabrous. All these declarations as many others, too, show that the authors have not had any precise view as regards this character. Analysing herbarium material available I succeeded in observing some dependence between the presence or absence of pubescence on the ovary, and the geographical distribution. It can be seen that going from west to east the pubescence of ovary gradually disappears. This statement helped to separate a new subspecies of. *C. arborescens,* the only one, according to me that is supported by morphology and geography. It has been described below.

2a. *Colutea arborescens* ssp. *gallica* Browicz.

Type. France. Col. du Frène, au-dessus de St. Pierre d'Albigny (Savoie), 25.9.1914 c.fl., Saint-Lager (G.).

Ovary wholly or only partly pubescent. Flowers mostly smaller (lower limit of dimensions in the species). Calyx teeth narrower. Calyx usually with black hairs. Fruit loosely pubescent or glabrate. Leaves mostly with 3—4 pairs of leaflets.

Distribution: Eastern Spain, southern France, south-western Germany, Switzerland, Italy, and Austria. It grows in similar conditions to the type species (Fig. 4).

Specimens examined:

Spain. Burgos, Bujedo, 20.6.1918 c.fr., H. Elias, 3344 (G. GZU. W.); Corla-Aragon, 7.1873 c.fr., Bordére (G.); Peniscola, Barranco de Irta par les rochers, 16.4. et 27.5.1909 c.fl. et fr., Sennen, 767 (E. GB. JE. PR. PRC. RUEB. W.); Plana de Vich- S. Bartomen: Gargues Malezas, 19.7.1923 c.fr., H. Gonzalo (KRA.);

France. St. Béat, 6.1867 c.fr., Fourcade (WRL.); à Genas, 16.6.1851 c.fl. et fr., Martin (FI. W.); Lyon, à Genas, 1864 c.fl. et fr., herb. Jordan (C.P.W.); Saint-Béat,

9.7.1856 c.fr., Zetterstedt (GB.); Arles, 18—22, c.fr., Jacquemin (P.); Bois à St. Paul, près du Vigan, 8.5.1874 c.fl. et fr., Anthourard (P.); Nice, Route de Levens a Lautosque, 28.6.1860 c.fr., Thuret (P.); Meuse: Thierville, coteau calcaire à la lisière E. du bois Simonot, 24 et 17.7.1891 c.fl. et fr., Bullemont, 2700 (G. JE. P. W. WU.); Bois de Serignan, 10.6.1881 c.fr., Delacour, (G. P.); Kirchberg prope Barr, 375 m., 29.6.1891 c.fl. et fr., Hausser (GZU. WRL.); Amélie, les hains, c.fr. Meebold (WRL.); Gorges du Tarn, rochers, 6.6.1924 c.fr., Zlatnik (PR.); Coteaux calcaire jurassique à Pompey près de Nancy, 5—6.1854 c.fl. et fr., Mathieu, 1651 (B. CGE. G. JE.); Rochers de Pompey, 6. 1833 c.fl. et fr., ? (E.); Montpellier, 21.5.1893 c.fl. et fr., ? (C. E.); Montarnaud, Hérault, 6.1892 c.fr., ? (C.); St. Julien (H-te Savoie) 9.1861 c.fr. et fr., Franchet (P.); Lozère, c.fr., Prost (P.); Abondant parmi les rocailles calcaires des carrières du mont Querelles à Cause (Doubs), 11.8.1860 c.fl. et fr., Lenoir et Paillot, 2827 (CGE. G. P.); Carrieres du calcaires jurassique, au mont Querelles, près du Cause, à 380 m., 30.8.1872 c.fl. et fr., Morfaux, 433 (CGE. BP. JE.); St. Aignan, Carrieres de Belleroche 7. 1868 c.fr., Franchet (P.); Environs de N-Dame-du Laus, (Htes-Alpes, 4.6.1864 c.fr., ?, 4499 (P.); Aix en Savoie, Perret (CGE.); Brousse entre le Signal de Relong et Villefontaine, 2.6.1919 c.fl., Briquet, 2275 (G.); Cevenne, 1862 c.fl., herb. Delessert (G.); Alpes Lèmaniennes: Taillis de la cote d'Hyob (?), 2.7.1899 c.fl. et fr., Briquet (G.); Roche du Guet (Savoie), 1.000 m., 7.6.1931 c.fr., Beauverd (G.); Route des Balmettes près Faverge au pied de la Tournette, c.fr., Beauverd (G.); Draguignan: Le Malmot, 5.1910 c.fr. Girod (G.); Aoste, 5.1875 c.fl. et fr., Chenevard (G.); valée d'Aoste, 15.7.1890 c.fl. et fr., Chenevard (G.); Coteaux de Cruet (Savoie), 2.6.1883 c.fl., Chabert (FI.); Saint Beat, in fruticetis, 1845 c.fl., Francaville (FI.); Pyrenees, c.fr., Arnott and Bentham (E.); Bois de Ferriere (Villeneux), 5. 1846 c.fl., Desentages (G.); Cote d'Or, Dijon, carrières abandonnées sur le bathonien supérieure, 10.7.1900 c.fl. et fr., Gérard 4570 (G.); Coteaux calcaires à Bau-le-Duc (Meuse), 2.8.1904 c.fl., Garniér (G.); Col. du Frène, près Saint-Pierre d'Albigny (Savoie) 28.8.1910 c.fl. et fr., Kohler (G.); Passy (Hte-Savoie) 8.1902 c.fr., Guinet (G.); St. Saturnin, près Chambéry (Savoie), c.fl. et fr., Perrier (G.); près Chambéry (Savoie), 8.7.1851 c.fl. et fr., Huet de Pavillon (G.); Colline de Chautagne, Mt. Corsuet, taillis en montagne de Brison à la Chambotte, 20.6.1902 c.fr., Briquet, 3796 (G.); Montagne de Génat, 6.1884 c.fr., Marhlos (B.); Dep. Var., Montrieux, 10.6.1916 c.fl. et fr., Berger (B.);

Germany: Le long du Rhin et au mont Kaiserstuhl, 12.8.1828 c.fl. et fr., herb. Daenen (G.);

Switzerland. Above Bex, Canton Vaud, 1852 c.fl., ? (P.); Felsen, St. Léonard, 12.7.1936 c.fl. et fr., Simon (GB.); Lens, Valais, 1843 c.fl. et fr., Muret (W.); Valère (Sion), Terrain de Verrucano, 15.6.1876, Wolf (JE. W.); Bex, 5.7.1878 c.fl. et fr., Chenevard (JE.); Graubünden, Trockene Heide oberhalb Trimmis, 27.3.1913 c.fl., Vierkopper (WU.); Canton du Neuchatel, c.fl., ? (G.); Bex, c.fl. et fr., Schleicher (G.); près Stalden, 9.8.1887 c.fl., Gondet (G.); entre Saillon et Mazenbre (?), 3.7.1861 c.fl. et fr., Mercier (G.); Fully (Valais) 1.7.1928 c.fl., Meylan (G.); Aigle, 12.7.1880 c.fl., Kohler (G.); chemin le Bex, 6.7.1878 c.fl. et fr., Chenevard (G.); Genève- tranchées, 7.1868 c.fl. et fr., Bernet (G.); les Sables du Rhone, près Genève, 7.8.1875 c.fl. et fr., Schmiedely (G.); au bord du Rhone, 12.8.1888 c.fl. et fr., Paiche (G.); Route de Viege au Stalden, 7.1853 c.fl., H. de Pavillon (G.); between Aigle and Sepey, 4.6.1885 c.fl., Hamilton (E.); Rocailles à Aigle, 21.5.1862 c.fl. et fr., Leresche (C.); Tessin, 6.1900 c.fl., Müller (RUEB.); Colline du Martel à Bex, 5.7.1910 c.fl. et fr., Jaccard (RUEB.); Misox: Lumino, an sonnigen Felsen 21.6.1916 c.fl., Walser (RUEB.); Coteau sec, ruines du Chareau de Sailon, 22.5.1880 c.fl., Romieux (RUEB.); Val d'Anniviers, 900 m., 1.8.1896 c.fl. et fr., Romieux (RUEB.); Siders, gebüsche geg. Géronde, 21.7.1923

c.fl. et fr., Lüdi (RUEB.); aux gorges de la Reuse, 6.1852 c.fl., Payot (G.); près Boudry, Neuchatel, 29.6.1845 c.fl., Burnat (G.);

Austria. Parndorff, 18.6.1864 c.fl. et fr., ? (W.); S. W. Abhang der Jungerberges bei Bruck a.L., 29.6.1912 c.fl. et fr., Morton (WU.); Gumpoldskirchen bei Wien, Kalkberge, 6.7.—1.8.1876 c.fl. et fr., Dichtl (GB. GZU. JE.); Salzburg, 1874 c.fl., ? (GZU.); Zirl bei Innsbruck, Kalkfeslen, 4.1858, Uechtritz (WRL.); Trimmis, am Weg nach Talein recht häufig, 27.8.1919 c.fr., Hatz, 260 (FI. G. GB. GZU. PR. RUEB. W.); Mödling, sonnige Abhänge auf dem Eichkogel, auf Kalk, 350 m., 7.1903 c.fl. et fr., Krebs (G.); Vervildert am Schlossberge von Graz in Steiermark, 450 m., 30.6.1882 c.fl. et fr., Preissmann (W.); In colle prope Gumpoldskirchen, c.fl. et fr., herb. Jacq. W.); in der Brühle bei Wien, c.fl. et fr., Preissmann (W.);

Italy. Sardinia orient., ad sepes Dorgali, 5.1842 c.fl. et fr., ? ((FI.); inter frutices, Camaldioli di Napoli, 8. 1840 c.fl., herb. Heldreich (FI.); Ischia, 1849 c.fl., Gussone (FI.); Ascoli (Marche) in sylvaticis, 1856 c.fr., ? (FI.); presso Camerino, 9.1896 c.fr., ? (FI.); presso Gricigliano (Pontassieve), 8.1890 c.fr., Martelli (FI.); Pineta di Ravenna, 1864 c.fr., herb. Beccari (FI.); Mt. Donato presso Bologna, 1861 c.fl. et fr., herb. Beccari (FI.); Rep. S. Marino, M. Titano, 14.10.1916 c.fr., Pampanini (FI.); Boschetti nei colli di Sassuolo, Prov. di Modena, 30.9.1882 c.fl. et fr., Fiori (FI).; Sardegna, Dorgali, Monte Vardia, 1894 c.fr., Martelli (FI.); Sardegna, Oliena, 1894 c.fl. Martelli (FI.); Luconia, Potenza, in quercetis, 850 m., 12.6.1918 c.fl. et fr., Gavolli, 2681, 2682 (FI.); Campania, Valle della Ferriera (Amalfi) 31.5.1952 c.fl. et fr., R. Corradi, R. Bavazzano, A. Contardo (FI.); in sylvatis agro Romani. Macchia, in muris antiquis, 13.5.1858 c.fl. et fr. (FI.); Dintorni di Rieti (Umbria), 1888 c.fl., Battelli (FI.); Appenini Piceni, 1838 c.fl. et fr., Mazzialetti (FI.); presso Ancona, 1890 c.fl. et fr., herb. Groves (FI.); Urbino (Marche), 1916 c.fl. et fr., Funari (FI.); Toscana, Cascine, 5.1834 c.fl. et fr., herb. Ricasoli (FI.); Emilia, rupis serpentinose presso Corniana, 1907 c.fr., Bolzon (FI.); Appenn. Reggiano, 9.8.1908 c.fl. et fr., Fiori (FI.); Venezia. Prov. Veron. in nemorib. supra Torri, della Bona di Garda, 7.1872 c.fl., Rigo (FI.); In valle Venosta, c.fl. et fr., Kerner (FI.); Trentino: Val Venosta inizio di Val Martello: Morter (Bolzano) 800 m., 1956, Chiarugi (FI.); in montibus di Cesena, 17.6.1834 c.fl. et fr., Cesati (RO.); Colosseo, 1876 c.fl. et fr., herb. Rolli (RO.); Roma, Terme di Caracalla, 29.4.1890 c.fl., herb. Grampini (RO.); Lago d'Albano, c.fl., Cortesi (RO.); Montenuovo, 16.6.1903 c.fl. et fr., Cufino (RO.); Isola di Capri, 1894 c.fl. et fr., Bellini (RO.); Cava (Napoli) c.fl. et fr., herb. Borgia (RO.); Sondalo (prov. di Sondrio) 26.9.1903 c.fl. et fr., Longo (RO.); Calabria — valle de Sao, Bosco di Fellireto, 31.7.1893 c.fr., Longo (RO.); supra Sasso (Bologna) 1882 c.fl., Pezzini (RO.); Contorini N. Baja, 5. 1839, herb. Pedicino (RO.); Abruzzo, Pizzoli, 1828 c.fl., herb. Mauri (RO.); Triest, Monte Spaccato, 22.7.1886 c.fl. et fr., Engelhardt (B.); Sondrio, felsige Hänge, 2.6.1914 c.fl. et fr., Berger (B.); Susa, alla Brunetta, 14.8.1884 c.fl. et fr. Martelli (GB. FI.); Bozen, 1845, c.fl. et fr., Hausmann (W. WRL.); Verona, in dumetis Pestrini et sylva Mantua, 1843 c.fl. et fr., Bracht (LE. W.); Fort de la Brunette près Susa, 6.1864 c.fl. et fr., Rostan, 156 (CGE.); ad littora sinus Baiae, prope Neapolim, 4.1841 c.fl. et fr., Ball, (CGE.); prope Daon, 2.400', 21.6.1865 c.fl., Porta (K.); bei Meran, 13.9.1858 c.fl., Uechtritz (WRL.); Gaul (Meran) c.fl., Hartmann (WRL.); Castelbell in Vintschgau, 18.9.1858 c.fl., Uechtritz (WRL.); Zw. Schulderns und Spondnig in Vintschgau, 13.9.1858 c.fl. et fr., Uechtritz (WRL.); Gratsch bei Meran, 23.5.1888 c.fl., ? (GZU.); Riva, 7.1902 c.fl., ? (GZU.); Trobole, Felsen am Weg nach Riva, 14.5.1887 c.fl., Evers (GZU.); ad Baitoni, 4—600 m., 6.1897 c.fl. et fr., Cimarolli (GZU.); Vintschgau, felsige Abhänge, 20.8.1884 c.fl. et fr., Evers (GZU.); Susa: Conaglie sopra al Seghino, 1.100 m., 31.5.1937 c.fl.,

Cappelletti (PR.); Iudicariis ad sepes prope pagum Creto, 5—600 m., 7.1886 c.fl. et fr., Porta (BP. PR.); prope Riva, 12.8.1860 c.fl. et fr., Ball, (FI.); Aosta, nelle collina verso S. Martin, 10.5.1899, Vaccari (FI.); Brixen, sonnig. Abhänge, 1855 c.fl., Pittoni (W.); Lecco, 7.1883 c.fl. et fr., Ducommun (G.); Insel Capri, 1867 c.fl., Alioth, 294 (G.); bei Triest, 6.1885 c.fl. et fr., herb. Alioth (G.); Bormio, 21.6.1907 c.fl. et fr., Longa (RUEB.); Sondrio, 5.1914 c.fl., Berger (RUEB.); Capri, 3.6.1898 c.fl., Kuegler (JE.); Trento, 7.6.1883 c.fl. et fr., Gelmi (JE.); Monte Bonelle, c.f., herb. Ball (E.); circa Bozen c.fl., Sauter (E.); Rep. S. Marino, Montalbo, 15.10.1916 c.fl. et fr., Pampanini (FI. W.); Bei der Ruine von Lichtenberg, Vintschgau, 7.8.1903 c.fl. et fr., Engelhardt (B.); Rafenstein, Schloshof (bei Bozen), 2.8.1896 c.fl. et fr., Maly (BP.);

Yugoslavia. Insel Arbe, Macchien, ca. 80 m., 27.7.1912 c.fl. et fr., Morton, 753 (JE. RUEB.); Insel Arbe, Flyschkegel westlich des "Paludo" bei Arbe, 31.5.1912, Morton, 754 (WU.); Insel Arbe, In der Campora, 20.7.1911 c.fr., Morton, 755 (WU.); Inter frutices, in rupestribus, Ins. Lesina, c.fl. et fr., Bolteri (W.); Sandige Abhänge auf des Insel Sansego bei Lessina, 4.6.1885 c.fl., Engelhardt (B.).

Discussion: The variability of this subspecies is expressed, above all, in the degree of pubescence of ovary, which is never so strong as to cover its walls. The further east the lesser the degree of pubescence, so in Italy, Switzerland and Austria the pubescence is usually very weak and covers only the middle part of the ovary. Specimens with hairs placed only along the ventral suture are not included to this subspecies. The pubescence of ovary is greatly, though not absolutely, correlated with other characters. Individuals of this variety mostly have smaller flowers, shorter wings, narrower calyx teeth, usually covered with dark hairs, and a smaller number of pairs of leaflets. The greatest number of deviations can be met in the centre of *C. arborescens* area, where the disappearance of pubescence begins.

Correlation of the pubescence of ovary with the geographical area is more clearly seen when we look at the geographical distribution of two species most closely allied to *C. arborescens*: *C. atlantica* and *C. cilicica*. The one borders on *C. arborescens* on the Iberian peninsula and is distinguished by the ovary being distinctly tomentose so that its walls are not seen. The other, *C. cilicica*, whose area seems to form a prolongation of the area of *C. arborescens* in the south-east has quite a glabrous ovary.

The same difficulty met when separating transitional forms between *C. arborescens* and *C. cilicica* on the border of their areas, can be seen in the Iberian peninsula. It is rather difficult to give an answer to the question where the northern limit of the area of *C. atlantica* and the southern of *C. arborescens* ssp. *gallica* runs through, as the herbarium material from Spain, seen by me, has been rather insufficient. These difficulties are probably strengthened, by the fact of the crossing of both species. The difference between *C. atlantica* and *C. arborescens* ssp. *gallica* is based on the following features: stronger pubescence of ovary

and shoots, regular shape of leaflets, a smaller number of flowers in inflorescence.

Within *C. arborescens* ssp. *gallica* one very characteristic form formerly described as species can be distinguished.

Colutea arborescens ssp. *gallica* f. *brevialata* (L a n g e) gradus novus.

Syn.: *Colutea brevialata* Lange, Ind. Sem. Hort. Acad. Haun., 30 (1861); Pugillus Pl. Imp. Hisp., 4: 371 (1865); Loret et Barrandon, Fl. Montpellier, 136 (1886); Koehne, Deutsch. Dendr., 337 (1893); Rouy, Fl. France, 5: 203 (1899); Schneider, Ill. Hand. Laubh., 2: 87, fig. 53 k—m, 54 a (1907); Bonnier, Fl. Comp. Fran. Suisse, Belg., 3: 56 (1914); Cadevall, Fl. Catalunya, 2: 159 (1915—1936); Rehder, Man. Trees Shrubs, ed.1., 508 (1927), ed. 2., 512 (1940); Sokolov, Dier. Kust. SSSR, 4: 166 (1958);

Colutea arborescens var. *brevialata* Dippel, Hand. Laubh., 3: 704 (1893); Ascherson u Graebner, Syn. Mitteleur. Fl., 6, 2: 730 (1908).

Shrub up to 1 m high. Leaves composed of only 2—3 (4) pairs of leaflets. Leaflets smaller, scarcely longer than 1.5 cm. Inflorescence 3—4 cm with 2—4 (6) flowers. Pedicels up to 1 cm long, mostly covered with dark hairs. Flowers small, 12—15 mm long. Wings without spur, twice as short as keel. Ovary tomentose. Calyx up to 5 mm long, with dark hairs, and narrow, acute teeth, 2—3 times as short as tube. Fruit pubescent. (Fig 5, III a—d).

S p e c i m e n s e x a m i n e d:

F r a n c e: Murviel, pr. Montpellier, 28.5.1851 c.fl. et juv. fr., J. Lange (*C.* — typ. pro *C. brevialata* Lge.); ex horto bot. Hauniense, 1860 c.fl. et fr., J. Lange (C.); ?. 1863 c.fl. et fr. J. Lange (C.); in horto botanico hauniensi culta, 1866 c.fl., J. Lange (WU.); in horto bot. Haun. culta, 1872 c.fl., J. Lange (FI.); H-tes Alpes: Gap à St. Jean, 7.6.1902 c.fl. et fr., L. Girod, (G.); Gap à St. Jean, coteaux, 12.6.1904 c.fl. et fr., L. Girod (G.); Vesonne, Haute Savoie, 9.6.1906 c.fl., Beauverd (G.); Taillis de Vesonne, sous Mont ?, vers 800 m., calcaire jurassique (Massif de la Tournette), 9.6.1906 c.fl., Beauverd (G.); Marseille, 1851 c.fl., Herb. Soleirol, 3948 (FI.); Le Vigane (Gard), 8.1866 c.fl. et fr., Le Jolis (FI.); Drome, Crest, collines calcaires, 6.1870 c.fl. et fr., Hervier (BP.); Montagne de Genas, en face des farges de Niaux, 12.5.1866 c.fl., 3.6.1866 c.fr., Marhos (B.); Nancy (Meurthe). Bois pierreaux, Pompey, c.fl. et fr., V. Suard (CGM.); près Aulas, 450 m., coteau calc., 31.6.1913 c.fl., Braun-Chur. (RUEB.); Cot. boisée, vallon de l'Ouche (?), 1845 c.fl., Durer (W.).

S p a i n: Massif du Tibidabo et de Montalgere, 1916 c.fl., 6.1916 c.fr., F. Sennen, 2598 (W.); Serrania da Cuenca, 6.1898 c.fl., M. Gandoger (W. PRC.); Serrania de Cuenca: Hoz de Beteta (Cuenca), 17.5.1933 c.fl., Caballero, (K.).

S w i t z e r l a n d: Abhänge südestl., Grabels nord. exp., substr. Ca., ?, 19.4.1914 c.fl., M. Noack (RUEB.).

D i s c u s s i o n: A very rare form (a few localities) dispersed in the area of. *C. arborescens* ssp. *gallica* in Spain, France and Switzerland (?), recorded by Markgraf (Fedde Rep. 45, 1927) from Albany, but this is rather doubtful. Lange examining shrubs cultivated in the Botanical Garden in Copenhagen and herbarium specimens collected by him in Murviel (Montpellier) described it as a new species: *C. brevialata.* Cultivated specimens differ from native ones in larger leaflets and flowers.

E. Koehne's specimen (No. 164) determined as *C. brevialata,* collected in the Botanical Garden in Berlin has a glabrous ovary and rather large flowers (16—17 mm), therefore it is to be included with the typical *C. arborescens.*

The small number of herbarium specimens, rather damaged, I have had the opportunity to see, do not allow to draw any conclusions as regards the variability of this form. Thanks to its features (pubescent ovary, darkhaired calyx, smaller number of pairs of leaflets and others) it can be considered as *C. arborescens* ssp. *gallica.* Taking into account that several organs are smaller than in this subspecies of *C. arborescens,* we can assume that it is only an ecological form dependent on peculiar conditions of environment. Whether it is so, could be only stated after precise observations of this form in its natural habitats and after analysing richer collections than those I have had at my disposal.

Colutea × *media* Willdenow *(C. arborescens* × *orientalis).*

Enum. Pl. Hort. Berol., 771 (1809); Loudon, Arb. Frut. Brit., 2: 636 (1854); Petzold u. Kirchner, Arb. Muscav., 381 (1864); Koch, Dendr., 1: 64 (1869); Dippel, Hand. Laubh., 3: 704, fig. 273 (1893); Koehne, Deutsch. Dendr., 338 (1893); Schneider, Ill. Hand. Laubh., 2: 89, fig. 53 t—x (1907); Rehder, Man. Trees Shrubs, ed. 1., 509 (1927), ed. 2., 513 (1940); Sumniewicz, Fl. Uzbek., 3: 457 (1955); Sokolov, Dier. Kust. SSSR, 4: 166 (1958).

Syn. *Colutea orientalis* sensu Moench non Mill., Verz. Ausl. Bäume, Sträuch. Wiessenst., 24 (1785).

Colutea arborescens × *orientalis,* Ascherson u. Graebner, Syn. Mitteleur. Fl., 6, 2: 733 (1908); Shaparenko, Fl. URSS, 11: 319 (1941).

A hybrid between *C. arborescens* and *C. orientalis,* intermediate features. It differs from *C. arborescens* in a weaker growth, bluishgreen leaflets, smaller flowers (15—16 mm), brown red or orange coloured, keel narrowed at the top and occasionally with an indication of a beak, and in fruit slightly dehiscing at the top. From *C. orientalis,* it differs in a stronger growth, leaflets not broad obovate or nearly elliptic, in larger and more yellow flowers, wing geniculate, keel without, or with a minute beak; in fruit mostly indehiscent, without strong bending at the top. Leaves composed of 3—6 pairs of leaflets. Ovary commonly slightly pubescent, which indicate that *C. arborescens* ssp. *gallica* took part in the crossing.

Discussion: *Colutea* × *media* cultivated already before 1790, was described for the first time as hybrid in 1809 by C. L. Willdenow. Very common in cultivation, more often met than all the other species of *Colutea,* even *C. arborescens.* It is represented by a number of forms hard to define, and related in its features to one or to the other mother species. Probably it forms back-cross hybrids being, erroneously determined as *C. arborescens, C. orientalis* or even *C. brevialata.* It easily runs wild (Shaparenko, Ascherson and Graebner, l.c.).

3. *Colutea cilicica* Boissier et Balansa.

Diagn. Pl. Or., sér. 2, 5: 83 (1856); Tchihatcheff, Asie Mineure, 3, 1: 49 (1860); Boissier, Fl. Or., 2: 195 (1872); Schneider Ill. Hand. Laubh., 2: 90, fig. 54 h—k, 55 a—e (1907); Handel-Mazzetti, Pterid. Anth. Mesopot, Kurdist., 2: 39 (1910); Hayek, Ann. K. K. Naturhist. Hofmus., 28, 1/2: 161 (1914); Bornmüller, Notizbl. König. Bot. Gart. Mus. Berlin-Dahlem, 7, 63: 14 (1917); Nabelek, It. Turc.-Pers., 1: 75 (1928); Rehder, Man. Trees Shrubs, ed. 1., 508 (1927), ed. 2., 512 (1940); Post, Fl. Syr. Pal. Sinai, ed. 2, 1: 371 (1932); Krause, Ankarn. Fl., 85 (1934); Czeczott, Fedde Rep., 108: 160, pl. 27 fig. 3a (1939); Bornmüller, Fedde Rep., 89, 1 : 165 (1940); Thiébaut, Fl. Lib.-Syr. 2: 45 (1940); Bornmüller, Fedde Rep., 50: 135 (1941); Krause, Bot. Jahrb. Engler, 71: 69 (1941); Shaparenko, Fl. URSS, 11: 319, tabl. 22 fig. 5 (1941); Kolakovsky Fl. Abchazii, 3: 37 (1948); Grossheim, Opried. rast. Kawkaza 124 (1949); Sachokin, Fl. Gruzii, 5: 151 (1949); Stankov-Taliev, Opried. rast. ewrop. SSS, 437 (1949); Grossheim, Fl. Kawkaza ed. 2., 5: 339 (1952); Prilipko, Fl. Azerbaidż., 5: 324 (1954); Sokolov, Dier. Kust. SSSR, 4: 166 (1958); Wulf, Fl. Krym., 2, 2: 134 (1960). Syn.: *Colutea arborescens* auct. non L., Biberstein, Fl. taur. cauc., 2: 168 (1808); Ledebour, Fl. Ross., 1: 574 (1842); Steven, Verz. taur. Halb. Pfl., 120 (1857); Tchihatcheff, Asie Mineure, 3, 1: 49 (1860) p.p.; Stapf, Fl. Lycien, 36 (1886); Schmalghauzen, Fl. Ross., 1: 251 (1895); Post, Fl. Syr. Pal. Sinai, ed. 1., 253 (1896); B. et O. Fedtschenko, Bull. Herb. Boiss., sér 2, 1: 267 (1901); Bornmüller, Bot. Centralbl. Beih., 34: 457 (1909); Bornmüller, Verhandl. K. K. Zool. Bot. Gesell. Wien., 60: 194 (1910); Grossheim, Fl. Kawkaza, ed. 1., 2: 292 (1930) p.p.; Malejev, Rast. raj. Noworossijsk. 142 (1931); Krause, Ankarn. Fl., 85 (1934); Thiébaut, Fl. Lib.-Syr., 2: 45 (1940); Rechinger, Symb. Bot. Upsal., 11: 16 (1952).

Colutea arborescens var. *melanotricha* Freyn et Sintenis, Oesterr. Bot. Zeitschr., 43: 414 (1893).

Colutea melanocalyx sensu Anon., non Boiss., Gard. Chron., ser. 3, 16: 155 fig. 24 (1894).

Colutea longialata Koehne, Mitt. Deutsch. Dendr. Ges., 5: 49 (1896).

Colutea arborescens B. cilicica Ascherson et Graebner, Syn. Mitteleur. Fl., 6, 2: 731 (1909) p.p.; Dzievanovsky, Zap. Krym. obszcz. jestestw., 11: 121 (1930).

Type: Turkey. Cilicia litoralis prope Mersina, B. Balansa (G. ? — n.v.) Paratype: in pinetis prope Güllek Boghas, 4.000′, 11.7.1853 c.fl., Th. Kotschy, 98a (G. LE. P. W.).

Shrub up to 5 m high. Youngest parts of recent shoots covered with loose, appressed hairs, older ones glabrous or glabrate. Two years old shoots yellow-grey or brown, finely peeling fibrelike; older shoots brown-grey or dark grey. Stipules large, up to 3 mm long, ovate-lanceolate, with single, white hairs. Leaves 6—10 cm long, with (3) 4—5 pairs of leaflets. Rachis with loose, white hairs. Leaflets elliptic or slightly obovate, exceptionally roundish, rounded at apex, with a short acute appendage of midrib, more rarely shallowly retuse, up to 30 mm long by 24 mm broad, usually, however, smaller (20 × 14 mm), glabrous above, with loose hairs below, occasionally glabrate, thin, with well marked lateral nerves, sometimes with a bluish shade. Inflorescence with 3—5 (6) flowers, 5—8 cm long, shorter than supporting leaves. Rachis with a few white hairs. Pedicels 5—12 mm long, similarly pubescent to rachis;

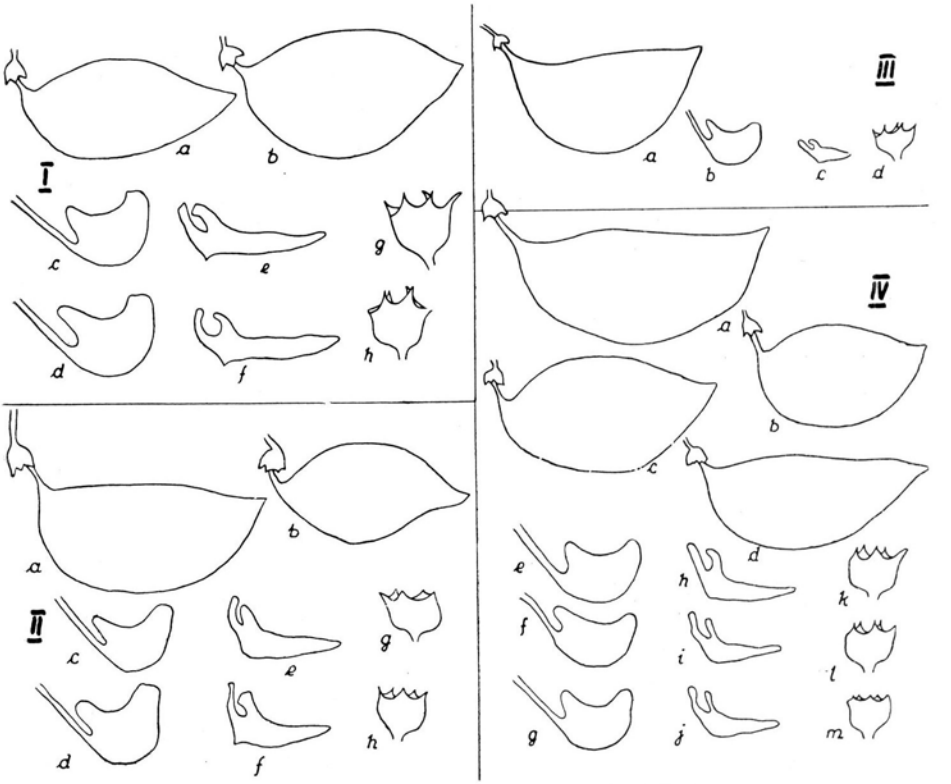

Fig. 5. Subsect. *Arborescentes*, sect. *Colutea*.

I. *C. cilicica*: *a-b* — fruits; *c-d* — keels; *e-f* — wings; *g-h* — calyces; II. *C. atlantica*: *a-b* — fruits; *c-d* — keels; *e-f* — wings; *g-h* — calyces; III. *C. arborescens ssp. gallica f. brevialata*: *a* — fruit; *b* — keel; *c* — wing; *d* — calyx; IV. *C. arborescens*: *a-d* — fruits; *e-g* — keels; *h-j* — wings; *k-m* — calyces (*m* = *f. macedonica*).

(keels, wings and calyces × 1; fruits × ½)

when black hairs on calyx there are such on pedicels, too. Bracts up to 2 mm long, narrow-ovate, with white hairs. Flowers yellow, large, usually 20—22 mm long, exceptionally slightly smaller. Wings distinctly longer than keel, mostly convolute on the margin, spreading at an angle of about 100°, with a well marked spur in place of breaking. Ovary quite glabrous. Calyx broad campanulate, 7—9 mm long, with short loose hairs. Hairs white, mostly, more or less mixed, however, with black hairs, or nearly exclusively black. Calyx teeth acute, about 2 mm long, with black hairs inside, more rarely with white ones and so only in forms where calyx covered exclusively with white hairs. Bractlets 1 mm long, ovate, similarly pubescent to calyx. Legume glabrous, with thin lustrous valves, 5—7 cm large by 2.5—3 cm broad, short acute at the top, on stipe distinctly exserted from calyx, indehiscent. Seeds 4 mm long by 3.5 mm broad. Flowers IV—IX (Fig. 5, I a—h, Pl. III).

Distribution: Turkey; USSR — Crimea, Armenia, Azerbaijan; north-western Iran, north Irak, north Syria, Lebanon, north Israel (?), probably in Greece, too. It grows in lower mountain positions mostly between 500—1.400 m a.s.l. The highest locality is given by P. H. Davis (No. 23535) from Turkey — about 2.000 m a.s.l. *Colutea cilicica* grows in open oak or pine woods (*Pinetum halepense*), in phyrgana or macchie and in steppe communities on mountain sides, on lime or serpentine rocks (Fig. 6).

The east and south limit of the area of *C. cilicica* is not yet precisely determined; it refers to regions of Turkey bordering with Syria, Irak and Iran, and of USSR with Iran. *Colutea cilicica* reaches furthest south Lebanon and north Israel, where it is supposed to grow on Mt. Carmel (Herb. Firenze). I have only seen a few specimens from Karadagh Mts., north-western Iran; they must not have been known to A. Parsa, as he does not record *C. cilicica* in his Iran flora (1948).

The occurrence of *C. cilicica* in south-western Turkey needs still confirmation. Two other species (*C. melanocalyx* and *C. davisiana*) grow in that part, but they have not yet been sufficiently recognized from the point of view of their geographical distribution. These species are, however, distinguished by a pubescent ovary, therefore it is easy to recognize their difference from *C. cilicica*.

Specimens examined:

Greece (?) Agrapha (Dolopia veterum (in reg. infer. m. Pindi, circa monasterium Korona, 3.500—3.700', 20—28, 6.1885, c.fl., C. Haussknecht (JE.); Kalampaka: Hagios Stephanos 4. 5. c.fl., 25.7.1896 c. fr., Sintenis, 396 (G. JE. PRC. SARA. W. WU.):

Turkey: Gallipoli, Suvla and Anzac, c.fl., R. Kett, 143 (K); in agro Byzantino, c.fl., Wiedemann (LE.); Ciftelan, 950 m., 1.10.1938, Ellenberg, 917 (B.); Amasia, in inferiore monte Logman, 5—600 m, 20.5.1890 c.fl., Bornmüller, 2696 (BM.FI.G. GB.JE.K.LE.P.PR.PRC.); Amassia, Galatia c.fl. et fr., Manissadjian, 36 (G.LE.P.); Amasia, in collibus siccis, 4—600 m, 2.5.1889 c.fl., Bornmüller, 233 (JE.LE.); Amasya, Logman c.fl. et fr., Manisadjian, 96b (K.W.); Pontus Galat., prope Amasiam, 5—600 m, 29.5.1890 c.fl. et fr., Bornmüller, 2324 (JE); ad oppidum Cânkri (Tschangry, Germanicopolis), in vinetis derelictis vallis Čakmakli-dere, c. 800 m, 16.6.1929 c.fl. et fr., J. et F. Bornmüller, 13386/87 (BM.BP.G.W.); ad Angora Galatiae, 1892 c.fl., Bornmüller, 3027 (G. JE. K. PR. W. WRL. WU.); Cilicien, Gysel-Dere, Wald v. Eichen, 1.300 m, 4.1896 c.fl., Siehe, 70 (BP. E. G. JE. K. LE. WRL. WU.); Anatolia: Hadim, 1883 c.l., Herb. Post, 62 (BM. G.); Ali-Dagh, à 7 km au SE de Ceasree, vers 1,350 m, 25.6.1856 c.fl. et fr., B. Balansa, 922 (G. K. P.); N. Anatolia, Env. of Gökçeagaç, forest of Quercus-Carpinus, 21.8.1959 c.fr., M. et D. Zohary, 2573 (HUJ); Centr. Anatolia, Ankara. Env. of Dikmen, 19.6.1953 c.fl. et fr., M. Zohary, 124 (HUJ); Centr. Anatolia, 7 kms. E. of Nevsehir, 29.8.1959 c.fr., M. et D. Zohary, 2186 (HUJ); Centr. Anatolia, Ankara. Env. of Keci Ören, 6.7.1953 c.fr., M. Zohary, 125 (HUJ); Centr. Anatolia, ca. 7 km. N. of Ankara, S-E slope, 1.200—1.400 m, 20.8.1959 c.fr., M. et D. Zohary, 2290 (HUJ); Taurus-banan, 22.5.1930 c.fl. et fr., O. Cyrén (GB.); Prov. Bitlis: Nemrut Dag, on E. flank between Tatvan and Sogurt, 6.000', 3.7.1954 c.fl., Davis, Polunin, 23535 (E.K.); Prov. Bitlis: Tatvan-Tug, 1.800 m., 29.6.1954 c.fl., Davis, Po-

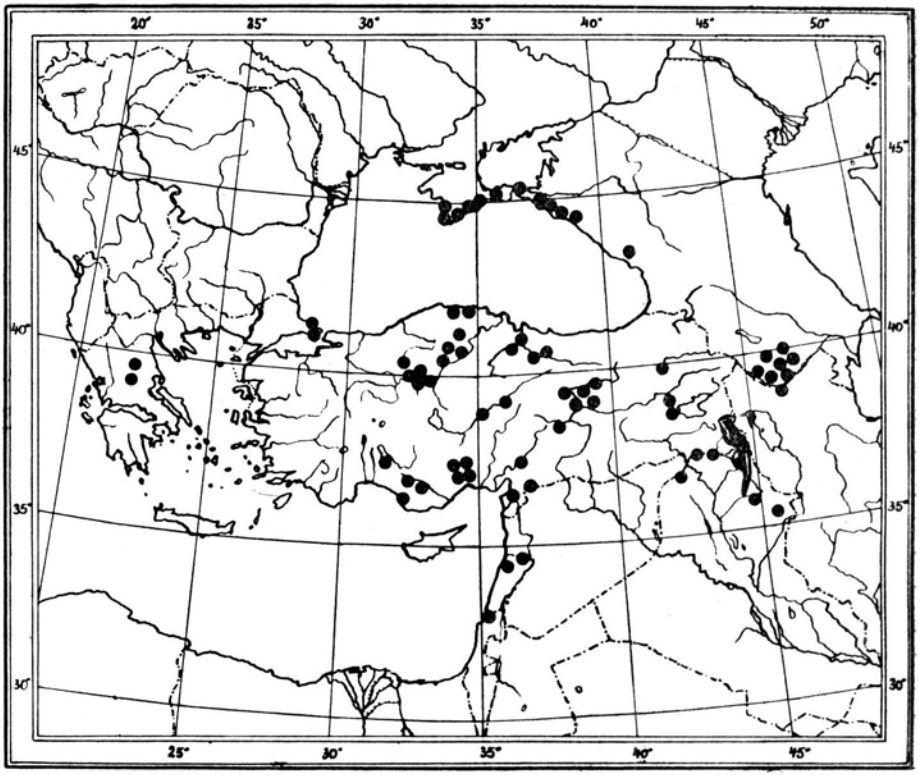

Fig. 6. Distribution of *C. cilicica* (subsect. *Arborescentes*, sect. *Colutea*).

lunin, 23310 (E.K.); Anatolia: Prov. Konya: Bozkir Vadisi, 1.9.1949 c.fl., Davis, 16602 (E); Prov. Kastamonou; Inebolu-Kure, 2.000', 8.6.1954 c.fl., Davis, 21665 (E.K.); Prov. Tunceli: Tunceli-Pülümür, 17 miles from Tunceli, 1.100 m, 7.6.1957 c.fl. et fr., Davis, Hedge, 29229 (E.K.); Prov. Tunceli: Pertek-Tunceli, 27 miles from Elaziğ, 1.400 m., 6.6.1957 c.fl., Davis, Hedge, 29139 (E. K.); Vil. Antalya, N. of Alanya, 1.000 m, 24.8.1947 c. fl., Davis, 14414 (E.K.); Vil. Ankara: near Beynan (c. 300 m above Ankara), 5.7.1947 c.fr., Davis (E.K.); Vilajet Adana, an feslen beim Dorfe Ofun, 5 Stunden von Mersina, 700 m, 5.1913 c.fl., W. Siehe, 351 (BM.E.LE.WU. — topotypus): Pandik Han to Marash, 17.5.1934 c. fl. et fr., Balls, 1110 (E.K.); Taurus Cilicicus, Namrun, 3.7.1927 c.fr., Bernhard (JE.); Armenia turcica: Kharput, prope Kekan ad Murad Szu, 20.5.1889 c.fr., Sintenis, 355 (G. PR.); Amanus mountains above Karakisich, 500—800 m, 30.6.1932 c.fr., A. Eig, M. Zohary, 123 (HUJ); Armenia turcica: Egin, Altikivei, in quercetis, 1.6.1890, c. juv. fr., Sintenis, 2411 (JE. PR. W. WU.); Wilajet de Sivas: Kizi près Tokat, 4.8.1892 c.fl. et fr., Radde (G); Paphlagonia: supra oppidulum Tukht, in declivitate orientali collium stepposorum, ca. 1.300 m, 11.7.1925 c.fl. et fr., H. Czeczott, 192 (G. KRA., priv. herb. of H. Czeczott); Prope pagum Yailadjik (vallis Ilgaz-su) ca. 1.130 m., 23.7.1925 c.fr., H. Czeczott, 595 (priv. herb. of H. Czeczott); supra pagum Yailadjik, in declivitate meridonali montium, ca. 1.360 m, 27.7.1925 c.fl. et fr., H. Czeczott, 610 (KRA., priv. herb. of H. Czeczott); Dikmen tepe bei Ankara. Berghänge 18.6.1933, c.fl., W. Kotte (K.); bei Ankara,

zwischen Weinbergen, 25.6.1932 c.fl. et fr., W. Kotte (K.); Monts Amanus, 5.000', 7.1906 c.fl., Manoog Haradjian, 570 (G.); Kurdistania occidentalis, Taurus Cataonicus. In convallibus subalpinis prope vicum Bekikara, inter urbem Malatja et vicum Kjachta, in declivibus siccis, ca. 1.600 m., 9.6.1910, c.fr., Handel-Mazzetti, 2453 (W.WU.); Kassan-Oglu. In valle ad pagum Gorumse, 4.000', 19.5.1859 c.fl., Th. Kotschy, 117 (BM. BP. CGE. JE. K. LE. P. PR. W.); Armenia turcica: Kharput, Schuschnat, 5.6.1889 c.fl., Sintenis, 578 (G. K. LE. P. PR. PRC. WRL.); Prope Angora, in montibus calcareis Dykmen, 1834 c.fl. et fr., Wiedemann (LE.); Hand-Dagh, 2.500' (freq. ad devexa Apisch Gaja alt. 3.000') c.fr., Th. Kotschy, 298 (W.); Tokat. Kisch-Kisch Dagh, NE Amasia c.fl., Wiedemann (LE.); Paphlagonia. Wilajet Kastambuli. Tossia: in collibus ad Szuluk-Tschesme, 21.5.1892 c.fl., Sintenis, 3882 (BM. FI. PR.); Paphlagonia: Wilajet Kastambuli. Tossia, in montosis supra urbem, 13.6.1892 c.fl. et fr., Sintenis, 3882 (G. JE. P. PR. PRC.); Paphlagonia: Wilajet Kastambuli. Tossia, 4.7.1872 c.fr., Sintenis, 3882 (G. W.).

Iraq. Sarsang, slopes of Qara Dagh, 1.000 m, 12.6.1958 c.fr., E. Chapman, 26415 (K.); Zawita, 6.1955 c.fr., Hunting Aero Survey, 165 (K.); Zawita, c. 3.000', 30.7.1933 c.fr., Rustan, 4804 (K.); Mesopotamia: In lapidosis montium Dschebel Sindschar spra oppidum Sindschar, ca. 1.000 m., 9.6.1910 c.fr., Handel-Mazzetti, 1470 (W. WU); Distr. Mosul (Kurdistan), ad confines Turciae, prov. Hakari, inter Dohuk et Amadiya; inter Sersang (Sirsank) et Suwara Tuke, ca. 1.400 m., 10—12.7.1957 c.fr., K. H. Rechinger, 15809 (W.); Kurdish Hills, 2.500', 1.5.1936 c.fl., A. Low, 280 (BM.); Querchel-Swaratuka, 10.5.1958 c.fl., J. A. Kas, 18673 (K); Kurdistania (Assyria orient.) in montis Kuh-Sefin, reg. infer. ad pagum Schaklava (ditionis Erbil), 1.000 m, 15.5.1893 c.fl. et fr., Bornmüller, 1099 (JE); ad rivulum prope pagum Sakri-Sakran, dist. Rowanduz, ca. 1.900 m., 6.6.1961 c.fl. et fr., E., Hadač et Faisal and'el Kader, 5.600 (priv. herb. of E. Hadač).

Syria. Montagnes du Kurd-Dagh, 4—5.000', 5.1907 c.fl., Manoog Haradjian (G.).

Lebanon. Wadi Ibrisan, 24.7.1891 c.fr., Post (BM.); Northern Lebanon, Hasrou (?), ca. 1.300 m., 22.7.1931 c.fr., M. Zohary (HUJ.); Liban, c.fl., Labillardiere (G.); Liban, 1866 c.fr., ?, 3085 (JE); Liban, Nallir et Hutchit (?), 15.5.1866 c.fl., Teste J. Bornmüller (JE.).

Israel: Mont Carmel, c.fl. (FI.).

Iran. Prov. Azerbaidjan: Montes Karadagh prope Hassanbaghlu, c.fr., Mirdamai, 598 (W.); Hasanbeili, in silvis caeduis, 17.9.1884 c.fr., I. A. Knapp (WU.).

USSR. Crimea: Decliv. septentr. Kaczikalen, 6.6.1905 c.fr., Busch (LE.); Ałupka, 31.5.1911 c. fl. et fr., C. Kossinsky (LE.); Martjan, 7.7.1948. c.fr., Juzepczuk, 610 (LE.); Martjan, 27.5.1949 c.fl., Juzepczuk, 1497 (LE.); Bajdarskije worota, c.fl. et fr., Grigoriev (LE.); prope Jałta, ad riv. Utschann, prope Issar, 8/21.6.1901 c. fr., ? (LE.); Balaklawa, 1874 c.fr., A. Rehmann, 223 (KRA.); Laspi, 1874 c.fr., A. Rehmann, 224 (KRA.); ad viam, Sudak- "Nowyj Swiet", 19.12.1929 c.fl. et fr., Syrejszikow, 857/58 (MW.); Balaklawa, pag. Karan, 18.7.1930 c. fr., Stankov (MW.); Balaklawa, in vicinitate monaster. Gieorgijewskij, 18.7.1930 c.fr., Stankov (MW.); Alupka, c.fl., Teplow (MW.); Suuk-Su, 2.7.1923 c.fr., Teodorewicz (MW.); in Junipereto, prope Nikita, 4.6.1948 c.fl., Magaryszkin (MW.); Monasterium Gieorgijewskij, 29.6.1885 c.fr., N. Zelenetzky (G.); Sympheropol, 6.1885 c.fr., N. Zelenetzky (G.); Distr. Yalta, Nikita, 150 m, Rocky slopes, 29.5.1959 c.fl., Davis, 33091 (E); Sudak: Abhänge des Sokoll, 14.6.1895 c.fl. et fr., A. Callier (B. JE. PRC. W. WRL. WU.); Abhänge des Sokoll bei Sudak, 20.7.1896 c.fr., A. Callier, 347 (FI. P. WRL. WU.).

Krasnodar region. Novorossijsk, in valle fl. Adera, prope Gielendshik, 24.5.1907 c.fl., Litwinow (LE.).

Georgia. Chodshali, 1.5.1890 c.fl., N. Busch (LE.).

Armenia. Prov. Megry, inter Vargavar et Bugakiar, in faucibus, 30.6.1929 c.fl., Schelkovnikov et Kara-Murza (ERE. LE.); Distr. Zangezur, inter Kartschevan et Vargavar, 30.5.1923 c.fl., Grossheim (ERE. LE.); Zangezur austr.-occid., in systemate fluvii Megrigiet, 1.300—1.400 m, 5.6.1947 c.fl., A. Doluchanov, 39991 (ERE.); Zangezur, 6.8.1927 c.fl. et fr., Tachtadshian, 4818 (ERE.); Kafan, 12.10.1935 c. fr., Tachtadshian, 25653 (ERE.); ad viam, pag. Megri, 21.9.1934 c.fr., A. Fedorov, 22358 (ERE); Zangezur austr.-occid., inter pag. Legwaz et Vargavar, 9.6.1947 c.fl.,? 39710 (ERE.); Megri, prope pag. Legwaz, 21.9.1934 c.fr., Tachtadshian, 14816 (ERE.); Zangezur, Zabuch-Dych, 24.7.1927 c.fr., ?., 14919 (ERE.); Distr. Megri, Legwaz-Megri, 25.7.1957 c.fr., 63039 (ERE.); Kafan, in declivibus austr.-occid. prope pag. Giechi 25.8.1952 c.fr., Gabrielian, 54108, 39009, 63040 (ERE.); Distr. Megri inter Legwaz et Arewik, 17.6.1939, Jaroszenko, 27762 (ERE.); Megri, 18.6.1958 c.fr., Mulkidjanian, 64005 (ERE.); Zangezur, Distr. Kafan, ad viam, Szurnuchi-Kafan, 9.8.1950, Mulkidjanian, 59008 (ERE.); Megri, 27.6.1939, Jaroszenko, 27763 (ERE.); Megri, ad viam prope Kaler, 1.500—1.600 m, 11.7.1958 c. fr., Mulkidjanian (ERE.); Megri, Liczk, 17.7.1958 c.fl. et fr., Mulkidjanian (ERE.); Caucasus, c. fl., Bayer (G.K.); Caucasus, c.fl., Hohenecker, 326 (LE.).

Azerbaijan. In saxosis ad munimentum Schuscha, 22.5.1829 c.fl., Szovits, 195 (LE.); Distr. Zangielan, non procul pag. Pirczewan, 400 m, 18.5.1948 c.fl., Grossheim, Kirpicznikov, Smoljaninova (LE.); Karabagh, Distr. Gadrut, pag. Dottu, 1.100 m, 1.6.1948 c.fl., Smoljaninova, 31.5.1948 c.fl., Kirpicznikov, Smoljaninova (LE.); Karabagh, 10.1830 c.fr., Szovits (LE.); Karabagh, inter Baludsha et Agdagan, 6.1895 c.fl., Lomakin (FI. LE.).

Discussion: Herbarium specimens of *C. cilicica* have been often determined as *C. arborescens, C. arborescens* var. *melanotricha* or *C. melanocalyx*. Basing on the examined and recorded material I can state for certain that *C. arborescens* does not occur either in Asia Minor or West Asia, or in Crimea, or Caucasus. Yet it is a very difficult task to fix the eastern limit of the area of *C. arborescens* and the western one of *C. cilicica*. This difficulty lies in the proper classification of transitional forms of *C. arborescens,* characterized by long wings, often even barely longer than the keel. Schneider (l.c.) drew attention to these forms, and he thought that they made up a peculiar species growing from the Balkan to north Asia Minor. Ascherson and Graebner (l. c.) moved still further in their suggestion taking into account the great variability of *C. arborescens*. They included *C. cilicica* to the broadly taken species "*C. arborescens*". This way of classifying has been criticized by H. Czeczott (l.c.) who has given some criteria to discriminate between these two species. Not all features recorded by H. Czeczott can be taken as essential, because not only the number of pairs of leaflets, but also the length of calyx teeth and the way of the termination of the fruit in both species show a considerable variability. The proper criterion may be almost exclusively the flower features. Flowers in *C. cilicica* are larger, with wings distinctly longer than keel, always bearing a spur in place of breaking. Therefore I reckon among the *C. arborescens* all

those forms of *Colutea* from the Balkan peninsula that have wings with a spur but clearly shorter than the keel or, at the most, equal to it or even somewhat longer but without spur. Among *C. cilicica* I have included only a few specimens (see list of specimens) of which the Greek specimens are still rather uncertain (Haussknecht, s. n., Sintenis, 396). It may be possible that this difficulty in separating *C. arborescens* from *C. cilicica* is caused by their crossing; attention should also be drawn to the fact that while transitional forms are rather frequent on the Balkan peninsula they are not met in Asia Minor.

Besides there are transitional forms between *C. cilicica* and *C. armena* in Turkish Armenia, though rather few. They have roundish or broadly--ovate leaflets and an ovary with traces of hairs, especially along the ventral suture (Sintenis, 355, 578). Shaparenko included them among *C. armena* (Herb. Kew, Leningrad), though it is wrong, because the latter species has a tomentose ovary, while the mentioned forms have a slightly pubescent ovary only.

The problem of a special variety in *C. cilicica,* with the calyx covered with black hairs and called by Freyn (l.c.) "*C. arborescens* var. *melanotricha*", can be thought as solved now, with such an amount of herbarium material deriving from different parts of the area. We must wholly conform to H. Czeczott's opinion who reduced its rank to form (f. *melanotricha* (Fr. et Sint.) Czeczott), as we lack any geographical differentiation in the occurrence of individuals with white or black hairs, and intermediate stages between those extreme forms are very common. The black haired form of *C. cilicica* has absolutely nothing in common with *C. melanocalyx,* though it has been often determined just so (Bornmüller 2696, 3027, Sintenis 2411, Zohary 124, 125).

3a. *Colutea cilicica* var. *shaparenkoi* Browicz.

Type. URSS, in declivitate montium prope Novorossijsk, 26.5.1912 c.fl., I. V. Palibin, 1270 (LE.).

Leaves up to 20 cm long with 5—7 (8) pairs of leaflets. Inflorescence to 12 cm long with 5—12 flowers (Pl. IV).

Distribution: USSR — Crimea and vicinity of Novorossijsk. Separate localities are in southern Armenia and in Amanus Mts. It is more frequent than the type species in Crimea.

Specimens examined:

USSR. Crimea: Batiliman, 13.10.1937 c.fl., V. P. Sawicz (LE.); Laspi, in saxosis prope Ajja, 10.6.1906 c.fl. et fr., A. Kristofovicz (LE.); Alupka, 18.6.1911 c.fl. et fr., Kossinsky (LE.); Sevastopol. Monasterium Gieorgijevskij, in saxosis, 23.6.1880 c.fl. et fr., Korshinsky (LE.); in declivibus septentrionalis, Jaila, 9.6.1905 c.fl., Busch (LE.); Distr. Jalta, Martjan, 18.6.1925 c. fr., S. Dzievanovsky, (LE.); inter Bajdarskije worota et Szajtan Mierdwien, 26—27.6.1893 c.fl. et fr., O. et B. Fedtschenko (G.LE.);

Distr. Lenin, peninsula Kertsch, 20.6.1954 c.fl., Krylov (LE.); prope Jalta, ad riv. Utschann, prope Issar, 23.5.1901 c.fl.,? (LE.); Sevastopol, in declivibus, Inkierman, 3.7.1893 c fl. et fr., Korshinsky (LE.); in vicinitate urb. Sevastopol, 20—25.6.1889 c.fl., Korshinsky (LE.); Tauria, 22.7.1852 c. fl., Gugajewicz (LE.); in saxosis, prope mont. Krestow, Alupka, 29.5.1912 c.fl. et fr.,? (LE.); Plantae Tauricae, 27.8.1927 c. fr., Wankov (LE.); Tauria austr., in saxosis, 28.5.1929 c.fl., Stankov (LE. MW.); in saxosis cretaceis prope Albat, 24.5.1924 c.fl., S. Dzievanovsky (LE.); Kuczuk-Uzen, 1830 c.fl., G. Meyer (LE.).

Krasnodar region. Distr. Tuapse, inet pagos Olginskoje et Dzhubaga, 15.6.1951 c.fl. et fr., A. Kolakovsky, 3680 (C. E. G. K. KRA. W. WA.); Tuapse in saxosis, 5.7.1933 c.fl., P. Panjutin, 1172 (LE.); Gielendshik, Promont. Tolstyj, 28.8.1925 c.fl. et fr., Komarov, 55 (LE.); in vicinitate urb. Novorossijsk, mont. Kojadugie, 12.7.1937 c.fl. et fr., Kravcova, 152 (LE.) in vicinitate urb. Novorossijsk, Markotch, 19.7.1923 c.fr., Pojarkova 118, 263 (LE.); in vicinitate urb. Novorossijsk, 18.9.1891 c. fr., Lipsky (LE.); in vicinitate pag. Tuapse, 12.5.1895 c. fl., Lipsky (LE.).

Armenia. Distr. Kafan, inter Kafan et Czakten, 24.7.1959 c.fr., Mulkidjanian, 64731 (ERE.).

Turkey: Monts Amanus, 800—3.000′, 9.1913 c.fl. et fr., Manoog Haradjian, 4700 (E. G.).

Discussion: For a long time specimens of *Colutea* from Crimea were determined as *C. arborescens*. Only in 1930 Dzievanovsky (l.c.), and later Shaparenko (l. c.) classified them to *C. cilicica* in a proper way. Before Boissier's diagnosis G. Meyer drew attention to their difference. On a herbarium specimen collected in the Crimea in the vicinity of Maloreczinsk he left a remark *"Colutea taurica mihi"* and a Latin diagnosis but he did not publish it. I have reckoned Meyer's specimen among the *C. cilicica* var. *shaparenkoi*.

Colutea × *variabilis* Browicz *(C. cilicica* × *orientalis).*

Type. Azerbaijan. Regio Zangelan, prope pagum Padar, in silvis collucatis, in declivitate borealii montium, 550 m, 19.5.1948 c.fl., Grossheim, Kirpicznikov, Smoljaninova (LE).

Shrub. Young shoots glabrous or glabrate, older ones grey-brown, peeling in short, thin fibres. Stipules about 1.5 mm long. Leaves 4—7 cm long, with 2—3(4) pairs of leaflets. Rachis with single hairs or glabrous. Leaflets obovate, cuneate at the base, retuse at apex, glabrous above, glabrate below, up to 13 mm long by 8—10 mm broad. Inflorescence 1—3 flowered, shorter than, or equal to, supporting leaves. Rachis with a few, white hairs. Bracts ovate-lanceolate, up to 1.5 mm long with white and black hairs. Pedicels up to 8 mm long, with short, black hairs. Flowers 16—19 mm long. Standard dark yellow, with a distinct light yellow spot at the base. Keel rounded at the top, or with a barely marked indication of a beak, darker coloured in the upper part, probably red or violet. Wings equal to keel, similarly to it dark coloured, rounded in place of breaking, or with a hardly marked spur. Ovary glabrous. Calyx up to

7 mm long, campanulate, with black, or mixed with white, hairs. Calyx teeth 1.5—2 mm long, tomentose, hairs black inside. Bractlets lanceolate, up to 1 mm long, hairy like calyx. Fruit not seen. Flowers V. (Fig. 15, III a—d).

Distribution: Natural hybrid between *C. cilicica* and *C. orientalis* growing in USSR, in southern Azerbaijan.

Colutea × *variabilis* is shown by three specimens in the herbarium in Leningrad, collected in the time of flowering. They distinctly show characters intermediate between mother species. It inherited a darker colour of wings and keel of *C. orientalis*, as well as its shape of wings and leaflets, and of *C. cilicica* the length of wings and rounding of top of keel and size of flowers.

This hybrid is, beside *C.* × *media*, another example that species of *Colutea* can cross, and even between different sections. We may suppose, that in other cases too, when areas of species overlap natural hybrids can occur. Hence, probably, the difficulties in a proper determination of herbarium material from just such regions. I am drawing attention to it when discussing *C. cilicica* (possible hybrids with *C. arborescens* and *C. armena*), *C. buhsei* (possible hybrids with *C. gracilis*), and *C. davisiana*.

4. *Colutea melanocalyx* Boissier et Heldreich.

Diagn. Pl. Or., sér. 1, 9: 35 (1849); Tchihatcheff, Asie Mineure, 3, 1: 50 (1860); Boissier, Fl. Or., 2: 194 (1872); Dippel, Hand. Laubh., 3: 706 (1893); Koehne, Deutsch. Dendr., 338 (1893); Schneider, Ill. Hand. Laubh., 2: 90, fig. 54 l—m, 55 f—i (1907); Ascherson u. Graebner, Syn. Mitteleur. Fl., 6, 2: 732 (1908) p. p., Rehder, Man. Trees Shrubs, ed. 1: 508, (1927), ed. 2, 512 (1940).

Type. Turkey. In pinetis montium Climax et Solyma, Lyciae, 3—5, 1845, c.fl. et fr., Heldreich (W. holo. + BM. CGE. FI. G. LE. K.iso.).

Shrub. Shoots tomentose, hairs white when young, but glabrescent later. Older shoots grey-brown. Stipules ovate, acute, up to 2 mm long, with white hairs. Leaves up to 7 cm long, mostly with 3, more rarely with 4, pairs of leaflets. Rachis tomentose at first, hairs white with single black ones, later loosely pubescent. Leaflets up to 20 mm long by 14 mm broad, broad-elliptic, obtuse or retuse at apex, with a distinct acute appendage of midrib, thin, glabrous above, tomentose, hairs white, below. On very young leaflets there are also black hairs along the midrib beneath. Inflorescence 2—5 flowered, longer than supporting leaves. Rachis loosely pubescent with white and black hairs; on upper part of rachis the number of black hairs becomes more numerous. Pedicels 5—6 mm long, tomentose, hairs black slightly erect so that pedicels seem thicker than they really are. Bracts ovate-lanceolate, up to 2 mm long, with black hairs, especially on the margin. Flowers up to 18 mm long. Wings, as long, or only slightly longer than keel, rounded in place of

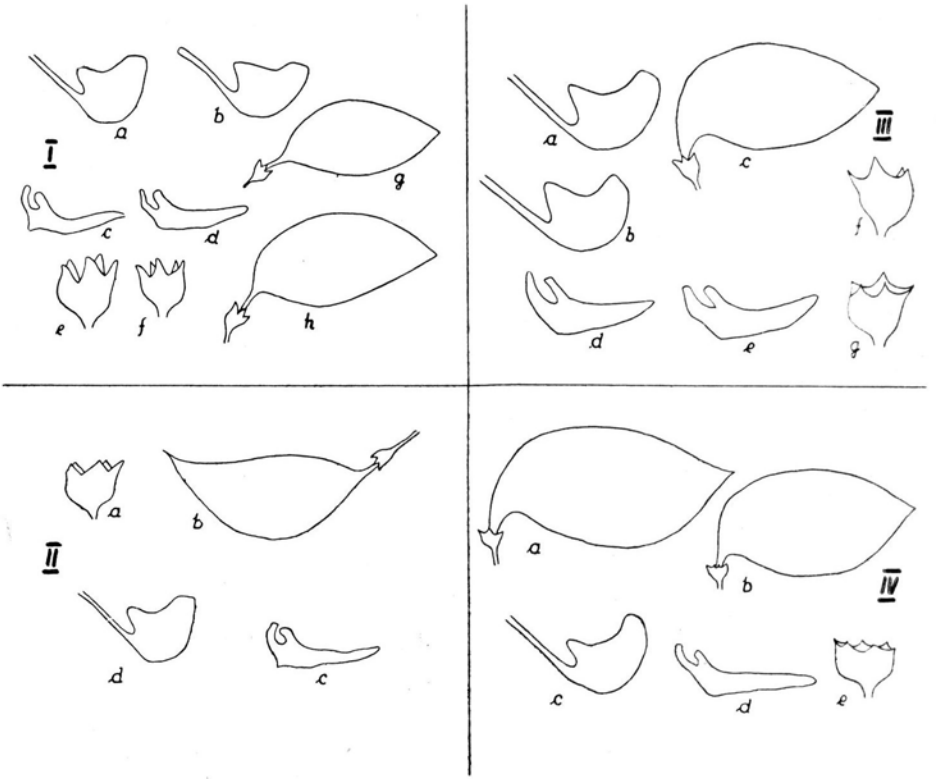

Fig. 7. Subsect. *Arborescentes*, sect. *Colutea*.
I. *C. melanocalyx*: *a-b* — keels; *c-d* — wings; *e-f* — calyces; *g-h* — fruits; II. *C. davisiana*: *a* — calyx; *b* — fruit; *c* — wing; *d* — keel; III *C. insularis*: *a-b* — keels; *c* — fruit; *d-e* — wings; *f-g* — calyces; IV. *C. armena*: *a-b* — fruits; *c* — keel; *d* — wing; *e* — calyx.
(keels, wings and calyces × 1; fruits × ½)

breaking, or with a spur, spreading at an angle of about 110°. Ovary pubescent, especially strongly near the ventral suture. Calyx tubular, 8—9 mm long, covered with black hairs, so much that its surface notvisible. Calyx teeth obtusely terminated, up to 3 mm long. Incisions between teeth acute. Bractlets ovate-lanceolate, 1 mm long, brown, ciliate with black hairs, distinctly varying from calyx. Fruits 5—6.5 cm long and up to 2.5 cm wide, short acute on the top, placed on a stipe about 12 mm long, exserted from calyx, indehiscent, loosely pubescent. Flowers III—V. (Fig. 7, I a—h, Pl. V).

Distribution: Turkey. Endemic species, known only from few localities. (Fig. 8).

Specimens examined:

Hafis Pasha, 800 m., 12.4.1936 c.fl. et juv. fr., T. A. Tengwall, 329 (K.); in monte Tcharyklar ad Adalia Pamphyliae, c.fl., Bourgeau (n.v. — apud Boiss. Fl. Or.).

Discussion: Since its description by Boissier *C. melanocalyx*

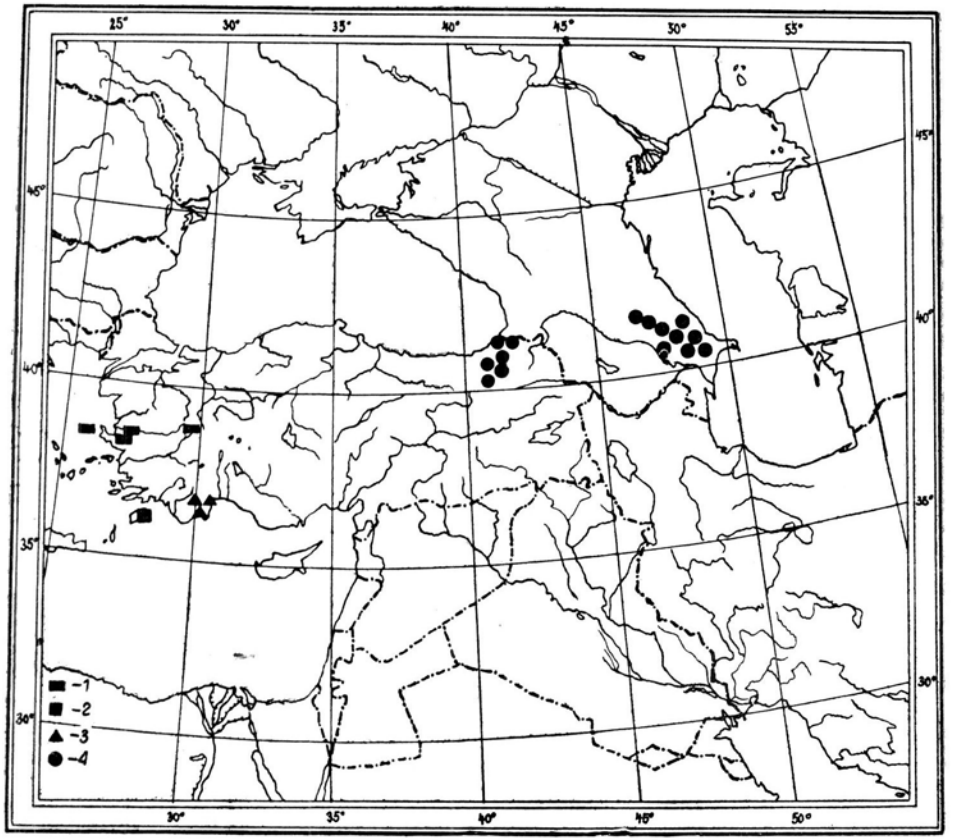

Fig. 8. Distribution of some species of subsection *Arborescentes*, section *Colutea*: *1 — C. davisiana; 2 — C. insularis; 3 — C. melanocalyx; 4 — C. armena.*

was very often mentioned from the Balkan peninsula, Turkey and Caucasus. The name was erronously used for black calyx specimens of *C. arborescens, C. cilicica,* and even *C. armena.* Suggestive was the specific epithet: "*melanocalyx*". A black pubescence of calyx (usually with white hairs intermixed) is quite often met in both *C. arborescens* and *C. cilicica. C. melanocalyx* differs from these two species mainly in acute incisions between the calyx teeth. This type of calyx is very rare in the genus *Colutea,* and is also met only in *C. gifana* and *C. davisiana,* and in the latter the acute incisions are neither so deep nor so acute.

After analysing a rich herbarium material from south-eastern Europe, Turkey and Caucasus I can definitely state, that *C. melanocalyx* is confined in its distribution only to Turkey. All specimens from the Balkans determined as "*C. melanocalyx*" belong without doubt to *C. arborescens*; they are distinguished by a glabrous ovary and rounded incisions

between the calyx teeth. It is rather difficult to state how large the area of *C. melanocalyx* is in Turkey, because with the exception of type specimens, cited by Boissier (l.c.) I have seen only one that can be determined as belonging to this species. Lately P. Mouterde (Bull. Soc. Bot. France, 106: 473, 1959) mentions several localities of *C. melanocalyx* from Lebanon. I have not seen the specimens from these localities, nevertheless I rather doubt that *C. melanocalyx* grows in this part of West Asia. Most probably Mouterde's data refer to dark calyx forms of *C. istria* or *C. cilicica;* this should be accurately verified.

5. *Colutea davisiana* Browicz.

Syn. *Colutea arborescens* sensu Boissier non L., Fl. Or., 2: 194 (1872). p.min.p.
Colutea cilicica var. *melanotricha* (Freyn) O. Schwartz, Fedde Rep., 36: 92 (1934). p.p. (?).

Type. Turkey. Collines situées au nord d'Ouchak (Phrygie), 2.6. c. fl., 29.7.1857 c.fr., B. Balansa, 1203 (P. holo. + BM. G. JE. K. LE. RUEB. WRL. iso.).

Shrub. Young shoots with appressed white hairs. Two year old shoots brown-grey, peeling in short fibres. Stipules ovate-triangular, 1.5 mm long, with white hairs. Leaves 5—8 cm long, with (3) 4 pairs of leaflets. Rachis with loose, appressed white hairs or glabrate. Leaflets elliptic, obovate or even roundish, rounded or retuse at apex, with a barely visible appendage of midrib, glabrous or exceptionally with single white hairs above, with appressed white hairs below, slightly rugose, up to 20 mm long by 16 mm wide, mostly smaller. Petiolules 1—1.5 mm long. Inflorescence as long or shorter than supporting leaves, 4—7 cm long, composed of 3—7 flowers. Rachis with loose, white hairs. Pedicels 5—12 mm long, dark brown, pubescent; hairs brown, black or white. Bracts ovate-lanceolate, 1—1.5 mm long, with white hairs on the margin. Flowers 18—19 mm long, yellow. Wings narrow, often convolute on the margin, as long or slightly longer than keel, with a more or less visible spur in place of breaking, spreading at an angle of about 110—120°. Ovary with distinct appressed hairs. Calyx 5—6 mm long, with brown, black or white hairs. Calyx teeth broad triangular, acute, about 1.5 mm long. Incisions between teeth acute, though wide. Bractlets up to 1 mm long, lanceolate, similarly pubescent to calyx. Fruit 5—6 cm long by 2—3 cm broad, on long stipe, almost twice as long as calyx, lustrous and loosely pubescent; top of fruit very narrowed, straight or slightly bent upwards. Seed 3.5 mm long by 3 mm broad. Flowers V—VI. (Fig. 7, II a—d, Pl. VI).

Distribution. West Turkey and Aegean Islands. It probably occurs in lower positions, up to 800 m a.s.l. According to Schwartz (l.c.) it grows in phyrgana together with such species as: *Pinus bruttia,*

Pistacia lentiscus, P. terebinthus, Laurus nobilis, Phillyrea media, Jasminum fruticans, Anagyris foetida, Quercus pubescens ssp. *anatolica* and *Pyrus amygdaliformis.* (Fig. 8).

Specimens examined:

Turkey: Mont Sipyle au dessus de Magnésie, 6.1854 c.fl. et juv. fr., B. Balansa (G. LE.); Smyrna, Burnova: in latere spetentrionali collis calcarei "Papasian" dicti, ca. 100 m., 5.1933. c.fl., O. Schwartz, 576 (B.); Izmir (Lydien). Hügel Papasian ob. Burnova, 90 m., 19.5.1935 c.fl. et fr., Huber-Morath, 2262 (HUJ.).

Greece. Chios: Sklavicá, edge of road, 29.5.1940 c.fl., J. W. O. Platt, 495 (K.).

Discussion: The species is closely allied to *C. cilicica* and *C. melanocalyx* and is possibly their hybrid only. The type specimen was determined by B. Balansa as *C. arborescens* and under this name it was also mentioned by Boissier (l.c.). H. Czeczott (Fedde. Rep., 107: 162, 1939) used it as an example of *C. arborescens* growing in Asia Minor. It differs, however, from *C. arborescens* in size and shape of calyx teeth, acute incisions between teeth and pubescent ovary; east European specimens of *C. arborescens* have a quite glabrous ovary. These features relate *C. davisiana* to *C. melanocalyx*, but it does not possess such a tomentose black haired calyx and pedicels. The presence of a spur on wings, which are often convolute on the margin and lustrous fruits show its affinity with *C. cilicica,* but the latter has quite glabrous ovary and fruits. The material at my disposal has not allowed to state whether the feature of a long and acute top of the fruit is constant for this species, as the other herbarium specimen with fruits (Huber-Morath, 2262) has a short terminated legume.

O. Schwartz (l.c.) classified his specimen No. 576 to *C. cilicica* var. *melanotricha,* and did not pay attention to the pubescent ovary. According to him, basing on the length of calyx teeth, specimens of *Colutea* from Thrace, Lidia and Anatolia are intermediate forms between *C. cilicica* and *C. arborescens.* Schwartz proposes the name *C. intermedia* for them. I have not applied this name to my new species, as it refers to a group of small not described forms, having a glabrous ovary (?). The name "*davisiana*" was given in honour of P. H. Davis from Edinburgh, who is engaged in a study of the flora of Turkey.

6. *Colutea insularis* Browicz.

Syn. *Colutea arborescens* sensu Boissier non L., Pl. Or., 2: 194 (1872) p.min.p.

Type. Rhodes. Rochers à Filerino et à Salakos, 5—6.1870 c.fl. et fr., E. Bourgeau, 37 (G. holo. + BM. CGE. FI. G. K. P. RO. iso.).

Shrub. Young shoots finely puberulous, hairs white, glabrate in the lower part. Grey-brown, peeling finely the second year. Stipules narrow-triangular with white hairs, especially on the margin. Leaves 5—7 (8) cm long, composed of 4, more rarely of 5 pairs of leaflets. Rachis with loose,

white hairs. Leaflets elliptic, more rarely ovate-elliptic, 10—18 mm long by 7—14 mm broad, rounded or retuse at apex, with a distinct, acute appendage of midrib, with well marked lateral nerves, glabrous above, with loose, appressed hairs below. Petiolules up to 2 mm long, pubescent. Inflorescence 5—6 cm long, shorter than the supporting leaves or equal to them, 3—7 flowered. Rachis with appressed, white hairs. Pedicels thick, 8—10 mm long, with white hairs. Bracts 1.5 mm long, ovate-lanceolate, with white hairs. Flowers exceptionally large, 20—25 mm long. Wings equal to keel, broad, flattened, acute in place of breaking, spreading at an angle of about 130°. Ovary tomentose, especially the middle part. Calyx broad campanulate, 7—10 mm long by 8—9 mm broad with appressed white hairs. Calyx teeth broad-triangular, acute, 2.5 mm long, tomentose, hairs white inside. Stipules ovate-lanceolate, 1—1.5 mm long, ciliate on the margin, with white hairs. Fruits 5—5.5 cm long, by 2.5—3 cm broad, with loose hairs, on a short stipe, barely exserted from calyx. Flowers IV—V. (Fig. 7, IIIa—g, Pl. VII).

Distribution: Species endemic to Rhodes Island. (Fig. 8).

Specimens examined:

Rhodes. In saxosis ad Valthy, 20.5.1935 c.fl., K. H. et F. Rechinger, 7529 (BM. K. W.); Is. di Rodi, 170 m., 3.8.1923 c.fr. A. Fiori, 254 (RO.); Sonnige Abghänge, Insel Rhodos, 23.5.1938 c.fl. et fr., V. Engelhardt (B.); Rodi: Cata dei Peni, 4.1938 c.fl., A. Fiori, 15 (FI.).

Discussion: *Colutea insularis* is distinctly allied to *C. arborescens*, on the one hand, and to *C. cilicica*, on the other. It differs from the former, above all, in larger flowers and pubescent ovary and fruits (in the east part of the area *C. arborescens* has a wholly glabrous ovary). Its size of flowers and wings acute in place of breaking remind of *C. cilicica*, but it differs from it in pubescent ovary and shorter wings. In the exclusively white pubescent calyx and rounded incisions between teeth *C. insularis* differs from the remaining Turkish species of *Colutea* having a pubescent ovary (*C. melanocalyx, C. davisiana, C. istria, C. armena*). It is rather hard to state, because of lack of material, whether the colour of the calyx hairs in this species is a constant feature. Further observations especially on living material, could add some important data.

7. *Colutea armena* Boissier et Huet du Pavillon.

Diagn. Pl. Or., ser. 2, 5: 83 (1856); Tchihatcheff, Asie Mineure, 3, 1: 50 (1860); Boissier, Fl. Or., 2: 194 (1872); Shaparenko, Fl. URSS, 11: 321 (1941); Grossheim, Opried. rast. Kawkaza, 124 (1949); Grossheim, Fl. Kawkaza, ed. 2, 5: 239, tabl. 30 fig. 3 (1952); Prilipko, Fl. Azerbajdż., 5: 323 (1954); Prilipko, Lesn. Rastit. Azerbajdż., 294 (1954); Sokolov, Dier. Kust. SSSR, 4: 169 (1958).

Syn. *Colutea orientalis* sensu Tchihatcheff non Mill., Asie Mineure, 3, 1: 50 (1860).
Colutea arborescens sensu Grossheim non L., Fl. Kawkaza, ed. 1, 2: 292 (1930).

Type. Armenia, Erzerum c.fl. et fr. Calvert (G. (?) holo. + E. K. iso.).

Shrub about 2 m high. Youngest parts of recent shoots with loose white hairs, later glabrescent and glabrous. Shoots, the second year, brown-grey, peeling in short and thin fibres. Older shoots dark brown-grey. Stipules ovate-lanceolate, up to 1.5 mm long, with single, white hairs on the margin. Leaves 5—9 cm long, composed of (2) 3—4 pairs of leaflets. Rachis glabrate. Leaflets round or round-obovate, with a broad-cuneate base, up to 20 mm long by 18 mm broad, usually smaller, however, (15 × 13 mm), rounded or slightly retuse at apex, with a barely marked appendage of midrib, slightly rugose, with well marked lateral nerves, quite glabrous above, with loose hairs or glabrate beneath. Inflorescence 5—9 cm long, almost as long or slightly longer than, supporting leaves, 2—4 (5) flowered. Rachis with single, white hairs. Pedicels 5—12 mm long, with loose white hairs. Bracts ovate-lanceolate, 1 mm long, pubescent like pedicels. Flowers yellow, 18—20 mm long. Wings longer than keel, flat or convolute on the margin, rounded in place of breaking or with a slightly marked spur, spreading at an angle of about 100°. Ovary appressedly tomentose. Calyx broad-campanulate, 6—8 mm long, with short white hairs, occasionally with black ones admixed. Calyx teeth acute, 1—1.5 mm long, tomentose, inside hairs white. Bractlets ovate, about 0.5 mm long, with single, white hairs. Fruits 5—8 cm long by 2.5—3.3 cm broad, short acute at the top, on stipe slightly exserted from calyx, loosely pubescent, indehiscent. Flowers V—VIII. (Fig. 7, IV a—e, Pl. VIII).

Distribution: USSR — Azerbaijan, and Turkish Armenia, Sokolov (l.c.) mentions that *C. armena* grows also in northern Iran but I have not seen any herbarium specimen from that region; A. Parsa in his flora of Iran (1948) does not mention it either. *C. armena* grows on stony mountain slopes, usually in lower places, between 150—1.350 m a.s.l. in oak-juniper woods and in thickets, together with: *Quercus iberica, Pistacia mutica, Juniperus polycarpos, J. foetidissima, Carpinus orientalis, Paliurus spina-Christi, Cerasus microcarpa, Lonicera* sp., *Cotinus coggygria, Jasminum fruticans* and *Cornus* sp. (Prilipko, l.c.). It has a clearly disjunct area, divided into two parts. Grossheim (l.c.) published in 1952 a map of localities of this species. (Fig. 8).

Specimens examined:

USSR — Azerbaijan. Gub. Elisabetpol, distr. Nucha, ad fl. Daschagil-czai, 2.700′, 12.8.1900 c.fl., Alexeenko, 6123 (LE.); Gub. Baku, distr. Schemacha, ad fl. Sulut-czai, (confl. Ach-su) infra p. Chan-Kendy, 2.600′, 30.7.1900 c.fr., Alexeenko, 6122 (LE.); Gub. Baku, distr Schemacha, prope p. Müdshi, 4.100′, 30.7.1900, Alexeenko, 6125 (LE.); Gub. Baku, distr. Geokczai, in fruticetis siccis in ascensu ad pagum Vaenk, 2.000′, 31.7.1899, c.fr., Alexeenko, 6121 (LE.); Gub. Baku, distr. Kuba, ad fl. Ata-czai, 500′, 24.7.1900, c.fr., Alexeenko, 6126 (LE.); Prov. Baku, distr. Schemacha, in pascuis Gush-dili, 21.8.1928 c.fr., M. Sachokia (LE.); Prov. Baku, distr. Schemacha,

in monte Ljuter, 26.7.1928 c.fr., M. Sachokia (LE.); Prov. Elisabethpol, distr. Nucha, jugum Boz-dag, in angustiis Daddi-bulach, 28.5.1915 c.fr., A. Schelkovnikov (K. LE.); Prov. Elisabethpol, distr. Nucha, in rupestribus angustiarum Daschagil, 13.6.1899 c.fr., Fomin (LE.).

Turkey. Distr. Artwin, Ardanucz, in declivibus lapidosis, 31.5.1914 c.fl. et fr., S. Turkiewicz, 620 (LE.); Plantae Lasistanicae, 1885, c.fr., W. Massalsky (LE.); Plantae Armenae, 1886 c.fr., W. Massalsky (LE.); in vicinitate urb. Artwin, 9.6.1909 c.fl. et fr., P. W. Niesterow (LE.); Distr. Artwin, 7.5.1914 c.fl., G. Woronow (LE.); Distr. Artwin, inter pag. Cetlet i Ukalimier, in declivibus lapidosis, 26.7.1911 c.fl. et fr., N. Vvedensky, 4310, (LE.); Artwin, 5.1893 c.fl., Radde, 431 (G.); Armenie, c.fl., Collection de M. Simon (P.); Armenia, circa Tortum, 6.1853 c.fl., Huet du Pavillon (JE.); Armenia. In montibus inter Erzeroum et Ispir, prope Haho, 6.1853 c.fl. et fr., Huet du Pavillon (FI. G. K. — paratype); Prov. Kars, distr. Olty, prope Bardiz, 1.8.1904 c.fr., S. Mechailovsky (FI.); Prov. Batum, Chodlar-su, 19.8. ?., c.fr., W. Massalsky (priv. herb. of H. Czeczott).

Discussion: It is a very distinct species, easily recognizable thanks to shape and size of leaflets. Their size and the way of peeling of bark show clearly that it belongs to the subsection *Arborescentes*, yet the broad calyx with short teeth and pubesccent ovary show some affinity with species of the subsection *Graciles*, esp. *C. gracilis* and *C. istria*.

Subsection 2. *Acutifoliae* Browicz

Inflorescence 3—5 flowered. Flowers up to 13 mm long, orange-red. Wings nearly twice as short as keel, without geniculate breaking. Calyx teeth as long as tube. Leaflets elliptic, with a prickly appendage of midrib 1 mm in length.

Type species: *Colutea acutifolia* Shaparenko.

8. *Colutea acutifolia* Shaparenko.

Fl. URSS, 11: 394 (1941); Grossheim, Opried. rast. Kawkaza, 124 (1949); Grossheim, Fl. Kawkaza, ed. 2, 5: 238 (1952); Sokolov, Dier. Kust. SSSR, 4: 165 (1958).

Type. USSR. Ad ripam fluminis Psezuape inferioris, 21.5.1895, Lipsky (LE. ? n.v.).

Shrub. Young, one year old shoots with white hairs at first, later glabrous, greenish yellow. Stipules lanceolate, 1.5 mm long, glabrous or with single white hairs. Leaves up to 8 cm long with (3) 4—5 pairs of leaflets. Rachis glabrous or with single white hairs. Leaflets elliptic, narrow-elliptic, ovate-lanceolate or slightly obovate, acute on both ends, with a distinct prickly appendage of midrib 1 mm in length at apex, 10—22 mm long by 4—12 mm broad (most often 15 × 7 mm), with a distinct venation, glabrous above, with a few white hairs or glabrate beneath. Inflorescence up to 7 cm long, usually equal to supporting leaves in length, 3—5 flowered. Rachis yellow-brown, with single white hairs. Bracts lanceolate, 1.5 mm long, covered with hairs like rachis.

Pedicels 3—5 mm long, brown, with white hairs. Flowers 12—13 mm long, orange-red. Wings nearly twice as short as keel, narrow, without geniculate or with a barely marked breaking, spreading at an angle of about 130°. Ovary glabrous. Calyx campanulate, about 5 mm long, with loose white hairs, mixed with black ones on the margin. Calyx teeth narrow, subulate, almost as long as tube, with white hairs inside. Bractlets lanceolate, about 1 mm long, covered with hairs like calyx. Fruits 3—5 cm long by 15—20 mm broad, on a distinct, thin stipe nearly twice as long as calyx, glabrous, lustrous. Flowers V—VI (Fig. 10, IIa—d, Pl. IX).

Distribution: USSR. Species endemic to the east coast of the Black Sea. (Fig. 11).

Specimens examined:

USSR. Ad ripam fluminis Psezuape 25.6.1938 c.fr., Leg. ?., (LE. — paratype, acc. to the label of Shaparenko); Caucasus, in litore Ponti Euxini, 100 m, 7.6.1938 c.fl., Z. Gorotova (LE.).

Discussion: A very interesting species remarkably differing from all other Caucasian species of *Colutea,* known, however, only from few specimens. According to Shaparenko (l.c.) it is most closely allied to *C. abyssinica,* which it resembles in size of flowers and shape of fruits; it differs from it, however, considerably in: longer, subulate calyx teeth and different colour of flowers, narrower wings and prickly leaflets. These characters speak against including *C. acutifolia* to the subsection *Africanae*. The affinity of this species with other species of Sect. *Colutea* is still not very clear to me, therefore its separation into a special subsection *Acutifoliae* would be rather temporary.

According to Shaparenko's diagnosis the calyx of *C. acutifolia* should be covered with loose black hairs, but this is not the case, as the specimens I have seen have a calyx with white hairs. I think that in the case of *C. acutifolia* as well as in the majority of species of the genus *Colutea* the colour of hairs on calyx cannot be taken as an outstanding character because of its variability.

A typical specimen of this species can be seen according to Shaparenko in the herbarium of the Botanical Institute in Leningrad, but I could not find it there. Thus the description of the species was done on the basis of other specimens also reckoned by Shaparenko among *C. acutifolia.*

Subsection 3. *Africanae* Browicz

Inflorescence 1—3 flowered. Flowers small, up to 15 mm long, dark brown or even nearly black. Wings falcate, rounded on the outer margin, without geniculate breaking.

Type species: *Colutea abyssinica* Kunth et Bouché.

9. *Colutea abyssinica* Kunth et Bouché.

Annales Sci. Nat., ser. 3, 7: 188 (1847); Schneider Ill. Hand. Laubh., 2: 93, fig. 56 d—e, 57 u—x (1907); Gillett, Fl. Trop. East Afr.: Papilinoideae (m.s., ined.). Syn.: *Colutea microphylla* Raffenau-Delile, Ind. Sem. Hort. Reg. Bot. Monspel. 7 (1847).

Colutea halepica var. *sericea* Richard, Tent. Fl. Abys., 1: 192 (1847).

Colutea halepica auct. non Lam., Oliver, Fl. Tro. Afr., 2: 136 (1871): Schweinfurth, Bull. Herb. Boiss., 4, app. 2: 248 (1896); Pirotta, Fl. Col. Eritrea, 1: 195 (1903); Fiori, Boschi piante legnose Eritrea, 184 (1909—1912); Harms, in Mild. Deutsch. Zentr.-Afr. Exped., 1907—08, 2: 258 (1914); Harms, in Pflanzenwelt Afr., 3, 1: 602 (1915).

Colutea istria auct. non Mill., Baker, Legum. Trop. Afr., 2: 265 (1929); Gardner, Trees Shrubs Kenya Co., (1936); Brenan, Greenway, Check List for trees a. shrubs Brith. Emp. no. 5. Tanganyika Terr. 2 (1949); Cronquist, Fl. Congo Belg., 5: 74 (1954); Cufodontis, Bull. Jard. Bot. Brux., 25. supp., 288 (1955).

Colutea halepica var. *abyssinica* Schwfth. ex Gürcke (1895) in Cufodontis, Bull. Jard. Bot. Brux., 25. supp. 288 (1955).

Colutea istria var. *sericea* (Rich.) Cuf., Cufodontis, Bull. Jard. Bot. Brux., 25. supp. 288 (1955).

Type. Ethiopia, in regione septentrionali montis Kubbi, E. of Axum, 12.12.1837 (c.fl.) c.fr., Schimper, 240. (B. holo. + BM. CGE. E. FI. G. K. LE. P. RO. W. WRL. iso.).

Abundantly branched shrub, occasionally a small tree, up to 4,5 m high. Young shoots greenish, at first with white, appressed hairs; later glabrescent, glabrous or glabrate, light-brown. Two years old shoots with a delicately peeling bark, brown-grey, or grey. Stipules triangular, up to 3 mm long, with white hairs. Leaves 3—8 cm long, exceptionally longer, mostly between 4—6 cm in length, with (3) 4—6 (7) pairs of leaflets. Rachis with appressed, white hairs. Leaflets elliptic or slightly obovate, up to 18 mm long by 10 mm broad, usually not more than 10 mm in length and 7 mm in width, glabrous or with a few hairs above and appressed, white ones below, distinctly mucronate, thin with well marked lateral nerves. Petiolules very short, up to 1 mm. Inflorescence 1—3 (4) flowered, as long or shorter than supporting leaves. Rachis pubescent. Pedicels 6—10 mm long, mostly with black hairs. Bracts ovate-lanceolate, up to 3 mm long, pubescent like pedicels. Flowers small (11) 12—15 mm long. Standard dark brown, yellowish green at base. Keel rounded at the top, in the upper part almost black. Wings markedly shorter than keel, spreading at an angle of about 120°, similarly coloured to keel. Ovary quite glabrous, or exceptionally with single hairs along ventral suture. Calyx 4—5 mm long, covered with black, sometimes mixed with white, hairs; exceptionally hairs only white. Calyx teeth 1—1.5 mm long, acute, subulate, with dark hairs inside. Bractlets ovate, 0.5 mm long, pubescent like calyx. Fruit (4) 5—7 cm long by 2—3 cm broad;

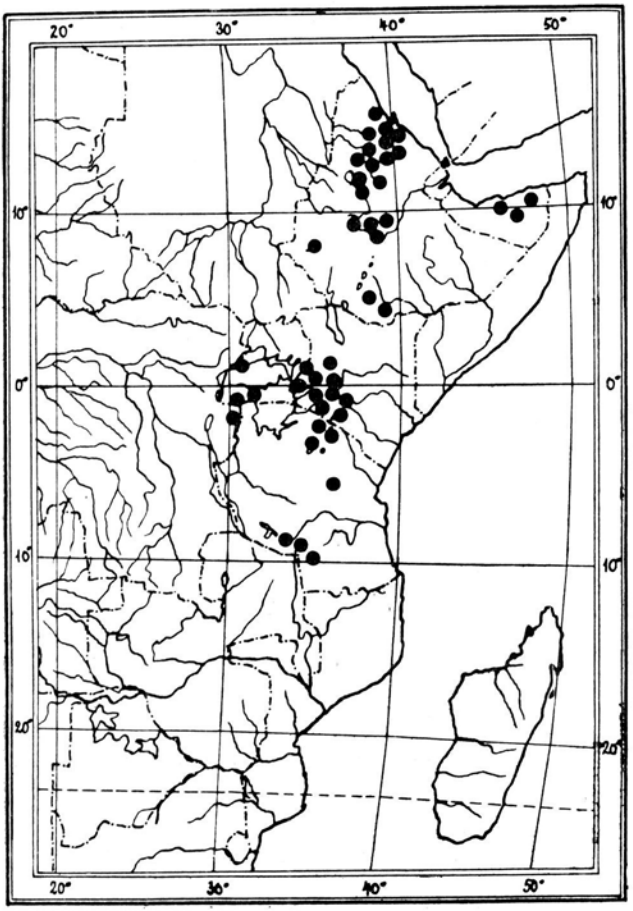

Fig. 9. Distribution of *C. abyssinica* (subsect. *Africanae*, sect. *Colutea*).

glabrous, on a distinct, thin stipe, 7—15 mm long, acute on top, or even acuminate, dehiscing. Seeds 3 mm long by 2.5 mm broad. Flowers and fruits all the year round (Fig. 10, I a—i).

Distribution: Eritrea, Ethiopia, Somaliland, Uganda, Kenya, Ruanda-Urundi, Tanganyika. It grows in mountain regions between 1.600 — and 3.400 m a.s.l., mostly between 2.000 and 2.600 m (in Uganda even 1.200 m), in grassland communities, in evergreen scrubs and on forest margins. In the region of Ruanda this species was collected only once north from the lake Mohasi (Mildbread, 6.1907, No. 447). Mildbread's herbarium specimen is cited by Cronquist (l.c.), but as I have been informed by R. Wilczek, it was destroyed during the war in Berlin. *Colutea abyssinica* probably grows in north-eastern

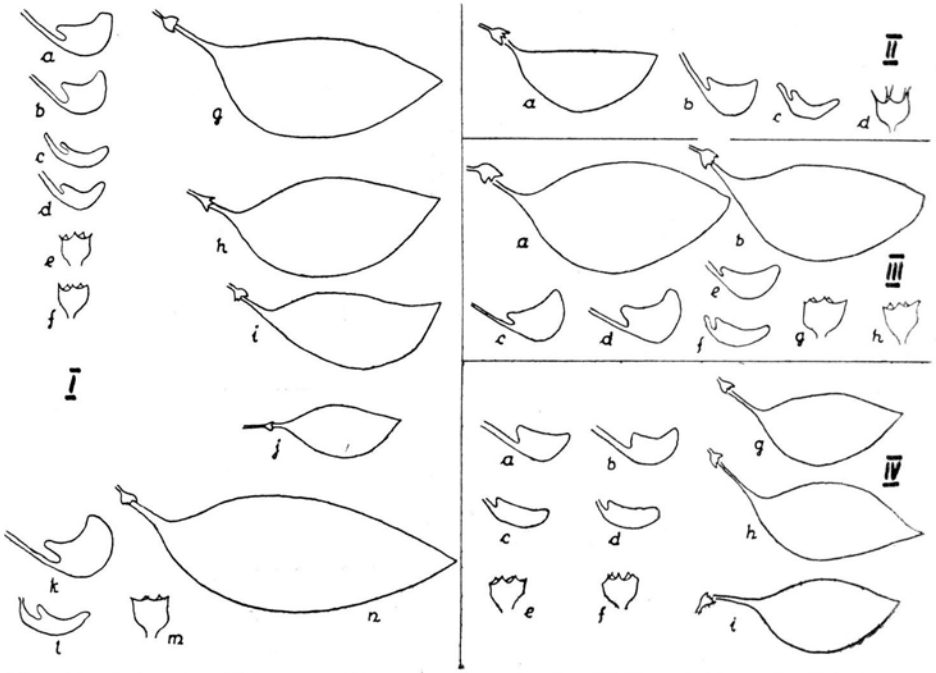

Fig. 10. Subsect. *Africanae* (I.) and subsect. *Acutifoliae* (II) sect. *Colutea;* sect. *Multiflora* (III—IV.)

I. *C. abyssinica: a-b* — keels; *c-d* — wings; *e-f* — calyces; *g-i* — fruits; *j* — fruit of var. *gillettii; k-n* — var. *macrophysa: k* — keel; *l* — wing; *m* — calyx; *n* — fruit. II. *C. acutifolia: a* — fruit; *b* — keel; *c* — wing; *d* — calyx; III. *C. multiflora: a-b* — fruits; *c-d* — keels; *e-f* — wings; *g-h* — calyces; IV. *C. delavayi: a-b* — keels; *c-d* — wings; *e-f* — calyces; *g-i* — fruits.

(keels, wings and calyces × 1; fruits × ½)

Congo as well, shown by Elliot's specimen (5497) from Ruwenzori, yet without any exact localization.

According to Harms (1914, l.c.) *C. abyssinica* grows in Uganda, in the grassland of Kiboroga together with such species as: *Boscia* sp., *Lannea Stuhlmannii* var. *brevifolia, Rhus glaucescens, Allophylus alnifolius, Terminalia Mildbraedii, Ximenia americana* var. *tomentosa, Cassia edulis, Securidaca longepedunculata, Senecio Petitianus.* P. J. Greenway (in sched.) mentions it in Tanganyika from communities with: *Themeda triandra, Digitaria scalarum, Exotheca abyssinica, Protea abyssinica* and *Setaria* sp., and R. A. Maas Geesteranus (in sched.) in Kenya, from open savannah-woodland with *Olea chrysophylla, Dombeya* sp., *Juniperus* sp., *Acacia lahai* and *A. abyssinica.* In its whole area *C. abyssinica* is a rather rare species (Fig. 9).

Specimens examined:

Eritrea. Amasen: Bet Ghirghi, 18.9.1915 c.fr., Baldrati, 134 (FI.); Asmara, 29.8.1916 c.fl. et fr., Baldrati, 782 (FI.); Adi Nifas, 1927 c.fr., Pappi (FI.); Saraé,

Dintorni di Adi Ugri, 23.10.1910 c.fr., Bellini, 341 (FI.); Oculé Cusai: Nei boschi del Monte Metaten, 2.500 m., 12.9.1902, c.fl. et fr., Pappi, 1616 (BM. FI. KRA); Oculé Cusai: Deca-Meré, 2.000 m., 6.9.1902 c.fr., Pappi, 2404 (BM. FI. G. GZU. K. KRA. LE. W.); Oculé Cusai: Bosco dell'Assaré presso Halat, 2.600 m, 2.9.1902 c.fl., Pappi, 1689 (FI.); Amasen: Addi-Barrò lungo il fiume Mareb, 28.10.1902. c.fr., Pappi, 2378 (FI. G.); Environs d'Acrour, 1.900 m., 12.3.1892 c.fl. et fr., Schweinfurth et Riva, 1038 (FI. G. K. LE).; Hamasen, M. te Bizen, presso il Convento, 2.480 m., 21.1.1909, c.fl. et fr., Fiori, 509 (FI.); Oculé Cusai: Dintorni di Halai, 2.600 m, 11.5.1902 c.fl., Pappi, 5233 (FI.); Assaorta Monte Urug, 2.547 m., 22.3.1893 c.fr., Pappi, 3484 (FI.); Amasen Maldi-M. Ciafrus, 1.600—2.400 m, 2.2.1893 c.fr., Terracciano, Pappi, 289 (FI.); Hamasen: Asmara macchie, 26.4.1909 c.fr., Chiovenda, 160 (FI.); tra Nalibaret ed Asmara, 8—15.5.1902 c.fr., Tellini, 705 (FI.); Amba Dehro, 1—2.12.1902 c.fr., Tellini, 498 (FI.); Altipiano-Asmara, 1—10.10.1902 c.fr., Tellini, 290 (FI.); Asmara, c.fl. et fr., Baldrati, D94 (FI.); Saganeïti, 2.200 m., 7.4.1892 c.fl. et fr., Schweinfurth et Riva, 1397 (G.); Mt. Amba bei Gheleb, 2.200 m., 16.4.1891 c.fl. et fr., Schweinfurth, 1459 (G.); Fra i dirupi calcarei del torrente di Enda Abba Matà presso Chessa Daarò (Saraé), 24.10.1923 c.fr., Pappi (FI.); Leraé Hizé Gherghis presso Debaroa, 1.900 m., 10.12.1925, Pappi, 36 (FI.); Amasien: nei terreni sassosi lungo il Mai Meleghen presso Ad Guadad, 2290, 12.9.1928 Amasien: Fra i dirupi pietrisi lungo il Mai Seghenà presso Ad Desonai, 2.160 m., 21.9.1928 c.fr., Pappi, 159 (FI.).

Ethiopia: Chiré, c.fl. et fr., Quartin-Dillon et Petit (FI.); Neghelli, 21.10. 1937 c.fl. et fr., Vatova, 120 (FI.); Neghelli, 28.10.1937 c.fl. et fr., Vatova, 346 (FI.); Scioa: Biscioftu, 10.1938 c.fl. et fr., Benedetto, 039 (FI.); Bosco di Neghelli, 1.650 m, 2.12.1937 c.fr. Senni, 2248 (FI.); Galla-Sidamo: Scioa, alle falde del monte Zugualà, 8.4.1906 c.fl. et fr., Buscalioni, 2076 (FI.); Neghelli, 2.1937, c.fr., Cufodontis, 213 (FI. W.); Scioa: Fosso ad Ovest del Ponte sull' Hauasch, 2.000 m., 16.4.1909 c.fl. et fr., Negri, 693 (FI.); Miss. Biol. Sagan-Omo, Presso Neghelli lungo il nuovo stradale, 1939 c.fr., Corradi (FI.); Neghelli, 26—29.9.1939 c.fr., Corradi, 3987 (FI.); Monte Jesus Tabor, 22.3.1937, c.fr., Pichi-Sermoli, 531 (FI. K.); Prope Adoam, 1852 c.fr., Schimper, 249 (E.); Muga Valley, 30 miles from Addis Abeba, 6.000', 10.1952 c.fl., Curle, 124 (BM.); Tingi, ? (C.); Abyssinie, c.fl. et fr., A. Rich., 184a (G.); Abissinie, c.fl. et fr., Petit (W.); Abu Gerisna, 6.500 — 9.000', 22.8.1862 c.fr., Schimper, 81 (BM. WU.); Debra Sina, c.fl. et fr., Steuder, 85 (LE.). Adaba: Bale, 2450 m., 10.1.1960 c.fl. et fr., H. F. Mooney, 8538 (WRL.).

Somaliland: Wagger Mt., southern slope, 4.800', 27.10.1954 c.fr., Bally, 10243 (K.); Al Madu Range at Sagot, W. of Gezir, 5.400', 14.10.1956 c.fr., Bally, 11100 (FI. K.); Darro Mts., 18.11.1894 c.fr., Smith, 271 (BM.); Somali-land, 1895 c.fl. et fr., Cole (K.).

Kenya: Mt. Kenia, 9—10.000', 24.6.1909 c.fl. et fr., Battiscombe, 91 (K.); Mt. Aberdare Exp., pr. Jaracuma River, 1922 c.fl. et fr., R. and Th. Fries, 1510 (K.); Menengai, 6.300', Nakuru district, 7.1939 c.fl. et fr., Taylor, 1334 (K.); Mt. Elgon, 8.000', 1.12.1930, c.fl. et fr., ?, 271 (K.); N.-E. Elgon, 8.800', 8. 1950 c.fl. et fr., Tweedie, 859 (FI. K.); Cherangani Hills, Elgon, 9.500', 12. 1933 c.fl. et fr., Powels, 34 (K.); Solai Escarpment, 7.500', c.fr., Gardner, 1466 (K.); Londiani, 7.600', 9. 1931 c.fl. et fr., Graham, 2700 (K.); Rift Valley Province, Nakuru Distr., Eastern Mau Forest Reserve, 8.9.1949 c.fl. et fr., Geesteranus, 6201 (K.); Poror, Hill (Samburu Dist: Nr. Maralal, N. F. P.), 8.000', 10.1935 c.fl. et fr., Leakey, 8556a (K.); Leroghi Forest, 8.000', 18.10.1935 c.fr., Leakey, 8556 b (K.); Ngong Grassland, 6.000', 1930 c.fl. et fr., Mettam, 212 (K.); Mt. Kenia (northern sector), 9.800', 31.7.1949 c.fl. et fr., Schelpe, 2502 (BM.); Mt. Elgon, 7.800', 1950 c.fl. et fr., Irwin, 33 (K.).

Uganda: Ruwenzori Exp. 1893—94, c.fr. Elliot, 6497 (BM. K.); Bugona, Koki, 4.000′, 8. 1945 c.fl. et fr., Purseglove, 1791 (K.); Masaka Distr: Koki area, 4.000′, 6.7.1905 c.fl. et fr., Dawe, 390 (K.)

Tanganyika: Mbeya Distr., Kikondo, 2250 m., 22.10.1956 c.fl. et fr. Richards (K.); Mbeya, 8.000′, 5. 1938 c.fl. et fr., Mc. Innes, 326 (BM.); Masai Distr.: Olomoti volcano, 8.300′, 16.9.1932 c.fl. et fr., 4372 (BM, K.); Arusha Distr. Ol Doinyo Sambu, 7.000′, 18.1.1936 c.fl., Greenway, 4421 (K.); Mtns. E. of L. Nyasa, 4.1884, c.fl. et fr., Waller, (K.); S. Mbulu distr.: Hemit, 8.500 m., S. slopes of Mt. Hanang, 12.2.1946, c.fl. Greenway, 7728 (K.); Njombe Distr., Matamba, 1.800 m., 6.1.1957, c.fl. Richards, 7517 (K.).

The name *C. abyssinica* introduced for the first time in 1847 by Kunth and Bouchĕ has been forgotten and not used in the course of many years. This was caused by Richard's "Tentamen Florae Abyssinicae" where the author described this species as a variety of the earlier known *C. halepica*. Just this name or incorrectly *C. aleppica* and sometimes correctly *C. istria* has been placed since that time on almost all herbarium labels as well as works on flora of eastern Africa. *C. istria* (= *C. halepica*) grows in the northern part of the Arabian Peninsula, and on the Sinai Peninsula, and differs so much from *C. abyssinica*, that a mistake is impossible. Therefore it is rather strange that these wrong names have been kept till recent years (Cufodontis 1955, Cronquist 1956). C. K. Schneider (l.c.) was the first to call attention to them, and he separated both species. Later Shaparenko (1938) marked the distinct areas of *C. istria* and *C. abyssinica* on a distribution map of species of the genus *Colutea* kept in the British Museum. He confined the area of *C. abyssinica* to eastern Africa. J. B. Gillett (l.c.) explained this problem finally in 1960 and restored the forgotten yet proper name *C. abyssinica*.

The variability of *C. abyssinica* is most probably dependent on environmental conditions. It is seen in the degree of pubescence of shoots, size of flowers and fruits, and in the colour of hairs covering the calyx and pedicels. The correlation of some feature has led to the separation of two varieties, the first of which occurs in a rather large region.

9a. *Colutea abyssinica* var. *macrophysa* (Chiovenda) combinatio nova.

Syn: *Colutea istria* var. *macrophysa* Chiovenda, Annali Bot., 9:58 (1911); Baker, Legum. Trop. Afr., 2:266 (1929).

Colutea istria var. *macrophylla* (?) Chiov., Cufodontis, Bull. Jard. Bot. Brux., 25. supp. 288 (1955).

Type. Eritrea: Amhara-Dembià, valle Cococc sopra Gondar, 3.9.1909 c.fl. et fr., Chiovenda, 1805 (FI.).

Leaves longer up to 10 cm with larger leaflets. Flowers larger, 15—16 mm long. Fruits larger, 7—9 cm long, and up to 3 cm wide, on long stipes (up to 22 mm). (Fig. 10, Ik—n, Pl. X).

Distribution: Erithrea, Ethiopia, Kenya.

Specimens examined:

Ethiopia. Aman Eski, 6.500′, 5.11.1854 c.fl. et fr., Schimper, 502 (FI. G. W.); Abissynie, c.fl. et fr., Schimper, 289 (G. JE. K.); Mont Saufetsch, 9.000′, 21.10.1852 c.fl. et fr., Schimper, 85 (G. P.); Debra-Eski, 8—9.000′, c.fl. et fr., Schimper, 2398 (FI. JE. RO. W.).

Kenya. from Nandi to Mumias, 1898, c.fl. et fr., A. Whyte (K.).

Discussion: Variety connected rather with northern than southern regions. Distinguished by larger size of its organs. Colour of flowers without change.

9b. *Colutea abyssinica* var. *gillettii* Browicz.

Type. Kenya. 4 miles N. of Gil Gil 7.000′, 8.12.1948 c.fl. et fr., Bogdan, 2167. (K.).

Flowers up to 12 mm long, yellow. Fruit smaller than in type, 3—3,5 (4) cm long, by 13—17 mm wide, on stipe about 5 mm in length. (Fig. 10, I j).

Distribution: Kenya, may be in Ethiopia, too, yet Senni's herbarium specimens are without flowers.

Specimens examined:

Ethiopia: Strada da Addis Abeba ad Oletta, 11.5.1937 c.fr., Senni (FI.).

Discussion: It is a very interesting variety because of the size of fruit and colour of flowers. If the yellow colour of flowers was a constant feature the variety would deserve the rank of species. Paucity of the herbarium material examined by the author does not enable such a decision.

Subsection 4. *Graciles* Browicz

Flowers yellow or orange-yellow. Wings geniculately broken. Leaflets mostly obovate. Leaves often fasciculate, several or over ten. Bark peeling in long fibres, after peeling red or red-brown, lustrous.

Type species: *Colutea gracilis* Freyn et Sintenis

10. *Colutea istria* Miller.

Gard. Dict. ed. 8., no. 2 (1768); Koch, Dendr., 1:65 (1869); Koehne, Deutsch. Dendr., 338 (1893); Schneider, Ill. Hand. Laubh., 2:87, fig. 53 e—i, 54 p. (1907); Ascherson u. Graebner, Syn. Mitteleur. Fl., 6, 2:729 (1908); Rehder, Man. Trees Shrubs, ed. 1., 508 (1927), ed. 2., 513 (1940); Post, Fl. Syr. Pal. Sinai, ed. 2, 1:370 (1932); Thiébaut, Fl. Lib.-Syr., 2:44 (1940); Rechinger, Arkiv Bot., 2, 5:367 (1952); Mouterde, Fl. Djebel Druce, 133 (1952); Mouterde, Bull. Soc. Bot. France, 106; 9:473 (1959); Sokolov, Dier. Kust. SSSR, 4:166 (1958).

Syn. *Colutea halepica* Lamarck, Encykl. Méth. Bot., 1:353 (1783); Loudon, Arb. Frut. Brit., 2:637 (1854); Boissier, Fl. Or., 2:195 (1872); Hart, Some account fauna fl. Sinai, Petra (1891); Dippel, Hand. Laubh., 3:706 (1893); Post, Fl. Syr. Pal. Sinai, ed. 1., 253 (1896); Kneucker, Allg. Bot. Zeitschr., 9, 9:146 (1903); Dinsmore, Pfl. Paläst., 32 (1911); Blatter, Rec. Bot. Surv. India, 8, 2:153 (1921) p. p.; Nabélek, Iter

Turc.-Pers., 1:74 (1928); Bouloumoy, Fl. Lib. Syr., 93 (1930); Oppenheimer, Florul. Transiord, 207 (1931); Eig, Fede Rep., 63:201 (1931); Montasir, Kassib, Ill. Man. Fl. Egypt, 1:250 (1956); Täckholm, Stud. Fl. Egypt, 302 (1956); Boulos, Fl. Gebel El-Maghara North-Sinai, 16, pl. 14 (1960).

Colutea Pocockii Aiton, Hort. Kew., ed. 1, 3:55 (1789).
Colutea pallida Salisbury, Prodr. Stirp., 337 (1796).

Type. ex cult. Chelsea Physic Garden, P. Miller (BM. n. v.). I saw the specimen collected later, perhaps from the same plants as the holotype (BM.).

Shrub up to 3 m high. Recent shoots thin, slender, covered with white minute hairs at first, but becoming glabrous or glabrate; peeling long fibrelike the second year. Older shoots red-brown, lustrous. Stipules 1—1.5 mm long, ovate-triangular, with white hairs. Leaves 3—6 cm long (exceptionally up to 8 cm), with 3—5 (6) pairs of leaflets. Rachis with appressed white hairs, older leaves glabrate. Leaflets elliptic or obovate, up to 9 mm long and 6 mm wide, mostly, however, not longer than 5—6 mm, slightly retuse or rounded at apex and then with a very short appendage of midrib, slightly rugose (the more so the smaller they are) with scarcely visible lateral nerves, glabrous above, with appressed, loose hairs, or glabrate below, on very short petiolules, nearly sessile. Inflorescence 7—8 cm long, equal to, or longer than supporting leaves, 1—3, more rarely 4-flowered. Rachis with white hairs, occasionally mixed with black ones. Pedicels 8—13 mm long, mostly with black hairs. Bracts ovate, up to 1.5 mm long, pubescent like pedicels. Flowers yellow, 18—20 mm long, occasionally even larger (up to 22 mm). Wing usually longer than keel, though sometimes almost equal, rounded in place of breaking, more rarely with a scarcely marked spur, spreading at an angle of about 130°. The upper part of wing narrow, convolute on the margin. Ovary tomentose. Calyx broad-campanulate, 6—8 mm long, 6—8 mm wide, in the upper part with black hairs, more rarely mixed with white ones; exceptionally all hairs white. Calyx teeth broad-triangular, acute 1.5—2 mm long, with dense black hairs inside. Bractlets ovate, 1 mm long, pubescent like calyx. Fruits 4—6 cm long by 1.8—3 cm broad, loosely covered with hairs, acute at the top, on thick, short stipe hardly exserted from calyx, indehiscent. Flowers III—VI (Fig. 12, Ia—d, Pl. XI).

Distribution: Southern Turkey (Amanus Mts.), Western Syria, Lebanon, west Jordan, Israel, north-eastern Egypt (Sinai Pen.). It grows on rocky slopes and cliffs, near water springs. The vertical distribution is hardly known, probably not exceeding 1.400—1.500 m a.s.l. (Oppenheimer, l.c.). The lower limit of distribution is about 600 m a.s.l. (Boulos, l.c., Kotschy, in sched.). The area of *C. istria* comprises exceedingly dry regions, with a rainfall often only up to 90 mm a year, with rain mainly during the two first months of the year: air temper-

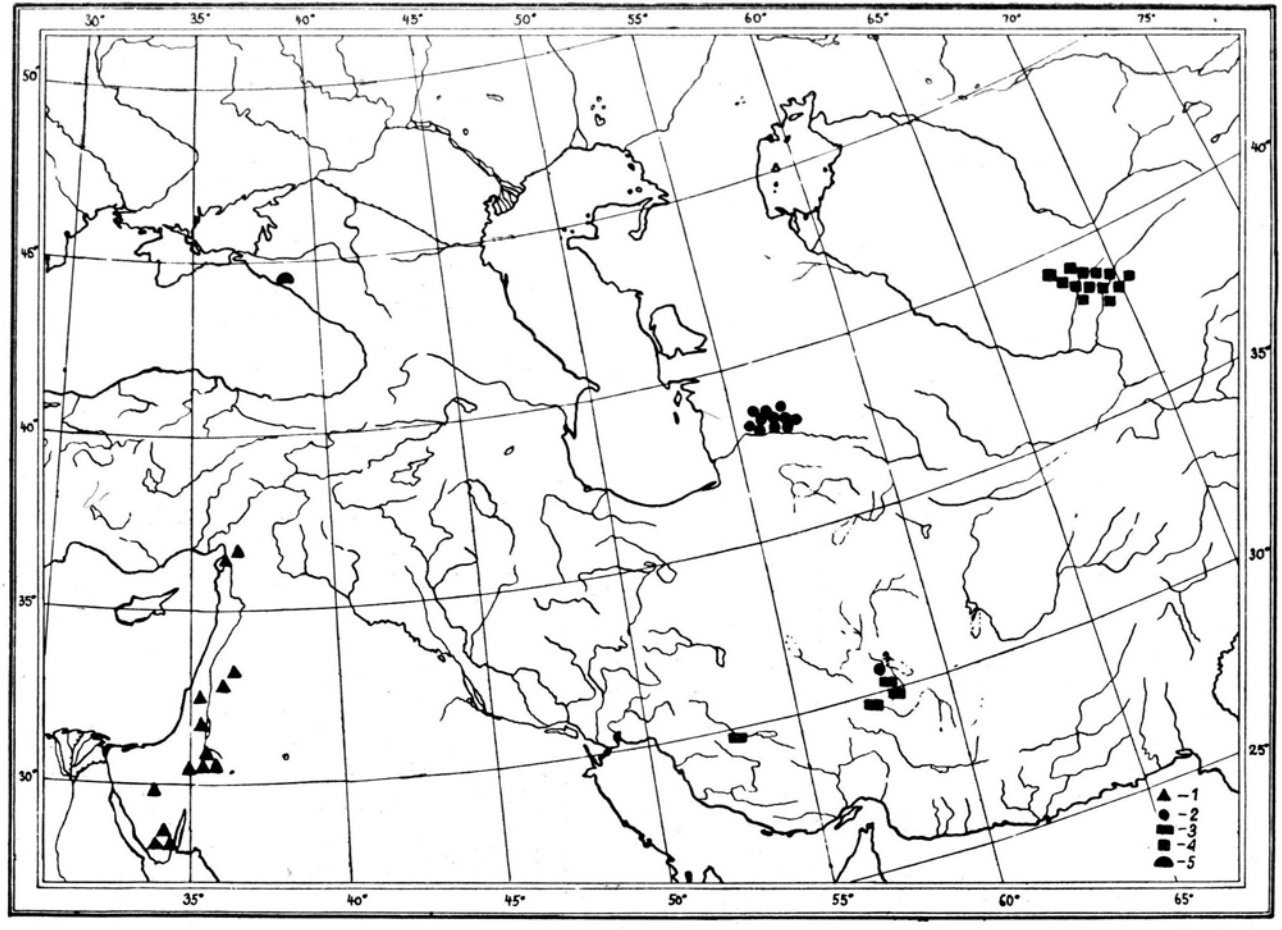

Fig. 11. Distribution of species of subsections *Graciles* (1—4) and *Acutifoliae* (5), section *Colutea:*
1 — C. istria; 2 — C. gracilis; 3 — C. persica; 4 —C. hybrida; 5 — C. acutifolia.

ature reaches even 46° C. According to Hart (l.c.) *C. istria* grows on Mount Hor in Jordan together with such species as: *Pistacia palestina* and *Juniperus phoenicea.* In the whole area it is a rare species, more often met only in the Sinai peninsula (Fig. 11).

Specimens examined.

Turkey. Amanus, Tchakallu, 27.5.1933 c.fr., Ararf Haptron (GB.); Col. Beylan, Ost Amanus, 600 m, 24.4.1933 c.fl., E. Wall (GB.); Rara in valle Beilan versus Mesgidou, locis argillosis, 2.300′, 21.6.1862 c.fr., Th. Kotschy, 42 (BM. C. JE. K. LE. P. W.); Near Beilan, 13.6.1884 c.fr., Herb. Post. (BM.).

Syria. Djebel Drouze, Env. of Souweida, Hill of basaltic tuff, 20.6.1932, c.fl., A. Eig, M. Zohary, 120 (HUJ); Syria Septentr., c.fl. et fr., Herb. Montbret., 1660 (FI. W.):

Israel. Cliffs, Jerusalem, 12.3.1919 c.fl., F. Meyers, 5053 (G. K.); Jerusalem, cultivated and escaped, 4.5.1906 c.fl., J. E. Dinsmore, 1053, (E); S. Negev, Wadi Murra, rocks, 3.4.1952 c.fl. et fr., M. Zohary a. J. D'Angelis, 536 (BM. C. E. FI. G. GB. HUJ. K. KRA. W. WU.); Wady Ratem, between Tel-Arad and Bir Zuweira, calcareous clay, 24.3.1929, R. Gabrielith, 103 (K.).

Jordan. Moutn Hor, Petra, 11. 1883 — 2. 1884, c.fr., H. C. Hart (BM.); Limestone Shajarat and Tayiar, 2.5.1955 c.fl. et fr., Hunting Areo Survey, 163 (E.); Shaubak, El Myreu, near Village Abu Mahtub, 1.200 m, 12.3.1955, Baki Kasapligil, 2189 (HUJ.); Petra, rocks, 10.4.1935 c.fl., J. E. Dinsmore (K.); Edom. Petra, 18.4.1929 c.fr., N. Natolsky, 15096 (HUJ.); Edom, Petra, on walls, 17.4.1929 c.fl. et fr., A. Eig a. M. Zohary, 121 (HUJ.).

Egypt. In monte Sinai ad scaturiginem prope Nakkeb, 2.5.1835, c.fl. et fr., W. Schimper, 160 (BM. BP. CGE. E. FI. G. K. LE. P. RP. PRC. RO. W. WRL.); Plantes du Sinai, 1926, A. Kaiser; 203 c.fl. (B. G. W.), 122, 123 c.fl., 206 c.fl., 735 c.fr., 818 c.fl., 867 c.fl., 952 c.fr. (G.); Sinai, Kloster Hof, 1896, c.fl., A. M. (WU.); in horto Conventi Sinaitici, 3.1846., E. Boissier (G.); Gebel Beda in Ouadi En Nasl, 14.4. 1898 c.fl., F. Grote, 30 (G.); Arabia Petrea, regione montana del Sinai (nonche verso Gaza), 1849 c.fl. et fr., Figari (FI.); on rocks, top of Gebel Shomar, Sinai, 15.5.1937 c.fr., T. R. Shabetai (K.); Mt. Shomar, 1.500 m, Sinai, 20.5.1937 c.fl., T. R. Shabetai (K.); Arabia Petrea, 1849 c.fl. et fr., Mc Donald (K.); El Rabba n. St. Catherine Mount (in a garden), 15.4.1937 c.fl., T. R. Shabetai (K.).

Discussion: *Colutea istria* belongs, besides *C. arborescens* and *C. orientalis,* to the earliest known species of the genus *Colutea.* P. Miller (l.c.) based his description of it on a shrub cultivated in Chelsea Physic Garden. This shrub grew from seeds brought from the Levant by Richard Pocock, who had travelled in Egypt, Arabia and Greece in 1732—42. Remembering this, the date of introduction *C. istria* into cultivation given by Rehder (l.c.) — 1752, is most probably erroneous. Miller knew well where the species described by him was native, as referring to Dr Russel, he mentions that it commonly grows around Aleppo in Syria. Therefore it is not clear why he gave it the name *"istria";* this suggests that it grows on the Istria peninsula in Europe, where, however, only *C. arborescens* is met. So, when 15 years later, Lamarck (l.c.) formed a new name *"C. halepica"* it came into use much quicker and was met more often, and it has been applied up to

recent times. According to P. Mouterde (1959, l.c.) *C. istria* is not known, at present, in the vicinity of Aleppo.

According to Miller *C. istria* has leaves with as many as 9 pairs of leaflets; I have not seen, however, any native herbarium specimen that would show such leaves. Nevertheless in some herbaria (Vienna, Geneva) there are specimens having leaves with 7—9 pairs of leaflets — but these are taken from cultivated individuals (Hort. Bot. Paris, or without localization), determined as *C. Pocockii* or *C. aleppica*. They have exceptionally large leaflets — up to 15 mm long by 9 mm broad. So we can assume that *C. istria* — species from exceedingly dry regions in favourable conditions of cultivation grows much more luxurious than when native, and thence the difference in number of pairs of leaflets and in their size.

The herbarium specimens mentioned above do not represent a homogenous material but several forms, differing in size of flowers and leaflets. Schimper's specimens (No. 160) from Sinai, have exceptionally large flowers, over 20 mm in length. Remarkably small leaflets (4—5 mm) are seen in specimen 2189 from Jordan. Most outstanding are the specimens from Amanus Mts. Th. Kotschy's specimen (No. 42) first determined as "*C. arborescens* var." has large leaflets, but fruits pubescent. The only specimen with flowers from Amanus (E. Wall.) has but one flower fully developed; it is determined as *C. cilicica*. The distinctly pubescent ovary, however, shows that it cannot belong to that species. The classification of these specimens to *C. istria* seems to be rather uncertain, it is mainly based on the fact that no other species with a pubescent ovary but *C. istria,* is known from the regions of southern Turkey, as well as from Syria and Lebanon. Only further herbarium collections from those regions and a precise analysis of flowers can explain this problem.

11. *Colutea gracilis* Freyn et Sintenis.

Bull. Herb. Boiss., ser. 2., 4:46 (1904); Schneider, Ill. Hand. Laubh., 2:91 fig. 56 i—k, 57 a—e (1907); Shaparenko, Fl. URSS, 11:321 tabl. 22 fig. 6 (1941); Fl. Turkm., 4:158 (1949); Parsa, Supp. Fl. Iran, 1:96 (1952); Sokolov, Dier. Kust. SSSR, 4:169 (1958).

Syn.: *Colutea cruenta* sensu Trautvetter non Aiton, Acta Hort. Petr., 9, 2:75 (1885).
Colutea persica var. *Buhsei* Boiss. f. *gracilis* Lipsky, Acta Hort. Petr., 26:281 (1910).
Colutea persica var. *gracilis* (Freyn) Parsa, Fl. Iran, 2:97 (1948).

Type. USSR, Turkmenistan: Kisil Arvat; Karakala, in monte Sundsodagh, 14.5.1901 c.fl. et fr., P. Sintenis, 1705 (G. holo. + B. BM. BP. G. JE. K. LE. P. PR. PRC. RUEB. W. WRL. WU. iso.).

Shrub 2—3 m high, sometimes treelike. Young shoots thin, greenish in the upper part, with a violet tint in the lower one, finely puberulous,

hairs white. Shoots, 2—3 years old, brown-grey with membranaceous bark peeling in fibres; fibres long and narrow. Older shoots brown-red, or brown-violet, lustrous. Stipules ovate, up to 1 mm long, membranaceous, white ciliated. Leaves up to 8 cm long, usually, however, not longer than 5 cm, with 3—4 (5) pairs of leaflets. Rachis with white, appressed hairs or glabrate, too. Leaflets 3—6 (7) mm long by 2—5 (6) mm broad, roundish, broad elliptic or obovate, cuneate at the base, retuse or rounded at apex, exceptionally with a very short, barely visible appendage of midrib, rugose, glabrous above, with rare, short appressed hairs below. Petiolules up to 1 mm long. Inflorescence about 5 cm long equal to or slightly shorter than supporting leaves, composed of 4—5 (6) flowers. Rachis with a few white hairs, while on pedicels mainly black hairs. Pedicels very thin, slender, 8—10 mm long. Bracts about 1 mm long, triangular-ovate, with white and black hairs. Flowers light yellow, 14—16 mm long. Wings longer than keel, broken at an angle of 90—100°, rounded in place of breaking, and only exceptionally bearing traces of a small spur, often convolute on the margin. Ovary tomentose. Calyx tubular-campanulate, up to 5 mm long, covered with minute, loose, mainly black hairs. Calyx teeth 4—5 times shorter than tube, broadly triangular, covered densely by black hairs inside. Bractlets about 0.5—0.8 mm long, lanceolate, pubescent like calyx. Legumes 3—4.5 cm long by 2 cm broad, with rare hairs, short acute and dehiscent at the top on short stipe distinctly exserted from calyx. Pubescence best marked along ventral suture and in lower part. Seeds almost round, 3—3.5 mm in diameter. Flowers IV—VI (Fig. 12, IIa—g, Pl. XII).

Distribution: USSR-Turkmenistan and north-eastern Iran, in Kopet-Dagh Mts., on slopes and river ravines, between 1.000—1.500 m a.s.l. According to Tscherniakowskaja (Bull. Jard. Bot. Rep. Russe, 24, 1925) *C. gracilis* occurs on north-west sides of the Sjunt mountain in Kopet-Dagh, together with such species as: *Paliurus australis, Acer mospessulanum, Cotoneaster racemiflora, Crataegus ambigua, C. azarolus, Lonicera Korolkowi, Jasminum fruticans, Rosa* sp., *Prunus prostrata* var. *concolor,* and in the valley of the river Ioldere with: *Cotoneaster nummulifera, Celtis australis, Cornus australis, Evonymus velutinus, Prunus divaricata, P. prostrata, Ulmus* sp., *Rosa canina, Punica granatum.* (Fig. 11).

Specimens examined:

USSR — Turkmenistan. Chodsha-kala, Bami, 11.5.1886 c.fl., Radde, 219 (LE.); Distr. Krasnowodzk, Karakal, in angustiis Ioldere, in declivibus orient. mont. Sjunt, 8.5.1912 c.fl., Lipsky, 3341 (LE.); Kopet-Dagh austr.-occid., in declivibus borealis mont. Sjunt, 1.100 m., 12.6.1930 c.fr., E. G. Bobrov, 259 (LE.); Karakal, in angustiis Aj-dere, 30.5.1912 c.fr., A Michelson (B. FI. GB. K. PR. W.); in declivibus orient. mont. Sjunt, 12.5.1912 c.fr., Michelson, 3490 (LE.); in mont.

Sjunt, 15.5.1916 c.fl., Tscherniakowskaja 1104 (LE.); in angustiis Ioldere, 15.5.1916 c.fl. et fr., Tscherniakowskaja, 1144 (LE.); Alty-wajem, 7.5.1916 c.fr., Tscherniakowskaja, 448 (LE.); in mont. Sjunt, 14.5.1916, Tscherniakowskaja, 519 (LE.); Kisil-Arwat, 1883 c.fl., Becker, 174 (LE.); Kopet-Dagh austro-occid., 1.050 m, 25.5.1930 c.fr., E. G. Bobrov, 441 (LE.); Kopet-Dagh austro-occid, in angustiis flum. Parchaj, 11.6.1930 c.fl., E. G. Bobrov, 223 (LE.); Sjunt, 14.5.1916 c.fr., B. Fedtschenko, 147 (LE.); in angustiis Ioldere, 25.5.1912 c.fr., N. I. Samokilisz, 3190 (LE.); ad trajectum, inter Kisil-Arwat et Siekiz-chan, 24.6.1916 c.fr., D. D. Bukinin (LE.); Karakal, in angustiis Ioldere, 8.5.1912 c.fl. et fr., Lipsky, 2913 (LE.); Montes Kopet-Dagh centralis, in angustiis Achmed-Czijen-Dere, in declivibus occid. mont. Karaul, 10.7.1953 c.fr., Jegorova (LE.); Sumbar, in angustiis Aj-dere, 19.5.1951 c.fl. et fr., L. E. Rodin, 593 (LE.); ca. 13 km Kisil-Arwat austrooccidentale, 23.4.1952 c.fl., L. E. Rodin, 1619 (LE.); Karakal, in angustiis Ioldere, 4.7.1931, Borissova, 368 (LE.); Germab, in angustiis, 1.6.1889, Antonov (LE.); in angustiis Ioldere, prope Kara-Kala, 26.6.1916 c.fr., V. A. Dubianskij (LE. MW.); in angustiis Ioldere, 23.6. 1931 c.fr., Borissova, 221 (LE. MW.); pag. Tumanowski, 10.5.1926 c.fr., Tscherniakowskaja, 60. (LE.); Sjunt, 14.5.1916 c.fr., Tscherniakowskaja, 1063 (LE.); fl. Sumbar, in angustiis Aj-Dere, 10.5.1912 c.fl., Lipsky, 3607 (LE.); in angustiis Aj-Dere, 30.5.1912 c.fr., Lipsky, 3686 (LE.); cacumen montis Sjunt, 1.500 m., 18.6.1930 c.fl. et fr., E. G. Bobrov, 320 (LE.); in jugo Arwaz, 1.100 m, 31.5.1954 c.fl. et fr., Markova, Fjodorova (LE.); ad viam, in angustiis Ioldere, 15.5.1916 c.fl. et fr., B. Fedtschenko, 207, 240 (LE.);

Iran. In angustiis Arwaz (Persia), 24.6.1926 c.fr., A. A. Dubianskij, N. A. Basilevskaja (LE.); Prov. Astrabad, in angustiis Chartut, 29.4.1916 c.fl., 3.5.1916 c.fl., Tscherniakowskaja, 806, 859 (LE.); Prov. Kerman in monte Kuh-i-Nasr, 2.800—3.000 m, 23.4.1892 c.fl., J. Bornmüller, 3688 (B. BM., BP. FI, G. JE. K. LE. P. PRC. W. WRL. WU. as *C. persica* var. *Buhsei*).

Discussion: *Colutea gracilis* is distinguished by a relatively small area, confined almost wholly to the Turkmenistan part of Kopet-Dagh. The majority of herbarium specimens from Kopet-Dagh, found in Leningrad was determined, as Lipsky has done (l.c.), as *C. persica* or *C. persica* var. *Buhsei*, these being changed by Shaparenko (remarks on labels). Freyn (l.c.) assumed that it was the species nearest related to *C. persica* var. *Buhsei* and excluded the possibility of any affinity with *C. istria*, as the latter has fruits dehiscing at the top. This point of view cannot be accepted, because, on one hand, *C. persica* var. *Buhsei* belongs to quite a different section, and on the other, dehiscing fruits cannot be a criterion of affinity. The affinity with *C. istria* is indisputable, expressed in the pubescence of ovary, in size of leaves and leaflets, in shape and number of pairs of leaflets, and in the length of calyx teeth. The most important difference is the size of flowers, and it must be stated that in some forms of *C. istria* (Zohary, 536, Baki Kasapligil, 2189) flowers are small, related to flowers of *C. gracilis* in size.

Judging from specimens with intermediate features: slightly larger leaflets and flowers, and an indication of a beak on the keel, *C. gracilis* forms, perhaps, hybrids with *C. buhsei* in Kopet-Dagh Mts. To such spe-

cimens, still reckoned among *C. gracilis* by me, belong No. 3607 and 3686 Lipsky, 320 Bobrov, 207 and 240 Fedtschenko.

It is very strange that *C. gracilis* grows so far from its proper area, namely in south-eastern Iran (Kuh-i-Nasr near of Kerman). J. Bornmüller determined, at first, the specimen collected in this locality (No. 3688) as *C. persica* var. *Buhsei*, however, he corrected this name after the publication of Freyn's diagnosis. This specimen is certainly distinguished by its minute flowers and small leaves, the ovary is, however, slightly pubescent. In a typical *C. gracilis* the ovary is tomentose, so that its walls are not visible. In Bornmüller's specimen pubescence is more clearly marked at the ventral suture, on the remaining part of the ovary pubescence is rather loose. Taking this feature into account Bornmüller's specimen could be considered as a transitional form to *C. persica.* Noteworthy is not only the great distance from Kopet-Dagh, but perhaps more, the altitude of the collection, about 3 000 m a.s.l. A. Parsa (l.c.) mentions *C. gracilis* from the region of Kerman, from a still higher locality (Kuhé Lalazar 3 300—3 700 m); I have not had the opportunity to see the collections from this region.

Colutea gracilis was mentioned by K. H. Rechinger (Symb. Afgh. 3: 24.1957) from Afghanistan, too, but he at once stated that his determination was not sufficient because of flowers lacking. Volk's specimen No. 634 cited by Rechinger, has fruits with a distinct long stipe and belongs, no doubt, to *C. paulsenii.* Therefore the area of *C. gracilis* has to be confined to the Kopet Dagh Mts. exclusively though it may be that it also includes the south-eastern Iran.

12. *Colutea persica* Boissier.

Diagn. Pl. Or., sér. 1, 6:33 (1845); Fl. Or., 2:196 (1872); Stapf, Jour. Linn. Soc. Bot., 30:141 (1895); Schneider, Ill. Hand. Laubh., 2:90, fig. 55 p—q, 56 g—h (1907); Rehder, Man. Trees Shrubs, ed. 1., 509 (1927), ed. 2., 513 (1940); Parsa, Fl. Iran, 2:96 (1948) p. p.; Sokolov, Dier. Kust., 4:169 (1958).

Type. Iran. In fauce Perezend, c.fl., Aucher-Eloy-Herbier d'Orient, 4348 (G. holo + BM. FI. G. LE. W. iso).

Shrub up to 2 m high. The youngest parts of one year old shoots are delicately puberulous, older ones quite glabrous. Two year old shoots peeling fibrelike; fibres long, thin, almost translucent. Older shoots violet-brown, lustrous. Stipules membranaceous, ovate, up to 1 mm long, finely pubescent. Leaves 3—6 cm long, with 2—3 (4) pairs of leaflets. Rachis with loose, appressed hairs. Leaflets 8—10 mm long by 6—8 mm broad, occasionally larger, broad obovate, rounded or retuse at apex, exceptionally with a scarcely visible appendage of midrib, rather thick, bluish, glabrous above, with a few white hairs below. Petiolules

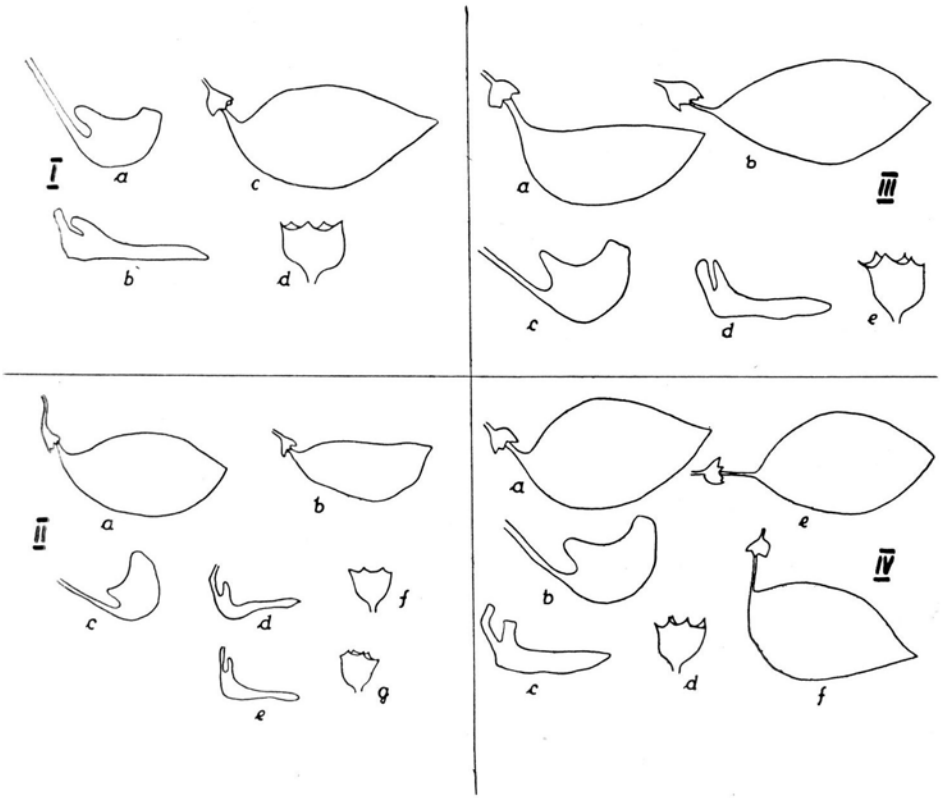

Fig. 12. Subsect. *Graciles*, sect. *Colutea*.
I. *C. istria*: *a* — keel; *b* — wing; *c* — fruit; *d* — calyx; II. *C. gracilis*: *a-b* — fruits; *c* — keel; *d-e* — wings; *f-g* — calyces; III. *C. persica*: *a-b* — fruits; *c* — keel; *d* — wing; *e* — calyx; IV. *C. hybrida*: *a* — fruit; *b* — keel; *c* — wing; *d* — calyx; *e-f* — fruits of var. *longestipitata*.
(keels, wings and calyces × 1; fruits × ½)

very short. Inflorescence up to 5 cm, as long or shorter than supporting leaves, with 2—4 (5) flowers. Rachis nearly quite glabrous. Pedicels 7—9 mm long, with single black hairs. Bracts glabrous. Flowers up to 20 mm long. Wings longer than keel, rounded in place of breaking or with a barely marked spur, spreading at an angle of 100—110°. Ovary glabrous or with a few hairs on ventral suture at the most. Calyx broad-campanulate, 8—9 mm long, with loose, mainly black hairs. Calyx teeth broad-triangular, up to 1.5 mm long, with dense, black hairs inside. Bractlets lanceolate, up to 1.5 mm long, pubescent like calyx. Fruits up to 6 cm long, obtuse or short acute at the top, on a distinct stipe, twice as long as calyx, dehiscing on top. Seeds up to 4 mm long by 3.5 mm broad. Flowers V—VII (Fig. 12, III a—e, Pl. XIII).

Distribution: Southern Iran, in mountains, altitude about 2.600 — 3.000 m a.s.l. (Fig. 11).

Specimens examined:

In umbrosis faucium in alpe Kuh-Delu, 13.6.1842, c.fl. et fr., Th. Kotschy, 511 (BM. BP. C. GGM. FI. G. JE. K. P. PR. PRC. RO. W. WRL.); Kuh Barfi, c. 9.000′, 19.6. 1885 c.fl., O. Stapf, 2106, 2115 (K.), 1020 (W.); Mont. of Dasht Arijn, 1888 c.fr., L. I. Jeffries (K.); Valley above Seguch nr. Kerman, 8.000′, 7.1934 c.fl., H. E. J. Biggs, 13154 (BM.); Herbier de Perse, 1825, c.fr., M. Belanger (G.).

Discussion: One of the earlier described species of *Colutea* and, at the same time, one of the most often confused and the least known. The majority of herbarium sheets of *Colutea* from Middle and West-Asia has been labelled in herbaria under this name. Up till recent times I have only seen a few specimens conforming to Boissier's diagnosis; they usually come from the XIX century. Boissier's type and paratype differ from each other in the size of leaflets: the type (No. 4348, Aucher-Eloy) has leaflets up to 8 mm long at most, while the paratype (No. 511, Kotschy) up to 18 mm long by 15 mm broad. It is possible that the Aucher-Eloy's specimen was collected in early spring (no date of collection on label), therefore the leaflets could not yet be fully developed.

An important diagnostic feature of *C. persica* is glabrous ovary and glabrous fruit, but it must be noted that the glabrousness is not constant. In several specimens (No. 511, Kotschy), besides flowers with a quite glabrous ovary, there are flowers with an ovary slightly pubescent along the ventral suture, or with single hairs on the surface of walls; most probably the hairs perish quickly. Insufficient herbarium material does not enable to state, how often such flowers are met in one individual or in a whole population.

According to several authors (Schneider, l.c. Rechinger, Symb. Afgh.) *C. persica* is a species closely related to *C. buhsei* but this statement is wrong. These species belong to two quite separate sections and differ from each other not only in the ovary pubescence, but also in the ending of keel, in length of fruit-stipe and lastly in geographical distribution.

All material of *C. persica* accessible to me comes from southern Iran, (surroundings of Kerman and Shiraz) and it seems quite probable that it is a species endemic to those regions. A. Parsa (l.c.) mentions localities with *C. persica* from other regions too, even from the north. When we consider, however, that it is a species so often mistaken for others, Parsa's statement seems very uncertain; these data probably refer either to *C. gracilis* or *C. buhsei*. *C. persica* needs a further, critical study, that would be based on much richer collections than those I had at my disposal.

13. *Colutea hybrida* Shaparenko.

Fl. URSS, 11: 395 (1941); Sokolov, Dier. Kust. SSSR, 4: 170 (1958).
Syn.: *Colutea persica* sensu Borissova non Boiss, Fl. Tadzhik., 5: 219 (1937). p.min.p.

Colutea orbicularis Sumnievicz, Not. Syst. Herb. Inst. Bot. Sect. Uzbek. Ac. Sc. URSS, 6: 19 (1941); Fl. Uzbek., 3: 458 (1955).

Type. In jugo Hissar, in vicinitate pag. Gushar, 15.5.1933 c. fl., Zaprjagaev, 242 (LE).

Shrub. Youngest parts of recent shoots yellow-green, with a few, white hairs, older ones yellowish white. Two year old shoots peeling white, in fibres. Many year old shoots dark brown, lustrous. Stipules membranaceous, ovate-triangular, 1.5—2 mm long, puberulous. Leaves 3—7 cm, even up to 9 cm long on strongly growing recent shoots, with 2—3 pairs of leaflets. Rachis with white hairs or glabrate. Leaflets roundish or broad obovate, without appendage of midrib, slightly rugose, quite glabrous above, with short, appressed, white hairs below, up to 16 mm long by 14 mm broad, mostly, however, smaller (10—12 mm × 7—10 mm). Inflorescence 4—6 cm long, shorter than, or equal to, supporting leaves, 2—4 (5) flowered. Rachis puberulous, hairs white, or with loose, white hairs. Pedicels 7—11 mm long, puberulous, hairs white, sometimes mixed with black ones. Bracts lanceolate, 1 mm long, puberulous. Flowers 19—21 mm long, yellow. Wings longer than keel, or almost equal, rounded or with a scarcely marked spur in place of breaking, spreading at an angle of about 100°. Ovary tomentose, hairs silver. Calyx campanulate, 6—7 mm long, with white, occasionally with a few black hairs. Calyx teeth triangular-lanceolate, 2—3 times shorter than tube, with white hairs inside. Bractlets lanceolate, about 1 mm long, pubescent like calyx. Legume 3—5 cm long by 2.5—3 cm broad, narrowed and acute at the top, on a stipe twice as long as calyx, loosely pubescent. Flowers V—VII (Fig. 12, IV a—d, Pl. XIV).

Distribution: USSR — Middle Asia: south-eastern Uzbekistan, Tadzhikistan. In mountains between 1.000 and 2.000 m a.s.l. (Fig. 11).

Specimens examined:

Jug. Baba-Tag, ad fines boreo.-orient., 15.5.1933 c.fl., I. A. Linczewskij, 67 (LE. TAD.); Baba-Tag, in vicinitate pag. Uljantul, 29.5.1930 c.fr., Babajev, 39957 (TAK.); Buchara, prov. Hissar, opp. Fajzabad australe, 23.5.1897 c.fl., S. Korshinsky, (LE.); Baba-Tag, ad viam inter pag. Dshida-Bulak et pag. Szachar-Uldy, 28.5.1930 c.fl., Babajev, 39930 (TAK. — as isotype C. orbicularis Sumn.); Hissar occid., in systemate fluvii Tupalanga, 29.8.1955 c.fl. et fr., I. T. Vassilczenko, 15 (K. LE.); in jugo Hissar, in declivibus australis, 19.9.1928 c.fl. et fr., N. Gonczarow, 2001 (LE.); in systemate fluvii Warzob, 1.150 m., 2.6.1952 c.fr., Stiepanienko, Dodonova, 136 (LE.); in angustiis fl. Warzob, 15.5.1933 c.fl., Zaprjagaew, 232 (LE.); Garbani-Uszti, 2.000 m., 21.6.1947 c.fl., Wariwcewa, Nepli, 1456 (LE.); Garbani-Uszti, 2.100 m., 2.6.1947 c.fl., Wariwcewa, Nepli, 1561 (LE.); Garbani-Uszti, 2.150 m., 4.6. 1948 c.fr., Wariwcewa, Nepli, 1307 (LE.); Garbani-Uszti, loco dicto Terak, 2.000 m., 2.6.1947 c.fr., Wariwcewa, Nepli, 1454 (LE.); praemont. Garbani-Uszti, 19.5.1948 c.fl., Wariwcewa, Nepli (LE.); jug. Darwaz, ad fines occid., in angustiis prope pag. Arszi, 1.700 m., 13.7.1948 c.fl. et fr., Nikitin, Borissova, 257 (TAD.); in declivibus australis mont. Chanoka, 22.6.1948 c.fl. et fr., Nikitin, Borissova, 31 (TAD.); jug.

Wachsk, prope pag. Chodshanor, 3.6.1937 c.fl. et fr., M. I. Prjachin (TAD.); distr. Nurek, prope pag. Tut-kaul, 10.6.1937 c.fr.,? (TAD.).

Discussion: *Colutea hybrida* is a species most closely allied to *C. persica* from which it differs in pubescent ovary and slightly larger calyx teeth. The new species "*C. orbicularis*", described in 1941 by Sumnievicz (l.c.) should be reckoned, without doubt, among its synonymy. Differences between Shaparenko's and Sumnievicz's diagnoses are seen only in the size of leaflets, but this feature is in the majority of species of *Colutea* the most variable. The Shaparenko type was collected about the middle of May and therefore probably the leaflets are not yet fully developed.

13a. *Colutea hybrida* var. *longestipitata* Browicz.

Type. URSS, Tadzhikistania australis inter flumen Kafirnigan et Gazimajlik, 1.050 m., 27.5.1939 c.fl. et fr., S. Tazba, 584 (LE.).

Unlike the type, where the stipe of fruit becomes gradually broader, this variety has a stipe linear, threadlike in its whole length, and suddenly passing into the broadened part of fruit (Fig. 12, IV e—j).

Distribution: USSR — Tadzhikistan.

Specimens examined:

Tadzhikistania. Darwaz, Uschor, in declivibus lapidosis, 15.5.1897 c.fr., S. Korshinsky, 2134, 2136 (LE.); jug. Hissar, in declivibus borealis. In systemate fl. Kaszka-Daria (fl. Tanchas), mont. Kok-tepe occidentale, 28.5.1937 c.fr., S. N. Kudrjaszev, 846 (LE. — as *C. persica* var. *violacea* S. Kudr.).

Discussion: Of all cited specimens of this variety S. Korshinsky's specimen (2136) is the most interesting, because its stipe is not fixed at the base of the inflated part of fruit, but at its middle part; it is probably a teratologic form (= f. *monstrosa mihi*).

SECTION 2. *MULTIFLORA* BROWICZ

Shrubs unarmed. Leaves with 4 to 12 pairs of leaflets. Inflorescence strongly elongated with 5 to 30 flowers. Flowers small, 12 to 15 mm long. Wings broad, without spur, in shape reminding of the keel, but shorter than the latter. Keel without beak.

Type species: *Colutea multiflora* Shaparenko ex Ali.

KEY TO THE SPECIES OF THE SECTION *MULTIFLORA*

Ovary and young shoots glabrous. Leaflets pubescent beneath
14. *C. multiflora*

Ovary and young shoots tomentose. Leaflets pubescent on both sides
15. *C. delavayi*

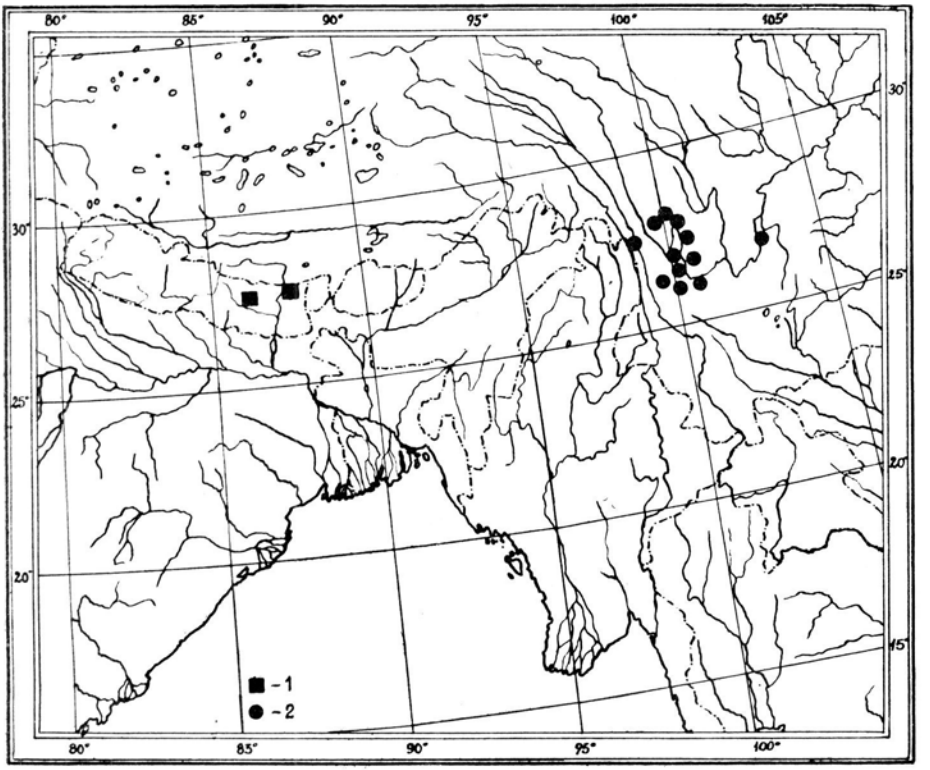

Fig. 13. Distribution of species of section *Multiflora*:
1 — C. multiflora; 2 — C. delavayi.

14. *Colutea multiflora* Shaparenko ex Ali.

Bot. Notiser, 112, 4: 491, fig. 2 A—E (1959).

Syn. *C. arborescens* var. *nepalensis* sensu Lall Dhevoj non Baker (in. sched).

Type: Nepal. Pongsing, 15.000′, 1929 c.fl., Lall Dhevoj, 76 (BM. holo. + E. iso.).

Shrub about 1.5 m in height. Young shoots greenish brown, finely striated, glabrous or with only single white hairs on the youngest parts. Stipules triangular-lanceolate, 1 to 3 mm long, glabrous or with single hairs, especially on margin. Leaves 5 to 9 cm long, with 4 to 8 pairs of leaflets. Rachis covered with loose, white hairs. Leaflets elliptic or slightly obovate, up to 18 mm long by 9 mm broad, rounded or mucronate at apex, thin, glabrous above, with appressed white hairs beneath, smooth. Petiolules pubescent, up to 1 mm long. Inflorescences up to 17 cm long, markedly longer than leaves supporting them, 5—15 flowers. Rachis yellow-brown, glabrate or with loose, white hairs. Pedicels 4—6 mm long, with dark brown hairs. Bracts membranaceous, up to

1.5 mm long, acute, glabrous or covered with a few white hairs. Flowers yellow, 14 to 15 mm long. Wings shorter than keel, open at an angle about 140°. Keel rounded at the top, in upper part of a darker colour. Ovary glabrous. Calyx 5 to 6 mm long, campanulate, with brown hairs. Teeth up to 1.5 mm long, inside tomentose, hairs dark brown. Bractlets minute, 0.7 to 0.8 mm long, pubescent like calyx. Legume 5.5 to 6.5 cm long by 2.2 cm broad, on a stipe 8 to 10 mm long, obtuse at the top, indehiscent, with very thin, glabrous valves. Seeds unknown. Flowers (VII) VIII. (Fig. 10, III a—h, pl. XV).

Distribution: Species endemic to Nepal, where it occurs in mountains between 2.200 — 4.900 m a.s.l. (Fig. 13).

Specimens examined:

Nepal. Satey, 9.000′, 1930 c.fl., Lall Dhevoj, 0163 (BM, E.); Sibrung N. of Num, 7.000′, 27.8.1956 c.fl. et fr., J. D. A. Stainton, 1440 (BM.).

Discussion: Species erected in 1938 in the British Museum and Edinburgh herbaria by K. K. Shaparenko, who chose the Lall Dhevoj, no. 0163, specimen as holotype and no. 76 as paratype. S. I. Ali (l.c.) has done the reverse. The type gathered at great heights, most probably near the upper limit of occurrence, is characterized by a smaller number of flowers and shorter inflorescence.

Colutea multiflora is most closely allied to the Chinese *C. delavayi*, differing in a glabrous ovary, glabrous young shoots, and in a smaller number of pairs or leaflets.

15. *Colutea delavayi* Franchet.

Pl. Delavay., 1: 158, pl. 38 (1889); Schneider, Ill. Hand. Laubh., 2: 92, fig. 56 l, 57 f—k (1907); Léveillé, Cat. Pl. Yunn., 153 (1915—16); Handel-Mazzetti, Symb. Sin., 7, 3: 551 (1933); H. H. Hu, Fl. Ill. Sinic. Legum., 312, pl. 308 (1955).

Type: China. Yunnan, in sepibus secus rivulos ad Pien-kio, 20.10.1883 c.fr., Delavay, 513 (P. holo. + K. iso.).

Shrub up to 3 m high. Young shoots, rachides both of inflorescence and leaves, petioles, stipules and bracts appressed tomentose, with short gray hairs. Pubescence well kept even on second year shoots. Stipules lanceolate up to 3 mm long. Leaves up to 16 cm long, with 5—12 pairs of leaflets. Leaflets elliptic or ovate-elliptic, up to 25 mm long by 12 mm broad (mostly 15 × 7 mm), apex rounded, retuse or with a very short, scarcely visible appendage of midrib, both sides with appressed white hairs, more so beneath; in autumn pubescence minute above. Petiolules 1 to 1.5 mm long. Inflorescence, an erect raceme, as long or longer than supporting leaves, 9 to 20 cm long with numerous flowers (8—30). Pedicels 3 to 7 mm long, tomentose, hairs appressed, black and grey. Flowers 12 to 13 mm long, yellow or greenish yellow (f. *olivacea mihi*). Wings distinctly shorter than keel, open at an angle of about 140°.

Ovary silky tomentose. Calyx 4 to 4.5 mm long, as much wide, tomentose, hairs brownish black, often mixed with white hairs. Calyx teeth twice to 3 times as short as tube, inside tomentose, hairs black. Bractlets lanceolate, up to 1.5 mm long, pubescent like calyx. Legumes indehiscent, loosely pubescent (hairs white or black), 4 to 6 cm long by 12—20 mm broad, with thin parchment-like valves; distinctly acute at the top; set on a long (12 to 17 mm) and thin stipe. Seeds 4.5 mm long by 3.5 mm wide. Flowers VII—X. (Fig. 10, IV a—i, Pl. XVI).

Distribution: Southern China, Prov. Yunnan only, and southern Szechwan. It grows in dry, subtropical regions on a lime substratum, in thickets, even in mixed forests, very common in some places (Muli) at the height between 2.000 and 3.300 m a.s.l. It occurs perhaps, in northern Burma, too, in regions bordering upon China. (Fig. 13).

Specimens examined:

China. Yunnan. Coteaux calcaires au pied du Hee-chan-men, versant oriental (Ho-kin), 12.10.1885 c.fl. et fr., Delavay, 1981 (P.); Tien-tsin, près Kiao-Kia, 8.1906 c.fl. et fr., A. Tchen, 4846 (P. W.); on dry rockes slopes, Bey-ti-shan, 7.000′, 7.1921 c.fl. et fr., Forrest, 20563 (E. K.); open dry situation in thickets on the T'ong Shan, 9.000′, 9.1918 c.fl., Forrest, 16861 (BM. E.); Mekong, Salevin divide, 10.000′, 9.1914 c.fl., Forrest, 13369 (BM. E); and 10. 1914 c.fl. et fr., Forrest, 13427 (E.); open dry situation amongst scruby, T'ong Shan in the Jangtsy bend, 9.000′, 9.1913 c.fl., Forrest, 11164 (E.); circa Pe Yen Tsin in Yunn. bor.-occid., 1917 c.fl., Siméon Tén, 457 (E.); Yung Ning. Summit of the mountains, 27.7.1934, c.fl. et fr., McLaren, 123 (BM. E.K.); Nanfantschoang (?), 18.10.1920 c. fl., Siméon Tén, 195 (E.); Chungtien, Paitih, among mixed forest, 2.000 m, 21.11.1937 c.fr., T. T. Yü, 14932 (BM. KUN.); Chungtien, 2.100—2.500 m, 16.10.1955, c.fr., K. M. Feng, 21065 (KUN.); Chungtien, 10.1939, K. M. Feng (KUN. n. v.); Chungtien, 9.1939, K. M. Feng, 2250 (KUN. n. v.); Likang, 12.1939, R. C. Ching, 22155 (KUN. n. v.); Hoking, 9.1940, R. C. Ching, 24578 (KUN. n. v.); Szechwan: Muli, Guhtzun, 3.000′, among thickets, 3.12.1937 c.fr., T. T. Yü, 14817 (BM. KUN.); Muli, Lilang, 2.600 m., among thickets, 12.1937, c.fr., T. T. Yü, 14866 (BM. KUN.); Muli, 2.300 m, 10.1959, S. G. Wu, 2814 (KUN. n. v.).

SECTION 3. *ROSTRATA* BROWICZ

Syn. Sect. 1. *Eucolutea* Boiss., Fl. Or., 2: 194 (1872), p.min.p.

Shrubs unarmed. Keel ending with a beak which now and then, is much elongated and bent

Type species: *Colutea orientalis* Miller.

KEY TO THE SPECIES OF THE SECTION *ROSTRATA*

1. Ovary glabrous 2
   Ovary pubescent 4
2. Wings falcate, rounded on the outer margin, without any trace of

breaking. Leaves with 3 to 4 pairs of leaflets **3**
Wings broken, with a minute spur. Leaves with 1—2 pairs of leaflets **18.** *C. atabajevi*

3. Flowers hardly 11—13 mm long, orange-red. Fruits characteristically bent upwards at the top **16.** *C. orientalis*
Flowers larger, yellow. Fruits without bent top. **17.** *C. jarmolenkoi*

4. Wings shorter than keel, falcate, without any trace of breaking. Flowers up to 16 mm long. **17a.** *C. jarmolenkoi* var. *hirsuta*
Wings nearly as long or longer than, keel, distinctly broken. Flowers larger **5**

5. Ovary weakly pubescent, so that walls are clearly visible. Inflorescence 1—3 flowers **21.** *C. afghanica*
Ovary tomentose, silver hairs, walls closely covered with hairs and invisible. More flowers in inflorescence **6**

6. Keel with long beak (2—3 mm) characteristically bent upward. Fruits rounded on the upper part, with a short acute top. **23.** *C. nepalensis*
Keel with short beak. Fruits gradually narrowing into a distinct, acute top **7**

7. Calyx teeth at least 5 times as short as tube, broad triangular. Wings with spur **19.** *C. buhsei*
Calyx teeth as long as tube, or only twice or 3 times shorter. Wings mostly without spur **8**

8. Inflorescences 18—25 cm long. Leaves with 2 pairs of leaflets. Leaflets glabrous on both sides **20.** *C. gifana*
Inflorescences half as short. Leaves with 2 to 4 pairs of leaflets. Leaflets pubescent beneath, sometimes also above. **22.** *C. paulsenii*

Subsection 1. *Orientales* Browicz

Flowers small, 11—16 mm long, usually multi-coloured. Wings shorter than keel. Ovary glabrous (exception: *C. jarmolenkoi* var. *hirsuta).* Leaflets roundish or broadly obovate. Shoots finely peeling, after peeling grey or grey-brown, opaque.

Type species: *Colutea orientalis* Miller.

16. *Colutea orientalis* Miller.

Gard. Dict., ed. 8., no. 3 (1768); Lamarck, Encycl. Meth., 1: 353 (1783) and Illustr. 3, t. 624, 3 (1823); Koch, Dendr., 1: 65 (1869); Dippel, Hand. Laubh. 3: 707 (1893); Koehne, Deutsch. Dendr., 338 (1893); Schneider, Ill. Hand. Laubh. 2: 92, fig. 57 l—t (1907); Ascherson u. Graebner, Syn. Mitteleur. Fl., 6, 2: 732 (1908); Rehder, Man. Trees Shrubs, 1 ed. 509 (1927), 2. ed. 513 (1940); Shaparenko, Fl. URSS, 11: 317, tabl. 22 fig. 3. (1941); Grossheim, Opried. rast. Kawkaza, 123 (1949); Grossheim, Fl. Kawakaza 2. ed., 5: 239, (1952); Prilipko, Fl. Azerbajdż., 5: 323 (1954); Sokolov, Dier. kustar. SSSR, 4: 164 (1958).

Syn.: *Colutea aperta* Moench, Verz. Ausl. Bäume Sträuch. Weissenst. 24 (1785).
Colutea humilis Scop., Delic. Fl. Insubr., 2: 23, t. 12. (1786).
Colutea sanguinea Pallas, Fl. Ross. 2: 88 (1788).
Colutea cruenta Aiton, Hort. Kew, ed. 1., 3: 55 (1789); Marschall u. Biberstein, Fl. Ross., 2: 169 (1808); Willdenow, En. Pl. Hort. Reg. Bot. Berol. (1809); Ledebour, Fl. Ross., 1: 574 (1842); Loudon, Arb. Frut. Brit. 2: 636 (1854); Petzold u. Kirchner, Arb. Muscav., 381 (1864); Boissier, Fl. Or., 2: 195 (1872); Schmalhausen, Fl. Ross. Krym Kawk., 1: 251 (1895); Sommier, Levier, Acta Hort. Petr., 16: 333 (1900); Grossheim, Fl. Kawkaza, ed. 1., 2: 292 (1930).
Colutea versicolor Salisbury, Prodr. Stirp., 337 (1796).
Colutea rubra (hort.) ex F. H(enricq), Hortic. Franc., 138 (1852), pro. syn.
Colutea purpurea hort. ex Lavallée, Arb. segerz., 63 (1877).

Type: ex. cult. Chelsea Physic Garden, P. Miller (BM, n. v.). I saw the specimen collected later, perhaps from the same plants as the holotype (BM.).

Shrub up to 2—3 m high. Young shoots thin, quite glabrous; single hairs on youngest, freshly developed parts of shoot only. Two year old and older shoots delicately peeling fibrelike, brown-grey or grey. Stipules ovate up to 1 mm long, glabrous. Leaves 4—6 (8) cm long, composed of (2) 3—4 pairs of leaflets. Rachis quite glabrous. Leaflets broad obovate or roundish, with a broad cuneate base, retuse or truncate, scarcely mucronate at apex, slightly rugose, with distinctly visible network of lateral nerves, glabrous above, with loose white hairs below, bluish green, up to 18 mm long and 15 mm broad, usually smaller (12 × 10 mm). Inflorescence 4 to 6 cm long, shorter than leaves supporting it, or equal to them, with 3-4 (5) flowers. Rachis glabrous or glabrate. Pedicels 4—6 mm long, with single hairs, white or black. Bracts lanceolate, 1 to 1.5 mm long with single white hairs. Flowers 11—13 mm long, orange-red, with darker veins and light, yellow spot at the base of standard blade. Keel with small beak, darker at the top. Wings falcate, shorter than keel, spreading at an angle of about 140 — 150°. Ovary glabrous. Calyx campanulate, 5 to 6 mm long, with loose hairs. Hairs minute, mostly black, more numerous at the margin of calyx. Teeth narrow and sharp, 2—3 times shorter than tube, tomentose inside, hairs black. Bractlets narrow ovate, 0.5 mm long, with black hairs. Legume to 4 (5) cm long by 2 cm broad, on a short stipe, or almost sessile, narrowing at the top, bent upwards at a right angle, dehiscing at the top, glabrous. Seeds up to 3 mm long by 2.5 mm broad. Flowers IV—VIII (Fig. 15, I a—g, Pl. XVII).

Distribution: USSR: Daghestan, eastern and southern Azerbaijan, south-eastern and eastern Georgia. It probably grows in Northern Iran too, shown by Szovitz's specimen (No. 589). Met on dry, stony mountain slopes, between 500 and 2.000 m a.s.l. usually, however,

not higher than 1.500 m. V. V. Saposhnikov (Rastit. Tureck. Armenii, Tomsk, 1917) states that *C. orientalis* grows in Turkey near the town Mus; it seems rather doubtful (taking the present knowledge of the limits of the area) and it seems that the data refer to *C. cilicica*. (Fig. 14).

Specimens examined:

USSR. Daghestan: In Dagestan, 22.5.1889 c.fl. et fr., N. Kousnetzoff (LE. P.); Gunib, 5—6.500′, 25.7.1885, c.fr., Radde, 285 (LE); Distr. Temir-Chan-Schura, ad viam inter Humaly et Czirkei, 27.6.1897, c.fr., Alexeenko, 6124 (LE); Distr. Dargi. In calcarei prope pag. Chodshal-makhi, m. Kontsala-bek, 3.100—3.700′, 4.7.1897, c.fr., Alexeenko, 6141 (LE.); prope Gunib, 4.000—4.500′, 5.7.1897 c.fr., Alexeenko, 6142 (LE.); Achty, 1876 c.fl. et fr., Becker, 377 (BM. FI. JE. K. LE. P. WU. WRL.); Achty, 1880, c.fl. et fr., Becker, 245 (G. LE.); prope Achty, 1874 c.fl. et fr., Becker, 159 (LE.); Achty, 1885 c.fl. et fr., Becker, (P. PR.); Distr. Dargi, prope pagum Bokni, in angustiis fluvii Ullu-czai. In rupibus schistosis, 3.800′, 21.7.1898 c.fr., Alexeenko, 6131 (LE.); Distr. Dargi. In abruptis argilloso-calcareis ad viam inter pag. Kamha-makhiet et Ameterek, 3.900′, 16.7.1898, Alexeenko, 6132 (LE.); Distr. Tem.-Ch.-Schura. Prope p. Ischkarty in abruptis lapidosis, 3.000′, 21.5.1900 c.fl. et fr., Alexeenko, 6130 (LE.); Distr. Awarsk. Pr. p. Gimri (Genu). In decliviis montis Schuhi-meer. In umbrosis siccis, 3.100′, 21.5.1900. c.fl., Alexeenko, 6129 (LE.); Distr. Dargi, prope pagum Urari, in rupibus schistosis, 4.700′, 22.7.1898, c.fl., Alexeenko, 6133 (LE.); Distr. Dargi. In rupibus calcareis aridis prope pag. Tsudakhar loco Abuczczailia-bek, 3.900′, 18.8.1898, Alexeenko, 6134 (L.); Distr. Samur. Prope pagum Maza. In detritu argilloso, 6.300′, 20.9.1900 c.fl. et fr., Alexeenko, 6127 (LE.); Distr. Gunib 1650 m, 13.7.1928 c.fr., A. Poretzky, 815 (LE.); Distr. Gunib, 1.200 m, 1928 c.fr., A. Poretzky, 564 (LE.); Distr. Botlich, prope pag. Luni, 3.7.1940 c.fr., E. Schiffers (LE.); Botlich, 30.7.1904 c.fr., Busch (LE.); Zw. Kurah u. Kro, c.fl. et fr., A. Becker, 298 (LE. WRL.); Dagestania borealis, 8.6.1861 c.fl. et fr., Ruprecht (LE.); Usuch-czai, in valle fl. Samur, 9.7.1940 c.fl. et fr., R. Jelenievskij (LE.).

Azerbaijan: Gub. Baku, Distr. Kuba, prope pag. Kunach-Kent, in decliviis meridionalis, 4.100′—4.500′, 13.7.1899, Alexeenko, 6135 (LE.); Gub. Baku. Distr. Kuba, prope pag. Gümur. In decliviis meridiomalis aridissimis, 3.705—4.000′, 11.7.1899, Alexeenko, 6136 (LE.); Gub. Baku. Distr. Kuba, ad viam inter Tahrdshal et Dzuchull, in schistosis meridionalis, 3.000′, 4.7.1899, c.fr., Alexeenko, 6138 (LE.); Gub. Baku. Distr. Kuba, in schistosis pr. pagum Tahrdshal, 3.300′, 4.7.1899, Alexeenko, 6137 (LE.); Gub. Baku. Distr. Kuba, ad fl. Samur prope pag. Chazry. In fruticetis siccis, 2.000′, 5.7.1899, Alexeenko, 6139 (LE.); Elizapethpol, 1882, c.fl., Lagowski (FI.); Elisabethpol, am abhänge, c.fr., Prick, (LE.); Muchet, 5.6.1889 c.fr., Lipsky (LE.); Circa p. Ateni, prope Goré, 24.5.1920 c.f. Woronow (L.E.);

Georgia: Tiflis, in rupibus, 9.6.1919 c.fl. et fr., A. Grossheim (GB. LE. PR.); Tiflis, 8. 1894 c.fr., 29.8.1895 c.fr., N. Puring (LE.); prope Tiflis, 1854 c.fl. et fr., Pomorzoff, 146 (LE.); prope urbem Tiflis, 4.8.1844 c.fl. et fr., Kolenati, 2374 (LE. W.); in oppido Tiflis, 7.1887, Sredzinsky (LE.); prope Tiflis, 6.1881, A. H. a. V. F. Brotherus, 269 (LE.); Tiflis, 5.1867, Radde, 25 (BP. LE.); prope Tiflis, 2.7.1894 c.fr., O. i B. Fedtschenko (LE.); Tyflis, 14.6.1889 c.fl., Lipsky (LE.); Tiflis, c.fl. et fr., Hohenacker, 326 (LE.); Tiflis, in rupestribus supra Hort. Bot., 13.5.1910 c.fl. et fr., G. Woronow (LE.); prope Tiflis, 4.1830 c.fl., Szovits (LE.); prope Tiflis, steppa Karajazy, prope pag. Michajlovka, 20.5.1929 c.fl. et fr., A. Kolakovsky (LE.); Tiflis, 4.5.1864 c.fl., Radde (LE.); Tiflis, in montis Sancti Davidii, 6.7.1890 c.fl. et fr.,

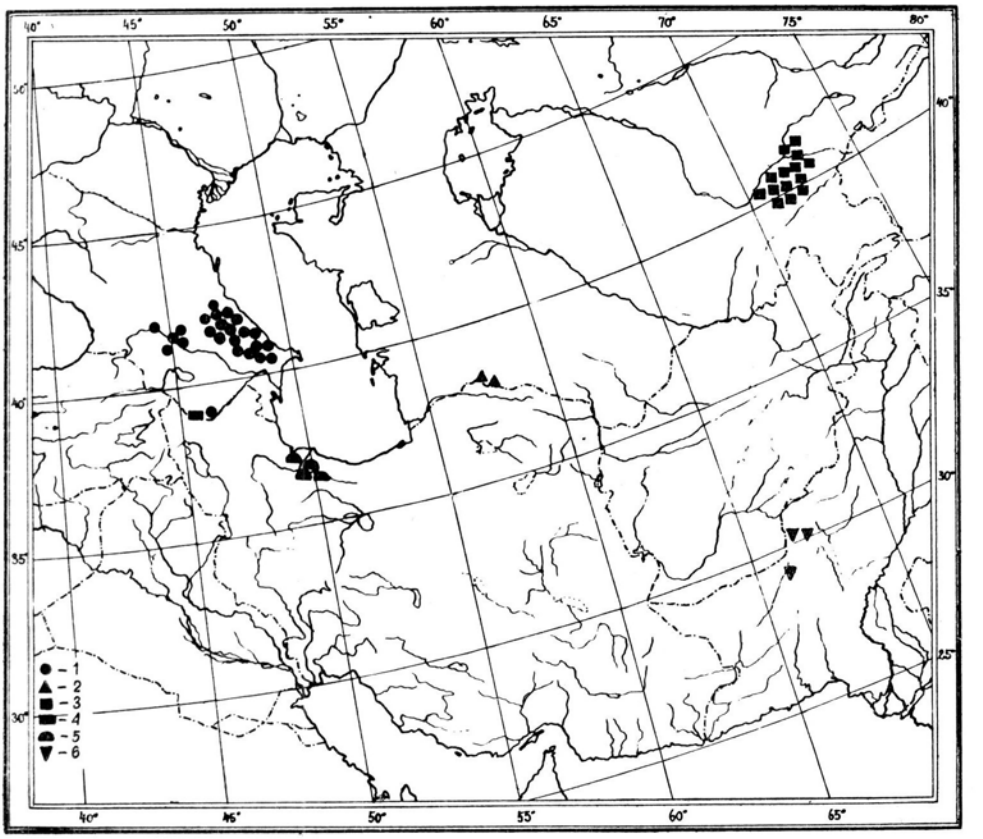

Fig. 14. Distribution of species of subsection *Orientales*, section *Rostrata* (*1-3*) and section *Armata* (*4-6*):

1 — C. orientalis; 2 — C. atabajevii; 3 — C. jarmolenkoi; 4 — C. komarovii; 5 — C. uniflora; 6 — C. armata.

Sommier, Levier, 333 (FI, G. LE.); prope Tiflis, 19.9.1844 c.fr., Kolenati, 2444 (G. LE.); Prov. Tiflis, distr. Gari, 25.5.1900, c.fr., G. Woronow (LE.); Transcaucasia orient. Schiraki, in rupestribus Kala-daga, 18.5.1899. c.fl., A. Fomin (LE.); Tiflis, 1500′, 26.6.1887 c.fl. et fr., I. J. Akinfiejev (LE.); Prov. et distr. Tiflis. Ad ripam sinistram fl. Wera, in collibus aridis, 26.5.1920 c.fl., B. Schischkin (W.); prope Tiflis, 14.6.1912 c.fr., R. Holmberg, 1518 (W.); Tbilisi: Hillside near the Dabahane gorge, opposite the Tbilisi Botanical Institute, 550—650 m, 29.6.1959. c.fr., Davis, 33792 (E. K.); Tbilisi: Kodjori highway, 500 m, 2.7.1959 c.fr., Davis, 33865 (E. K.); Tbilisi: Dabahane gorge, above Botanical Institute, 600—700 m, 30.6.1959 c.fl., Davis (E. K.); pag. Olginskij prope urb. Tiflis, 27.7.1903 c.fr., I. F. Seleżińskij (E. WA.); Tiflis, c.fl. et fr., Prescott (K.); In rupestribus supra Hortium Botanicum, Tiflis, 7.5.1914, c.fl. et fr., G. Woronow (K.); Tiflis, in faucibus fl. Dabachanka, 11.5.1924 c.fl., Grossheim (RUEB.); Tiflis, in horto botanico sponte, 26.10.1860 c.fl. et fr., Ruprecht (LE.); Caucasus, c.fl. et fr., Frick (C. E. FI. G. WA. WU.); Caucasus, 1898 c. fl. et fr., Wilhelms (G. W. WU.); Caucasus, 1887 c.fr., Radde, 237 (E. FI. LE.); Caucasus, c.fl.

et fr., Herb. Ledebour (LE.); Caucasus, 4.7.1865 c.fl., Scharrer, (JE.); Flora Caucasica, 1852 c.fl. et fr., N. Sredzinsky, 9 (LE.).

Armenia: in declivibus orient. montium Jagludsha, 24.7.1946, Mulkidjanian, 63041 (ERE.); Armenia, c.fl., Fischer, 41 (PR.).

Iran (?): In montibus calcareis circa Akartschai, in prov. Karabagh, c.fr., Szovitz, 598 (LE.).

Discussion: In literature some mistakes are made as to *C. orientalis* growing in other regions, too. K. K. Shaparenko (l.c.) and Sokolov (l.c.) mention it in Crimea, where it is met in a semi-wild state (Wulff, Fl. Krym, 2, 2. 1960). Koch, Koehne and Dippel (l.c.) record it from south-eastern Europe and Middle Asia; in the latter region it is also named by Ascherson and Graebner, Schneider and Rehder (l.c.). In Europe *C. orientalis* has been cultivated for a long time and run wild in many places e.g. in Dalmatia (Hayek, Prodr. Fl. Pen. Balc., 1: 772.1927). All data from Middle Asia (literature, herbaria) concern other species, mainly *C. buhsei*. Shaparenko (l.c.) cites herbarium specimens collected by A. Lehmann in Middle Asia and named *"C. orientalis"*. He did not, however, accept this name and in the Leningrad Herbarium he mentioned it as a new species. I have had the opportunity to see all Lehmann's specimens (LE. W.); they lack flowers and fruit, therefore judging from the shape of leaves and mode of bark-peeling it would be better to reckon them among *C. paulsenii*.

Colutea orientalis belongs, beside *C. arborescens*, to the oldest known species of the genus *Colutea*. It was discovered by J. P. Tournefort and brought by him to Paris for cultivation (Miller, l.c.). Tournefort described it under the name, applied till the present time, *"C. orientalis" in* "Corollarium Institutionem Rei Herbariae". The diagnosis was short and stressed the colour of flowers, so characteristic of this species "...flores sanguinei coloris, lutea macula notato" (p. 44). This name was next applied by R. Miller. In the following years it has been very often changed (see list of synonyms), but the name given to it in 1789 by Aiton *"Colutea cruenta"* has been applied most often. It is one of the best known species, differing from other species of the genus *Colutea* in its specific fruit being bent at the top.

17. *Colutea jarmolenkoi* Shaparenko.

Fl. URSS, 11: 394, tabl. 12 fig. 4. (1941); Sokolov, Dier. Kust. SSSR, 4: 168 (1958).
Syn. *Colutea persica* sensu Lipsky non Boiss, Acta. Hort. Petr., 26: 279 (1910).

Type: Uzbekistan, ad tracjectum Tschermak, distr. Osch, reg. Ferganensis, 23.6.1913 c.fl. et fr., O. Knorring, 553 (LE.).

Shrub. Young shoots greenish yellow or white-yellow, glabrous or covered with single white hairs on the youngest parts at the most. Older shoots brown-grey or dark grey, weakly peeling fibrelike. Stipules

triangular-ovate, up to 2 mm long, glabrous. Leaves 6—8 cm long, sometimes longer (to 10 cm) with 3, more rarely with 4, pairs of leaflets. Rachis glabrous, or with only single, white hairs. Leaflets up to 25 mm long by 20 mm broad, mostly smaller (12—14 × 11—13 mm) round, or broad obovate, usually retuse, without acute appendage of the midrib, glabrous and green above, glabrous or exceptionally with a few hairs, bluish green, with distinctly visible lateral nerves below. Petiolules up to 1 mm long. Inflorescence 5—7 cm long, somewhat shorter than supporting leaves, composed of 3—5 (7) flowers. Rachis glabrous, or with a few white hairs. Pedicels 6—8 mm long, with loose black and brown hairs. Bracts ovate-lanceolate, up to 2 mm long, glabrous or glabrate. Flowers yellow, 15—16 mm long. Keel with a weakly marked beak, sometimes scarcely visible. Wings shorter than, or almost equal to, keel, spreading at an angle of about 130°. Ovary glabrous, or only exceptionally with traces of quickly disappearing hairs on the inside edge. Calyx campanulate, 5—7 mm long, with loose, mostly black, hairs. Calyx teeth lanceolate, 2 to 2.5 mm long, inside tomentose, hairs black. Bractlets lanceolate, 1 mm long, tomentose like calyx. Legume 4—6 cm long by 2.5—3 cm broad, almost equally wide on its whole length, apex short acute or rounded and nearly obtuse, glabrous. Stipe does not protrude of calyx or very minutely so. Seeds 4 mm long by 3.5 mm broad. Flowers V—VIII (Fig. 15, IV a—h, Pl. XVIII).

Distribution: USSR — Middle Asia. Endemic species, limited in occurrence to Fergana Valley and Alai Range (Uzbekistan and Kirgizia) (Fig. 14).

Specimens examined:

Middle Asia. Prov. Fergana, distr. Osch, pr. Gulcza, 7.6.1900 et 27.5.1900 c.fl. et fr., W. Tranzschel (LE.); Prov. Fergana, in jugo Alai, inter pag. Karaul et Ljangar, 28.6.1904 c.fl., B. A. Fedtschenko (LE.); Prov. Fergana, in jugo Alai, inter Sufikurgan et Gulcza, 14.8.1901 c.fl. et fr., B. A. Fedtschenko (LE.); Kaplan-kul, 8.7.1878 c.fl. et fr., A. Kuschakevitsch (LE.); ad viam inter Gulcza et Kyzyl-kurgan, ad ripas fl. Kurszab; Kara-daban, 10.7.1878 c.fl., A. Kuschakevitsch (LE.); in angustiis fl. Murdasz, 11.7.1878 c.fl. et fr., A. Kuschakevitsch (LE.); auf trockenen Hügeln der Nordostseite des Piket Kizil-Kurgan, auf dem Ufern des Flusses Gulscha im nordostli. Fergana, 1.800 m., 5.1904 c.fl. et fr., A. Kronnenburg, 97 (LE.); Fergana, 1901 c.fl., K. Chodorowskij (LE.); Prov. Fergana, distr. Margelan, pag. Mujan orientale, 1.6.1913 c.fl. et fr., N. Dessiatoff, 192 (LE. WA.); Prov. Fergana, distr. Skobielewo, in systemate fl. Isfajram, 8.8.1915 c.fl. et fr., W. Drobow, 460 (LE.); Prov. Fergana, distr. Kokand, in valle fl. Soch, 11.7.1913 c.fl., 12.7.1913 et 16.5.1913 c.fr., Z. v. Minkwitz, 396, 931, 932 (LE.); Prov. Fergana, distr. Osch, Koktjube, 18.5.1913 c.fl., O. Knorring, 263 (LE.); Prov. Fergana, non procul ab pag. Ucz-kurgan, 20.6.1931 c.fr., S. Lipschitz, 34 (LE. MW.); Prov. Fergana, distr. Margelan, inter pag. Ucz-kurgan et Arapalyk, 10.6.1913 c.fl. et fr., N. Dessiatoff, 1959 (LE.); Ucz-kurgan, 16.6.1895 c.fr., S. Korshinsky, 2261 (LE.); Fergana, in valle fl. Margelan-saj prope opp. Skobielewo, 7.7.1912 c.fl. et fr., Mizjajew (LE.); Prov.

Fergana, distr. Skobielewo, in declivibus borealis jug. Alai, in systemate fl. Szachimardan, Arpa, 27.4.1916, P. Babienko (LE.); in declivibus borealis jug. Alai, ad ripam fl. Szachimardan-saj, 4.9.1938 c.fl. et fr., S. Muchamdzanow, 12828 (LE.).

Discussion: Shaparenko (l.c.) assumed that it was a species closely allied to *C. persica,* and the type specimens, collected by Knorring (No. 553) have been, at first, determined in this way. The beak on the keel shows, however, that it belongs to quite a different section. It is, no doubt, related to *C. orientalis* distinctly seen in the shape and size of wings, size of flowers, glabrous ovary, and shape of leaflets. This similarity was already stressed, some time ago, by S. Korshinsky who determined one of his herbarium specimens (No. 2261) as *C. cruenta* (= *C. orientalis*). The variability of *C. jarmolenkoi* is mainly seen in the size of leaflets and in the shape of the beak on the keel.

17a. *Colutea jarmolenkoi* var. *hirsuta,* nom. et comb. nov.

Syn.: *Colutea brachyptera* Sumnievicz, Not. Syst. Herb. Inst. Bot. Sect. Usbek. Ac. Sc. URSS, 6: 18 (1941); Sumnievicz, Fl. Usbekistana, 3: 458, tabl. 55 fig. 2 a—e (1955); Nikitina, Fl. Kirghis., 7: 178 (1957).

C. persica var. *Buhsei* sensu Lipsky non Boiss., Act. Hort. Petr. 26: 280 (1910) p.min.p.

Type. URSS. Fergana orient., in systemate fl. Kugart-su, Aczi-saj, 17.6.1927 c.fr., E. P. Korowin, 78 (TAK. as type of *C. brachyptera* Sumn.).

Ovary tomentose. Pubescence of calyx and pedicels somewhat stronger than in type. Fruits mostly on stipe distinctly exserted from calyx.

Distribution: USSR — Middle Asia, the same region as the species.

Specimens examined:

Middle Asia. Fergana orient., in systemate fl. Kugart-su, Aczi-saj, 17.6.1927 c.fl. et fr., E. P. Korowin, 75 et 77 (MW.); in systemate fl. Arawan-saj, in angustiis inter pag. Naukat et Arawan, 6.6.1932 c.fr., Garszin (TAK.); jug. Alaj, in angustiis fl. Czigirczik, 11.7.1930 c.fl. et fr., Juzepczuk (LE.); jug. Alaj, 15 km. opp. Osch, 9.6.1958 c.fl. et fr., N. Cwielew, 30 (LE.); Auf trockenen Hügeln der Nordostseiten des Piket Kizil-Kurgan, auf dem r. Ufer des Flusses Gulscha in nordostl. Fergana, 1.800 m, 5.1904 c.fl. et fr., A. Kronnenburg, 178 (LE.); Prov. Fergana, prope Osch, secus fl. Ach-burn, in declivibus et abruptis argillosis, 3.300′, 23.6.1901 c.fl. et fr., Alexeenko, 352 (LE.); jug. Alaj, inter Gulcza et Ljangar, 15.8.1901 c.fr., O. et B. Fedtschenko (LE.); Prov. Fergana, distr. Osch, 5.6.1913 c.fr., O. v. Knorring, 482 (LE. WA.); Prov. Fergana, distr. Skobielewo, in systemate fl. Szachimardan, 13.7.1915 c.fr., W. Drobow, 207 (LE.); Osch, 23.6.1901 c.fr., O.A. et B. A. Fedtschenko (L.E.).

Discussion: The Middle Asiatic species of *Colutea* with a pubescent ovary and wings shorter than keel have been separated by Sumnievicz under the new species name: *C. brachyptera* (l.c.). The name *C. jarmolenkoi* has been included as a synonym of this species; it is,

however, a mistake, because *C. jarmolenkoi* has a glabrous ovary. Sumnievicz's species is consistent with *C. jarmolenkoi* in all other characteristics, therefore it has been mentioned only as a variety of the latter; the name *brachyptera* has not been kept for this variety in order not to suggest that it differs from its type just in shortness of wings.

18. *Colutea atabajevii* B. Fedtschenko.

Journ. Bot. URSS, 22, 7: 184 (1937).

Syn.: *Colutea kopetdaghensis* (B. Fedtsch.), Shaparenko, Fl. URSS, 11: 320 (1941); Fl. Turkm., 4: 158 (1949); Sokolov, Dier. Kustar. SSSR, 4: 168 (1958).

Type: Turkmenistan. In montibus Kopet-dagh, prope Robergoskoje, 27.5.1934 c. fl., N. Androsov (LE.).

Shrub up to 1.5 m high. Young shoots quite glabrous, green at first, later greyish yellow. Second year and older shoots dark grey, weakly fibrelike peeling. Stipules triangular-lanceolate, about 1 mm long, glabrous. Leaves up to 4 cm long, with one, more rarely, with two pairs of leaflets. Rachis glabrous. Leaflets broad obovate, 12—15 mm long by 7—12 mm wide, glabrous on both sides, or now and then with a few white hairs beneath, retuse or rounded at apex, without appendage of the midrib, slightly rugose, yet with well marked lateral nerves. Terminal leaflet usually larger, up to 18 mm long and 14 mm wide. Petiolule 1—2 mm long. Inflorescences somewhat longer than supporting leaves, up to 5 cm long, composed of 3—5 flowers. Rachis glabrous. Pedicels 5—7 mm long, with a few black-brown hairs. Flowers 14—15 mm long. Standard yellow with a light spot at base and with violet-coloured nerves in the lower part. Keel purple, darker at the top, with a distinct, large beak. Wings nearly equal to or shorter than, the keel, open at an angle of 110—120°, in place of breaking acute as if a minute spur were there. Ovary glabrous. Calyx broad campanulate, 6—7 mm long, with loose, black hairs, glabrate at base. Calyx-teeth broad triangular, acute, at least 3 times shorter than tube, inside tomentose, hairs black. Bractlets ovate-lanceolate, up to 1 mm long, pubescent like calyx. Legumes 3 to 3.5 cm long and up to 2 cm wide, glabrous, with a short, acute top, and a stipe strongly bent towards ventral suture, distinctly exserted from calyx. Seeds up to 4 mm long, by 3.5 mm broad. Flowers V. (Fig. 15, II a—e, Pl. XIX).

Distribution: USSR — Turkmenistan. Species endemic to Kopet-Dagh Mountains. It grows on gravel sides of ravines, in a very limited range, below the region of growth of *C. buhsei* (Fig. 14).

Specimens examined:

Turkmenistan, Montes Kopet-Dagh, pag. Robergoskoje, 22.5.1940 c.fr., N. Androsow (LE.); ad ripam fl. Szorlak, prope Gjaur-su, 17.5.1948 c.fr., K. W. Blinowski (LE.); in declivibus australis, 24.5.1930, Massagetow, 21a (LE.).

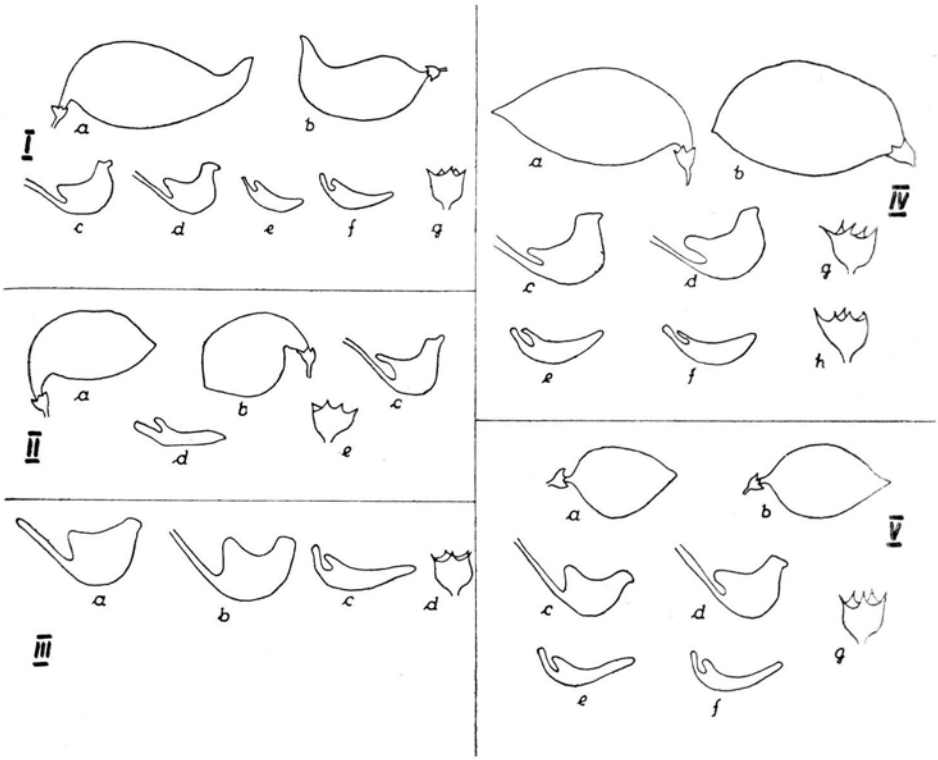

Fig. 15. Subsect. *Orientales*, sect. *Rostrata* (I—IV) and sect. *firmata* (V)

I. *C. orientalis*: *a-b* — fruits; *c-d* — keels; *e-f* — wings; *g* — calyx; II. *C. atabajevi*: *a-b* — fruits; *c* — keel; *d* — wing; *e* — calyx; III *C.* × *variabilis* (*C. cilicica* × *orientalis*): *a-b* — keels; *c* — wing; *d* — calyx; IV. *C. jarmolenkoi*: *a-b* — fruits; *c-d* — keels; *e-f* — wings; *g-h* — calyces; V. *C. uniflora*: *a-b* — fruits; *c-d* — keels; *e-f* — wings; *g* — calyx.

(keels, wings and calyces × 1; fruits × ½)

Discussion: *Colutea atabajevii*, though closely related to two previous species, differs from them in shape of wings which are broken and acute in place of breaking; this feature relates it to *C. buhsei*. Wings in *C. orientalis* and *C. jarmolenkoi* are falcate and rounded at the outer margin. As to the colour of flowers *C. atabajevii* is similar to *C. orientalis*, while their size is just the same as in *C. jarmolenkoi*. The number of pairs of leaflets is reduced to one, more rarely to two, this shows that *C. atabajevii* has undergone the process of xerogenesis in a higher degree than the preceding species, but it has kept a glabrous ovary.

The name "*C. atabajevii*" was changed in 1941 by Shaparenko (1941, l.c.) into "*C. kopetdaghensis*". There is no reason for this change, because B. Fedtschenko has never published such a name. Recognizing Fedtschenko's priority the present author has kept the right name of the species.

Subsection 2. *Central-asiaticae* Browicz

Flowers large, usually over 18 mm long, one-coloured: yellow or orange-yellow. Ovary usually tomentose. Wings longer than keel, exceptionally equal. Leaves often fasciculate. Leaflets roundish, broad obovate or elliptic. Bark peeling in long fibres, after peeling red or red-brown, lustrous.

Type species: *Colutea buhsei* (Boissier) Shaparenko

19. *Colutea buhsei* (Boissier) Shaparenko.

Fl. URSS, 11: 320 (1941); Fl. Turkmen., 4: 158, tabl. 22 fig. 1 (1949); Sokolov, Dier. Kustarn. SSSR, 4: 168 (1958).

Syn.: *Colutea persica* auct. non Boiss. Buhse, Nouv. Mém. Soc. Imp. Natur. Moscou, 57 (1860); Bornmüller, Gauba, Fedde Rep., 39: 97 (1936); Bornmüller. Bot. Centralbl. Beih., 58: 261 (1937).

Colutea persica var. *Buhsei* Boiss., Fl. Or. 2: 196 (1872); Freyn, Bull. Herb. Boiss. ser. 2, 4: 45 (1904); Bornmüller, Bull. Herb. Boiss., ser. 2, 5: 651 (1905); Schneider, Ill. Hand. Laubh., 2: 90, fig. 55 o (1907); Lipsky, Acta Hort. Petr., 26: 280 (1910) p.min.p.; Bornmüller, Bot. Centralbl. Beih., 33: 282 (1915); Rehder, Man Trees Shrubs, ed. 2, 513 (1940); Rechinger, Ann. Naturhist. Mus. Wien, 51: 403 (1940); Parsa, Fl. Iran, 2: 97 (1948).

Colutea persica var. *buhsei* f. *hortensis grandiflora* Bornm. in sched.; Freyn, Bull. Herb. Boiss., ser. 2. 4: 45 (1904).

Type: Iran. In monte Elburs Persiae borealis prope Ask. Buhse (G. ?. n. v.).

Shrub up to 3 m high. Young shoots delicately puberulous at first, becoming glabrous or glabrate. Bark on second year shoots peels in long broad fibres. Older shoots brownish-red, lustrous. Stipules triangular-ovate, 1 to 1.5 mm long, with a few white hairs. Leaves 5 to 9 cm long, composed of 3, more rarely, of 4 pairs of leaflets. Rachis glabrous or glabrate. Leaflets roundish or broadly obovate, up to 15 mm long by 12 mm broad, rounded or retuse at apex, only exceptionally with a scarcely marked appendage of midrib, smooth or slightly rugose, glabrous above, with loose white hairs beneath, gradually glabrescent. Inflorescence up to 9 cm long, more or less equal to supporting leaves in length, or even slightly longer, with 2—4(5) flowers. Rachis glabrate. Pedicels 8 to 15 mm long, with a few, mostly black, hairs. Bracts ovate 1 — 1.5 mm long, slightly pubescent. Flowers large, 20 to 22 mm long, orange-yellow. Keel with a distinct, though occasionally very short, beak. Wings longer than keel, open at an angle of about 100°, with a small spur. Ovary tomentose with silky, silver hairs. Calyx broadly campanulate, 7—8 mm long and wide, or wider, scarcely pubescent: hairs brown-black or black, sometimes mixed with white ones. Calyx teeth broad-triangular, about 5 times shorter than tube, inside tomentose,

hairs black. Bractlets 0.5—1 mm long, ovate, glabrous or with a few black hairs. Legume up to 7.5 cm long (usually ab. 6 cm) and 2.5 to 3 cm broad, loosely pubescent, on a short stipe, occasionally scarcely visible (not exserting from calyx) dehiscent at the top. Seeds about 4 mm in diameter. Flowers IV—IX (Fig. 17, I a—k, Pl. XX).

Distribution: USSR — southern Turkmenistan (in Kopet-Dagh Mountains only); Iran — mainly in the north in the Elbrus and Kopet-Dagh Mountains. It grows on mountain slopes, in gorges and river valleys, between 800 and 2.600 m a.s.l. (Fig. 16).

Specimens examined:

Iran. In ditione oppidi Keredj. In valle fluvii Keredj prope Wariau, 1.700 m. 26.5.1937 c.fl., K. H. Rechinger, 523 (W.); Montes Elburs centr. In ditione oppidi Keredj: In montibus Kúh-e-Dascht, in valle Darreh Wardi, 1.600 m., 7.6.1937 c.fr., K. H. Rechinger, 765 (W.); Gozlu, Mazenderan, in forest, 15.7.1940 c.fr., W. Koelz, 16215 (W.); Kotaliyekchinar, Khorassan, in steppe, 5.8.1940 c.fr., W. Koelz, 16724 (W.); Shahkuh, Mazenderan, in dry gulch, 17.7.1940 c.fl., W. Koelz, 16327 (W.); Prov. Gorgan (Asterabad), Aliabad, c. juv. fl., Gauba, Mirdamadi, 597 (W.); Gorgan: Minndarlet, 16.5.1948 c.fl., Sharif, 118 (E. W.); Prov. Khorasan, Montes Hazar Masdjid. Inter Ardak et Tolgor, ca. 1.200—1.600 m, 7—10.6.1948, K. H. et F. Rechinger, 4967 (W.); Pers. Austr., c.fl., Aucher-Eloy, 4347 (FI.W.); Prov. Mazanderan: In valle fluvii Talar, Sorkhabad, ca. 1.400 m, 20.6.1948 c.fr., K. H. et F. Rechinger, 5563 (E. W.); Prov. Shahrud-Bustam: In jugo Khosh-Jaila, ca. 70 km ab oppido Shahrud orientem versum, ca. 2.000—2.200 m, 17.6.1948 c.fl., K. H. et F. Rechinger (E. G. W.); Prov. Shahrud-Bustam: In declivibus australibus montium Shahvar ad supra Nekarman (Nigarman), 2.300 m, 20—26.7.1948 c.fr., K. H. et F. Rechinger, 5888 (E. W.); Persia borealis: jugi Elbursensis in reg. subalpina, in valle Lur fluvii Keredsch, c. 2.200 m, 9.6.1902 c.fl., J. et A. Bornmüller, 6622 (BM. BP. E. G. JE. K. LE. P. RUEB. W. WRL. WU.); Valley of Elburz range, N. of Teheran, 4.000—6.000′, sides of valley, 7.1933 c.fl. et fr., A. C. Trott, 35 (CGE. K.); Persia borealis: m. Elburs occid., in valle Lur, ad flumen Keredsch, 2.200 m, 18.6.1902 c.fr., J. et A. Bornmüller, 6621 (BP. G. JE. LE. P. WRL. WU.); inter prov. Kerman: in hortis ad Kerman (as. C. persica var. Buhsei f. hortensis grandiflora), 1900 m, 23.4.1892 c.fl., J. Bornmüller, 2689 (G. JE. K. LE. W. WRL. WU.); ex. sem. lg. Bornmüller — inter Schisar et Buschir: in trajectu "Mian-Kolel", 21.7.1895, C. Haussknecht (JE.); Keredj, Allangeh: Gebüsche (Elburs), 15.9.1933 c.fr., Gauba, 211 (B.); Pers. bor. Elburs, Allangeh, 12.7.1935 c. fl., Gauba, 440 (B.); Prov. Mazanderan: in valle fluvii Čalus, ca. 2.200—2.600 m, Pol-e Zanguleh in saxosis schist., 6—7.8.1948 c.fl., K. H. et F. Rechinger, 6359 (G. W.); In valle Talagon m. Elburs, 14.7.1843 c.fl. et fr., Th. Kotschy, 516 (paratypus, BM. FI. G. K. KRA. LE. W. WRL.); Iran, 7.5.1955 c.fl. et fr., H. F. Mooney, 6534 (K.); N. slope of Elburz, on Challen-Teheran Road, 7—8.000′, woodland, 19.7.1959 c.fl. et fr., A. Angew, 46 (K.); Prov. Khorasan: Montes Kopet-Dagh inter Kučān et Lutfābād. In jugo Allāh' Akbar, 1.800 m, 14—15.7.1937 c.fl. et fr., K. H. Rechinger, 1730 (K. W.); Prov. Khorasan: inter Gifan et Golaman, 1.300 m, c.fl., Gauba Sabeti, 603 (W.); Asterabad, 20.7.1916, M. E. Canczenko (LE.); Djehanname, in reg. Isfagan c.fl. et fr., Baron Bode (LE.); Prov. Astrabad, jug. Adshiljardagh, in declivibus mont. Ali-char, opp. Gumbet orientale, 29.4.1914 c.fl., A. I. Michelson, 514 (LE.); Oberhalb Warahosul, 5.930′, 17.6.1848 c.fr., Buhse, 1020 (LE.); Tunne Kabun, opp. Szarfrut orientale 13—14.6.1848 c.fr., Buhse (LE.); in angustiis

prope Czagartagau (Chorasan), 13.7.1896 c.fl. et fr., B. D. Korowjakow (LE.); Mazanderan: Haraz valley: Siah Bisheh, 700 m, 28.4.1959 c.fl., P. Wendelbo, 409 (BG.); Elburs Mts.: Nezva Kuh area: Shahmirzad (Bashm) Kuh Southern slope North of Shahmirzad, 2.300 m, 11.7.1959 c.fl. et fr., P. Wendelbo, 1357 (BG.).

U S S R. — Turkmenistan. Ashabad: Suluklü (Saratowka), ad fines Persiae, in vallibus montium, 7.1900 c.fl., P. Sintenis, 724 (BM. E. G. K. LE. P. PRC. W. WU.); Aschabad, in declivibus montium prope Firusa, 17.6.1900 c.fr., P. Sintenis, 580 (BP. G. JE. LE. P. W. WRL. WU.); Aschabad, Montes Kopet-dagh, Czuli, 17.6.1911 c.fr., Michelson, 491 (BP. FI. G. GB. RO. WA.); Firusa, in declivibus montium, 19.4.1895 c.fl., S. Korshinsky, 1257 (LE.); Firusa, in angustiis prope Aschabad, 9.5.1916 c.fr., Androsow (LE.); Czuli, 27.6.1912 c.fr., N. Samokisz, 1974 (LE.); Firusa, 3.5.1912 c.fl., Lipsky, 1528 (LE.); Kopet-dagh, distr. Geoktepe, 1.500 m, 17.7.1934 c.fl. et fr., A. G. Borissova, 416 et 416a (LE.); Aschabad, in declivibus orientalis montium Duszak, c.fl., A. Michelson, 1999 (LE.); In angustiis montium pr. Aschabad, 28.6.1897 c.fl. et fr., D. Litwinow, 140 (G. JE. LE. WU.); In montibus prope Cheirabad, 6.500′, 27.6.1898 c.fl. et fr., D. Litwinow, 1345 (G. LE.); Kopet-Dagh, in vicinitate urb. Firusa, 23.9.1930 c.fl., M. M. Iljin, 731 (LE. MW.); prope Aschabad, 10.5.1916 c.fl., Androsow (LE.); Pr. Ashabad. In montibus, 1898 c.fl., D. Litwinow, 1327 (LE. W.); Kopet-dagh, 800 m, prope Czakankala, 29.5.1931 c.fr., I. A. Linczewski, 59 (LE.); distr. Karakal, 4.5.1912 c.fl., D. P. Gedewanow, D. A. Dranicyn, 157 (LE); Kopet-Dagh, 1.450 m, 27.6.1934 c.fl., Borissova, 309 (LE); in angustiis Firusa, 17.4.1912 c.fl., A. Michelson, 1273 (LE.); Kopet-Dagh, Czuli, 17.5.1911 c. fr., A. Michelson, 333 (LE.); in angustiis Firusa, 23.6.1905 c.fr., Androsow (LE.); Firusa, in declivibus montium, 11.6.1915 c.fr., Androsow (LE.); Germab, 21.6.1912 c.fl., D. P. Gedewanow, D. A. Dranicyn, 445 (LE.); 28.4.1912 c.fl. D. P. Gedawanow, D. A. Dranicyn, 93 (LE.); Kopet-Dagh, inter Cheirabad et station. Czajek, A. Michelson, 2237 (LE.); 26.5.1925 c.fr., Fedtschenko, Massagetow, Bobrow, 57 (LE.); Montes Kopet-dagh central., ad viam Germab-Igian-Malbdan, 18.6.1953 c.fl. et fr., Mariowa (K.); Montes Kopet-dagh central., 1.7.1928 c.fr., Jarmolenko, Gonczarow, 871 (LE.); distr. Karakal, in angustiis Czoch-Rok, 26.4.1916 c.fl., Tscherniakowskaja, 14 (LE.); distr. Karakal, Teamil, 26.4.1916 c.fl., Tscherniakowskaja, 714 (LE.); distr. Karakal, Czakan-kala, 1.5.1916 c.fl., Tscherniakowskaja, 811 (LE.); prope Firusa, 10.8.1932 c.fr., O. Czishikow, 99 (MW.); opp. Firusa australe, in declivibus lapidosis, 26.8.1931 c.fl., Borissova, 689 (MW.).

Discussion: Boissier (l.c.) who was the first to describe this species giving it the rank "variety" of *C. persica*, has mentioned that it differs from the latter only having pubescent legumes. He does not say anything of the structure of flowers. A few herbarium specimens collected in Iran and Turkmenistan till the end of XIX century were determined, mostly as *C. persica* or *C. cruenta* (Litwinow, No. 140, Androsow). In 1904 J. Freyn (l.c.) paid attention to the great variability of *"C. persica* var. *Buhsei"* with regard to the size of leaflets and he assumed that this variety was most closely allied to *C. orientalis*. C. K. Schneider (l.c.) has not found any difference between *C. persica* and its variety (var. *Buhsei*). These inconsistencies have been caused by lack of a greater number of herbarium specimens, especially of *C. persica*, that would allow to show the taxonomic difference of "var. *Buhsei*".

Only in 1941 Shaparenko (l.c.) separated this variety into a distinct species and showed, that in USSR (Turkmenistan) *C. persica* has not occurred at all. The basis of this separation were the following distinguishing features: keel with beak, minute stipe of fruit, scarcely exserted from calyx, ovary and fruit pubescent. K. H. Rechinger (Symb. Afgh. 1957), however, criticizes the separation of this species and applies Boissier's old name "*C. persica* var. *Buhsei*". Herbarium specimens mentioned by Rechinger belong neither to *C. persica* nor *C. buhsei*; the presence of a strongly elongated beak permits to classify them to *C. nepalensis*. Only the specimen 13270 (W. Koelz) corresponds to *C. paulsenii* not only with regard to morphological features but also to its geographical distribution. Just this specimen, however, because of the presence of a very short spur on the wing and sligtly shorter calyx teeth than in the type *C. paulsenii*, is similar to *C. buhsei*. It represents, may be, some transitional form between these species, which may prove that they grew in the same geographical area some time ago. The place of collection of this specimen (Lorinj) is in Central Afghanistan on the western border of the area of *C. paulsenii* i.e. nearest to the area of *C. buhsei*.

Besides Rechinger also S. Kitamura (Fl. Afgh. 1960) mentions *C. buhsei* from the region of Afghanistan, yet without naming its localities. These data, too, seem to be erroneous and refer to *C. nepalensis*, or *C. paulsenii*. As I have not seen any *Colutea* specimen from Afghanistan or Tadzhikistan that could be reckoned among *C. buhsei*, I may state, that the area of this species is limited only to Northern Iran and Southern Turkmenistan.

The occurrence of *C. buhsei* in Central Iran has still to be examined. J. Bornmüller's specimen (3689) named *C. persica* var. *Buhsei* f. *hortensis grandiflora*, collected in Kerman, having exceptionally large flowers with a strong spur on wing, belongs to a cultivated plant (not native) and this explains its large flowers. It is possible that *C. buhsei* is native near Kerman and thence has been taken for cultivation. According to Parsa (l.c.) it grows in Kuhé Nasr (Kerman), but I am not likely to accept this news as I have not been able to see any herbarium specimen from that region, where *C. persica* or *C. gracilis* (?) may grow. The only specimen of *C. buhsei* from Iran that has not been collected in the region of Elburs and Kopet-Dagh, comes from the region of Isfagan (Baron Bode).

Colutea buhsei is undoubtedly a good species, distinct from *C. persica*, which belongs to quite a different section. The closest affinity is met with *C. nepalensis*, distinguished also by a broad calyx, with calyx teeth longer than in *C. buhsei*, but shorter than in *C. paulsenii*. In north

Kopet-Dagh there are, most likely, hybrids of *C. buhsei* and *C. gracilis* as shown by some herbarium specimens from Leningrad and collected by Tscherniakowskaja (14,714 and 811). They have slightly smaller flowers (17—19 mm), with a very faintly indicated beak, and smaller fruits.

19a. *Colutea buhsei* var. *densiflora* Browicz.

Type. USSR. Turkmenistan, Montes Kopet-Dagh, distr. Geok-tepe, ad pedes montis Massinjew, 29.8.1934 c.fl. et fr., A. Borissova, 639 (LE.).

Inflorescences compact, somewhat longer than supporting leaves with 5—8 flowers. Blossoms abundantly.

Distribution: USSR — southern Turkmenistan, Kopet-Dagh Mountains.

20. *Colutea gifana* Parsa.

Kew Bull. 1: 21 (1947); Fl. Iran, 2: (1948).

Type: Iran: Bodjnurd (Gifan), 1.300 m, associe avec un hymenocrater, 21.5.1939, c.fl., A. Parsa, 238 (K.).

Shrub. Recent shoots yellowish-green, quite glabrous. Two year old shoots grey. Stipules ovate, 3 mm long, glabrous. Leaves up to 7 cm long with two pairs of leaflets. Rachis quite glabrous. Leaflets elliptic or almost roundish, up to 15 mm long by 11 mm broad, apex obtuse or with a short appendage of midrib (mostly on the terminal leaflet), glabrous on both sides. Petiolules 1.5 mm long. Inflorescence 18—25 cm long, with flowers concentrated at the top, 4—5 in number. Rachis glabrous, similar in colour to young shoots. Bracts ovate-lanceolate, up to 4 mm long, quite glabrous or, exceptionally, with single white hairs. Pedicels 10—13 mm long, glabrous or with single white hairs. Flowers large, 20—25 mm long, yellow. Keel distinctly narrowing in the upper part, with a small beak. Wings equal to or slightly longer than keel, in place of breaking without spur, spreading at an angle of 100—110°. Ovary tomentose, hairs white. Calyx tubular, up to 12 mm long, glabrate in the lower part, with a few appressed white hairs in the upper part, denser at the margin. Calyx teeth strongly elongated, 5—6 mm long, acute, tomentose inside, hairs white. Incisions between calyx teeth acute. Bractlets ovate, about 1 mm long with white hairs at the top. Fruits and seeds unknown. Flowers V (Fig. 17, III a—c, Pl. XXI).

Distribution. Northern Iran, Kopet-Dagh Mountains, 1.300 m a.s.l. Endemic species (Fig. 16).

Discussion: The author has seen only one herbarium specimen of this species (type) with 4 leaves, 3 inflorescences and only (4 flowers

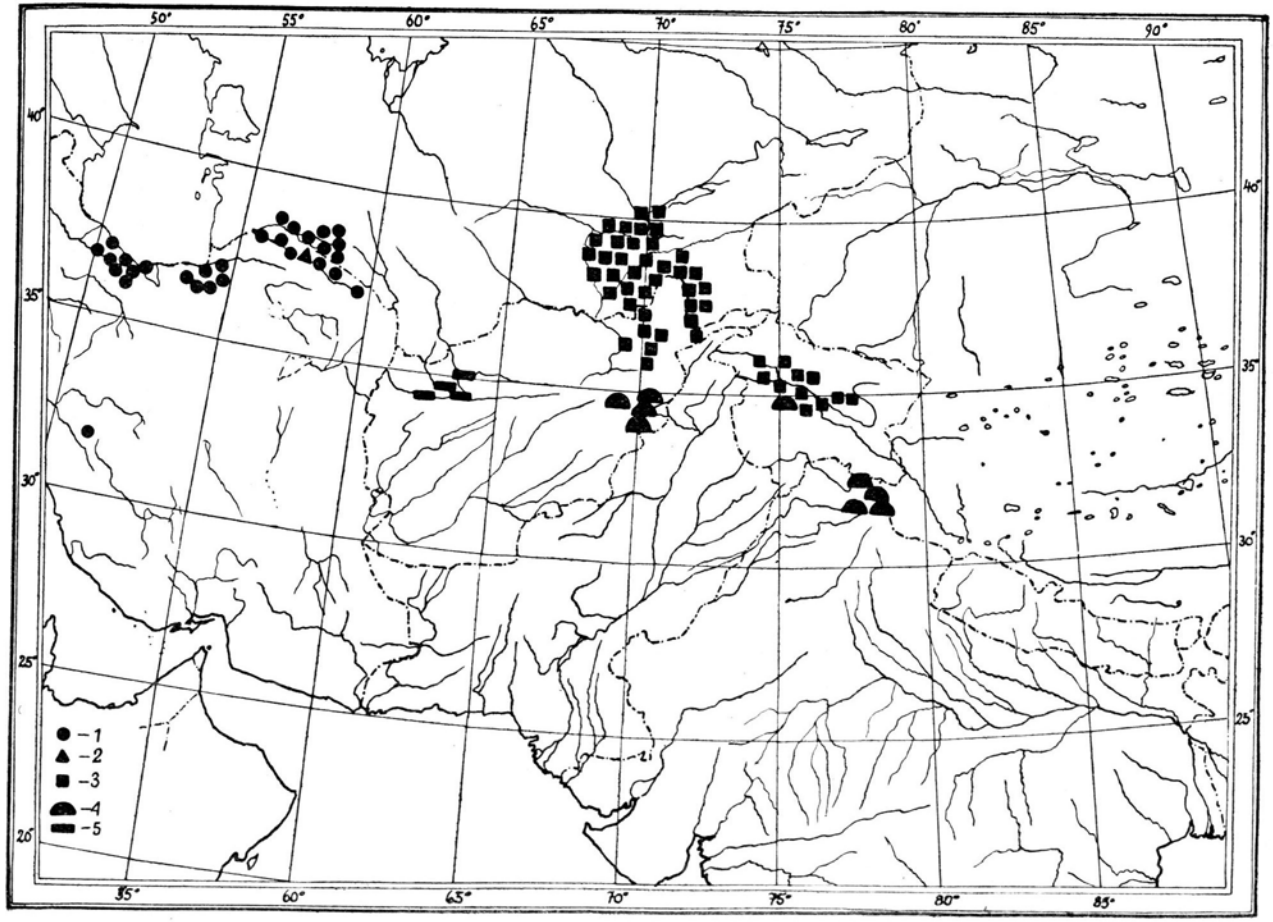

Fig. 16. Distribution of species of subsection *Centralasiaticae*, section *Rostrata:*
1 — C. buhsei; 2 — C. gifana; 3 — C. paulsenii; 4 — C. nepalensis; 5 — C. afghanica

wholly developed). It is, no doubt, a very good species distinguished from others of Sect. *Rostrata,* by large calyx with acute incisions and by a strongly elongated inflorescence. The structure of wings and keel and pubescent ovary show its affinity with *C. buhsei.*

In the herbarium of the Naturhistorisches Museum in Vienna there is one *Colutea* specimen wrongly identified as *C. gifana* (Gauba Sabeti, No. 603) and even given as type. It is, hovewer *C. buhsei,* no doubt, shown by short teeth of calyx, short inflorescence, and rounded incisions between calyx teeth; only leaves have 2 pairs of leaflets, like *C. gifana.*

P a r s a (1947 l.c.) thinks that *C. gifana* is closely related to *C. persica,* but taking into account the diverse characters, especially the pubescent ovary, and beak on keel this opinion seems to be wrong.

21. *Colutea afghanica* B r o w i c z.

T y p e. Afghanistan. Herat-Shin Dand, 1.700 m., 8.5.1949 c.fl. et juv. fr., M. Köie, 3931 (C.).

Shrub 2—3 m high. Young shoots with a few, appressed hairs or glabrate. Two year old shoots covered with white bark peeling in long fibres; after peeling reddish brown, lustrous. Stipules ovate-triangular, up to 3 mm long, glabrous or with single, white hairs. Leaves up to 8 cm long, with 2 pairs of leaflets. Rachis with appressed white hairs mainly in lower part. Leaflets obovate or elliptically obovate, up to 13 mm long and 10 mm wide, rugose, with a well visible network of lateral nerves, indented at the top, without or with a scarcely marked appendage of midrib, glabrous above or with single appressed hairs, more or less pubescent below, hairs appressed. Inflorescence with 1—3 flowers. Bracts triangular lanceolate, 1.5—2 mm long. Pedicels up to 10 mm long, like bracts with loose, short, white and black hairs. Flowers yellow, large, up to 25 mm long. Wings somewhat longer than, or nearly as long as the keel, rounded in place of breaking, spreading at an angle of about 110—120°. Keel with a distinct, large beak. Ovary weakly pubescent so that its walls are clearly visible. Calyx broad campanulate, up to 10 mm long, loosely pubescent, in lower part almost glabrous, hairs very short, white or black, denser on margin of teeth. Calyx teeth acute, broad-triangular, 2—3 mm long, inside tomentose, hairs white, mixed with black ones. Bractlets lanceolate, up to 1 mm long, pubescent like calyx. Fruits 4—5 cm long and up to 2.5 cm wide, apex short acute, on a short stipe, distinctly exserted from calyx, probably dehiscent at the top, only traces of hairs. Seeds 4 mm long and 3 mm broad. Flowers IV—V (PL. XXII).

D i s t r i b u t i o n: Afghanistan, northwest, 1.600—1.900 m a.s.l. Endemic species (Fig. 16).

Specimens examined:

Afghanistan. Chaman, 1.900 m., 9.5.1948 c.fr., M. Köie, 3241 (C.); Obeh, 1.900 m., 16.4.1949, M. Köie, 3627 (C.); Chisht, 1.600 m., 20.4.1949 c.fl., M. Köie, 3682 (C.).

Discussion: *Colutea afghanica* is distinguished from all other species of the subsection *Centralasiaticae* mainly by its weak pubescence of ovary, which quickly glabrates so that few hairs only can be found on ripe fruits. Other species of this subsection have tomentose ovary; its walls covered by silver hairs are quite invisible. The closest affinity of *C. afghanica* is seen with *C. nepalensis:* size of flowers and well developed beak, rounded in place of breaking of the wing are the features common to both the species. *C. afghanica,* however, has a smaller number of pairs of leaflets and of flowers in inflorescence. On the other hand, it is also allied to *C. gifana* (the same number of pairs of leaflets — 2 pairs — the size of flowers and the shape of wings). *C. afghanica* can be easily told from *C. gifana* as the latter species has acute incisions between calyx teeth, richer and longer inflorescence and the beak on keel more weakly shaped.

Herbarium material from Northwest Afghanistan at my disposal is represented only by four specimens, two of which have flowers; the third was gathered only with leaves and the last has leaves and fruits from the previous year only. Single hairs were found on ripe fruits so it cannot be classed among *C. persica* as it was done on the herbarium label. A common feature of all specimens mentioned here is a constant number of pairs of leaflets — 2 pairs.

The other specimen with flowers which has a glabrous or glabrate ovary (hairs along ventral suture) was determined at first as *Colutea persica.* The presence of a large beak on keel does not allow to accept such classification. This specimen, however, as pubescence is lacking, has been numbered among *C. afghanica* only provisionally; the other features wholly correspond to those of the newly described species.

The typical specimen (No. 3931) has been determined as *C. persica* var. *Buhsei.* It differs from *C. buhsei* in a clearly weaker pubescence of ovary, lacking spur on wing, stronger shaped beak, longer calyx teeth and in a smaller number of pairs of leaflets.

22. *Colutea paulsenii* Freyn.

Bull. Herb. Boiss. sér. 2, 4: 47 (1904); Schneider, Ill. Hand. Laubh. 2: 92 (1907); O. A. u. B. A. Fedtschenko, Bot. Centralbl. Beih., 22: 177 (1909); Shaparenko, Fl. URSS, 11: 322, tabl. 22, fig. 7 (1941); Parsa, Supp. Fl. Iran, 1: 96 (1952); Rechinger, Symb. Afgh., 3: 24 (1957); Sokolov, Dier. Kust. SSSR, 4: 170 (1958); Kitamura, Fl. Afgh., 227 (1960).

Syn.: *Colutea arborescens* auct. non L., Fedtschenko, Trud. Bot. Mus. Imp. Akad. Nauk, 1: 62 (1902); Acta Hort. Petr. 28: 173 (1912).

Colutea persica var. *Buhsei* auct. non Boiss., Lipsky, Acta Hort. Petr., 26: 280 (1910) p. max. p., Rechinger, Symb. Afgh. 3: 24 (1957) p. min. p.

Colutea persica auct. non Boiss., Paulsen, Stud. veget. Pamir, (1920); Borissova, Fl. Tadsh., 5: 219, tab. 19 (1937) p. max. p., Grigoriew, Opr. rast. okrest. Stalinabada, 164 (1953).

Colutea rostrata Sumn., Not. Syst. Herb. Inst. Bot. Sect. Uzbek. Ac. Sc. URSS, 6 : 19 (1941); Fl. Uzbek., 3; 457 (1955); Nikitina, Fl. Kirgiz. 7: 178 (1957).

Colutea rostrata Gilli, Fedde Rep., 59, 3: 190 (1957) p. max. p.

T y p e. Pamir: prov. Goran: ad Seïs, 2.600 m sm., **5.10.1898**, c.fl. et fr., Ove Paulsen, 1459 (C. holo. + LE. iso.).

Shrub up to 2 m high. Young shoots light yellow or whitish, at first with appressed white hairs, later glabrate. Two year old shoots with bark peeling in long fibres. Older shoots reddish-brown, lustrous. Stipules ovate-triangular, up to 2 mm long, sparingly pubescent. Leaves 5—10 cm long with 2—3, more rarely with 4, pairs of leaflets. Rachis with a few white hairs. Leaflets very rugose, broadly elliptic, obovate or even roundish, 7—20 mm long by 5 to 15 mm broad, mostly smaller (9—11 × 6—9 mm), glabrous above, or with a few hairs, mainly at the base, with loose white hairs below, obtuse or retuse at apex, exceptionally with a scarcely marked appendage of midrib, with scarcely visible nerves. Inflorescences 4—10 cm long, equalling or extending the supporting leaves in length, 3—5, sometimes more, flowered. Rachis glabrate. Pedicels 6—12 mm long, with hairs loose, appressed, white, or mixed with black ones. Bracts ovate, up to 1.5 mm long, with hairs similar to those of pedicels. Flowers yellow, 17—19 mm long, sometimes, however, longer — up to 22 mm (f. grandiflora mihi). Wings somewhat longer than, or equal to, keel (forms with small flowers), without spur, or only exceptionally with an indication of spur (forms with large flowers), spreading at an angle of 110—130°. Keel with a distinct, though small beak. Ovary tomentose, silver hairs. Calyx broadly campanulate, 7—10 mm long, mostly with white hairs, but with black or brown ones too; in such forms calyx teeth tomentose inside, hairs black. Calyx teeth narrow, sharp $^1/_2$—$^1/_3$ as long as tube. In forms with small flowers incisions between teeth almost acute. Bractlets minute, about 1 mm long, lanceolate, pubescent like calyx. Legumes 4 to 8 (9) cm long by 3.5 cm broad, ovate or broad ovate, with a more or less acuminate top, on stipe twice, or more, longer than calyx, with loose hairs, dehiscent at the top. Seeds 3.5 mm long, and wide. Flowers V—X (Fig. 17, IV a—m, Pl. XXIII).

D i s t r i b u t i o n: USSR; south-east Uzbekistan, south Kirgizia, Tadzhikistan; north-east Afghanistan; Kashmir. It grows on mountain slopes, gorges, and river valleys, in steppe communities or in thickets or open juniper woods, on stony (sandstone, limestone) or loessy substra-

tum, between 1.200 and 3.000 m a.s.l. Sometimes it occurs on a lower altitude ab. 700 m a.s.l., and in Kashmir even at 3.600 m, the more to the east the higher (Fig. 16). According to M. G. Popov and N. W. Androsow (Rastit. zapowied. Guralasza i Zaaminskogo lesniczestwa, 1936) it grows on southern slopes of the Turkestan range together with: *Juniperus turkestanica, J. semiglobosa, J. seravschanica, Ephedra equisetina* and *Prunus prostrata.* B. A. Fedtschenko (Acta Hort. Petr., 1909) mentions it from Schugnan, accompanied by: *Prunus prostrata, Clematis songorica, Perovskia scrophulariaefolia, Cissus aegyrophylla, Acantholimon parviflorum, A. lycopodioides, Ephedra procera,* and *Atraphaxis spinosa.* In norther Afghanistan it forms thickets with some species of the genus *Cotoneaster, Rosa lutea, Crataegus turkestanica* and *Acer turkestanicum* (I. A. Linczewskij, A. W. Prozorowskij. — Sbornik rabot wypoł. w Leningr., 1946 as. *C. persica*).

Specimens examined:

USSR — Middle Asia. Ad trajectum Tscharaga, in jug. Baba-Tag, 21.5.1906 c.fl., Roshewitz, 718 (BP. LE.); ad fines occident. jug. Baba-Tag, 23.5.1906 c.fr., Roshewitz, 755 (BP. LE.); Denau-Sangardak, 4.500′, 20.6.1896 c.fl. et fr., Lipsky, 814 (LE.); in jugo Baba-Tag, 13.5.1897 c.fl., S. Korshinsky, 2137 (LE.); Prov. Buchara, distr. Denau, in parte jugi Hissar austrooccidentali, in angustiis fl. Sangar, 22.5.1913 c.fr., Michelson, 2839 (LE.); Prov. Buchara, distr. Bajsund, Derbent, 8.8.1913, B. Fedtschenko, 758 (LE.) Szachrisjabz: Tamszusz, 4.980′, 9.6.1896 c.fr., Lipsky, 815 (LE.); Hissar: Hakimi ad ripam fl. Karatagau, 5.000—6.000′, 8.8.1892 c.fr., Regel (LE.); Buchara, Hissar, Sarydshuj, 2.400′, 9.6.1897 c.fr., Lipsky, 917 (LE.); distr. Hissar, jug. Karategin, ad trajectum Zardolju, 4.900′, 3.5.1913 c.fl., Michelson, 1196 (LE.); in declivibus australis ripae dextrae fl. Chingou, pag. Isztiok, 2.9.1932 c.fl., Korolewa (LE.); in jugo Hissar: in systemate fluvii Kaszka-Daria, Tanchas, 22.6.1937 c.fl. et fr., Kudriaszew, 672 (LE.); inter opp. Stalinabad et st. Warzobsk, 1932 c.fl., B. Fedtschenko, 327 (LE.); in valle fl. Warzob, 13.7.1933 c.fl., B. Fedtschenko, 200 (LE.); Montes Pamir-Alaj occid., Jakka-bag-darja, in vicinitate pag. Tasz-kurgan, 21.6.1936 c.fr., Boczancew, Butkow, 186 (LE.); as preceding, 27.6.1936 c.fr., 434 (LE.); ad viam inter st. Warzobstroj et pag. Obiodzuk, 5.6.1932 c.fr., B. Fedtschenko, 192 (LE.); ad trajectum, inter Fajzabad et Nurek, 21.9.1929 c.fr., Rusanow, 66 (LE.); Jakkabag, Bachcza, 5.400′, 10.6.1896 c.fr., Lipsky, 813 (LE.); in systemate fluvii Jagnob, in parte jugi Hissar boreali, in declivibus australis, calcareis fl. Anod, 22.9.1934 c.fr., Grigoriew, 276 (LE.); Prov. Hissar, in montis inter Faisabad et Cheirabad, 1.400—1.600 m., 9.8.1913 c.fr., J. Bornmüller, 966 (LE.); jug. Hissar, in angustiis Warzob, prope pag. Obiodzuk, 24.6.1932 c.fl., 30.6.1932 c.fr., Astapowa, 155 et 155a (MW.); jug. Hissar, in declivibus australis, in systemate fluvii Warzob, 1.080 m., c.fr., P. Kamielin, 367 (TAD.); Rengientau, 1.600 m., 6.7.1952 c.fl. et fr., P. N. Owczinnikow, G. T. Sidorenko, 328 (TAD.); jug. Hissar, in declivibus australis, in systemate fl. Warzob, in angustiis Chorongon, prope pag. Chorongoni-bolo, 1.700 m., 14.6.1952 c.fr., Zaprjagaeva, 327 (TAD.); in vicinitate opp. Stalinabad, 850 m., c.fr., Zaprjagaeva, 163 (TAD.); in jugo Turkestanico, ad viam, ad trajectum Szachristan, 2.100 m., 12.8.1952 c.fl. et fr., P. Poljakow, 42 (LE.); in jugo Turkestanico, distr. Zaaminsk, in reservato "Guralasz", Kul-saj, 4.7.1940 c.fl., A. D. Pjatajeva, 60 (LE.); in jugo Turkestanico, in angustiis fl. Guralasz, 21.7.1926 c.fl., Popow, Androsow, 80518

(TAK.); in jugo Turkestanico, in declivibus borealis, Ak-su, 1.8.1956, c.fr., W. Dzanajewa (LE.); in jugo Turkestanico, in valle fl. Zeravschan, pag. Ajagdar, 3.8.1929 c.fr., Emme, 404 (LE.); in jugo Turkestanico, in declivibus borealis, Dzizak, ad fluv. Terekej-saj, 14.6.1914, Michelson (LE.); Prov. Buchara, 1913 c.fr., Michelson, 3588 (LE.); in jugo Turkestanico, in declivibus australis, c.fr., Afanasjew, 705 (LE.); in jugo Turkestanico, ad fontem fl. Guralasz, 7.7.1931 c.fr. Michajlowa, 855 (LE.); in jugo Turkestanico, in systemate fluvii Sanzar, in valle fl. Kok-Dzar, 23.7.1934 c.fr., Gomolickij, Protopopow, 268 (TAK- p. typ. C. rostrata Sumn.); in jugo Turkestanico, in declivibus borealis, in angustiis Kusowli, 30 km. pag. Szachristan australe, 2.200 m., 15.9.1958 c.fl. et fr., A. Konow (TAD.); Zeravschan, in angustiis Magian, 7.9.1870, O. Fedtschenko (LE.); Obburden, 3.7.1870 c.fl. et fr., O. Fedtschenko (BM. G. LE.); Seravschan: Berge zwischen Gusar u. Kschtut, 3.000—4.000′, 19.6.1882 c.fl., Regel (LE.); Hodsha-Machmet-Mazar-Boszara, 4.500—6.000′, 5.6.1892 c.fl. et fr., Komarow (LE.); Seravschan, an Pasrut, 7.000—8.000′, 24.6.1882 c.fl., Regel (LE.); Marguzar an Pasrut, 6.000′, 26.6.1882 c.fl., Regel (LE.); Seravschan, Berge von Kschtut, 5—7.000′, 19.6.1882 c.fr., Regel (LE.); inter Urmitan et Warzaminor, 5.000′, 7.8.1881 c.fr., Regel (LE.); Seravschan, Isskander — kul, 8—9.000′, 2.7.1882 c.fl., Mussa (LE.); Prov. et distr. Samarkanda, 6.7.1913 c.fl. et fr., B. Fedtschenko (LE.); Prov. Samarkanda, Ksztut, 2.6.1908 c.fl. et fr., 7.6.1908 c.fr., 17.5.1908 c.fl., Fiedotow, Golbek, (LE.); Kul-i-kalan, 6. 1878 c.fl. et fr., Russow (LE.); Prov. Samarkand., Alpes Seravschan in declivibus alp. ad pag. Simoul, 2.700 m., 25.7.1913, c.fl., J. Bornmüller, 429 (LE.); in jugo Zeravschanico, ad fluv. Darch, 1931 c.fl., S. A. Nikitin, 1565 (LE.); in jugo Zeravschanico, ad fluv. Zeravschan, c.fr., Owczinnikow, Slobodow (LE.); ad fluv. Zeravschan, prope pag. Daszty, 7.6.1932 c.fr., Owczinnikow, 318 (LE.); Prov. Samarkanda, Kschtut, in declivibus umbrosis, 1.500 m., 22.9.1934 c.fr., G. Kükenthal, 86 (LE.)., Prov. Samarkanda, Seravschan, in arieis vallis prope Kschtut, c. 1.550 m., 19.7.1913 c.fr., J. Bornmüller, 154 (LE.); Prov. et distr. Samarkanda, in declivibus borealis jug. Zeravschan., 14.6.1913 c.fr., Michelson, 2443 (LE.); Tak-fon, 5. 1893, Komarow (LE.); Isskander-kul, 16.8.1931 c.fl. et fr., Michajlowa, 1121 (LE.); in jugo Zeravschanico, in declivibus aridis, 23.7.1931 c.fr., S. A. Nikitin, 385 (LE.); in jugo Zeravschanico, in valle fl. Pasrut, prope pag. Marguzar, 28.8.1933 c.fr., Gordijenko, 419 (MW.); Gaouksar Kounak (?), Daschti Kane, 16.6.1881 c.fl. et fr., M. Capus, 342 (P.); Baldschuan, 3.000′, 5.1883 c.fl., Regel (LE.); Baldschuan, 3—4.000′, 5.1884 c.fl., Regel (FI. LE. W.); Tutkaul, 8.5.1906 c.fl., Roshewitz, 597 (BP. LE.); ad viam inter pag. Tutkaul et Karakamys, 23.9.1929 c.fl., Rusanow, 82 (LE.); in declivibus occident. montis Sarstau, 4—5.000′, 10.7.1883 c.fl. et fr., Regel (LE.); Kafirnigan, 15.9.1929 c.fr., Rusanow (LE.); ad trajectum, ad cacumen montis Chodsha-Mastan, 23.8.1931 c.fr., Gonczarow, 183 (LE. MW.); distr. Buchara, Baldschuan, ad viam prope traject. Och-terek, 5.7.1916 c.fl. et fr., B. Fedtschenko, 855 (LE); Samarkand., distr. Chodzent, 30.6.1914, O. v. Knorring, 501 (LE); Reg. Kul-ge-Kalon, ad fluv. Artucz, Jako-chora, 26.9.1925 c.fr., Massagetow, 696 (LE.); Pasrud, 28.9.1925 c.fr., Massagetow, 739 (LE.); Buchara, distr. Baldschuan, prope pag. Safedoron, 4.7.1916, B. Fedtschenko, 825 (LE.); Darwaz: Kalan-chum, 4.400′, 8.7.1897 c.fl. et fr., Lipsky, 816 (LE.); Darwaz, ad fluv. Panbis, 5.6.1897 c.fl., S. Korshinsky, 2133 (LE.); distr. Kuljab, pag. Czargi, 25.5.1910 c.fl. et fr., D. Diwnogorskaja, 519 (LE.); distr. Kuljab, in angustiis Mandamarskoje, ad ripam fl. Pjandsha, 16.5.1910 c.fl., D. Diwnogorskaja, 401 (LE.); Diwalaj, opp. Kuljab orientale, 2—3.000′, 6.1883, Regel (LE.); Kyz-Syjgan, in declivibus australis, 1.200 m., c. fl., Prjachin (LE.); Badachszan, in valle fl. Wancz, 28.8.1955 c.fl. et fr., S. Ikonnikow (LE.); Darwaz, inter pag. Ljangar et Argankul, 19.7.1916 c.fr., B. Fedtschenko, 1251 (LE.); in jugo

Darwaz, in declivibus borealis, ad fluv. Chingou, 1.970 m., 28.8.1949 c.fr., O. E. Agachanjanc, E. P. Czencowa, 1007 (LE.); in declivibus occidentalis Aruk-tau, 3.7.1951 c.fr., Popow, 179 (LE.); Sar-Saran, in systemate fl. Sar-czaszma, 1.200 m., 13.8.1931 c.fr., Zaprjagaew, Mikulin, 99 (MW.); Kurgan-Tjube: Sang-tuda, ad fluv. Wachsz, 2—3.000′, 5.1883 c.fl., Mussa (BM. LE.); in valle fl. Pjandsha Schugnan, 6.8.1913 c.fl. et fr., N. Tuturin, 166 (LE.); Schugnan, 4.7.1904 c.fl. et fr., B. Fedtschenko (LE.); in valle fl. Gunt, prope pag. Debasta, 24.5.1914 c.fl., N. Tuturin, P. I. Biessiedin, 587 (LE.); in valle fl. Bartang, inter pag. Czadut et Razudsh (?), 23.5.1914 c.fl., N. Tuturin, P. Biessiedin, 46 (LE.); reg. Schugnan, inter pag. Aider-ob et Chas-Chorog, ad fl. Ilibis, 10.6.1935 c.fl., Owczinnikow, Afanasjew, 436 (LE.); Schugnan, prope pag. Sumbshan, ad fl. Bartang, 20.6.1913 c.fl., D. Bukinicz, 284 (LE.); Schugnan, 6.8.1904 c.fl., B. Fedtschenko (LE.); Schugnan, ad fl. Pjandsha, 4.8.1904 c.fl. et fr., ? (LE.); Pamir, inter pag. Piszcz et Nitus, 6.6.1935 c.fl., Owczinnikow, Afanasjew, 214 (LE.); Pamir, 2.460 m., 12.9.1932 c.fl. et fr., N. P. Gorbunowa (LE.); Schugnan, in valle fl. Gunt, inter pag. Riwak et Chorog, 23.5.1901 c.fl. et fr., O. A. et B. A. Fedtschenko (LE.); Bartang, 26.8.1928 c.fr., N. P. Gorbunowa (LE.); Schugnan, ad fl. Pjandsha, inter pag. Saczarakie et angust. fl. Bartang, 1.8.1897 c.fr., S. Korshinsky, 2132 (LE.); Distr. Goran, prope Malvodsh, ad fl. Pandsh, 8.200′, 1.8.1901 c.fr., Alexeenko, 375 (LE.); In Sarafschan et Karatau, A. Lehmann, 327 (LE. W.).

Afghanistan: Prov. Kattagan-Badachszan, ad viam (Chanabad-Fajzabad), inter pag. Talachan et Abgan-kala, 1.680—1.780 m, 8.10.1924 c.fl. et fr., D. Bukinicz (LE.); Pandscherschlucht bei Gulbahr, 1.700 m., 26.5.1950 c.fr., A. Gilli, 1706 (W.); Im Bamian und Surch ab-Tal bei Duab und der Seitentälern an Berghängen, 1.500 m., 1.7.1951 c.fl. et fr., A. Gilli, 1705 (W.); Daraim, 8.500′, 9.8.1937 c.fl. et fr., W. Koelz, 13027 (W.); Baghlan, trockenen Au, an Basis der Steppenhügel, 18.6.1950 c.fr., O. H. Volk, 634 (W.); Lorinj, 8.000′, dry slopes, 26.8.1939 c.fr., W. Koelz, 13650 (W.); Lorinj, in collibus aridis, ca. 8.000′, 27.8.1939 c.fl., W. Koelz, 13270 (W.); Faizabad, 1.100—1.900 m, 11.7.1948, L. Edelberg, 1405 (C.); Doab, 1.200 m., 24.8.1948, M. Köie, 2885 (C.).

Kashmir: Ghorikot, Astor Valley, 6.7.1901 c.fl., J. F. Duthie, 25566 (K.); N. W. India, c.fl. et fr., J. L. Stewart (E.); Ulli Droppa Ladakh, 10—11.000′, 8.1905 c.fr., A. Meebold, 1419 (WRL.) Skirbichan Westtibet, 9—10.000′, 8.1905 c.fl., A. Meebold, 1420 (WRL.).

Discussion: Since Freyn's description *C. paulsenii* has been rarely mentioned in floristic and taxonomic works. The lack of a larger number of herbarium specimens from Middle Asia and of critical works have caused wrong determinations, mainly based on "Flora Orientalis" by Boissier. Therefore herbarium specimens from that region have such names as: *C. arborescens, C. orientalis, C. persica* and *C. persica* var. *Buhsei*. On the other hand in West-European herbaria specimens of *C. paulsenii* can be scarcely found, and the typical specimen of O. Paulsen (No. 1459) collected in the southernmost area and on a great altitude, could not answer the question about the relation of this species to other species of *Colutea* from Middle and Central Asia.

In 1910 W. Lipsky publishing part III of his "Contributio ad floram Asiae Mediae" (l.c.) analysed the herbarium specimens of *Colutea* found in the Leningrad collections and came to the conclusion that

C. persica is the only species of *Colutea* growing in Middle Asia, especially its variety "var. *Buhsei*". Lipsky stated that the species newly published by Freyn: *C. gracilis* and *C. paulsenii* were identical with *Colutea persica*. Lipsky's statement, that *Colutea orientalis* and *C. arborescens* does not grow in Middle Asia, is perfectly right and has been a step forward in the knowledge of the geographical distribution of *Colutea* but his naming *C. paulsenii* and *C. gracilis* to be synonyms of *C. persica* (or its variety *C. persica* var. *Buhsei*) has been completely wrong. Lipsky knew the type specimens of *C. paulsenii* well and determined it as *C. persica* β *Buhsei* (herbarium in Copenhagen) only and exclusively on the basis of the ovary and fruits being pubescent.

Lipsky's authority was so great that nearly all Russian botanists have reckoned Middle Asiatic specimens of *Colutea* just among *C. persica* (Herb. Leningrad, Borissova, Fl. Tadzhik. l.c.). In 1938 K.K. Shaparenko again revised the herbarium sheets of *Colutea* from Middle Asia, greatly enriched since Lipsky's time, and came to the conclusion that in USSR *C. persica* did not occur, and its variety "var. *Buhsei*" was exclusively confined to Turkmenistan. According to Shaparenko (l.c.) *C. paulsenii* is distinguished by its great variability and needs to be studied further. Since 1941 *C. paulsenii* was still mentioned by Parsa (Fl. Iran, Supp., 1952) for the regions of Iran (most probably wrongly), and by Rechinger (l.c.) and Kitamura (l.c.) for Afghanistan.

In 1960 I had the opportunity to see the herbarium specimens of *Colutea* in Leningrad, labelled by Lipsky and Shaparenko, and newer ones, collected in Middle Asia during the last 20 years. Like Shaparenko I observed a considerable variability of such features in *C. paulsenii* as size and shape of leaflets, shape of fruits, and size of flowers. In spite of this variability *C. paulsenii* is a species distinctly differing from *C. buhsei*, not mentioning *C. persica*. The most outstanding diagnostic features of *C. paulsenii* are the following: calyx teeth $^1/_2$—$^1/_3$ as long as tube, wings rounded without spur at the place of breaking and a thin fruit-stipe at least twice as long as calyx.

A test to find some direction or correlation of variable features has remained with scarcely any results. It seems, however, that large flowered forms, as well as forms not with white hairs on the calyx, are dispersed in the whole area of *C. paulsenii*, yet large flowered forms are more often met in the southern area and lower altitudes. These forms are a link connecting *C. paulsenii* with *C. nepalensis* growing farther south. Small flowered forms come, as a rule, from the highest localities; they are distinguished by smaller leaflets, as well as stronger pubescence.

The new species *C. rostrata* described by Sumnievicz in 1941 (l.c.) shows characters that do not exceed the limits of variability of

C. paulsenii, and black-brown hairs of the calyx cannot form a basis for its separation (I have seen Sumniewicz's types). Under the same name "*C. rostrata*" A. Gilli (l.c.) described a new species from Afghanistan. Having examined all 3 herbarium specimens, cited by Gilli, I came to the conclusion, that two of them (1705, 1706) ought to be included to *C. paulsenii*, because of a long stipe and acute top of fruits and beak of keel too short as far as *C. nepalensis* is concerned. Specimens No. 1705 with large flowers, over 20 mm in length, is reckoned by me among f. *grandiflora*. Gilli's third specimen is a typical *C. nepalensis*.

22a. *Colutea paulsenii* var. *canescens* (Shaparenko) gradus novus.

Syn.: *Colutea canescens* Shaparenko, Fl. URSS, 11: 394 (1941).

Colutea persica sensu Borissova non Boiss., Fl. Tadzhik., 5: 219 (1937) p. min. p.

Colutea persica var. *Buhsei* sensu Lipsky non Boiss., Acta Hort. Petr., 26: 230 (1910) p. min. p.

Type. Karatiegin: inter Ali Galaban et Pumbatschi, 20.8.1878 c.fl. et fr., Newssky (LE. — p. typ *C. canescens* Shap.).

Young shoots yellow-grey, glabrous. Leaflets up to 12 mm long, by 9 mm broad, hairy on both sides, tomentose below, thus the colour of leaflets greyish white. Flowers 17 to 18 mm long. Keel with a scarcely indicated beak (contrary to Shaparenko). Legume up to 5 cm long by 18 mm broad, on a thin stipe, over twice longer than calyx.

Distribution: USSR, western Tadzhikistan.

Specimens examined:

Baldschuan: Kalkasz, Sangulak, 5.000′, c.fl., 12.7.1883, Regel (LE.).

Discussion: "*Colutea canescens*" was decribed by Shaparenko (l.c.) from 5 herbarium specimens collected by Newssky in the same locality, the same day; presumably all come from the same shrub, so, of course, it is rather difficult to judge of its variability. Characters distinguishing it from the typical *C. paulsenii* are so insignificant, that there is no sufficient reason to give it the rank of an independent species. Distinguishing features are only stronger pubescence of leaflets beneath, narrower fruits and hardly developed beak on keel. "*C. canescens*" was mentioned only once in literature by W. W. Pisajukowa in 1951 (Fl. uszczela Kondara, 55). According to her it grows 30 km north from Duschanbe, on sides of the right bank of the Kondar river on the altitude of 1.200 m a.s.l. I have not seen, however, any herbarium specimen, that I could recognize as just this species (variety).

22b. *Colutea paulsenii* var. *mesantha* (Shaparenko ex Ali) *gradus novus.*

Syn.: *Colutea mesantha* Shap. ex Ali, Bot. Notiser, 112, 4: 493 fig. 1B, 3B, 4 A—E, (1959).

Colutea arborescens sensu Stewart non L., Punjab Pl., 64 (1869).

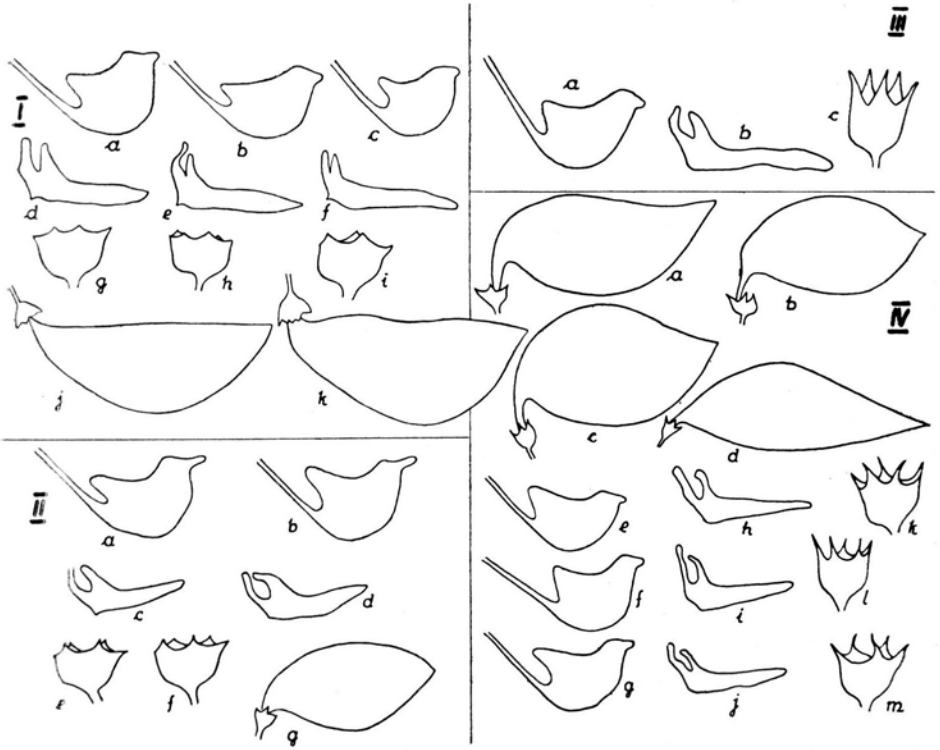

Fig. 17. Subsect. *Centralasiaticae*, sect. *Rostrata*.

I. *C. buhsei*; *a-c* — keels; *d-f* — wings; *g-i* — calyces; *j-k* — fruits; II. *C. nepalensis*: *a-b* — keels; *c-d* — wings; *e-f* — calyces; *g* — fruit; III. *C. gifana*: *a* — keel; *b* — wing; *c* — calyx; IV. *C. paulsenii*: *a-d* — fruits (*d* = var. *mesantha*), *e-g* — keels, *h-j* — wings; *k-m* — calyces. (keels, wings and calyces × 1; fruits × 1/2)

Colutea arborescens var. *nepalensis* auct. non Baker, Pirotta, Cortesi, Relazz. Karakor. Spediz. il duca Abruzzi, 104 (1912); Stewart, Fl. Ladak, Bull. Torr. Bot. Club, 43: 12 (1916).

Colutea nepalensis sensu Pampanini non Sims, Fl. Caracorum, 145 (1830).

Type: Kashmir. Kartichu. Dras valley, 8.900′, 16.7.1928 c.fl. et fr., B. B. Osmaston, 101 (K. — p. typ. C. mesantha Shap. ex Ali.).

Rachis of leaf and leaflets stronger pubescent. Fruits up to 8 cm long by 2—2.5 cm broad, gradually narrowing into a long, acute top. (Fig. 17, IV d, Pl. XXIV).

Distribution. USSR — southern Tadzhikistan; Kashmir. This variety grows easternmost of the typical species.

Specimens examined:

USSR, Tadzhikistan: Pamir, ad viam inter Pas-Chuf et Kalaj-Wamar, 2.020 m., ad ripam fluv. Pjandsha, 18.9.1932 c.fl. et fr., N. P. Gorbunowa, 1176 (LE.); Pamir, ad viam inter pag. Andryz et Pas, ad fl. Pjandsha, 2.230 m, 14.9.1932 c.fl., N. P. Gorbunowa, 1153 (LE.); jug. Darwaz austro-occid., in systemate fl. Jach-Su, 27.6.1959 c.fr., P. Kamielin, 55 (TAD.).

Kashmir: N. Godeh and Naugaon in Hupora, c. juv. fr., Winterbottom, (K.); Godeh, Hupora, 2.7.1847 c.fr., Winterbottom, 697 (K.); Naugaon, Hupora, 3.7.1847 c.fl., Winterbottom, 697 (K.); Distr. Baltistan: Satpur Valley above Skardu, 8—9.000', 14.7.1892 c.fr., J. F. Duthie, 12040 (BM. CAL. E. FI. WU.); Chutrun, 6.000', Baltistan, 12.5.1928 c.fl., F. Ludlow, 276 (BM.); Tibet. Balti, Sáling, (on the right side of the Shyók opposite Khápalu) to Húshe on the Tsetánga river, 13—15.7.1856 c.fr., Schlagintweit, 5484 (BM.); Tibet. Province Balti, Húshe viâ Háldi to Tšorkónda, 18—30.7.1856, c.fr., Schlagintweit (LE.); Gilgit Expedition, 1885 c.fr., Giles, 55 (CAL. K. LE.); Entre Astor et Bunji, 1.300—2.300 m., c.fl. et fr., F. Schmid, 1813 (G.); Rupal Nullah, above Astor, rocky slope, 8.500', 22.7.1946 c.fr., R. R. Stewart, 22866 (K.); West Tibet, c.fr., Herb. Falconer, 4017 (CAL. K.); Exp. to the Karakorum Glaciers, Hispar valley, 9.000—10.000' c.fl., W. N. Conway, (K.); Fra Paiju e Valle Punmah (Caracorum), 25.7.1909 c.fl. et fr., Pirotta, Cortesi, 58 and 59 (RO.).

Discussion: For the first time it was separated into an independent species in 1938 by Shaparenko thanks to herbarium specimens from the British Museum, Kew and Leningrad, yet it was described only in 1959 by S. I. Ali (l.c.). After examining herbarium sheets seen by Shaparenko and Ali, and some others, and after comparing them with the rich material of *C. paulsenii* from Leningrad herbarium "*C. mesantha*" proved to differ from *C. paulsenii* only in shape of fruits which are narrower and more elongated. In all other features it conforms to the variability of *C. paulsenii*. The difference in structure of fruits cannot be the basis to separate a new species, the more so that a distinct elongation of fruits of *C. paulsenii* can be noted going eastward within the area. According to S. I. Ali "*C. mesantha*" is near to *C. nepalensis* in affinity; it can be easily distinguished by its strongly narrow, acuminate fruits and a short and small beak on keel.

23. *Colutea nepalensis* Sims.

Bot. Mag., 53, t. 2622 (1826); Bot. Reg, 20, t. 1727 (1835); Royle, Ill. Hist. Himal., 1: 198 (1839); Loudon, Arb. Frut. Brit., 2: 637, fig. 319 (1854); Petzold u. Kirchner, Arb. Muscav., 382 (1864); Brandis, Stewart, Forest. Fl. India, 136 (1874); Colett, Fl. Simlensis, 123 (1902); Schneider, Ill. Hand. Laubh., 2: 91, fig. 55 r-u, 56 f (1907); Parker, Forest Fl. Punjab, 143 (1924); Rehder, Man. Trees Shrubs, ed. 1, 508 (1927), ed. 2, 513 (1940); Ali, Bot. Notiser 112, 4: 491, fig. 1 A, 3 A, (1959); Kitamura, Fl. Afgh., 227 (1960).

Syn.: *Colutea arborescens* var. *nepalensis* Baker in Hook f., Fl. Brit. India, 2: 103 (1876—79); Strachey, Cat. Pl. Kumaon, 42 (1906); Brandis, Ind. Trees. 217 (1907) p. p.

Colutea arborescens sensu Aitchison non L., Jour. Linn. Soc. Bot. 28: 43 (1881):

Colutea aleppica sensu Boiss, Fl. Or. Supp., 173 (1888).

Colutea kunawarensis Lipsky, Acta Hort. Petr., 26: 281 (1910).

Colutea rostrata Gilli, Fedde Rep., 59, 3: 190 (1957) p. min. p.

Colutea persica var. *Buhsei* sensu Rechinger non Boiss, Symb. Afgh., 3: 24 (1957) p. max. p.

Type. Illustration. Sims in Bot. Mag. tabl. 2622 (1826). Neotyp: In Horto Societatis Horticult. Londinensis, colitur ex seminibus Nepalensibus, 6. 1833, J. F. Royle (CGE. c.fl. et fr., + K.c.fl.).

Shrub up to 3 m high. Young shoots with loose white hairs, becoming glabrate later. On two year shoots the bark peels in long, narrow fibres. Older shoots red-brown or brown, lustrous. Stipules ovate-triangular, 1.5 mm long, with white hairs. Leaves 4 to 8 cm long, with 3 to 5 (6) pairs of leaflets, mostly 3—4. Rachis with loose, appressed white hairs or glabrate. Leaflets up to 10 (12) mm long by 7—8 mm wide, elliptic or slightly obovate, rounded or retuse at apex, with a very short appendage of midrib, at first pubescent on both sides, later glabrescent and almost glabrous above, rugose, with obscure venation. Petiolules up to 1 mm long, with white hairs. Inflorescence 5—9 cm long, equal to, or longer than supporting leaves, (2) 3—5 flowered. Rachis with loose, appressed, white hairs, exceptionally almost quite glabrous. Pedicels 10—15 mm long, hairs on them white, appressed, often mixed with black ones, sometimes the latter prevail. Bracts 1—1.5 mm long, ovate-lanceolate, with white and black hairs, mainly on margin. Flowers yellow, often with a reddish tint (acc. to Collett, Parker, l.c.), up to 22 mm long. Keel with a distinct, 2—3 mm long, beak bent upwards. Wings equal in length to keel, or somewhat longer, rounded in place of breaking, sometimes with a scarcely marked spur, spreading at an angle of 130—140°. Ovary tomentose, hairs silver. Calyx broad-campanulate, up to 8 mm long, with black and white hairs. Calyx teeth acute, narrow, up to 2 mm long, black hairs inside. Bractlets lanceolate, up to 1 mm long, black ciliate. Legumes 4—6 cm long by 2 to 2.5 cm broad, with loose hairs, rounded in the front part, with a short, suddenly narrowing, acute top, on a stipe minutely exserted from calyx, dehiscent. Seed 4 mm long by 3.5 mm broad. Flowers VI—VII. (Fig. 17, II a—g, Pl. XXV).

Distribution: Eastern Afghanistan, northern Pakistan, Kashmir, northern India, Nepal (it may occur also in south-western China and Tibet). It grows in mountains between 2.000 and 3.800 m a.s.l. — in westernmost area, in Afghanistan, also below 2.000 m; and in the Himalayas even above 4.000 m. Usually rare everywhere, but it seems to be less rare in Afghanistan. S. I. Ali (l.c.) gave a map of the distribution of *C. nepalensis,* yet the line of its distribution goes here too far north, since specimens of Colutea from Karakorum and Ladakh Range belong already to *C. paulsenii;* (Pirotta, Cortesi No. 58, 59, Meebold No. 1419, 1420). (Fig. 16).

Specimens examined:

Afghanistan: Bei Kabul, Tangi Gharu, Schutthalde, 1.740 m, 12.5.1950 c.fl., A. Gilli (W. as typ. C. rostrata); Bagrami, Nedjeru-Tal, 28.6.1951 c.fl., H. F. Neubauer, 212 (W.); Bagrami, Nedjeru-Tal, 2.600 m., 27.6.1951 c.fl., H. F. Neubauer, 318 (W.); West-Nuristan; Kulam (Munui) im Kulam-Tal. ca. 2.150 m., 28.6.1935 c.fl., G. Kerstan, 1057 (W.). Afghanistan, 1858 c.fr., Bellew, 130 (CAL.); Kurrum Valley, 7.6.1879 c.fl. et fr., Aitchison, 511 (BM. C. CAL. FI. K. LE.).

Kashmir: Takht i Sulaiman (?), 1906 c.fr., H. Deane (K.).

India: Shalkar, 10.000′ c.fl. et fr., Stoliczka, 113252 (CAL.); Tibet Occ. Regio. temp. 8—10.000′ (Piti valley, 31.8.1847) c.fr., Herb. Ind. Or., Hook f. and Thomson (CAL. K. P. W.); Piti, 10.500′, 31.8.1852 c.fr., Thomson (LE. K.); Rarang, Dzonggui, 2.600 m., c.fr., Jacquemont, 1451 (K.); N. W. India, c.fr. Royle (LE. K.) as C. kunawarensis; Bashahr: Iangi, 9.000′, 9.6.1890 c.fl., Herb. J. H. Lace, 239 (E.); Bashahr State, Punjab, zwischen Huling u. Sangzam, 15.000′, c.fr., 2.10.1933, W. Koelz, 7242 (G.); N. W. Himalaya, Challing, c.fr., Stewart, 2980 (CAL.).

Discussion: Herbarium specimens of *C. nepalensis* are only a few in number, and as far as the region of the Himalayas goes, they are very old and in a bad state, mostly with fruits only. As specimens from Nepal, are not known, the coloured illustration added by Sims to the diagnosis of the species may be accepted as type (as Ali proposes). According to Sims (l.c.) the illustration was made from a shrub grown by Messrs Whitley Brame & Milne (Fulham) out of seeds from Nepal. The shrub flowered for the first time in 1825. Sims's drawing does not show any details of flower-structure of *C. nepalensis*, yet one can observe that flowers are large and the beak on the keel is well developed. The oldest herbarium specimen of *C. nepalensis* comes from 1833 (Royle, cultivated) and it can be taken only as neotype.

Colutea nepalensis is most closely allied to *C. afghanica* (exceptionally long beak), but it reminds also of the large flowered form of *C. paulsenii* (f. *grandiflora*) by the size of flowers. The typical shape of fruits of *C. nepalensis* is a fruit rounded, with a suddenly narrowed, short and acute top. It is not a constant feature, because, e.g. specimens from Afghanistan (No. 511, Aitschison) are characterized by a more elongated top, related to *C. paulsenii*. Nevertheless the fruit being rounded is the most outstanding feature of *C. nepalensis*. S. I. Ali (l.c.) drew attention to it when he first tried to classify the herbarium specimens of this species collected in India and Pakistan. Having the opportunity to see almost all herbarium specimens mentioned in Ali's work I cannot agree to reckon the specimen from Kew among *C. nepalensis* (citing acc. to Ali): "Piti, Godeh and Naugaon, 10.500 ft. 31.8.1852, Thomson and Winterbottom". We have here to do probably with a wrong citing of the herbarium label, on which the first line refers to Thomson's specimen from Piti (with fruit), and the other to Winterbottom's specimen from Godeh and Naugaon (closed flowers, fruits young). The label is fixed in such a way that it holds branchlets of both specimens. The branchlet with fruits conforms wholly to the *C. nepalensis* in its characters, while the other belongs, no doubt, to *C. paulsenii* var. *mesantha*. This is seen by the shape of the young fruit, conforming to the fruits of another Winterbottom's specimen (No. 697) noted by Ali as "*C. mesantha*".

The new species described by Gilli (l.c.) under the name *C. rostrata* as has been shown in the discussion on *C. paulsenii,* was erected by means of heterogenous material, one specimen of which (Tangi: Gharu bei Kabul) belongs, no doubt, to *C. nepalensis.* Such is the case with specimens of *C. persica* var. *Buhsei* (No. 212, 318 and 1057 — Symb. Afgh.) mentioned by Rechinger. These are specimens with well preserved flowers, therefore easy for identification.

SECTION 4. *ARMATA* BROWICZ

Shrubs spinescent. Leaves with 1 to 2 (3) pairs of leaflets. Leaflets minute, pubescent on both sides. Flowers minute, single or in twos. Keel with beak. Fruit broad ovate, short pointed.

Type species: *Colutea armata* Hemsley et Lace.

KEY TO THE SPECIES OF THE SECTION *ARMATA*

1. Fruit glabrous. Leaflets up to 5.5 mm long at the most, ovate-round **26.** *C. komarovii*
   Fruit pubescent. Leaflets larger, elliptic or obovate 2
2. Leaves up to 6 cm, and flowers to 15 mm, long. Shrubs weakly spinescent. **24.** *C. uniflora*
   Leaves up to 2.5 cm, and flowers to 10 mm, long. Shrubs strongly spinescent **25.** *C. armata*

24. *Colutea uniflora* G. Beck.

Apud Satpf, Denkschr. Acad. Wien, 51: 332 (1886); Bornmüller, Bull. Herb. Boiss., ser. 2, 5: 651 (1905); Schneider, Ill. Hand. Laubh., 2: 86, fig. 53 a—d (1907); Parsa, Fl. Iran, 2: 97 (1948).

Type: Persien, bei Kaswin, 3.5.1881 c.fl., Th. Pichler (W. holo. + W. WU. iso.).

Shrub with virgate shoots, partly spinescent. Young shoots with white, closely pressed hairs. On second year shoots the white bark peels fibrelike. Older shoots brownish red or brown gray. Stipules ovate, up to 1.5 mm long, with white hairs. Leaves 3 to 6 cm long, with 2, more rarely with 3, pairs of leaflets. Rachis with white, appressed hairs, hardening and remaining on the shoot for a longer time while the leaflets have fallen off. Leaflets elliptic or slightly obovate, rather thick, up to 10 mm long by 7 mm broad, usually smaller, obtuse or retuse at apex (mainly apical leaflet), with a very short, obtuse appendage of midrib and appressed white hairs on both surfaces; glabrescent, with

time, above, but always with visible loose hairs. Petiolules to 0.5 mm long, pubescent. Flowers single, on a rachis 1—2 cm long, covered with white hairs. Pedicel 5 to 7 mm long, with white and black hairs. Bracts lanceolate, 1.5—2 mm long, pubescence as on pedicels. Flowers light yellow, 14—15 mm long. Keel distinctly narrowing towards top, with a small beak. Wings narrow, equal in length to keel, without spur, open at an angle of about 130°. Ovary tomentose, with appressed hairs. Calyx campanulate, 5 to 7 mm long, covered with white and black hairs. Calyx teeth narrow, subulate, twice or 3 times, shorter than the tube, inside tomentose, hairs white. Bractlets 0.5 mm long, ovate, pubescent like calyx. Fruit broad ovate, at the top distinctly but short pointed, 3 to 3,8 cm long by 2 to 2.3 cm broad, on a short stipe distinctly exserted from the calyx, probably dehiscent at the top. Seeds undescribed. Flowers V. (Fig. 15, V a—g, Pl. XXVI).

Distribution: Species endemic to North Iran (prov. Gilan) where it grows in the western part of Elburs mountains, between 500 and 1.200 m a.s.l. (Fig. 14).

Specimens examined:

Iran. Inter Rescht et Kaswin, in monte Charasan (Harazan), 9—1.200 m, 13.5.1902 c.fl. et juv. fr., J. et A. Bornmüller, 6623 (BM. BP. G. JE. K. LE. W. WU. WRL.); Prov. Gilan: Inter Rudbar et Mendjil, c.fr., Gauba Sabeti, 601 (W.); Prov. Gilan: Pol-e Loushan prope Rudbar, c.fr., Gauba Sabeti, 602 (W.).

Discussion: Compared with the remaining species of the section *Armata* *C. uniflora* is characterized by being less spiny as well as by larger leaves and leaflets, a number of other features, however, shows its close relation to the other representants of the section. C. K. Schneider (l.c.) already paid attention to the connection between *C. uniflora* and *C. armata*, but he knew the latter species from drawings only. Both *C. armata* and *C. komarovii* are species whose xerogenesis is seen in a much higher degree. It can be, therefore, assumed that *C. uniflora* is a species uniting the section *Armata* and section *Rostrata* (larger flowers, narrow wings).

25. *Colutea armata* Hemsley et Lace.

Jour. Linn. Soc. Bot., 28: 322, t. 39 (1891); Brandis, Ind. Trees, 217 (1907); Schneider, Ill. Hand. Laubh., 2: 87 (1907); Burkill, List. Flow. Pl. Baluchistan, 23 (1909); Parsa, Fl. Iran, 2: 98 (1948); Ali, Bot. Notiser, 112, 4:490 (1959).

Type: Baluchistan. Pil Hill, 7.000—8.000', 1888 c.fl. et fr., Lace, 3824 (K.).

Bush compact and short branched, spinescent. Young shoots tomentose, with white appressed, hairs, still visible on second-year shoots. Bark of the latter begins to burst and to peel in narrow fibres. Older

shoots reddish-or greyish-brown. Stipules scaly, ovate, up to 1 mm long, covered with hairs like shoots. Leaves 1—2 (2.5) cm long, with two pairs of leaflets. Rachis tomentose with closely pressed hairs, remaining on shoot after falling off of the leaflets, becoming woody. Leaflets elliptic or elliptic-obovate, 3 to 8 mm long by 4 mm broad, thick, both sides pubescent with closely pressed, white hairs, more so beneath, apex rounded or slightly retuse. Petiolules scarcely to 0.5 mm long. Flowers single or in twos. Rachis up to 22 mm long and like pedicels (3 mm) tomentose, white hairs. Bracts lanceolate up to 2 mm long. Flowers minute, 8—10 mm long, yellow (probably) with a darker shaded end of keel and wings. Keel with short, yet distinct beak. Wings broad, shorter than keel, similar to it in shape. Ovary with 9 ovules (acc. to Lace and Hemsley) tomentose, hairs appressed. Calyx campanulate, up to 4 mm long, with closely pressed white hairs. Calyx teeth narrow, subulate, as long as tube (ab. 2 mm). Bractlets to 1 mm long, lanceolate, covered with hairs like calyx. Fruit indehiscent, broad ovate, up to 3 cm long and 2.5 cm wide, obtuse or very short acute at the top, with loose hairs. Stipe very short, completely hidden in calyx. Seeds reniform, up to 2 mm long. Flowers V (beginning of blooming rather earlier, because Lace specimens, 3824 collected on 14th May already have well shaped fruits). (Pl. XXVII).

Distribution: Species endemic to Pakistan, known up till now from three localities in Baluchistan only, found in mountains between 2.300 and 3.000 m a.s.l. According to Lace and Hemsley (l.c.) it does not reach larger size, as sheep and goats feed on it. Parsa (l.c.) mentions it also from Iran Baluchistan yet without giving its locality. (Fig. 14).

Specimens examined:

Baluchistan. Pil Hill, 8.500′, 14.5.1889, c.fl. et fr., Lace, 3824 (E.); Pil Hill, 7.000′, 14.5.1889, c.fl. et fr., Lace (CAL.); Sohrab, 1877, c.fr., O. T. Duke (CAL.).

26. *Colutea komarovii* Takhtadzhian.

Not. syst. ac. Geogr. Inst. Bot. Tphilis., 9: 22 (1940); Shaparenko, Fl. URSS, 11: 323 (1941); Grossheim, Opried. rast. Kawkaza 124 (1949); Grossheim, Fl. Kawkaza, ed. 2, 5: 239 (1952); Prilipko, Fl. Azarbejdżana, 5: 323 (1954); Prilipko, Liesn. Rast. Azarbejdżana, 294 (1954); Sokolov, Dier. Kust. SSSR, 4: 170 (1958).

Type: USSR Republica Nakhitschevanica, circa Ordubad, m. Sagal, 24.6.1929 c.fr., A. Schelkovnikov et E. Kara-Murza (TBI. holo. n.v. + ERE. iso.).

Shrub 1 to 1.5 m high, spinescent. Young shoots puberulous, hairs white, second year shoots with bark peeling fibrelike. Older shoots brown yellow, lustrous. Stipules ovate, up to 1 mm long, with closely pressed white hairs. Leaves strongly reduced up to 12 mm long with

rather one than 2 pairs of leaflets. Rachis puberulous, hairs white. Leaflets ovate-round 4 to 5.5 mm long by 3 to 4.5 mm wide, thick, obtuse at apex, with appressed, loose white hairs on both sides, slightly rugose. Flowers unknown, but as far as fruit goes, they are single or by twos. Calyx ab. 4 mm long, pubescent, with appressed white and black hairs. Calyx teeth subulate, twice shorter than tube. Legume broad ovate, up to 23 mm long by 15 mm broad, quite glabrous, dehiscent (?) at the top, on a stipe 1.5 to 2 times longer than tube. Flowers ?. (Pl. XXVIII).

Distribution: Species endemic to southern Caucasian Mts., where it grows on stony slopes (Fig. 14).

Discussion: Species collected once only, without flowers, thus their size, and mode of ending the keel (beak present or not), unknown. All other characters: spinescent shoots, strongly reduced leaves and leaflets pubescent on both sides, distinctly show that it belongs to Section *Armata*. It shows the closest affinity with *C. armata*, from which it differs, above all, in glabrous fruit and in a more vigorous growth judging from herbarium specimens.

FOSSIL DATA

For the first time the fossil species of *Colutea*, named *C. edwardsiaefolia*, was described by O. Weber (Paleontographica, 4) in 1856. It was found in Rott in Germany. Since then, thanks especially to O. Heer's works as many as 17 such species, mainly from North America, Greenland and Western Europe, have been made known; only one species comes from Asia *(C. cordata)*. Their descriptions have been based on a few impressions of single leaflets; in four cases pinnate leaves were described, composed of 1—3 pairs of leaflets (*C. boweniana, C. debilis, C. parcefoliata* and *C. Salteri*). Once a fruit was found (*C. antiqua*) but it is rather doubtful whether it belongs to the genus *Colutea*. (Schenk, 1890; Kirchheimer, 1957). The impressions of leaflets represent a diverse material (esp. *C. primordialis*), both in shape and size of leaflets and in venation. That is why it is hard to believe that those impressions really belong to *Colutea* (Schenk, 1890; Hollick, 1906, 1930).

In 1940 busying himself with the classification of fossil remains of *Leguminosae*, K. K. Shaparenko (Bot. Jour. URSS, 25, 2: 102—121) found that *Colutea* has been already known since the Upper Cretaceous, Cenomanian. In the catalogue of the paleobotanical laboratory of the Botanical Institute in Leningrad, Shaparenko separated 2 further

fossil species without describing them; *C. berryana* (= *C. primordialis*, Berry 1916) and *C. heeriana* (= *C. Salteri*, Heer 1868).

I cannot undertake any critical analysis of fossil species of *Colutea*, as it could be only based on drawings and photographs, but a full list of those species is added. It can be stated, however, that the material that served for their description should be thoroughly revised as the likeness of leaflets in the family *Leguminosae* is exceptionally great between the different genera. P. Marty called attention to this fact, and he admitted that the shape of leaflets was a feature too unreliable to separate fossil species of *Leguminosae* on its basis alone (Études les végétaux fossiles du Trieu de Leval, 1907).

Some of the fossil species of *Colutea* belong, without doubt, to other genera, e.g.: *C. edwardsiaefolia* (shape of leaflet and venation), *C. Langeana* (leaflets too elongated and narrow), *C. primordialis* (Newberry's specimen, 1895), as well as *C. Salteri* (Fig. 47—48, Heer, 1859). The latter impressions show alternate leaflets so they may be twigs with small simple leaves, and not a compound leaf. The other impressions of leaflets could be divided into two groups: 1. leaflets obovate and 2. leaflets more or less roudnish. In the first group some specimens, esp. those that are emarginate at the top and more elongate show a certain similarity to small leaves of the fossil species *Liriodendron Meekii*. These are the impressions of the following species: *C. primordialis* (Heer, 1882; Hollick, 1894, 1906, 1930) and *C. valde-inaequalis* (Heer, 1882). Some of the other impressions are similar to the leaflets of *Dalbergia*, and even *Bumelia*, but it may be that some of these impressions belong to *Colutea* indeed.

1. *Colutea antiqua* Heer, Fl. tert. Helv., 3: 102 t. 132, f. 60—62 (1859); Schimper, Traité Paléontolog. végét., 3: 349 (1874); Kirchheimer, Die Laubgewächse der Braunkohlenzeit, 138 (1957).

Localities: Germany: Oeningen; Switzerland: Kasselstein, Locle b. Neuenburg.
Age: Upper Miocene.

2. *Colutea boweniana* Lesquereux, U. S. Geol. Surv. Terr. Rep. 8: 255, pl. 57 f. 4 (1883); Knowlton, Catal. Mesoz. Cenoz. Plants N. America, 815 (1919).

Localities: U.S.A.: Bowen Claim, Placer County, Calif.
Age: Miocene.

3. *Colutea cordata* Kryshtofovicz, Fl. URSS, 11: 316 (1941); Bajkowskaja. Paleobotanica, 2: 86, t. 20 f. 1. (1956).

Localities: U.S.S.R.; Amur region, Cagajan.
Age: Upper Cretaceous.

4. *Colutea coronilloides* Heer, Fl. foss. arct., 6: 100 (1882) — Leguminosites coronilloides Heer, Fl. foss. arct., 3: 119, t. 34 f. 14 (1875); Berry, Geol. Surv. New Jersey Bull., 3: 153 (1911).

Localities: Greenland: Lower-Anatekerdluk.
Age: Upper Cretaceous.

5. *Colutea debilis* Heer, Fl. tert. Helv., 3: 102 t. 132, f. 58—59 (1859); Schimper, Traité Paléontolog. végét., 3: 348 (1874).

Localities: Germany: Oeningen; Switzerland: Kesselstein.

Age: Upper Miocene.

6. *Colutea edwardsiaefolia* O. Weber, Paleontographica, 4: 161 t. 29, f. 22 (1856); Schimper, Traité Paléontolog. végét., 3: 349 (1874).

Localities: Germany: Rott.

Age: Upper Oligocene.

7. *Colutea Langeana* Heer, Fl. foss. arct., 6: 100, t. 40, f. 7b (1882); Seward, Livre Jubil. Soc. Geol. Belg. 1, 1: 250 (1925).

Localities: Greenland: Igdlokunguak.

Age: Upper Cretaceous.

8. *Colutea macrophylla* Heer, Fl. tert. Helv., 3: 102, t. 132 f. 43—46 (1859); Schimper, Traité Paléontolog. végét., 3: 349 (1874); Keller, Bericht. über die Thätigheit der St. Gallischen Naturw. Ges., 323, t. 11, f. 2—3 (1896); Engelhardt, Abhandl. d. Seneckenbergischen Naturforsch. Ges., 29: 395, t. 43, f. 21 (1911).

Localities: Germany: Oeningen, Flörsheim am Main; Switzerland: Kesselstein, Locle, Freudenberg.

Age: Middle Oligocene to Upper Miocene.

9. *Colutea obovata* Berry, Torr.. Bot. Club, 33, 3: 175 pl. 8, f. 5—6 (1906); Torr. Bot. Club., 40: 571 (1913); Torr. Bot. Club., 41: 297 (1914); Maryland Geol. Surv., 844 t. 76, f. 1—2 (1916); Prof. Paper, U. S. Geol. Surv., 112: 101 t. 23, f. 3 (1919); Knowlton, Catal: Mesoz. Cenoz. Plants. N. America, 188 (1919).

Localities: U.S.A.: Magothy — Grove Point (Maryland), Tuscaloosa — Shirley Mill (Alabama).

Age: Upper Cretaceous.

10. *Colutea oregonensis* Lesquereux, U. S. Geol. Surv. Terr. Rep., 8: 272 (1883).

Species mentioned in the Table, without description, probably a mistake, as the author gives the diagnosis of *C. boweniana* in the same work.

1. *Colutea parcefoliata* Saporta, Ann. Sci. Nat. Bot., 17: 286 t. 14, f. 5 (1862); Examen des flores tertiaires de Provence, in O. Heer, Recherches sur le climat et la végétation du Pays Tertiaire, 149.

Localities: France: Aix.

Age: Tertiary.

12. *Colutea primordialis* Heer, Fl. foss. arct., 6: 99 t. 27, f. 7—11, t. 43 f. 7—8 (1882); Lesquereux, Monogr. U. S. Geol. Surv., 17: 148 t. 13, f. 8—9 (1891); Hollick, Torr. Bot. Club 21: 56 t. 174, f. 2 (1894); Newberry, Monogr. U. S. Geol. Surv., 26: 97 t. 19, f. 4—5 (1895); Hollick, Monogr. U. S. Geol. Surv., 50: 84 t. 32 f. 14—15 (1906); Berry, Torr. Bot. Club, 37: 24 (1910); Torr. Bot. Club, 38: 407 (1911); Geol. Surv. New Jersey, 3: 156 t. 20, f. 4 (1911); Torr. Bot. Club, 39: 396 (1912); Torr. Bot. Club, 41: 297 (1914); Maryland Geol. Surv. 845 t. 75, f. 3 (1916); Torr. Bot. Club, 44: 184 (1917); Knowlton, Catal. Mesoz. Cenoz. Plants N. America, 815 (1919); Seward, Livre Jub. Soc. Geol. Belg., 1, 1: 250 (1925); Berry, Prof. Paper, U. S. Geol. Surv., 136: 59 (1925); Hollick, Prof. Paper, U. S. Geol. Surv., 159: 97 t. 74, f. 4 (1930).

Localities: Greenland: Atanekerdluk, Isunguguak; U. S. A.: Delphos (Kansas): Woodbridge (New Jersey); Eaton's Neck (Long Island); Grove Point, Cecil County (Maryland); Arthurs Bluff on Red River in Lamar County (Texas); Big Railroad

Cut, one mile southwest of Maxwell Spur, Pike County (Arkansas); Pawlof Bay, east side about 50 miles west of Portage Bay (Alaska); Gay Head, Marthas Vineyard.
Age: Upper Cretaceous.

13. *Colutea protogea* Herr, Fl. foss. arct., 7: 43 t. 61 f. 1c, t. 62 f. 1c. (1883); Seward, Livre Jub. Soc. Geol. Belg., 1, 1: 250 (1925).
Localities: Greenland: Patoot.
Age: Upper Cretaceous.

14. *Colutea Rinkiana* (Heer) ?, Schenk, Paleophytologie, 680 (1890).
Possibly a mistake, because Heer described (Fl. foss. arct., 6; 1882) Dalbergia Rinkiana and not Colutea.

15. *Colutea Salteri* Heer, Fl. tert. Helv., 3: 101, t. 132, f. 47—57 (1859); Sismonda, Mem. della Reale Acad. di Torino, 22, ser. 2, 455 t. 30 f. 8, (1865); Heer, Fl. foss. arct., 1: 126 t. 45, f. 8c. (1868); Schimper, Traité Paléontolog. végét., 3: 348 (1874); Heer, Fl. foss. arct., 7, 2: 138 (1883).
Localities: Germany: Oeningen; Switzerland: Kasselstein; Italy: Piémont-Guarène; Greenland: Atanekerdluk.
Age: Upper Cretaceous to Upper Miocene *.

16. *Colutea* sp., Krassnow, Notatki tireticznoj flory juga Rossi, Trudy Obszcz. ispyt. prir. Charkow. Uniw., 44: 245 f. 249 (1911); Kryshtofovicz, Paleontologija SSSR, 12, supp., 566 (1941); Fl. URSS, 11: 316 (1941).
Localities: U.S.S.R.: Kursk region, Tim.
Age: Oligocene.

17. *Colutea speciosa* Knowlton, Prof. Paper, U. S. Geol. Surv., 101: 270 t. 44, f. 4 (1917).
Localities: U.S.A.: West of Vermeyo Park, N. Mex.
Age: Cretaceous.

18. *Colutea valde-inaequalis* Heer, Fl. foss. arct., 6: 100 t. 27, f. 12—13 (1882); Seward, Livre. Jub. Soc. Geol. Belg., 1, 1: 250 (1925).
Localities: Greenland: Atanekerdluk.
Age: Upper Cretaceous.

GEOGRAPHICAL DISTRIBUTION, EVOLUTION AND MIGRATION

It is very difficult to estimate the age, origin and evolution of the genus *Colutea*. The fossil records at our disposal are, as has been shown in the preceding chapter, so doubtful and critical, that they cannot be made use of. Therefore my conclusions have been based only on the relation of the genus to other genera and their distribution, on recent area of the whole genus, as well as its sections, subsection and species, and lastly on the analysis of morphological features. These features are closely connected with the conditions of environment, and are subject to various changes, which illustrate best the chief trends of evolution.

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* *Colutea Salteri* sensu Palibin non Heer, Sov. Bot., 3: 33 (1935) = *Salvinia paleopsila* Shaparenko, Paleobotanika 2: 44 (1956).

The genus *Colutea* belongs to the subtribe *Coluteinae* Taub. (tribe *Galegeae,* subfamily *Papilionatae*, family *Leguminosae).* This subtribe is composed of 9 genera (Betntham and Hooker, Gen. Pl. 1867, Taubert in Engler u. Prantl, Pflanzenfamilien, 3, 3, 1894) namely:

1. *Clianthus* Soland. — herbaceous and suffruticose, 4 species: Australia, New Zealand, Indo-China, Philippine Is.
2. *Sutherlandia* R. Br. — shrub, 1 species: south Africa (Cape Province).
3. *Eremosparton* Fisch. et Mey. — shrubs, 3 species: Daghestan, region of Lower Volga, Middle Asia.
4. *Lessertia* DC. — herbaceous and suffruticose, about 40 species: south Africa, Guinea.
5. *Sphaerophysa* DC. — herbaceous, 2 species: Turkey and from Caucasus to east Siberia, Mongolia and North China.
6. *Swainsonia* Salisb. — herbaceous and suffruticose, about 50 species: Australia, Tasmania, New Zealand.
7. *Smirnowia* Bge. — shrub, 1. species: Middle Asia.
8. *Colutea* L. — shrubs, 26 species: south Europe, north-west and east Africa, Asia Minor, Middle and Central Asia.
9. *Oreophysa* (Bge. ex Boiss). Bornm. — suffruticose, 1 species: north Iran.

Thus the subtribe *Coluteinae* at present is composed of over 120 species, the majority of which, namely c. 100, are limited in their occurrence to the following floristic Kingdoms: *Paleotropis, Australis, Capensis,* and even *Antarctis;* not even one species is found in *Neotropis* or in North America.

This "southern character" of the subtribe is still strengthened when compared with the geographical distribution of genera of the entire tribe *Galegeae,* most of which are found in: *Neotropis, Paleotropis* and *Australis.*

Five genera, viz.: *Eremosparton, Smirnowia, Sphaerophysa, Colutea* and *Oreophysa* are almost exclusively connected with *Holarctis,* particularly with the Western and Central Asiatic Region. The genus *Colutea* excepted, all are poor in species, or even monotypic (*Smirnowia* and *Oreophysa*).

E. P. Korovin (Rastitielnost Sredniej Azii i južnowo Kazachstana, 1961) places the geological age of 3 genera: *Eremosparton, Smirnowia* and *Sphaerophysa,* in Paleogene. The species of the two first genera having remarkably xeromorphic features occur in deserts, on quicksands; their Paleogene origin seems to be probable, without doubt their age is great; they may be numbered among the so-called

"Paläoxeromorphen", as Rechinger understands them (Cousinia-Studien, Öst. Bot. Zeitschr., 1953). The last genus, *Sphaerophysa* is, most probably, younger (herbaceous plants, other conditions of occurrence).

Out of the holarctic genera only *Colutea* has retained the mesomorphic features to a very high degree, therefore the history of this genus was certainly slightly different. *Colutea* shows the closest affinity to the genus *Oreophysa,* especially in two very essential features. One is the stigma placed in the end part of the style, which is bent and turned downwards; in the other genera the stigma is terminal. The other feature are the characteristic swellings at the base of the blade of the standard. This kind of swellings is also known in the genus *Swainsonia*, though not in all species.

So both the area of the whole subtribe *Coluteinae* and the affinity with the genus *Swainsonia,* that is limited, at present, to Australia and New Zealand only, may in some degree show the old age of the genus *Colutea.* It is, however, worth stressing that though the species of *Colutea* in Middle and Central Asia lost a lot of mesomorphic features in the xerogenesis, the loss did not happen to such a degree as e.g. in the genus *Smirnowia* (reduction of leaves to one leaflet) or *Eremosparton* (entire reduction of leaves).

The area of the genus *Colutea* pertains to the Old Mediterranean (in Popov' s meaning), except *C. abyssinica,* whose area belongs already to *Paleotropis,* and species of the section *Multiflora: C. multiflora* and *C. delavayi* occurring in the border line of these two large floristic Kingdoms.

All species grow in mountain regions and in dry climate. A few only live in lower positions and then, as a rule, at the foot of mountains, or on rocky seashores, as e.g. *C. arborescens, C. acutifolia, C. insularis.* The more to the east and the drier the climate, the higher are the localities. In some species there are great differences in the vertical distribution, for instance: *C. atlantica* 500—2.500 m a.s.l., *C. paulsenii* 700—3.600 m, *C. abyssinica* 1.600—3.400 m. The following grow only above 2.000 m a.s.l.: *C. armata* 2.300—3.000 m, *C. persica* 2.600—3.000 m, *C. delavayi* 2.000—3.300 m, and *C. multiflora* 2.200—4.900 m.

Farthest to the north in Europe is met *C. arborescens,* up to 49°N, and farthest to the south *C. abyssinica* which grows beyond the equator and ends its area about 10°S. *C. atlantica* is found in Africa over 10°W, while *C. delavayi* reaches 103°E in China. (Fig. 18).

The shape of the area depends in *Colutea,* above all, on the course of mountain chains. Therefore in Europe and Asia the areas of individual species are extended, as a rule, along parallels of latitude. Only

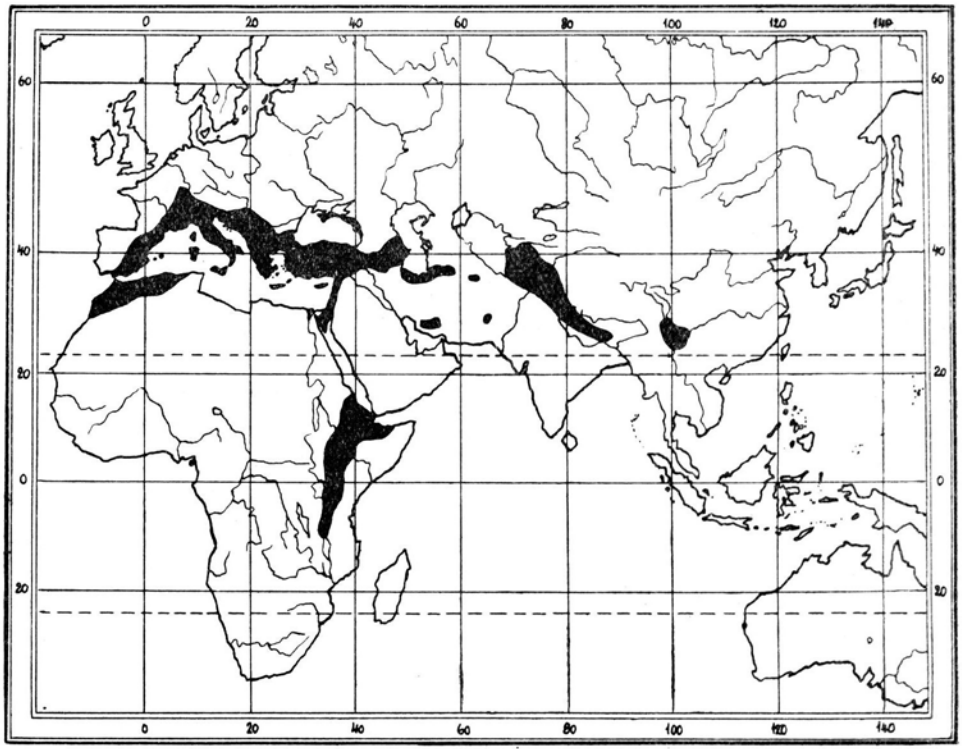

Fig. 18. Area of the genus *Colutea*.

2 species *C. istria* and *C. abyssinica* have areas elongated along meridians; — the area of the latter stretches from the shores of the Red Sea to the Nyassa Lake, a difference of 25°.

In its western part the area of the genus *Colutea* is continuous, in the eastern discontinuous. A few species occur on a large area, as *C. arborescens* in Europe, *C. abyssinica* in east Africa and *C. paulsenii* in Central Asia. The areas of the other species are, for the most part, small, disjunctive now and then (*C. armena, C. persica*), and often limited only to a few or even to one locality (*C. gifana, C. komarovii, C. atabajevii, C. acutifolia, C. armata, C. multiflora*). We must remember, however, that the flora of Iran, Afghanistan, Pakistan and Nepal has not yet been sufficiently examined and it may come out in future that some of these species will be much more common than it appears now.

Much more interesting than the distribution of individual species is the distribution of whole sections and subsections. It may best explain the trends of migration.

The section *Colutea,* richest in species, has a relatively continuous

area, particularly in the western part. This is still better seen in the case of the subsection *Arborescentes*. The area of this subsection comprises: north-west Africa, south Europe, Crimea, Caucasus, Turkey and Lebanon. It is composed of species with well marked mesomorphic features, as: glabrous ovary (*C. cilicica, C. arborescens*), large and thin leaflets, large flowers, non-dehiscent fruits, and gray, opaque bark. Besides xeromorphic features are met also strongly pubescent shoots and pubescent ovary. The pubescent ovary is found not only in the African *C. atlantica,* but also in the species found in Asia Minor: *C. armena, C. insularis, C. melanocalyx* and *C. davisiana*. The three last are closely allied to *C. cilicica* which, however, has a quite glabrous ovary. Compared with northern Turkey where *C. cilicica* is common, the rainfall is much lower in the region of their occurrence (cf. H. Czeczott — The distribution of some species in Northern Asia Minor and the problem of Pontide, 1937) and this explains their pubescence.

Mesomorphic features are also seen in two further subsections of section *Colutea: Acutifoliae* and *Africanae,* both monotypic. The area of subsection *Acutifoliae* is limited to a very small region situated at the Black Sea, near Novorossyisk. *C. abyssinica* of subsection *Africanae* grows in the mountains of East Africa. Like *C. acutifolia* it has a glabrous ovary, but fruits dehiscing on the top.

A clear loss of mesomorphic features may be seen in subsection *Graciles*. The following xeromorphic features are strongly marked: internodes shortened, leaves fasciculate, leaflets reduced in size, ovary pubescent, bark peeling in long fibres, lustrous afterwards. The areas of all species of this subsection do not touch but are rather far not only from one another but also from those of other species of the section *Colutea* (*C. istria* is an exception). A real peculiarity is *C. persica,* known only from a few dispersed localities in the mountains of south Iran. Though growing in such dry regions it still has a glabrous ovary, almost, quite glabrous shoots, and sparingly pubescent leaflets beneath. These features may give proof of *C. persica* being a relic and of its old age. It shows a closer affinity with *C. hybrida* from Pamiro-Alai, than with the two other species: *C. istria* and *C. gracilis,* having smaller leaflets and a larger number of pairs of leaflets.

Two groups of species can be distinguished in the section *Rostrata* like in the section *Colutea,* one with prevalence of mesomorphic features (subsection *Orientales*) and the other where xeromorphic features prevail (subsection *Centralasiaticae*). The area of subsection *Orientales* extends from west to east almost along one line and is divided into 3 parts: *C. orientalis* — Caucasus, *C. atabajevii* — Kopet-Dagh, and *C. jarmo-*

lenkoi — Pamiro-Alai. Species belonging here are distinguished by a glabrous ovary, shoots and leaflets glabrous or glabrate beneath, and by large leaflets; the number of pairs of leaflets ranges, however, from 3—4, and in *C. atabajevii* it is even reduced to one. Xeromorphic features in this subsection are found both in the reduced number of pairs of leaflets and in the formation of a variety in *C. jarmolenkoi* with a pubescent ovary (var. *hirsuta*).

The area of the subsection, *Centralasiaticae*, compared with the former, is placed more to the east. It is divided into two parts: one covers Elburs and Kopet-Dagh (*C. buhsei* and *C. gifana*), the other Afghanistan, Pamiro-Alai in USSR, Kashmir, north-west India and Nepal (*C. afghanica, C. paulsenii* and *C. nepalensis*). All species have a tomentose ovary (except *C. afghanica*), leaves fasciculate, composed of 2—3 (4) pairs of leaflets (more in *C. nepalensis*) and a bark peeling in long fibres and lustrous after peeling. These features resemble the features of the subsection *Graciles*, and they may prove that xerogenesis developed in a similar way in both subsections. *Colutea afghanica* represents, within subsect. *Centralasiaticae* a species whose mesomorphic features are indicated in a stronger degree (e.g. weak pubescence of ovary). Its geographical distribution and great similarity to *C. nepalensis* and *C. gifana*, and even to *C. buhsei*, again confirms the conclusion drawn below about the trends of development and migration of the whole genus. The subsection *Centralasiaticae* is in the genus *Colutea*, without doubt, the youngest evolutionary branch. The disjunction between separate species resulting from the climate getting drier is in this subsection still so young that is has not caused a sharp differentiation of its species.

Section *Armata* is represented only by 3 species where the xeromorphic features developed in the highest degree. These shrubs are distinguished not only by spiny shoots, but also by small leaves and leaflets (in *C. komarovii* up to 5.5 mm long) pubescent on both sides and by inflorescences composed of one or two small flowers only. The mesomorphic features in *C. komarovii* are represented only by a glabrous ovary (judging by fruits). The area of the section is discontinuous, forming 3 parts, and the areas of species holding few or even one locality are very far from one another. *C. komarovii* grows in the Caucasus distant ab. 400 km from *C. uniflora* from north Iran; the latter being 1.800 km away from *C. armata* (west Pakistan).

The last section *Multiflora* must be discussed in details, because the distribution of species belonging to it and their affinity with other species allow to draw conclusions of great importance. Only two species belong to the section *Multiflora*; both growing in mountains on considerable

altitudes (up to 4.900 m a.s.l.). One, *C. multiflora* grows in east Nepal, the other, *C. delavayi* in south-west China; 1.200 km separates one from the other. The species have long leaves with numerous (up. to 12 pairs) and thin leaflets, long inflorescences with up to 30 flowers and indehiscent fruits. Mesomorphic features are better marked in *C. multiflora* having a glabrous ovary and glabrous shoots.

Nearest to the area of sect. *Multiflora* are found species of section *Rostrata,* subsection *Centralasiaticae* (*C. paulsenii* and *C. nepalensis*) and of section *Armata* (*C. armata*). Comparing them with *C. multiflora* and *C. delavayi* we can see such remarkable differences that they rather seem to belong to quite different genera, were it not for the shrublike growth, swellings on the standard, and the way the stigma is placed on the bent style, common to all.

A striking resemblance is found, however, between the section *Multiflora* and the monotypic subsection *Africanae* of section *Colutea,* particularly between the Himalayan *C. multiflora* and east African *C. abyssinica.* This is seen in the length of leaves and the number of pairs of leaflets, in the shape, size and consistence of leaflets, in the size of flowers and their structure (glabrous ovary, keel rounded, without beak), and in the size and shape of fruits on long stipes. That is only why differences in the number of flowers in the inflorescence (in *C. abyssinica* 1—3, in *C. multiflora* 5—15, in *C. delavayi* 8—30), and in the breadth of wings, as well as dehiscency of fruits in *C. abyssinica,* do not allow to include this species to the section *Multiflora.* The likeness is the more striking, when we remember that these species are over 6000 km away from one another. The East-African-Himalayan disjunction of such kind must be, of course, very old.

The preceding data show clearly, that the development of the genus *Colutea* was caused by the climate getting drier and drier, and led to the loss of mesomorphic features in favour of xeromorphic ones. The changes went in the following directions:

1. Decrease in height of shrubs.
2. Shortening of internodes (leaves fasciculate) and appearance of spines.
3. Increase in pubescence of shoots.
4. Stronger peeling of bark, becoming lustrous from opaque.
5. Reduction in size of leaves and in number of pairs of leaflets, up to one pair.
6. Decrease in size of leaflets up to 3 mm long.
7. Increase in pubescence of leaflets up to both-sided.
8. Increase in rugosity of leaflets and loss in visibility of lateral nerves.

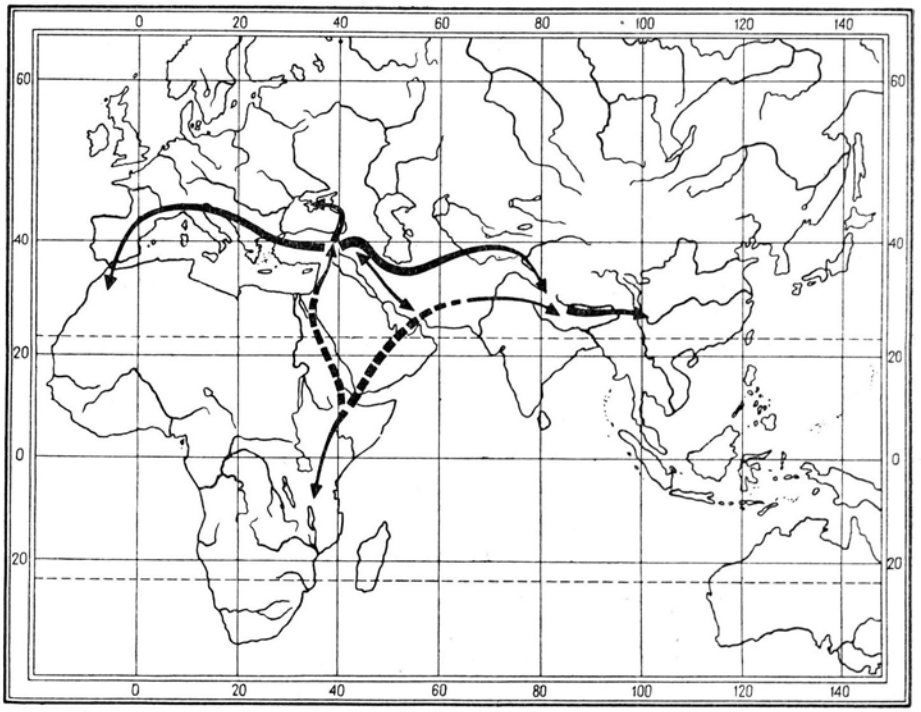

Fig. 19. Main migration paths of genus *Colutea*.

9. Reduction in number of flowers in inflorescences, up to one, and in length of flowers up to 10 mm.
10. Appearance of pubescence of ovary and fruits.
11. Formation of beak at the top of keel *.
12. Decrease in size of fruits.
13. Dehiscency of fruits at the top (easier scattering of seeds).

The same trend of evolution can be observed in the whole subtribe *Coluteinae*, but the following addenda have to be introduced: to feature 5 — reduction of leaves up to a single leaflet (*Smirnowia*); to feature 6 — complete reduction of leaves and taking over the assimilation by green shoots (*Eremosparton*, partly *Oreophysa*).

Evolutionary changes of the features discussed above took place with the progress of migration but generally not in a complex way.

Some features could become stable in one or other species (e.g. glabrous ovary in *C. persica*), others were subject to considerable changes with the passage of time (e.g. leaves and leaflets in *C. armata*).

* This feature cannot be taken as a xeromorphic one but it occurred in the group of species where the xerogenesis is better marked.

Basing on the geographical distribution of the whole subtribe *Coluteinae*, the affinity of the genus *Colutea* with the Australian genus *Swainsonia*, on the distribution of sections and subsections, the old African-Himalayan disjunction and on the xerogenesis, the history of the genus *Colutea* may be presented in the following way.

The genus *Colutea* is, without doubt, an old genus, that appeared in the Tertiary, at least during the Miocene, if not earlier. Its centre of origin was probably the mountain region from Ethiopia to South Iran. This region was partly separated during the Pliocene by the Red Sea and the Persian Gulf.

The primitive species of *Colutea* * were likely mesophytes or semi-xerophytes — high shrubs with long leaves composed of a large number of pairs of large and thin leaflets, of glabrous or sparingly pubescent shoots and leaflets, many-flowered inflorescences, flowers rather large with a glabrous ovary and rounded keel at the top and non-dehiscent fruits. These shrubs occurred in mountains, probably in communities resembling savannahs or warm and open forests.

From the original centre, may be from the mountains of Ethiopia, the migration of species led to the north in two directions: to north-east and north-west. The time of this migration could not be later than the early Pliocene, because after the Arabian peninsula and next the Balkans were separated from Asia Minor, and North-West Africa from Spain, the natural barriers, seas and gulfs, would have stood in the way.

A much older path of migration is the north-eastern one running through South Iran, Baluchistan and India to the Himalayas. The last trace of this migration are the dispersed localities of *C. persica* in Iran, a species with a rounded keel and glabrous ovary (Fig. 19).

The other path led along the mountains on the Red Sea shore and the Sinai peninsula to Asia Minor (to Armenia?). A witness of this migration is *C. istria* and next *C. cilicica* (both species with a rounded keel). With further migration and changes of climate different sections and subsections were formed, particularly subsection *Arborescentes* and next *Graciles*.

From Asia Minor the chief migration path was divided into two parts. Going to the west *Colutea* pushed its way to the Balkan peninsula and then along the shores of the Mediterranean sea to Spain, and northwest Africa. The lack of species of the genus *Colutea* in Tunisia would be a certain proof that its penetration into Africa did not run through the region of Tyrrhenis.

Migration towards the east took probably place at the end of the

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* I think it is impossible to explain the development of the genus *Colutea* on monophyletic principles.

Tertiary and beginning of the Quaternary, and it may be that the Pluvial Age, well marked in mountainous regions of Minor and West Asia, had a beneficial influence on this migration. Beginning with the Caucasus *Colutea* wandered along the Elburs chain, Kopet-Dagh, and then over Afghanistan to Pamir and the Himalayas. Along this path the species of section *Rostrata* differentiated first in subsection *Orientales* and then in subsection *Centralasiaticae*. Alongside, the migration of subsection *Graciles*, whose last representative reached the Pamir-Alai Mts. (*C. hybrida*), took place, though in a lesser degree. With the climate getting drier and drier *Colutea* perished completely in many places, and thus large breaks in areas of different subsections were caused. In some regions, however, as for example in Pamir-Alai it developed in a remarkable degree (*C. paulsenii* and its varieties).

Irrespective of the main path, migration could also run south-east, along the mountains of west and south Iran, but records from this region are so scarce that no important conclusions can be drawn (there is only one locality of *C. buhsei* near Isfagan, and a few localities of *C. persica*). It may well be that in this region the migration went in the opposite direction.

In East Africa a convenient meridional direction of the mountain chains favoured the migration southward and so *C. abyssinica* could pass the equator. The time of this migration is difficult to determine.

Areas of species of section *Armata*, typical xerophytes, distant from one another, may show that xerogenesis influenced by the same environmental conditions ran parallel in the same direction in various regions. This process is not yet finished in the genus *Colutea* and it is made clear by the development of varieties with pubescent ovary within *C. arborescens* and *C. jarmolenkoi: C. arborescens ssp. gallica* and *C. jarmolenkoi* var. *hirsuta*.

A factor which played an important role in the formation of species of the genus *Colutea* might be hybridization, not merely within one section, but even between sections (cf. *C.* × *media* and *C.* × *variabilis*). I mentioned it many a time in the discussion on *C. arborescens, C. cilicica, C. davisiana, C. gracilis* and others. It may be assumed that the considerable variability of *C. arborescens* on the borderline of its area with *C. cilicica* on the Balkan peninsula and with *C. atlantica* in Spain, that is in regions where the environments are so remarkably changed because of man's activity, is connected with introgressive hybridization. Yet only further direct observations could confirm this.

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Sectio 1. *Colutea*, sect. nov.

Frutices inermes. Folia 2—6 (7)-juga. Inflorescentia imprimis foliis fulcrantibus aequilonga, vel brevior, saepe 3—5 flora. Flores saepissime plus quam 15 mm longi. Carina apice rotundata, erostris. Alae plus minusve lineares.

Species 13. Typus sectionis: *C. arborescens.*

Subsectio 1. *Arborescentes* B r o w i c z, subsect. nov.

Flores plerumque flavi. Alae geniculato-infractae. Foliola magna, plerumque elliptica vel late elliptica. Cortex in fibras breves findens fissus autem griseus vel griseo-brunneus, opacus.

Species 7. Typus subsectionis: *C. arborescens* L.

1. *Colutea atlantica* B r o w i c z, sp. nov.

Frutex. Rami annotini dense breviter pubescentes, canescentes; biennes brunneo-grisei, pubescentia etiam conspicua. Rami vetustiores obscure grisei. Cortex in fibras teneras findens. Stipulae triangulari-ovatae, 1.5—2 mm longae, pilosae. Folia saepissime 4—5 cm longa, 3—5 (6)-plerumque 4-juga. Rhachis folii ut petioluli dense breviter albo-pilosa. Foliola forma regularia, elliptica, ad 15 mm longa et ad 9 mm lata, plerumque minora (10 × 7 mm), rarissime majora, supra inconspicue rugosa et glabra, subtus appresse sat dense pubescentia, nervis lateralibus distinctis apice rotundata, appendice nervi primarii (mucro) brevissima, vix conspicua, vel non profunde retusa, basi rotundata vel inconspicuo cuneata, nonnunquam anguste obovata. Petioluli ad 1 mm longi. Inflorescentia 1—3 (4) flora, 3—5 (6) cm longa foliis fulcrantibus aequilonga. Axis inflorescentiae appresse, laxe pubescens; pilis plerumque albis, additis nigris vel brunneis. Pedunculi 6—10 mm longi, atro- vel brunneo-pubescentes, nonnunquam pilis albis immictis. Bracteae 1.5—2 mm longae, ovato--lanceolatae, ut pedunculi pubescentes. Flores 17—20 (22) mm longi, flavi. Carina apice rotundata. Alae carina breviores vel ei aequilongae, sub angulo 120—130° infractae, loco infractionis nonnunquam calcare minuto praeditae. Ovarium dense argenteo-pubescens. Calyx campanulatus, 5—7 mm longus, dense brunneo vel atro-pubescens, nonnunquam pilis albis additis. Dentes calycis acuti, ad 2 mm longi, intus dense atro--pubescentes, nonnunquam brevissimi, 1 mm breviores. Bracteolae ovatae, ad 1 mm longae ut calyx pubescentes. Legumina 5—6 cm longa, 2.5—2.8 cm lata, praecipue basi apiceque distincte pubescentia, in stipite calyce 2—3-plo longiore. Semina 4 mm longa, 3 mm lata.

Typus: Algeria, Prov. Oran, Djebel Aïssa, declivitates orientales, 1.750 m, 19.5.1901, c.fl. et fr., Hochreutiner, 340 (G.).

Area geographica: Africa boreo-occidentalis (in Atlanto) et Hispania austro-orientalis; in montibus, 500—2.500 m alt.s.m.

Affinitas: Species *C. arborescenti* var. *gallicae* Browicz affinis, sed ovario atque ramis pubescentibus et foliolis ellipticis regularibus differt.

2a. *Colutea arborescens* L. ssp. *gallica* Browicz, ssp. nov.

Ovarium totum vel in parte tantum media disperse pubescens. Flores plerumque eis typi paulum minores. Dentes calycis angustiores. Calyx plerumque atro-pilosus. Legumina disperse pubescentia vel subglabra.

Typus: Gallia, Col. du Frène, infra St. Pierre d'Albigny (Sabaudia), 25.9.1914 c.fl., Saint-Lager (G.).

3a. *Colutea cilicica* Bois. et Bal. var. *shaparenkoi* Browicz var., nov.

Folia ad 20 cm longa, 5—7 (8)-juga. Inflorescentia ad 12 cm longa, 5—12 flora.

Typus: URSS, in declivitate montium prope Novorossijsk, 26.5.1912 c.fl., I. V. Palibin, 1270 (LE.).

Colutea × *variabilis* Browicz, spec. hybr. nov.

Frutex. Rami juveniles glabri vel subglabri, vetustiores griseo-brunnei. Cortex in fibras breves findens. Stipulae circa 1.5 mm longae. Folia 4—7 cm longa, 2—3 (4)-juga. Rhachis folii pilis singulis praedita vel glabra. Foliola obovata, basi cuneata, apice retusa, supra glabra, subtus subglabra, ad 13 mm longa et 8—10 mm lata. Influrescentia 1—3 flora, foliis fulcrantibus brevior vel aequilonga. Axis inflorescentiae parce albo-pilosus. Bracteae ovato-lanceolatae ad 1.5 mm longae, pilis albis nigrisque tectae. Pedunculi ad 8 mm longi atro-pilosi. Flores 16—19 mm longi. Vexillum obscuro-flavum, basi macula lucide flava distincta ornata. Carina apice rotundata vel rostro subinconspicuo praedita, apice obscure colorata, verismiliter rubra vel violacea. Alae carina aequilongae, ut carina apice obscuro-coloratae, loco infractionis rotundatae vel calcare indistincto praeditae. Calyx ad 7 mm longus, campanulatus, atro-pilosus vel pilis albis immixtis tectus. Dentes calycis 1.5—2 mm longi, interne dense atro-pilosi. Bracteolae lanceolatae, ad 1 mm longae, ut calyx pubescentes. Ovarium glabrum. Legumina ignota.

Typus: URSS, Azerbaidzhania, regio Zangelan, prope pagum Padar, in silvis collucatis, in declivitate boreali montium, 550 m.s.m., 19.5.1948, c.fl., Grossheim, Kirpicznikov, Smoljaninova (LE.).

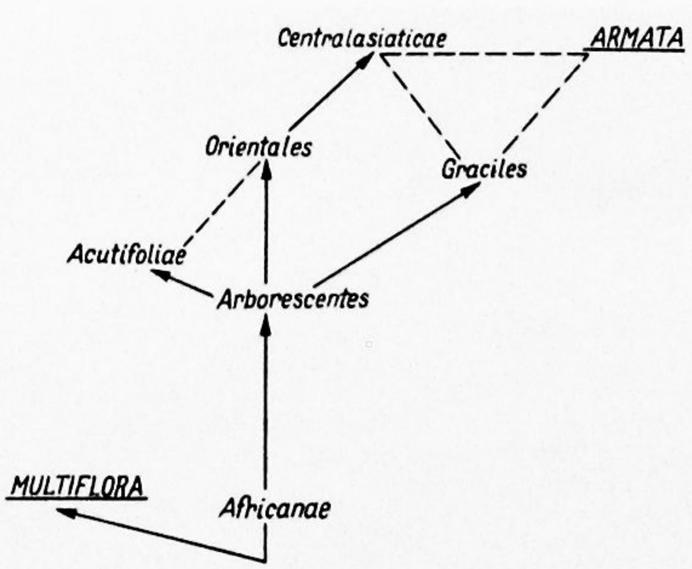
Hybrida *C. cilicica* Boiss. et Bal. × *C. orientalis* Mill.

5. *Colutea davisiana* Browicz, sp. nov.

Frutex. Rami juveniles appresse albo-pubescentes, biennes griseo-brunnei. Cortex in fibras breves findens. Stipulae ovato-triangulatres,

KEY TO THE SPECIES OF THE SECTION *ARMATA*

Keel	Prevalence of mesomorphic features: Glabrous ovary	Prevalence of mesomorphic features: Pubescent ovary	Prevalence of mesomorphic features: Glabrous ovary	Prevalence of mesomorphic features: Pubescent ovary	Section
Terminated by beak			*C. komarovii* 1-2/?	*C. armata* 1-2/1-2 *C. uniflora* 2-3/1.	*Armata*
	Subsect. *Orientales*		Subsect. *Centralasiaticae*		*Rostrata*
	C. atabajevii 1-2/3-5 *C. jarmolenkoi* 3-4/3-5 *C. orientalis* 3-4/3-4	*C. jarmolenkoi* var. *hirsuta* 3-4/3-5		*C. nepalensis* 3-5/3-5 *C. paulsenii* 2-4/3-5 *C. afghanica* 2/1-3 *C. gifana* 2/4-5 *C. buhsei* 3-4/2-4	
Rounded at the top	Subsect. *Arborescentes*		Subsect. *Graciles*		*Colutea*
		C. armena 3-5/2-4 *C. insularis* 4-5/3-7 *C. davisiana* 3-4/3-7	*C. persica* 2-3/2-4	*C. hybrida* 2-3/2-4 *C. gracilis* 3-4/4-5 *C. istria* 3-5/1-4	
	C. cilicica 4-5/3-5 *C. arborescens* 3-6/3-8	*C. melanocalyx* 3-4/2-5 *C. arborescens* ssp. *gallica* 3-4/3-6 *C. atlantica* 3-5/1-3			
	Subsect. *Acutifoliae*				
	C. acutifolia 4-5/3-5				
	Subsect. *Africanae*				
	C. abyssinica 4-6/1-3				
	C. multiflora 4-8/5-15	*C. delavayi* 5-12/8-30			*Multi-flora*



Scheme showing phylogenetical relation of sections and subsections within the genus *Colutea*.

The two first figures given with the name of species denote the number of pairs of leaflets, the others, the number of flowers in inflorescence.

1.5 mm longae, albo-pilosae. Folia 5—8 cm longa, (3) 4-juga. Rhachis folii disperse appresse albo-pubescens vel fere glabra. Foliola elliptica, obovata vel etiam subrotunda, apice rotundato vel non profunde retuso appendiceque nervi primarii subincospicua, supra glabra vel rarissime pilis albis singulis praedita, subtus appresse albo-pubescentia, subrugosa, ad 20 mm longa et 16 mm lata, plerumque minora. Petioluli 1—1.5 mm longi. Inflorescentia foliis fulcrantibus aequilonga vel brevior, 4—7 cm longa, 3—7 flora. Axis inflorescentiae disperse albo-pilosus. Pedunculi 5—12 mm longi, brunnei, pubescentes, pilis brunneis, nigris vel albis vestiti. Bracteae ovato-lanceolatae, 1—1.5 mm longae, margine albo-pilosae. Flores 18—19 mm longi, flavi. Alae angustae saepe margine convolutae, carinae aequilongae vel ea longiores, loco infractionis calcare plus minusve conspicuo praeditae, sub angulo 110—120° incurvae. Ovarium distincte appresse pilosum. Calyx 5—6 mm longus, brunneo- vel albo-pilosus. Dentes calycis late triangulares, acuti, circa 1.5 mm longi. Incisiones inter dentes calycis acutae, etsi latae. Bracteolae ad 1 mm longae, lanceolatae, ut calyx pubescentes. Legumina 5—6 cm longa et 2—3 cm lata, in stipite calyce subduplo longiore, nitida dispersequepubescentia. Apex fructus valde angustatus, rectus vel paulum sursum incurvatus. Semina 3.5 mm longa et 3 mm lata.

Typus: Turcia, colles in vicinitate Ouchak (Phrygia), 2.6. c.fl. et 29.7.1857 c.fr., B. Balansa, 1203 (P.).

Area geographica: Turcia occidentalis et insulae Aegaeae.

Affinitas: Species *C. cilicicae* et *C. melanocalyci* affinis, probabiliter earum hybrida.

6. *Colutea insularis* Browicz, sp. nov.

Frutex. Rami juveniles albo-puberuli, inferne glabrescentes, biennes griseo-brunnei. Cortex in fibras minutas longiusculas findens. Stipulae angusto-triangulares, margine praecipue albo-pubescentes. Folia 5—7 (8) cm longa, 4-rarius 5-juga. Rhachis folii disperse albo-pubescens. Foliola elliptica, raro ovato-elliptica, 10—18 mm longa et 7—14 mm lata, supra glabra, subtus laxe appresse pubescentia, apice rotundato vel retuso, appendice nervi primarii distincta, acuta atque nervis laterialibus bene distinctis. Petioluli ad 2 mm longi, pubescentes. Inflorescentia 5—6 cm longa, foliis fulcrantibus brevior vel aequilonga, 3—7 flora. Axis inflorescentiae appresse albo-pubescens. Pedunculi crassi 8—10 mm longi albo-pubescentes. Flores magni, 20—25 mm longi. Alae carinae aequilongae, latae, applanatae, loco infractionis acutae, sub angulo 130° incurvae. Ovarium parte praesertim media dense pilosum. Calyx late campanulatus, 7—10 mm longus et 8—9 mm latus, appresse pubescens, pilis omnibus albis. Dentes calycis late triangulares acuti, ad 2.5 mm

longi, interne dense albo-pilosi. Bracteolae ovato-lanceolatae, 1—1.5 mm longae, margine albo-ciliatae. Legumina 5—5.5 cm longa et 2.5—3 cm lata, disperse pilosa, stipite brevi.

Typus: Rhodus, saxa prope Filerino et Salakos, 5—6.1870 c.fl. et fr., E. Bourgeau, 37 (G.).

Area geographica: Species endemica, Rhodus.

Affinitas: Species *C. cilicicae* affinis, ab ea tamen ovario pubescente atque alis bervioribus differt.

Subsectio 2. *Acutifoliae* B r o w i c z, subsect. nov.

Inflorescentia 3—5 flora. Flores ad 13 mm longi, aurantiaco-purpurei. Alae carina circa 2-plo breviores, sine infractione geniculata. Dentes calycis tubo aequilongi. Foliola elliptica basi et apice acuta. Appendix nervi primarii subulata ad 1 mm longa.

Species 1. Typus subsectionis: *C. acutifolia* S h a p.

Subsectio 3. *Africanae* B r o w i c z, subsect. nov.

Inflorescentia 1—3 flora. Flores parvi ad 15 mm longi, brunnei, obscuri etiam subnigri. Alae falcatae, margine externo rotundato sine infractione geniculata.

Species 1. Typus subsectionis: *C. abyssinica* K t h. et B o u c h é

9b. *Colutea abyssinica* K t h. et B o u c h é var. *gillettii* B r o w i c z, var. nov.

Flores ad 12 mm longi, flavi. Legumina eis typi minora, 3—3.5 (4) cm longa et 13—17 mm lata, stipite 5 mm longo.

Typus: Kenya, ca. 6.5 km Gil Gil occidentale, 7.000′, 8.12.1948 c.fl. et fr., Bogdan, 2167 (K.).

Subsectio 4. *Graciles* B r o w i c z, subsect. nov.

Flores flavi vel aurantiaco-flavi. Alae geniculato infractae. Foliola plerumque obovata; folia saepe fasciculata. Cortex in fibras longas findens, fissus autem ruber vel rubro-brunneus, splendens.

Species 4. Typus subsectionis: *C. gracilis* F r e y n et S i n t.

13a. *Colutea hybrida* S h a p. var. *longestipitata B r o w i c z*, var. nov.

Stipes filiformis, in partem leguminis inflatam abrupte abiens.

Typus: URSS, Tadzhikistania australis inter flumen Kafirnigan et Gazimajlik, 1.050 m., 27.5.1939 c.fl. et fr., S. Tazba, 584 (LE.).

Sectio 2. *Multiflora* B r o w i c z, sect. nov.

Frutices inermes. Folia 4—12-juga. Inflorescentia valde elongata, 5—30 flora. Flores parvi 12—15 mm longi. Alae latae, carinae similes et ea breviores, sine calcare. Carina erostris.

Species 2. Typus sectionis: *C. multiflora* S h a p. ex A l i

Sectio 3. *Rostrata* Browicz, sect. nov.

Frutices inermes. Carina rostro nonnunquam valde elongato curvatoque finita.

Species 8. Typus sectionis: *C. orientalis* Mill.

Subsectio 1. *Orientales* Browicz, subsect nov.

Flores parvi, 11—16 mm longi, plerumque polychromi. Alae carina breviores. Ovarium glabrum. Foliala subrotundata, vel late obovata. Cortex in fibras findens, fissus autem griseus, vel griseo-brunneus, opacus.

Species 3. Typus subsectionis: *C. orientalis* Mill.

Subsectio 2. *Centralasiaticae* Browicz, subsect. nov.

Flores magni, saepissime plus quam 18 mm longi, unicolores, flavi vel aurantiaco-flavi. Ovarium saepissime dense pilosum. Alae carina longiores, rarissime ei aequilongae. Folia saepe fasciculata. Foliola subrotunda, late obovata vel elliptica Cortex in fibras longas findens, fissus autem ruber vel rubro-brunneus, splendens.

Species 5. Typus subsectionis: *C. buhsei* (Boiss.) Shap.

19a. *Colutea buhsei* (Boiss.) Shap: var. *densiflora*, Browicz, var. nov.

Inflorescentia densa, 5—8 flora, foliis fulcrantibus vix longior. Copiosae floret.

Typus: URSS. Turcomania, montes Kopet-Dagh, distr. Geok-tepe, ad pedes montis Massinjew, 29.8.1934 c.fl. et fr., A. Borissova, 639 (LE.).

21. *Colutea afghanica* Browicz, sp. nov.

Frutex 2—3 m altus. Rami hornotini pilis paucis appressis tecti, vel glabri, biennes cortice albo, in fibras longas fisso vestiti, decorticati rubescenti-brunnei, nitidi. Stipulae ovato-triangulares, ad 3 mm longae, glabrae vel pilis albis solitariis tecti. Folia ad 8 cm longa, foliolis bijugis, rhachide in parte inferiore praecipue appresse albo-pilosa. Foliola obovata vel elliptico-obovata, ad 13 mm longa, ad 10 mm lata, rugosa, sed nervis lateralibus reticulatis bene conspicuis, ad apicem retusis, nervo medio vix vel non extra apicem exeunte, supra glabra, vel pilis appressis sparsis tecta, subtus plus minusve appresse pubescentia. Inflorescentia 1—3 flora. Bracteae triangulari-lanceolatae, 1.5—2 mm longae, pedicelli ad 10 mm longi, ut bracteae pilis brevibus albis et nigris sparsis vestiti. Flores flavi, magni, ad 25 mm longi, alis carina vix longioribus vel ei subaeqilongis, angustis, in fracto rotundatis, sub angulo 110—120° incurvis. Carina distincte rostrata. Ovarium parce pubescens, ita ut parietes eius bene perspiciantur. Calyx late campanulatus, ad 10 mm longus, parce pilosus, in parte inferiore subglaber, pilis brevissimis albis vel nigris, ad margines dentium densioribus praeditus. Dentes calycini late triangulares, 2—3 mm

longi, interne dense pilis albis vel nigris immixtes vestiti. Bracteolae lanceolatae, ad 1 mm longae, ut calyx pubescentes. Fructus 4—5 cm longi, ad 2.5 cm lati, apice breviter acuminati, stipite brevi, sed e calyce distincte exserto, apice ut videtur, dehiscentes, pilis sparsis obsoletis tantum praediti. Semina 4 mm longa, 3 mm lata.

Typus: Afghania. Herat — Shin Dand, 1.700 m s.m., 8.5.1949 c.fl. et juv. fr., M. Köie, 3931 (C.).

Area geographica: Afghania boreali-occidentalis. Species endemica.

Affinitas: Species *C. nepalensi* Sims et *C. gifana* Parsa affinis, a quibus tamen ovario parce pubescente praecipue differt.

Sectio 4. *Armata* Browicz, sect. nov.

Frutices spinescentes. Folia 1—2 (3)-juga. Foliola minuta, utrinque pubescentia. Flores parvi, singulares vel bini. Carina rostrata. Legumina late ovata, breviter acutata.

Species 3. Typus subsectionis: *C. armata* Hemsl. et Lace.

Colutea aeschinomenoides Scop. (Delc. Insub., 3: 22. 1788) = *Aeschynomene americana* L.
— *alpina* Lam. (Encycl., 1 : 354.1773) = *Astragalus penduliflorus* Lam.
— *americana* Mill. (Gard. Dict. ed. 8, no. 5.1768) = *Caesalpinia vesicaria* L.
— *annua* Murray (Nov. Comm. Göttingen, 40.1774-75) = *Lessertia linearis* DC.
— *arborescens* var. *alpestris* Bolzon (Bull. della Soc. Bot. Ital., 337.1900) = *Astragalus alpinus* L.
— *arenaria* Poir. (Encycl. suppl., 1: 562) = *Astragalus chorinensis* Bunge
— *astragalina* Poir. (Encycl., suppl., 1: 561) = *Astragalus alpinus* L.
— *australis* Lam. (Encycl., 1: 354.1773) = *Astragalus australis* (L.) Lam.
— *baetica* Poir. (Encycl., suppl., 1: 561) = *Astragalus lusitanicus* Lam.
— *caspica* M. B. (Fl. taur.-cauc., 2: 169.1808) = *Sphaerophysa salsula* (Pall.) DC.
— *davurica* Spreng. (Syst. Vegetab., 3: 242.1826) = *Sphaerophysa salsula* (Pall.) DC.
— *excisa* Thunb. (Prod. Pl. Cap., 134.1794) = *Lessertia excisa* DC
— *fistulosa* Retzii (Fasc. observ. bot., 3: 40.1783) = *Lessertia perennas* DC.
— *floribunda* Poir. (Encycl. suppl., 1: 562) = *Sesbania platycarpa* Pers.
— *frigida* Poir. (Encycl. suppl., 1: 561) = *Astragalus frigidus* (L.) A. Gray
— *frutescens* L. (Sp. pl., 723.1753) = *Sutherlandia frutescens* (L.) R. Br.
— *fruticosa* Houtt. (Nat. Hist., 2, 5: 517.1775) = *Sutherlandia frutescens* (L.) R. Br.
— *galegifolia* Sims (Bot. Mag. 21 t. 792) = *Swainsonia galegifolia* R. Br.
— *glabra* Poir. (Encycl. suppl., 1: 561) = *Astragalus australis* Lam.
— *grandiflora* Salisb. (Prodr. Stirp., 338.1796) = *Sutherlandia frutescens* (L.) R. Br.
— *halicacaba* Poir. (Encycl. suppl. 1: 562) = *Astragalus vulnerariae* DC.
— *herbacea* L. (Sp. pl., 723.1753) = *Lessertia linearis* DC.
— *incana* Poir. (Encycl. suppl., 1: 562) = *Astragalus antylloides* Lam.
— *linearis* Thunb. (Prodr. Pl. Cap., 135.1794) = *Lessertia linearis* DC.
— *Novae-Hollandiae* Walpers (Ann. Bot. Syst., 2: 368.1851-52) = *Clianthus oxleyi* A. Cunn. ex Lindl.
— *obtusata* Tunb. (Prodr. Pl. Cap., 134.1794) = *Lessertia obtusata* DC.
— *perennas* Jacquin (Enum stirp., 311.1762) = *Lessertia perennas* DC.
— *Pomeliana* O. Debeaux (in sched. — Pl. de l'Algérie) = *Sutherlandia frutescens* (L.) R. Br.
— *procumbens* Mill. (Gard. Dict. ed 8, no. 7) = *Lessertia procumbens* DC.
— *prostrata* Thunb. (Prodr. Pl. Cap., 134.1794) = *Lessertia prostrata* DC.
— *pubescens* Thunb. (Prodr. Pl. Cap., 134.1794) = *Lessertia pubescens* DC.
— *rigida* Thunb. (Prodr. Pl. Cap., 134.1794) = *Lessertia rigida* DC.
— *salsola* Poir. (Encycl. suppl., 1: 562) = *Sphaerophysa salsula* (Pall.) DC.
— *spinosa* Forsk. (Fl. aegypt.-arab., 131.1775) = *Astragalus spinosus* Muschler
— *tomentosa* Thunb. (Prodr. Pl. Cap., 135.1794) = *Lessertia tomentosa* DC.
— *triflora* Poir. (Encycl. suppl., 1: 562) = ?
— *trifoliata* Poir. (Encycl. suppl. 1: 562) = ?
— *triphylla* Bge. ex Boiss. (Fl. Or., 2: 196.1872) = *Oreophysa microphylla* (Jaub. et Spach) Browicz
— *vesicaria* Thnub. (Prodr. Pl. Cap., 135.1794) = *Lessertia vesicaria* DC.
— *Wightiana* Wall. ex Steud. (Nomencl. bot., ed., 2, 1: 399.1840-41) = *Sutherlandia frutescens* (L.) R. Br.
— *wolgarica* Lam (Encycl., 1: 353.1783 ?) = *Calophaca wolgarica* (L. f.) Fisch.

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SPECIES MENTIONED IN THE TAXONOMIC PART. SYNONYMS IN ITALICS

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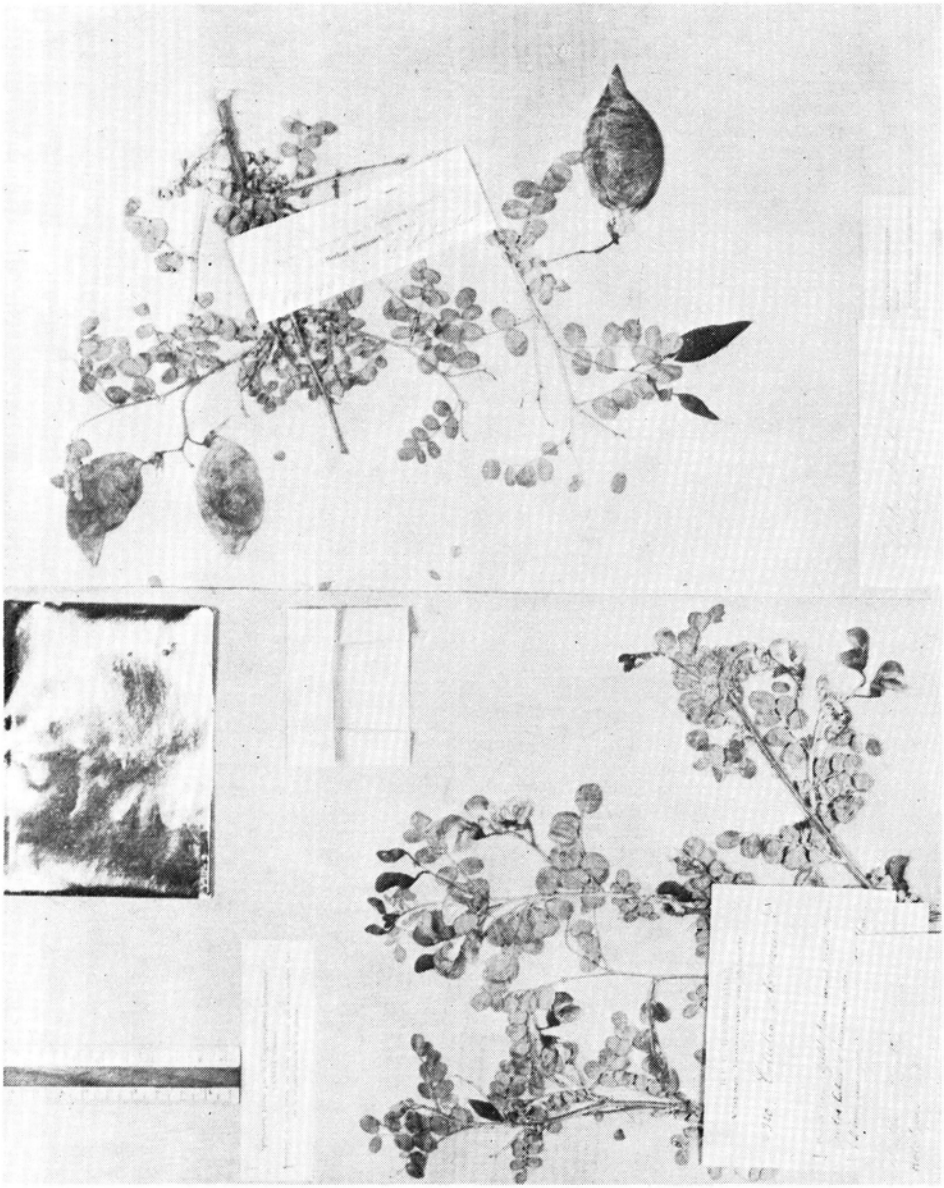
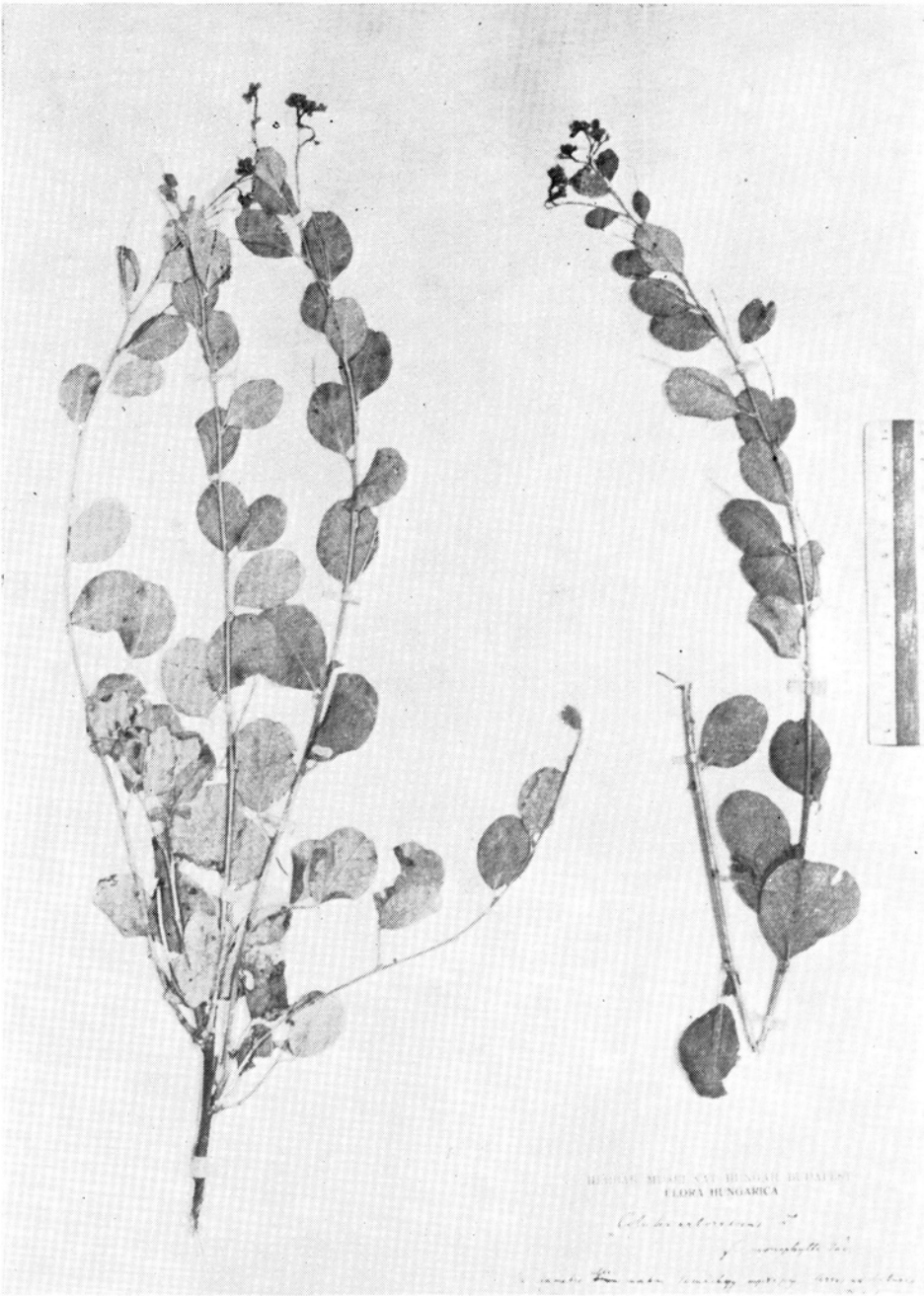
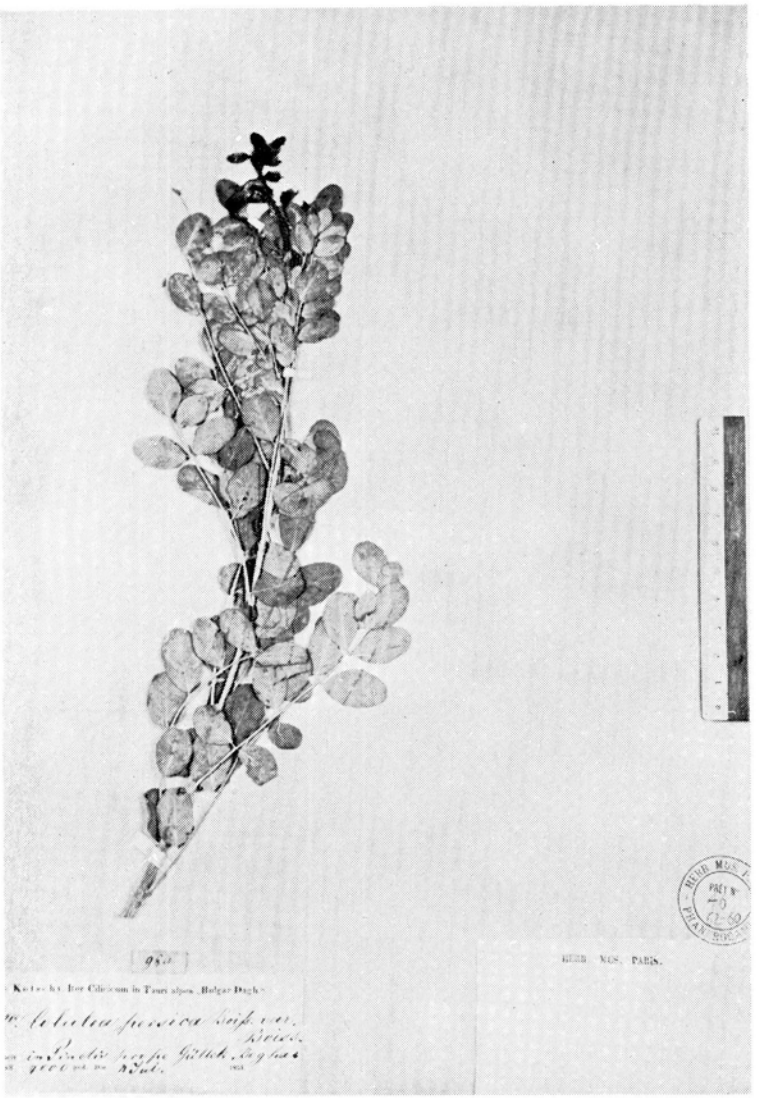


Colutea atlantica — holotype (Conservatoire et Jardin Botaniques, Genève)



Colutea arborescens ssp. *arborescens* f. *monophylla* (Museum of Natural History, Budapest)

Plate III



Colutea cilicica — paratype (Muséum National d'Histoire Naturelle, Paris)

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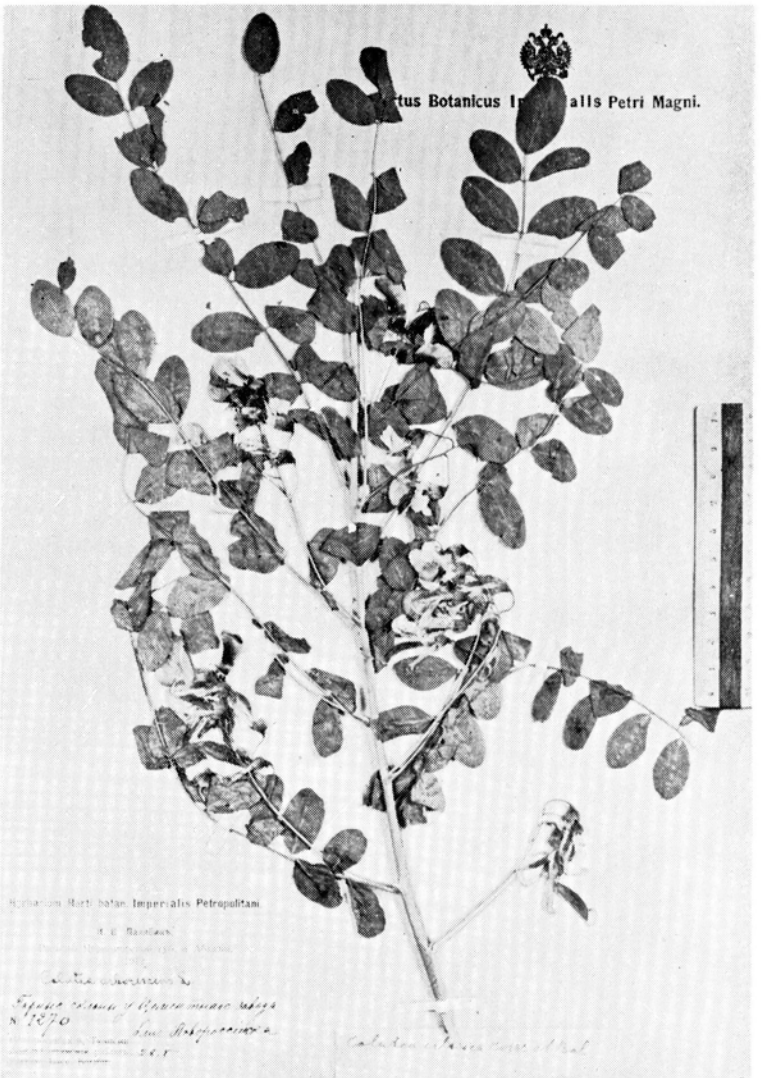

Colutea cilicica var. *shaparenkoi* — type (Botanical Institute, Leningrad)

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Colutea melanocalyx — isotype (Conservatoire et Jardin Botaniques, Genève)

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Colutea davisiana — holotype (Muséum National d'Histoire Naturelle, Paris)

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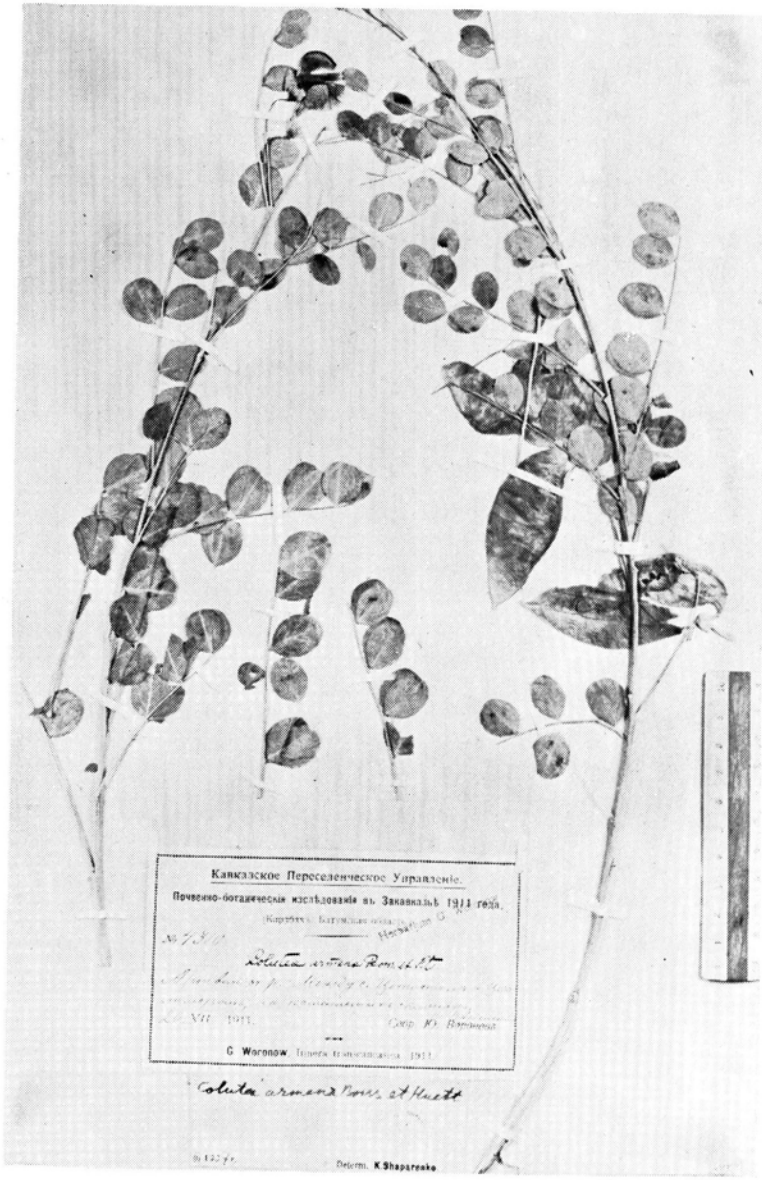
Colutea insularis — isotype (Muséum National d'Histoire Naturelle, Paris)

Plate VIII



Colutea armena — (Botanical Institute, Leningrad)

Colutea acutifolia — paratype (Botanical Institute, Leningrad)

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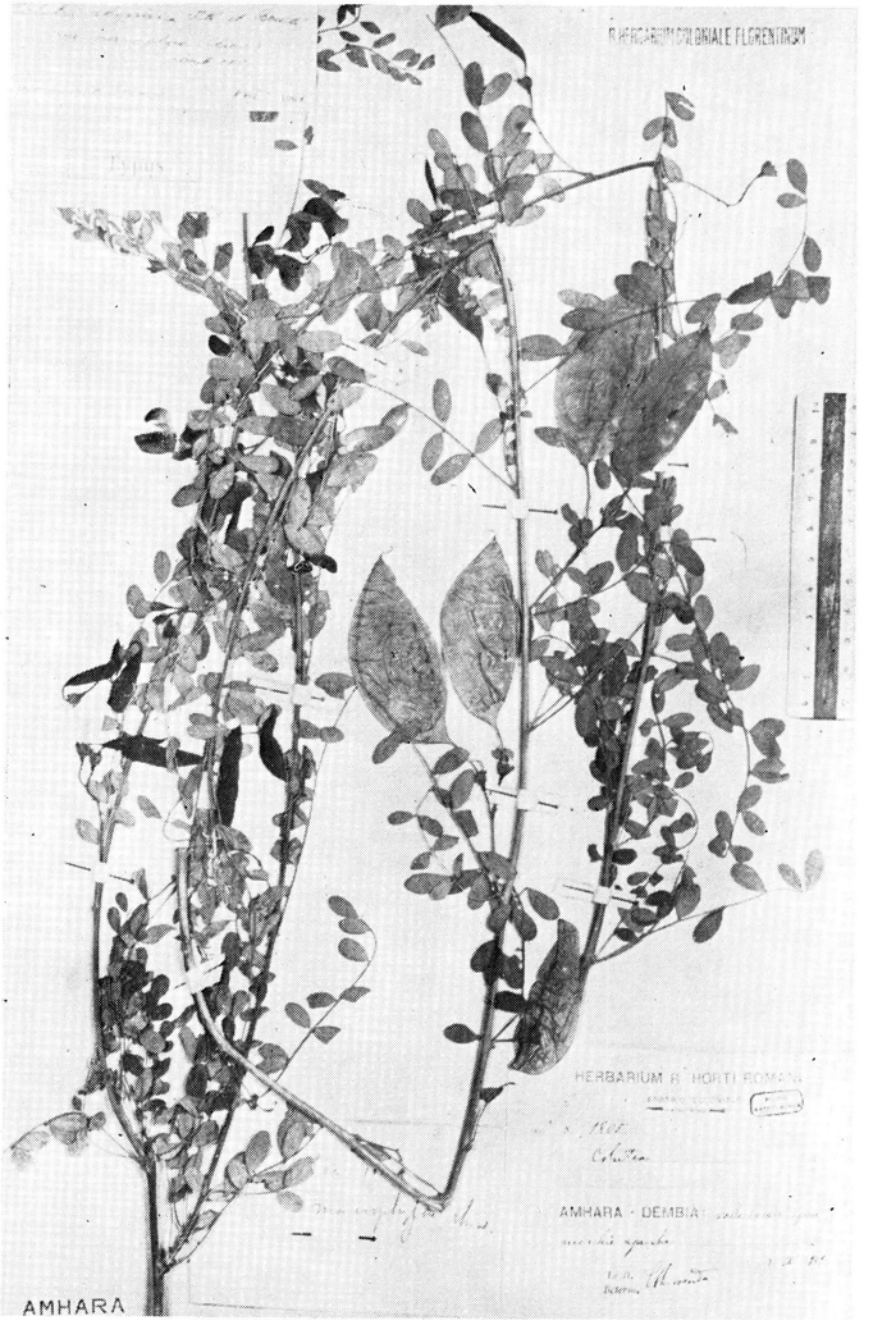
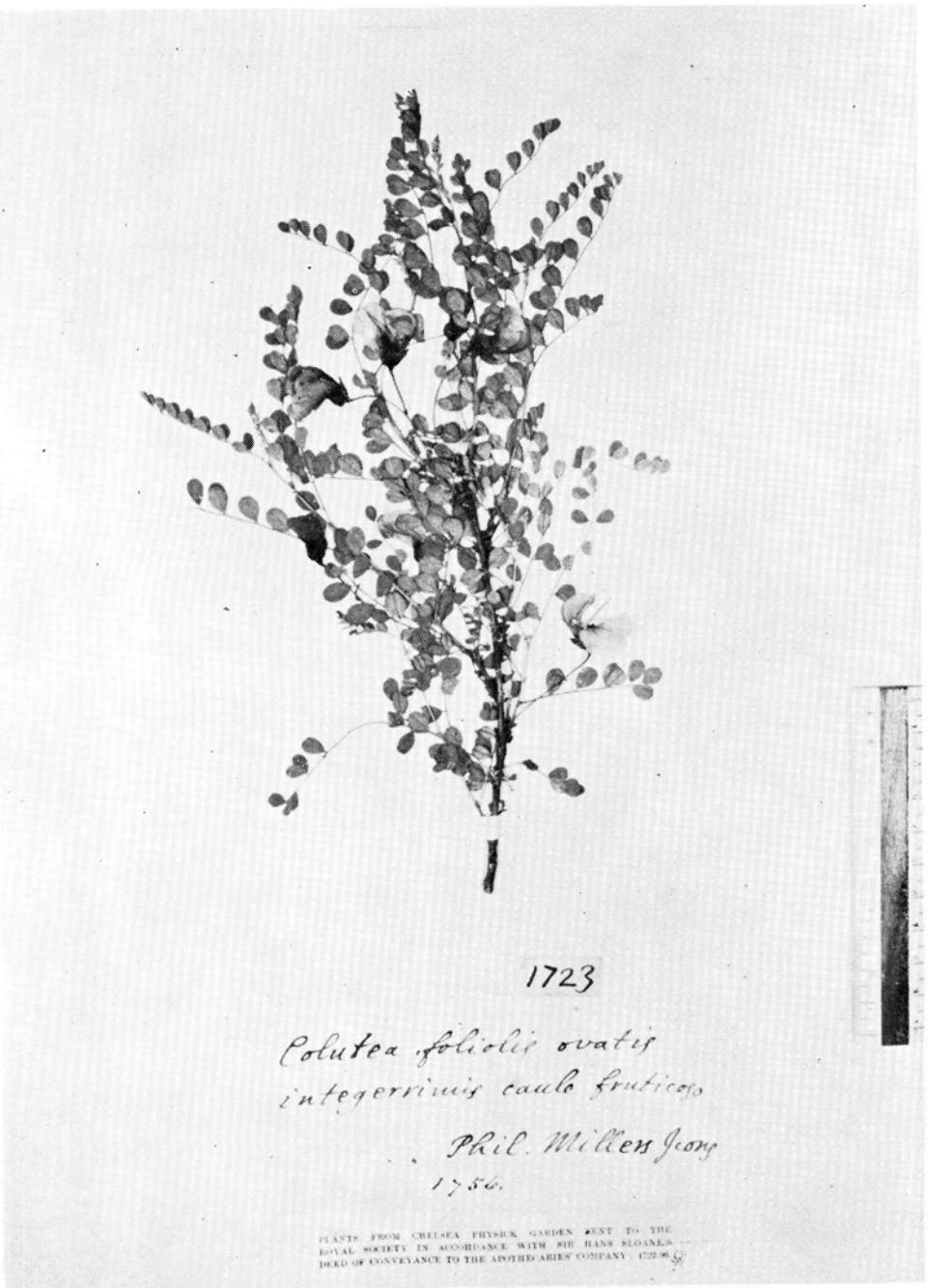
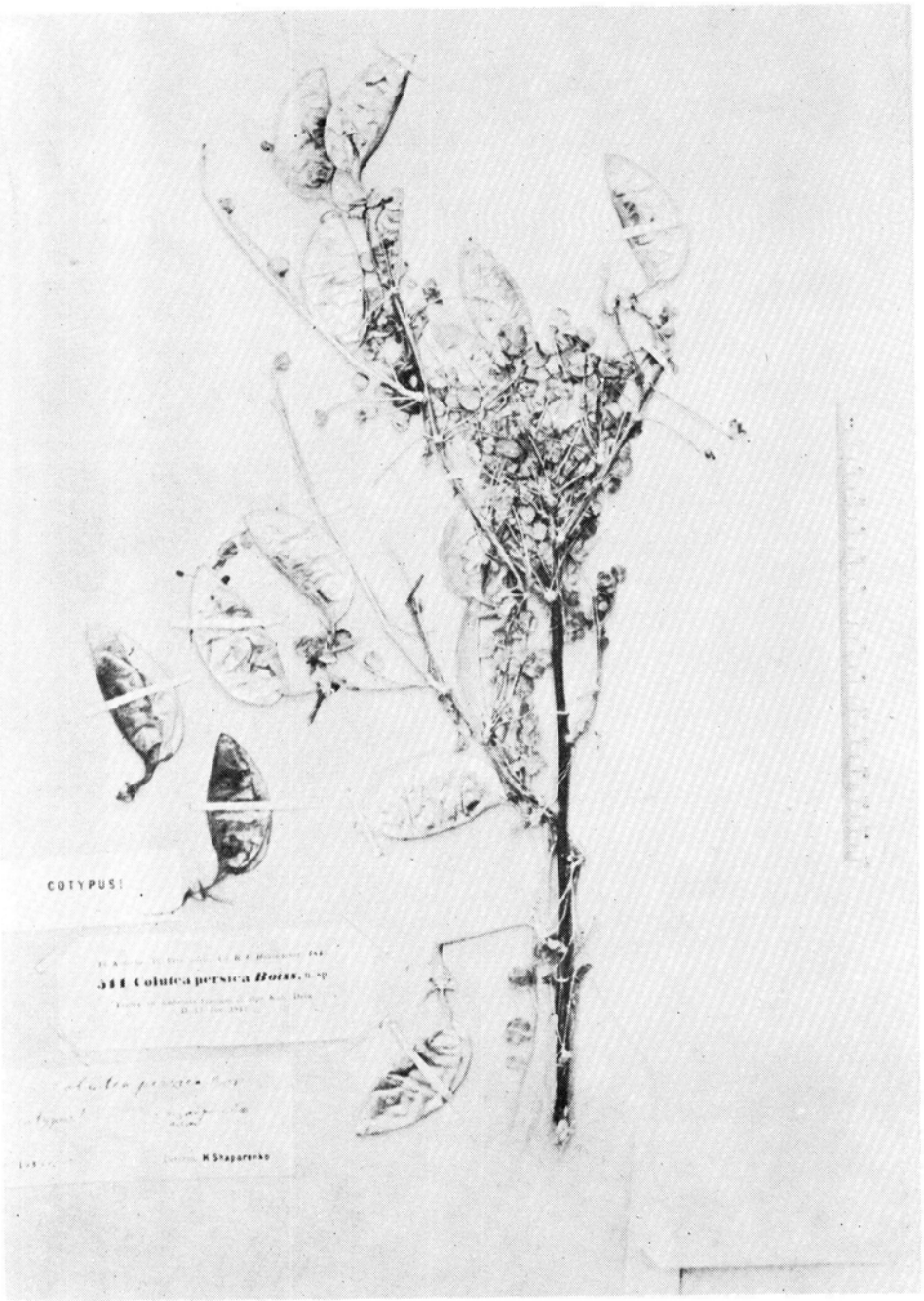


Colutea abyssinica var. *macrophysa* — type (Instituto Botanico, Firenze)

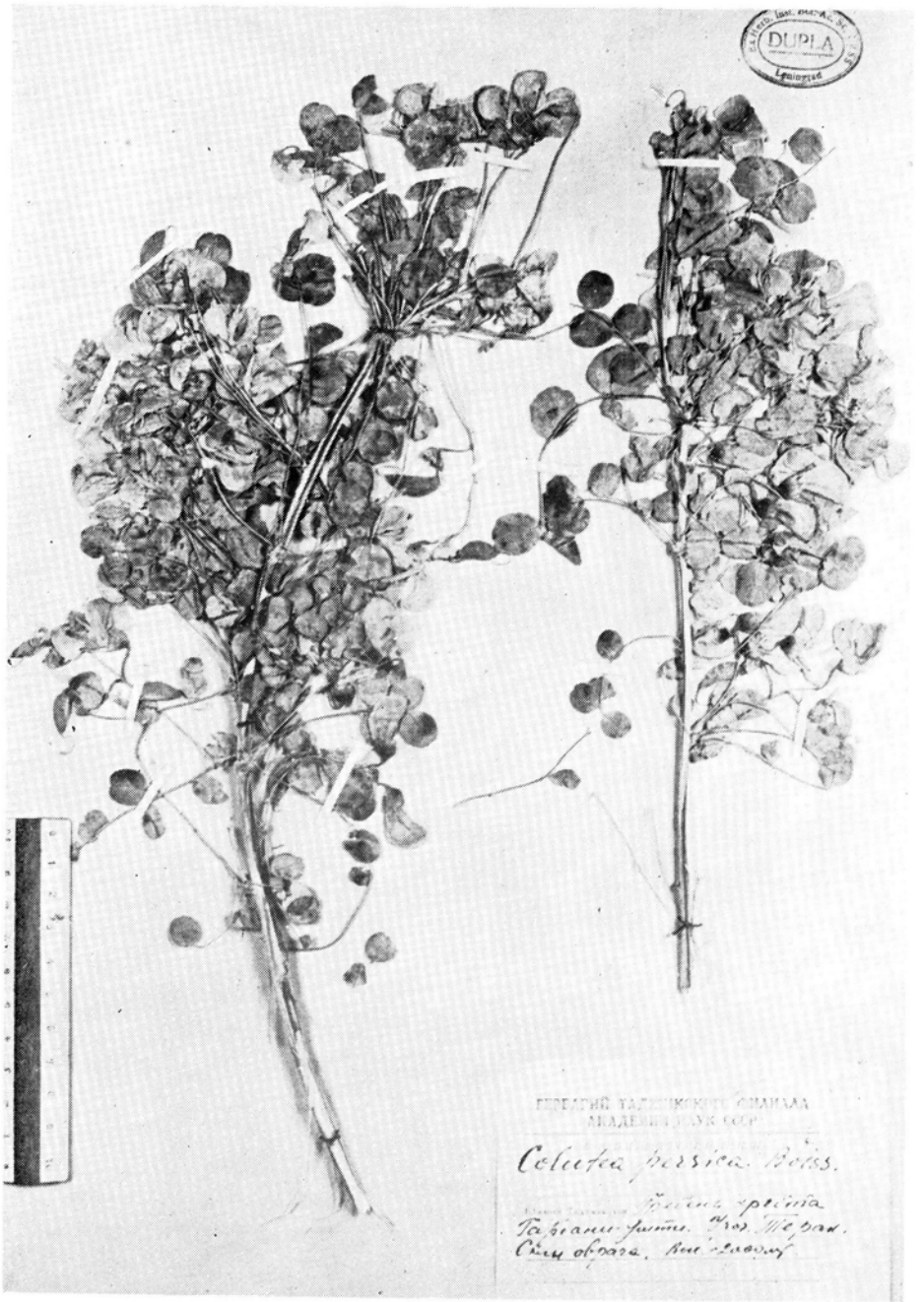


Colutea istria from Chelsea Physic Garden (British Museum, London)

Colutea gracilis — isotype (Institutum Botanicum Universitatis Carolinae, Praha)



Colutea persica — paratype (Botanical Institute, Leningrad)



Colutea hybrida (Botanical Institute, Leningrad)

Colutea multiflora — paratype (Royal Botanic Garden, Edinburgh)

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Colutea delavayi — paratype (Muséum National d'Histoire Naturelle, Paris)

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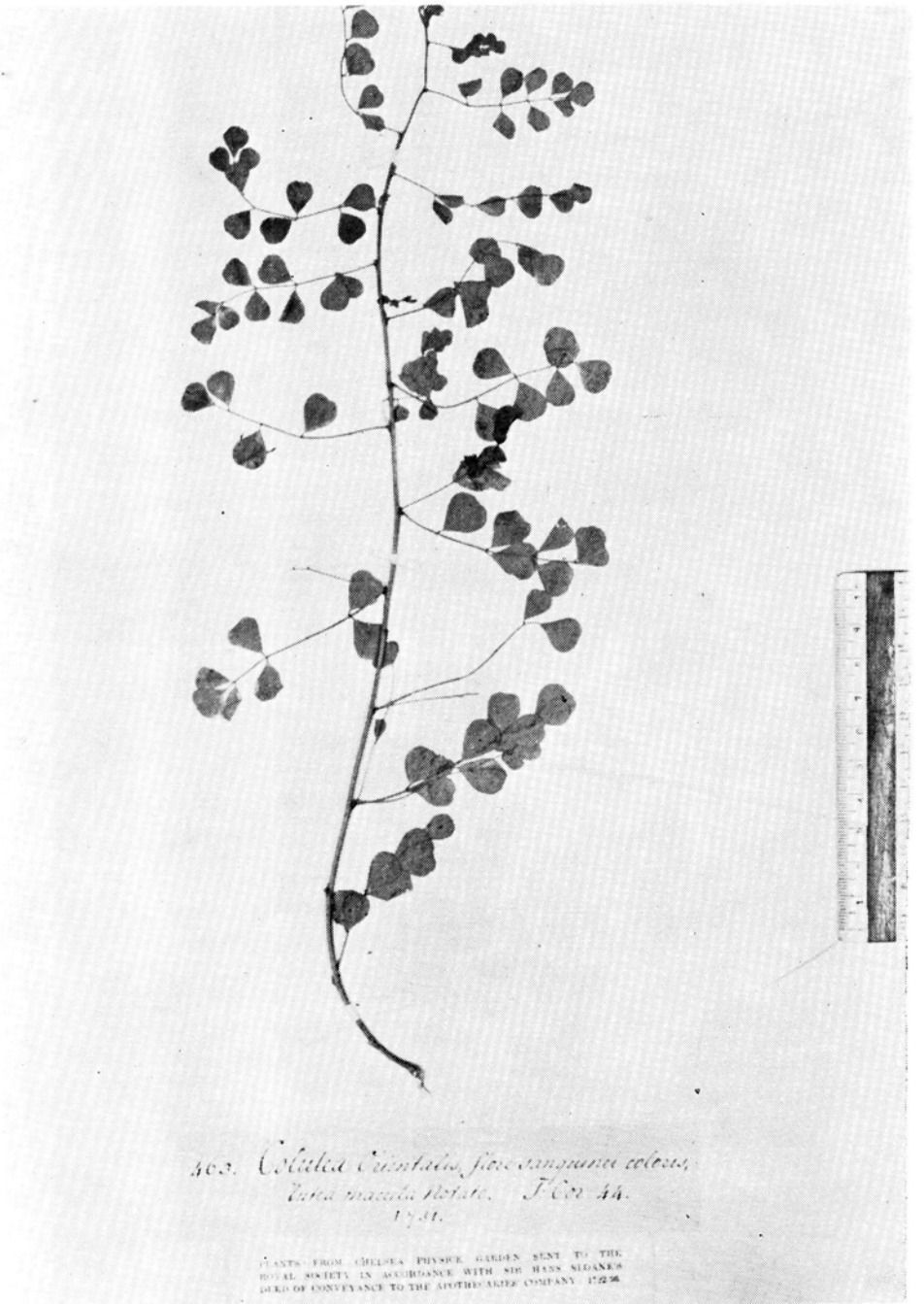

Colutea orientalis from Chelsea Physic Garden (British Museum, London)

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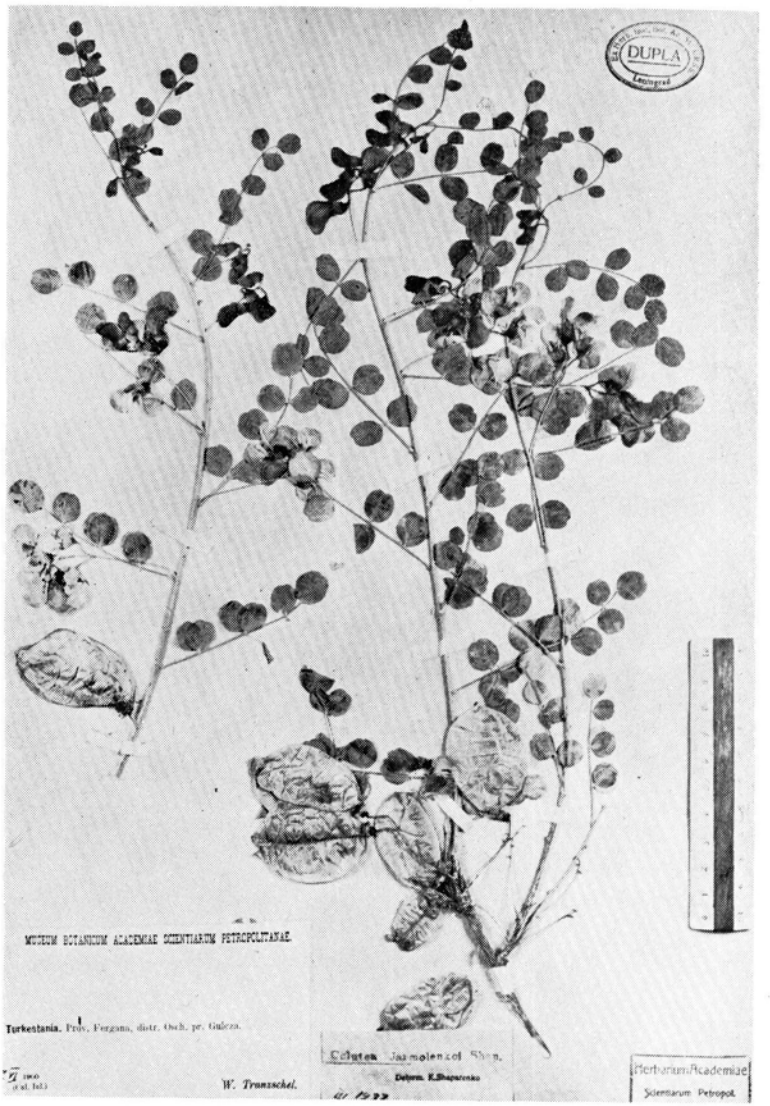

Colutea jarmolenkoi (Botanical Institute, Leningrad)

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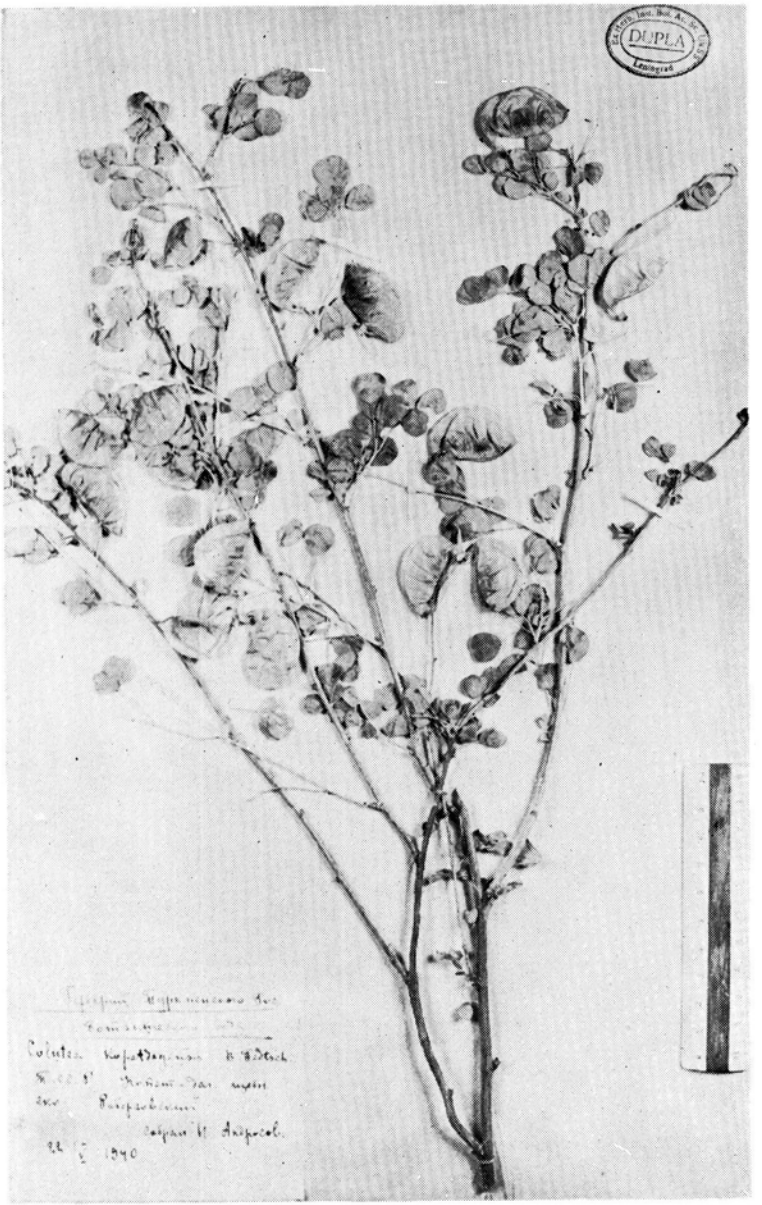
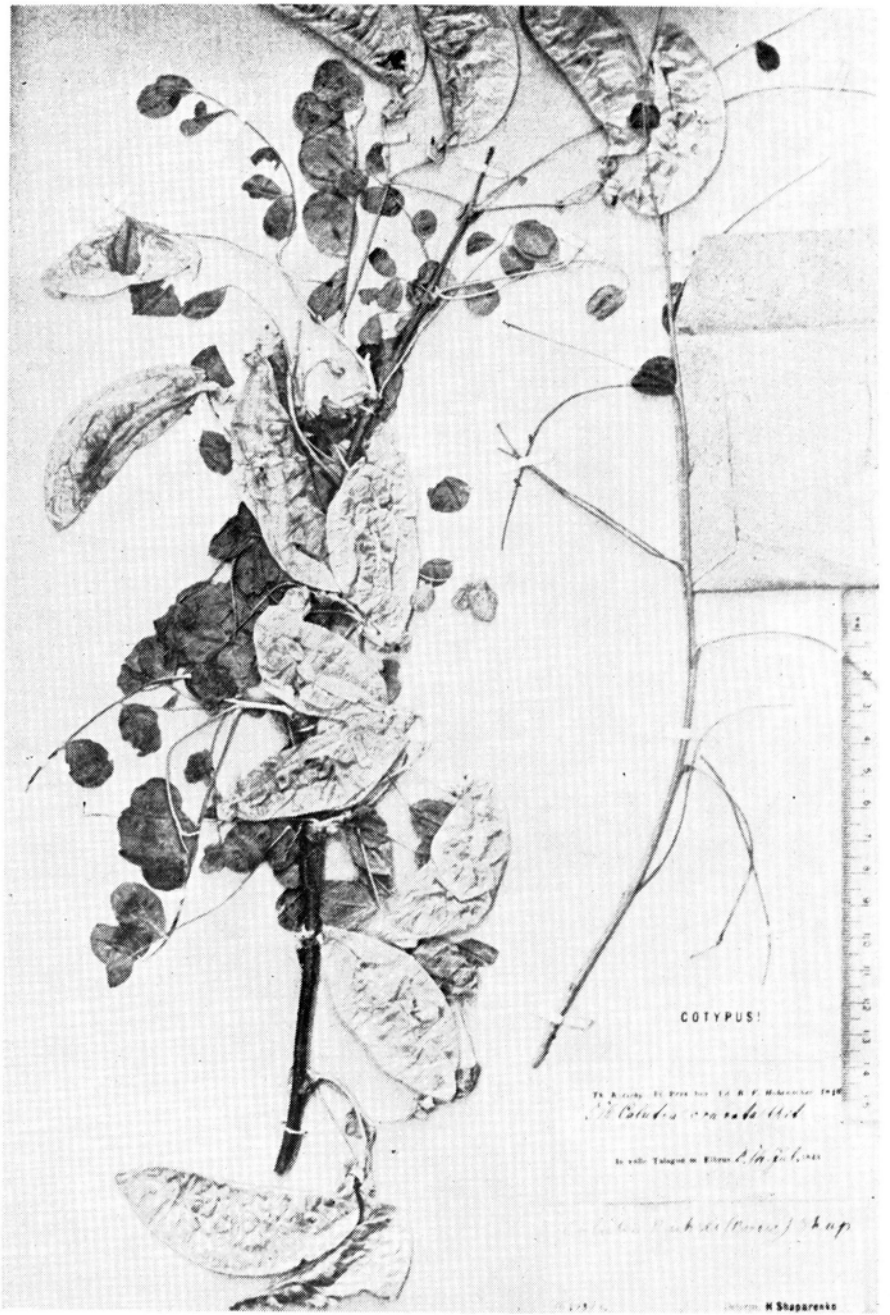


Colutea atabajevii (Botanical Institute, Leningrad)



Colutca buhsei — paratype (Botanical Institute, Leningrad)

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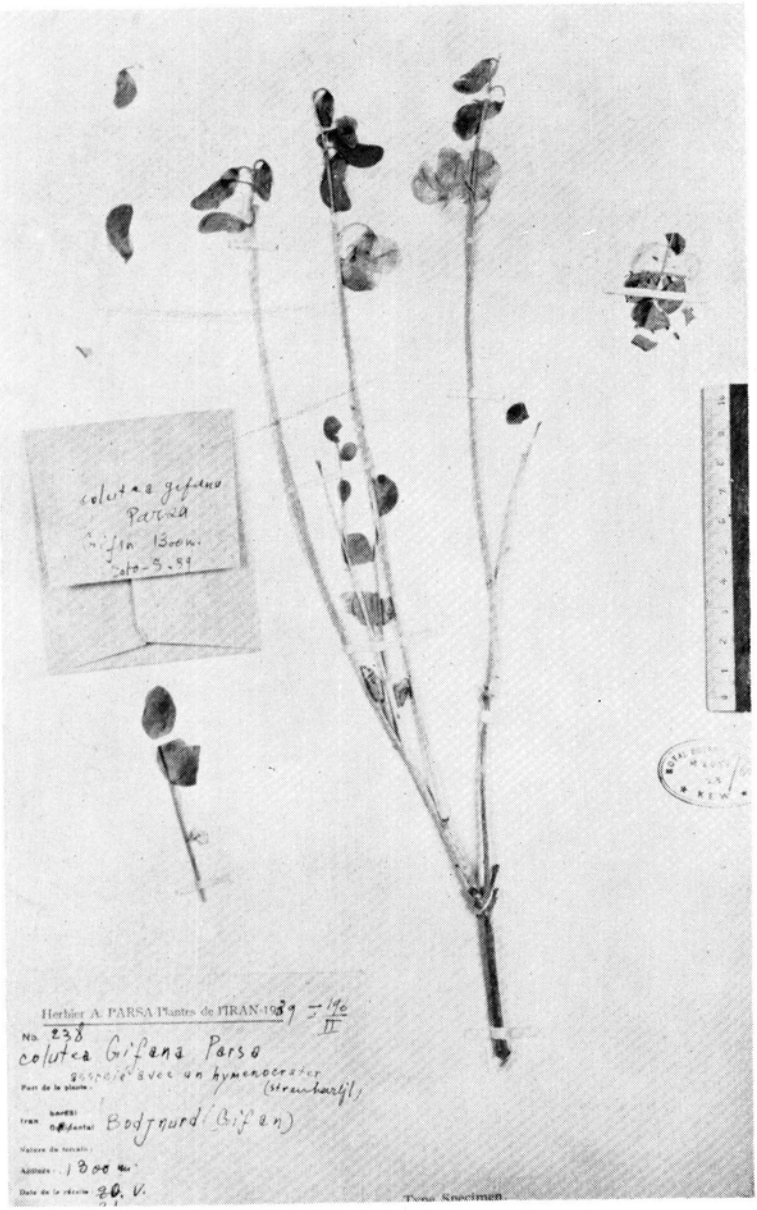
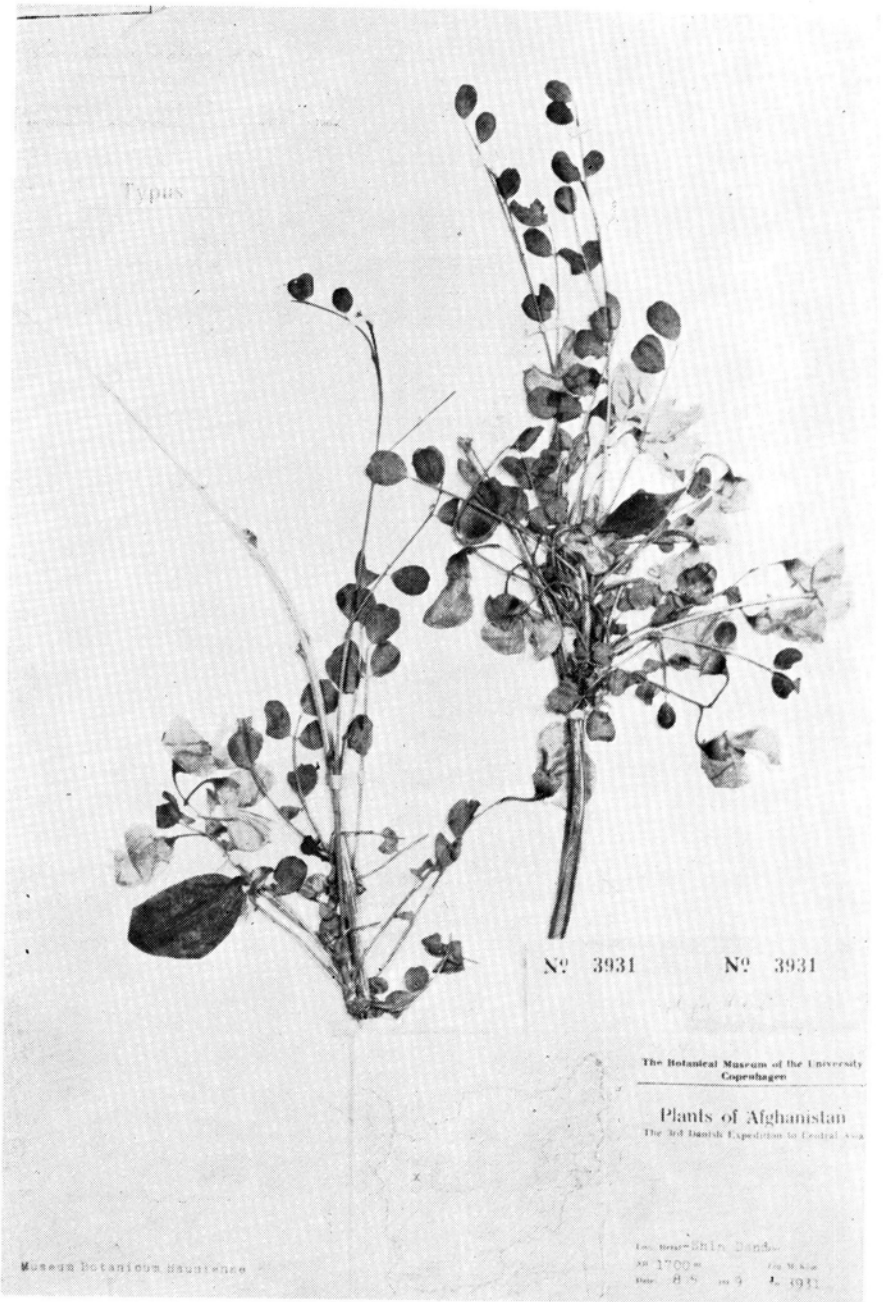
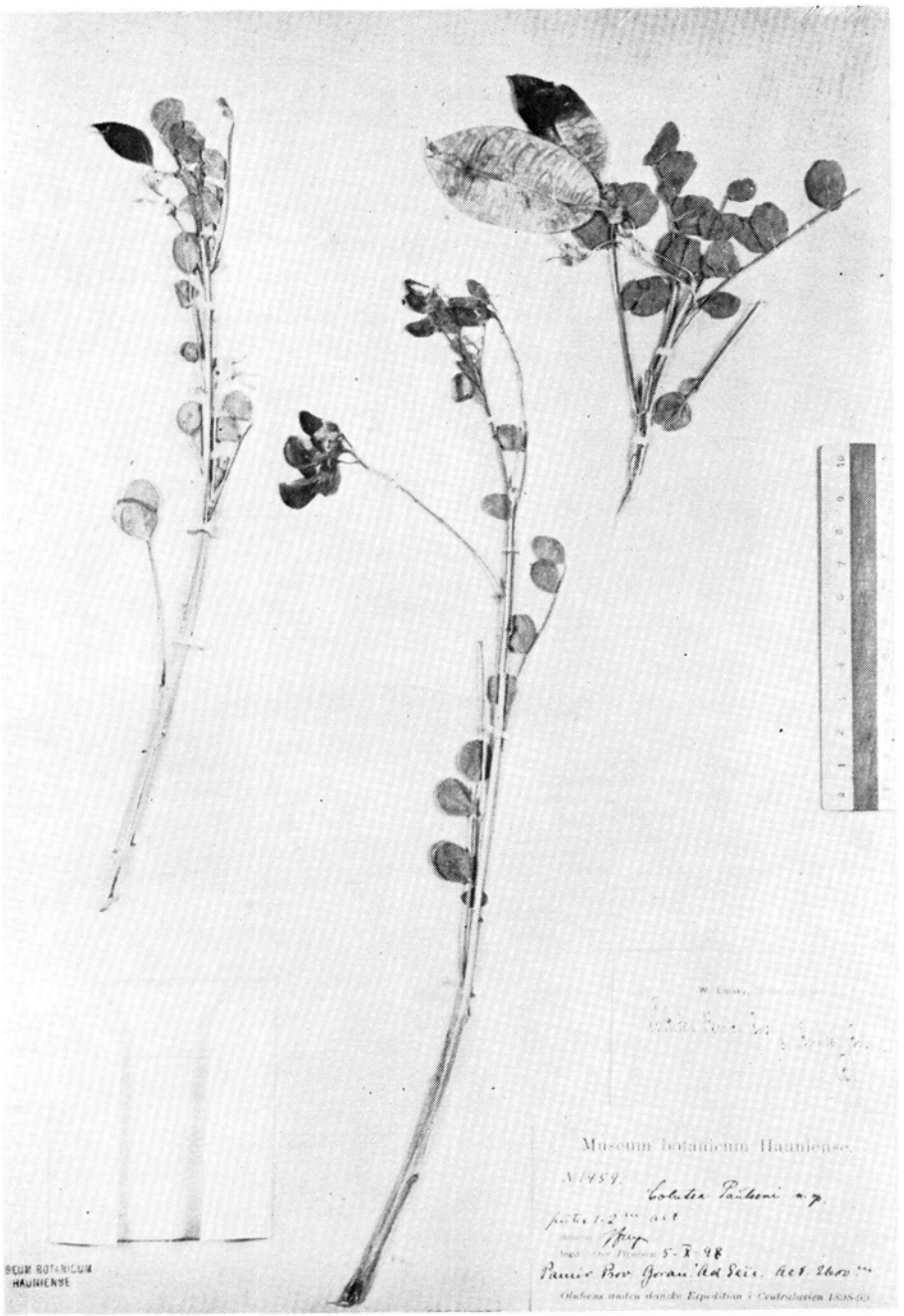


Colutea gifana — holotype (Royal Botanic Gardens, Kew)



Colutea afghanica — type specimen (Botanical Museum and Herbarium, Copenhagen)



Colutea paulsenii — holotype (Botanical Museum and Herbarium, Copenhagen)

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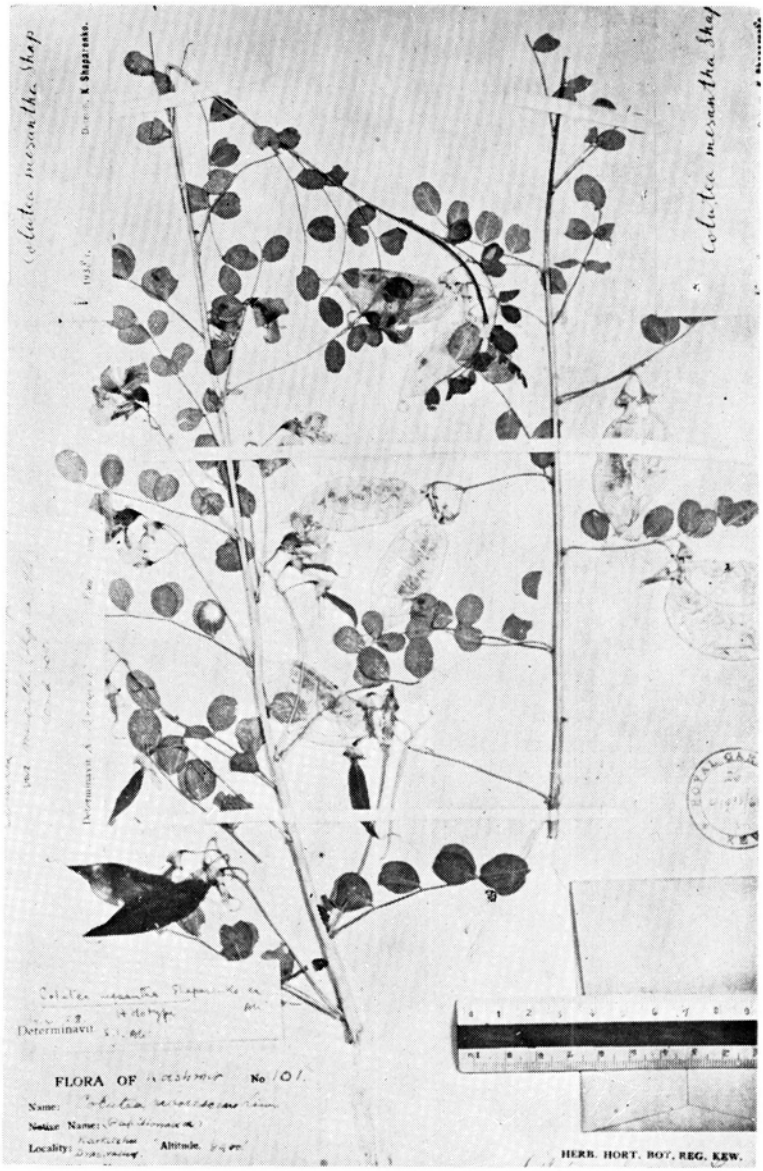

Colutea paulsenii var. *mesantha* — type (Royal Botanic Gardens, Kew)

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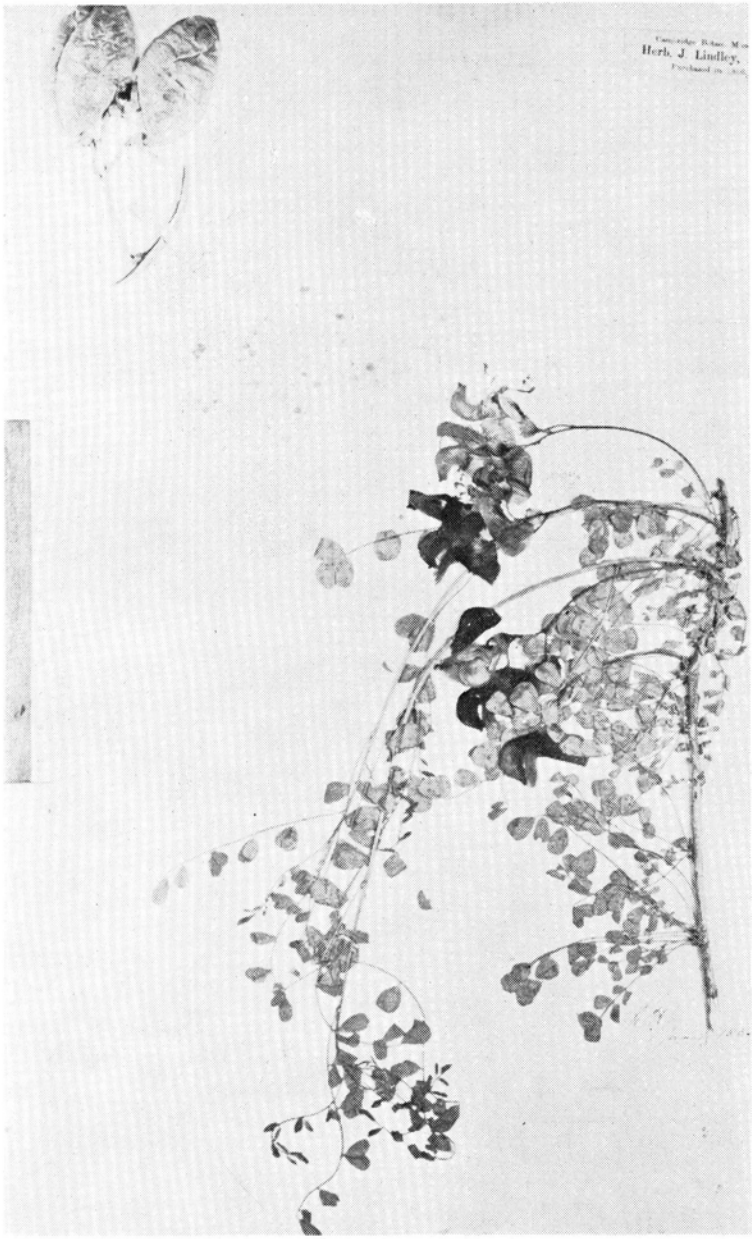


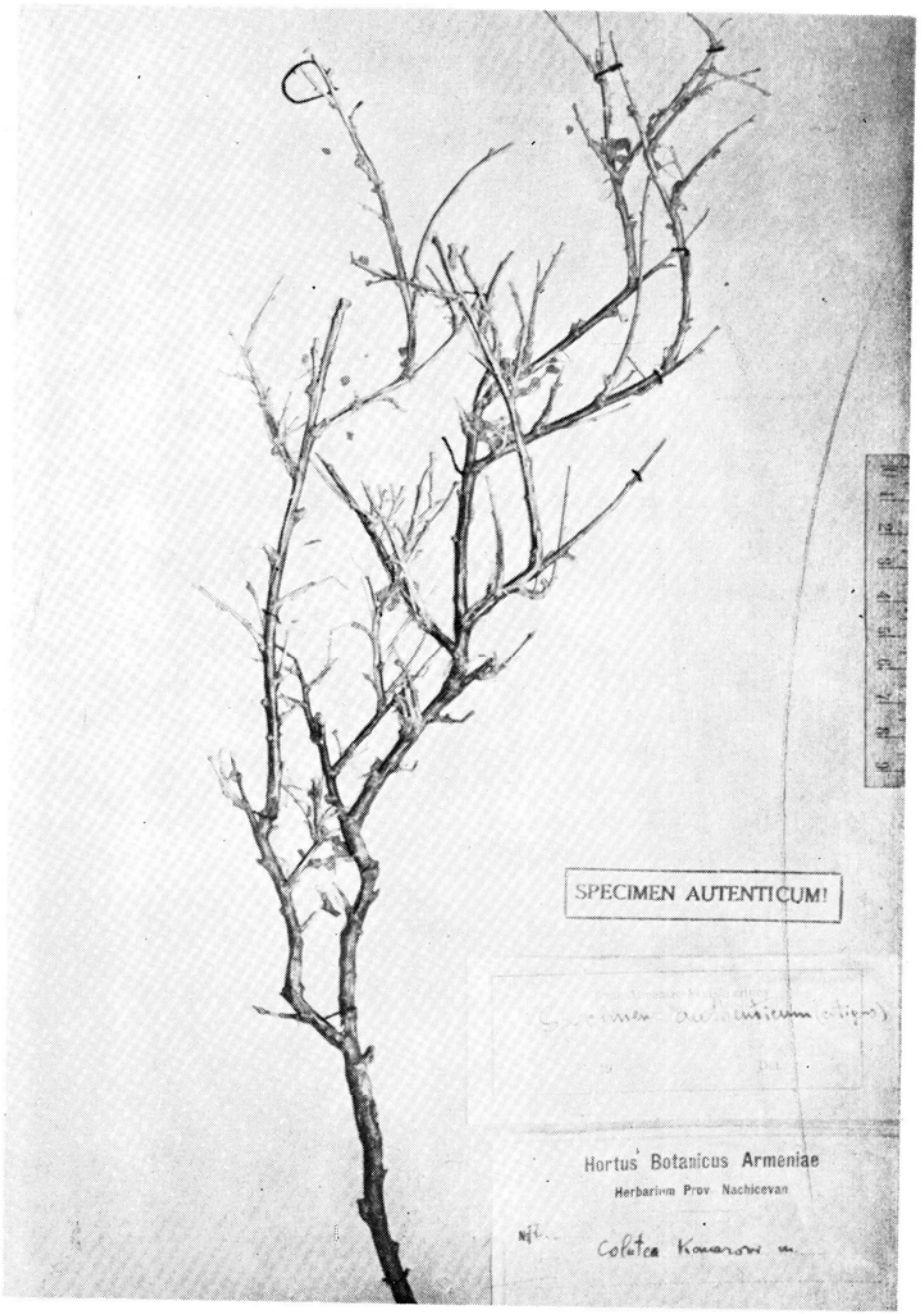
Colutea nepalensis — neotype (Botany School, University of Cambridge)

Plate XXVI

Colutea uniflora — topotype (Botanisches Institut, Wien)

Plate XXVII

Colutea armata — paratype (Royal Botanic Garden, Edinburgh)



Colutea komarovii — istotype (Botanical Institute, Erevan)