

# Assessing the contribution of genebanks: the case of the UPM seed bank in Madrid

**C. Gómez-Campo**

Dept. Biología Vegetal, Universidad Politécnica de Madrid, Ciudad Universitaria s/n, E-28040, Madrid, Spain.  
E-mail: gomezcampo@terra.es

## Summary

### Assessing the contribution of genebanks: the case of the UPM seed bank in Madrid

Through a combination of methods, the contribution of seed material distributed from the UPM (Madrid, Spain) seed bank for basic or applied research on a worldwide basis over 40 years is estimated.

## Résumé

## Resumen

**Key words:** [AUTHOR TO PROVIDE KEYWORDS]

## Introduction

Genebanks are usually established to fulfil two major objectives. Firstly, to avoid—or at least minimize—genetic erosion, i.e. the loss of valuable plant material at any level: genotypes, varieties, species, etc. Secondly, they are expected to make their material available to others for scientific or applied research or for other purposes. How these objectives are accomplished with the passing of time is usually very difficult to assess because feedback is either lacking, incomplete or dispersed. An accurate record of the destinations where seed accessions were sent is important, but not enough, because it is the use of these accessions afterwards that really matters. Though inquiries or questionnaires to the users might appear to be the correct follow-up method, many difficulties may arise because of the time elapsed between the reception, the use of the material and the publication of the results. Also, there may be changes in the staff to whom the material was originally sent, or in the lines of research, all resulting in imperfect or fragmentary information.

## Activities of the UPM Genebank

Some essential characteristics of the UPM (Universidad Politécnica de Madrid) Genebank make this assessment possible. It is a small bank (4000 accessions preserved), with two well defined objectives: (1) wild crucifers, including relatives of crops belonging to the genera *Brassica*, *Sinapis*, *Raphanus*, *Eruca*, etc.; and (2) rare, threatened or endemic species of any family from the west Mediterranean area. It was started in 1966 to keep a small collection of Cruciferae seeds that had been left over from a previous experiment [72] and has steadily grown as the result of a large number of collecting missions. Seeds are kept in flame-sealed glass vials, with silica gel to ensure low moisture content. More recently, other possibilities to adapt this method to crop species have been explored (see [www.seedcontainers.net](http://www.seedcontainers.net)). From 1969,

several editions of a catalogue, both specialist Cruciferae and a general catalogue, have been distributed (see [www.etsia.upm.es/DEPARTAMENTOS/biologia/index.asp](http://www.etsia.upm.es/DEPARTAMENTOS/biologia/index.asp)) to interested specialists. In 1973, the bank extended its scope to include rare or endemic species. In 1983, it was designated as the Global Base Collection for Wild Crucifers by IBPGR (later IPGRI, and now Bioversity International). In 1994, it was honoured with the National Award for the Environment by the Government of Spain, and other important awards have followed.

Highly encouraging germination results have been obtained in several intermediate assessments [60; 186; 245], and recent evaluations after removing dormancy indicate average viability rates very close to 100% after four decades [219]. The level of duplication in other banks is high: 90% for the Crucifer collection and 50% for the collection of rare plants.

Since 1966, the combination of the double specialization of the bank (Cruciferae + rare species) and the scientific staff closely associated with it, working very persistently in related lines, have made it easy to follow the relevant bibliography and to relate it with previously recorded data on seed distribution. The receipt of reprints, the acknowledgement of the origin of the seeds that most papers include and, in some cases, direct testimony by the users, have helped this follow-up. In particular the cruciferous material has been extensively used, and therefore considerable information could be obtained. In contrast, the use of the collection of endemic species has been more limited since its main orientation is towards conservation itself, and has therefore been managed as a kind of 'black-box' collection.

In relation to the first objective, that of avoiding losses of plant material in the field (genetic erosion), the UPM genebank collected and multiplied seeds of *Diploaxis siettiana* in 1974. This was a few years before this limited endemic endangered species completely disappeared from its natural habitat on the Island of Alborán (southern Spain), thus saving this plant

Table 1. Intended use of samples supplied from the UPM Genebank. Numbers refer to the relevant information sources in the bibliography.

Area of interest	Reference
Anatomy	27, 30, 53, 70, 71, 75, 149, 166, 214.
Breeding	42, 43, 177, 190.
Cancer research	62, 66, 192.
Chemosystematics	1–5, 90, 251–260, 282, 283, 300.
Chloroplast DNA	113, 141, 142, 147, 153, 200, 203, 206, 208, 209, 216, 235, 296, 301, 302, 304, 307, 309, 311, 312.
Chorology	73, 77, 78, 142.
Conservation	31, 35, 98, 127, 261.
Cotyledons	76, 182.
Cryopreservation	92–95, 97, 98, 175, 220.
Cultivation	31.
Cytogenetics	7, 15, 34, 40, 42, 79, 80, 102, 103, 104, 109, 232, 265, 277, 280.
Fertility	18, 19, 22, 32, 54, 130, 134, 237, 238, 274.
Fertility restoration	22, 54, 130, 237, 238.
Flavonoids	1–5, 256–260.
Flowering	267.
Genetics	39, 51, 63, 81, 133, 134, 161, 216, 249.
Germplasm	35, 60, 86, 92, 93, 101, 121, 162, 186, 187, 219, 278.
Germination	8, 12, 55, 56, 91, 92, 175, 218–223, 226, 227, 229, 230, 245.
Glucosinolates	38, 62, 63, 66–69, 100, 107, 137, 150, 163–165, 194, 196, 199, 217.
Hybridization (sexual)	7, 14, 16–20, 24, 25, 102, 111–120, 131, 178, 190, 212, 243, 244, 247, 266, 268, 269, 270, 274, 284, 285, 287.
Intergeneric hybrids	7, 13, 14, 16–20, 24, 25, 28, 41, 102, 111–120, 129, 131, 135, 153, 202, 213, 244, 247, 269, 284, 285, 287, 291–294, 296, 297.
Interspecific hybrids	102, 115, 136, 178, 212, 243, 266, 268–270, 274.
<i>In vitro</i> culture	94–97, 119, 122–128, 168–172, 191, 285, 287, 290.
Isozymes	143, 154, 157, 245, 282, 283.
Male sterility	21, 22, 32, 33, 54, 130, 189, 236, 237, 238, 239.
Micropropagation	44, 96, 122, 125, 169, 171, 172.
Mitochondrial DNA	200, 235.
Morphology	6, 36, 45–49, 53, 75, 89, 99, 105, 121, 149, 167, 182.
Morphogenesis	26, 71, 263.
Molecular taxonomy and/or phylogeny	26, 29, 50, 64, 108, 110, 138, 140, 141, 144–148, 151–159, 173, 185, 202–211, 216, 233–235, 261, 275, 276, 301–309.
Pests and diseases	23, 37, 38, 52, 58, 59, 68, 193–195, 194–199, 215, 248, 262, 264, 289.
Photosynthesis	11, 247, 286, 298, 299.
Plant geography	139, 142, 143, 204
Plant physiology	11, 20, 72, 87, 247, 286, 288, 296–299.
Polyploids	142, 143, 161.
Proteins, peptides	1, 3, 202, 204, 207, 212, 252–255, 282, 283.
Seed morphology	5, 30.
Seed preservation	60, 91, 93, 101, 167, 175, 186, 219, 220, 245.
Seed physiology	8, 12, 55–57, 60, 65, 91–93, 98, 175, 186, 218–223, 228, 245.
Somatic hybridization	13, 28, 41, 129, 135, 136, 200, 213, 291–294, 296.
Taxonomy (classical)	9, 10, 61, 73, 74, 76, 82–85, 88, 106, 132, 160, 174, 176, 177, 179–181, 183, 211, 224, 225, 231, 232, 240–242, 250, 267, 271, 273, 279, 281.
Transgenesis	246, 288, 295, 310.
Variability	58, 77, 98, 126, 170, 174, 183, 279, 299, 306.
Wax	75.
Weed research	51, 55–57, 221, 272.
Wide hybridization	212, 284.
Wild relatives	1, 75, 155, 157, 158, 244.

from extinction. This episode and the re-introductions that followed are well known to conservationists, and provide a good example of the important role a genebank can play [86; 184; 188; 202]. The number of other endemic species with limited distribution preserved in the bank is considerable, and similar situations might occur in the future.

The second objective, that of ensuring the availability of the material, has also been fulfilled. Hundreds of packages with samples of viable Cruciferae seeds have been despatched in the past forty years, mostly to specialists. Around 35% of the references derive from the UPM team and can be identified by the names of Aguinalgalde, Clemente, Durán, Gómez-Campo, González-Benito, Hernández-Bermejo, Iriondo, Lázaro, Martín, Martínez-Laborde, Pérez-García, Sánchez-Yélamó and Sobrino-Vesperinas. Other recipients of our seed material (65%) are distributed over at least another 16 countries. Endemic species have also been distributed, although to a much lesser extent. The references listed below belong strictly to activities and investigations where material from our seed bank has played a role, whether major or minor. No indirectly related subjects—such as reports of collecting missions, data bases, sending of duplicates or investigations based on directly collected material—are considered, unless collected material entered the seed bank. Other uses, such as exhibits of rare or common species in botanical gardens have probably been very extensive, but are practically impossible to reflect. According to the information we managed to obtain, the seeds have been used for many different purposes, summarized in Table 1.

### Acknowledgements

The infrastructure provided by the Universidad Politécnica de Madrid (UPM), the continued support by the Instituto Nacional de Investigaciones Agrarias (INIA) and the more specific fundings by the Instituto Nacional para la Conservación de la Naturaleza (ICONA), Juan March Foundation, Comisión Interministerial de Ciencia y Tecnología (CICYT), the International Board of Plant Genetic Resources (IBPGR, later IPGRI, now Bioversity International), EU Mediterranean Special Protection Actions (MEDSPA) and Fondo para la Protección de la Naturaleza (FONDENA) are fully acknowledged. Thanks are also due to many users who directly helped to trace their own papers. Specially to S. Prakash and T. Nishio, who helped to trace some sets from India and Japan that were difficult to obtain. P. Ballesteros kindly contributed to improve the text.

### References

1. Aguinalgalde I, Gómez-Campo C, Sánchez-Yélamó MD. 1992. A chemosystematic survey on wild relatives of *Brassica oleracea* L. Botanical Journal of the Linnean Society 109:57–67.
2. Aguinalgalde I, Gómez-Campo C. 1984. The phylogenetic significance of flavonoids in *Crambe* L. (Cruciferae). Botanical Journal of the Linnean Society 89:277–288.
3. Aguinalgalde I, Sánchez-Yélamó MD, Sagarodsky T. 1991. Phytochemical diversity in *Brassica cretica* Lam. Botanika Chronika 10:667–672.
4. Aguinalgalde I. 1988. Flavonoids in *Brassica nigra* (L.) Koch, *B. oleracea* L., *B. campestris* L. and their natural amphidiploids. Botanical Magazine, Tokyo. 101:55–60.
5. Aguinalgalde I. 1993. Flavonoid glycosides in *Brassica oleracea* L. and some allied species. In: H Demiriz and Özhatay N. (editors). Proc. V OPTIMA Meeting. Istanbul, Turkey. pp. 453–457.
6. Agulló MA, Tortosa ME, Ceresuela JL, Ortiz JM. 1991. Seed morphology in several taxa of the subfamily Papilionoideae (Fabaceae). Botanika Chronika 10:651–660.
7. Ahuja I, Bhaskar PB, Banga SK, Banga SS. 2003. Synthesis and cytogenetic characterization of intergeneric hybrids of *Diplotaxis sifolia* with *Brassica rapa* and *B. juncea*. Plant Breeding 122:447–449.
8. Albert MJ, Iriondo JM, Pérez-García F. 2002. Effects of temperature and pretreatments on seed germination of nine semi-arid species from NE Spain. Israel Journal of Plant Sciences 50:103–112.
9. Al-Shehbaz IA. 1985. *Raphanus boissieri* (Cruciferae), a new species from the Middle East. Journal of the Arnold Arboretum 66:275–278.
10. Al-Shehbaz IA. 1989. Systematics and phylogeny of *Schizopetalon* (Brassicaceae) Harvard Papers on Botany 1:10–46.
11. Apel P. 1980. CO<sub>2</sub> compensation concentration and its O<sub>2</sub> dependence in *Moricandia spinosa* and *Moricandia moricandioides* (Cruciferae). Biochemie und Physiologie der Pflanzen 175:386–388.
12. Ayerbe L, Ceresuela JL. 1982. Germinación de especies endémicas españolas. Anales del Instituto Nacional Investigaciones Agrarias, Madrid 6:17–41.
13. Baldev A, Gaikwad K, Kirti PB, Mohapatra T, Prakash S, Chopra VL. 1998. Recombination between chloroplast genome of *Trachystoma ballii* and *Brassica juncea* following protoplast fusion. Molecular General Genetics 260:357–361.
14. Bang SW, Iida D, Kaneko Y, Matsuzawa Y. 1997. Production of new intergeneric hybrids between *Raphanus sativus* and *Brassica* wild species. Breeding Science 47:223–228.
15. Bang SW, Kaneko Y, Matsuzawa Y, Bang KS. 2002. Breeding of *Moricandia arvensis* monosomic chromosome addition lines (2n=19) of alloplasmic (*M. arvensis*) *Raphanus sativus*. Breeding Science 52:193–199.
16. Bang SW, Kaneko Y, Matsuzawa Y. 1996a. Production of intergeneric hybrids between *Raphanus* and *Sinapis* and the cytogenetics of their progenies. Breeding Science 46:45–51.
17. Bang SW, Kaneko Y, Matsuzawa Y. 1996b. Production of intergeneric hybrids between *Raphanus* and *Moricandia*. Plant Breeding 115: 385–390.
18. Bang SW, Kaneko Y, Matsuzawa Y. 2000. Cytogenetical stability and fertility of an intergeneric amphidiploid line synthesized from *Brassica fruticulosa* Cyr. ssp. *mauritanica* (Coss.) Maire. and *Raphanus sativus* L. Bulletin of the College of Agriculture Utsunomiya University 17(3):67–73.
19. Bang SW, Kaneko Y, Matsuzawa Y. 1998. Cytogenetical stability and fertility of an intergeneric amphidiploid line synthesized between *Brassica maurorum* Durieu. and *Raphanus sativus* L. Bulletin of the College of Agriculture Utsunomiya University 17(1):23–29.
20. Bang SW, Mizuno Y, Kaneko Y, Matsuzawa Y, Bang KS. 2003. Production of intergeneric hybrids between the C<sub>3</sub>-C<sub>4</sub> intermediate species *Diplotaxis tenuifolia* (L.) DC. and *Raphanus sativus* L. Breeding Science 53:231–236.
21. Banga SS, Banga SK, Bhaskar PB, Ahuja I, Payal B. 2003. Alloplasmic line of *Brassica napus* L. with *Erucastrum canariense* cytoplasm is male sterile. Proceedings of the 11th Rapeseed Congress, Copenhagen. 1:324–325.
22. Banga SS, Deol JS, Banga SK. 2003. Alloplasmic male-sterile *Brassica juncea* with *Enarthrocarpus lyratus* cytoplasm and the introgression of gene(s) for fertility restoration from cytoplasmic donor species. Theoretical and Applied Genetics 106:1390–1395.
23. Bansal VK, Tewari JP, Tewari I, Gómez-Campo C, Stringam GR. 1997. Genus *Eruca*: a potential source of white rust resistance in cultivated brassicas. Plant Genetic Resources Newsletter 109:25–26.

24. Batra V, Prakash S, Shivanna KR. 1990. Intergeneric hybridization between *Diplotaxis siifolia*, a wild species, and crop brassicas. *Theoretical and Applied Genetics* 80:537–541.
25. Batra V, Shivanna KR, Prakash S. 1989. Hybrids of wild species *Erucastrum gallicum* and crop brassicas. *Proceedings of the 6th International Congress of SABRAO*. pp. 443–446.
26. Baum DA., Yoon HS, Oldham RL. 2005. Molecular evolution of the transcription factor LEAFY in Brassicaceae. *Molecular Phylogenetics and Evolution* 37:1–14.
27. Beebe DU, Evert RF. 1990. The morphology and anatomy of the leaf of *Moricandia arvensis* (L.) DC. (Brassicaceae). *Botanical Gazette, Tokyo* 151(2):184–203.
28. Begum F, Paul S, Bag N, Sikdar SR, Sen SK. 1995. Somatic hybrids between *Brassica juncea* (L.) and *Diplotaxis harra* (Forsk.) Boiss. and the generation of backcross progenies. *Theoretical and Applied Genetics* 91:1167–1172.
29. Beilstein MA, Al-Sehbab IA, Kellog, EA. 2006. Brassicaceae phylogeny and trichome evolution. *American Journal of Botany* 93(4):607–619.
30. Bengochea G, Gómez-Campo C. 1975. Algunos caracteres de la semilla en la tribu Brassiceae. *Anales del Instituto Botánico A. J. Cavanilles* 32(2):793–841.
31. Bermúdez de Castro L, Gómez-Campo C, Santos A. 1990. Cultivo de especies vegetales endémicas. In JE Hernández-Bermejo, M Clemente and VH Heywood. (editors). *Conservation Techniques in Botanic Gardens. Proceedings of the International Conference on Conservation Techniques in Botanic Gardens, Cordoba, Spain, 10–14 May 1987*. Koeltz Scientific Books, Koenigstein, Germany. pp. 91–92.
32. Bhat SR, Prakash S, Kirti PB, Dineshkumar V, Chopra VL. 2005. A unique introgression from *Moricandia arvensis* confers male fertility to two different cytoplasmic male-sterile lines of *Brassica juncea*. *Plant Breeding* 124:117–120.
33. Bhat SR, Vijayan P, Ashutosh, Dwivedi KK, Prakash S. 2006. *Diplotaxis erucoides*-induced cytoplasmic male sterility in *Brassica juncea* is rescued by the *Moricandia arvensis* restorer: genetic and molecular analyses. *Plant Breeding* 125:150–155.
34. Blangiforti S, Venora G. 1997. Cytological studies on rocket species by means of image analysis system. In: S Padulosi and D Pignone (editors). *Rocket: a Mediterranean crop for the world*. IPGRI, Rome, Italy. pp. 36–40.
35. Boukema IW, Bas N, Thomas G, Stavropoulos N, Branca F, Díaz MJ, Van't Hoendal K. 2004. Evaluation, characterization and regeneration of *Brassica oleracea* germplasm collections in the EU GENRES CT99 109–112 project *Brassica*, including *B. carinata*. *Cruciferae Newsletter* 25:107–108.
36. Bowman JB, Brüggemann H, Lee J-Y, Mummenhoff K. 1999. Evolutionary changes in floral architecture within the genus *Lepidium* (Brassicaceae). *International Journal of Plant Sciences* 160:917–929.
37. Bradburne R, Majer D, Magrath R, Werner C, Lewis B, Mithen R. 1999. Winter oilseed rape with high levels of resistance to *Pyrenopeziza brassicae* derived from wild *Brassica* species. *Plant Pathology* 48:550–558.
38. Bradburne R, Mithen R. 2000. Glucosinolate genetics and the attraction of the aphid parasitoid *Diaeretiella brassicae* to *Brassica*. *Proceedings of the Royal Society of London, Biological Sciences* 267:89–95.
39. Brocard I. 1999. Etude de gènes s'exprimant spécifiquement dans le pétale jeune de colza: application à la création de colza apétale. Thèse, Université Paris-Sud, France.
40. Carriège MC, Martínez AJ. 1984. Números de cromosomas, I. *Parodiana* 3(1):113–128.
41. Chatterjee G, Sikdar SR, Das S, Sen SK. 1988. Intergeneric somatic hybrid production through protoplast fusion between *Brassica juncea* and *Diplotaxis muralis*. *Theoretical and Applied Genetics* 76:915–922.
42. Chevre AM, Eber F, Quirós CF, Delourme R. 1994. Creation and characterization of *Brassica napus* – *Diplotaxis erucoides* addition lines. *Cruciferae Newsletter* 16:28–29.
43. Chopra VL, Kirti PB, Prakash S. 1995. Accessing and exploiting genes of breeding value of distant relatives of crop brassicas. *Genetica* 97:305–312.
44. Clemente-Muñoz M, Contreras P, Susín J, Pliego-Alfaro F. 1991. Micropropagation of *Artemisia granatensis*. *Hortscience* 26(4):420.
45. Clemente-Muñoz M, Hernández-Bermejo, J.E. 1978. El aparato nectarígeno en la tribu Brassiceae (Cruciferae). *Anales Instituto Botánico A. J. Cavanilles* 35:279–296.
46. Clemente-Muñoz M, Hernández-Bermejo, J.E. 1978. La corola en la tribu Brassiceae (Cruciferae). *Anales Instituto Botánico A. J. Cavanilles* 35:297–334.
47. Clemente-Muñoz M, Hernández-Bermejo, J.E. 1980. El cáliz en la tribu Brassiceae (Cruciferae). *Anales Jardín Botánico de Madrid* 36:77–96.
48. Clemente-Muñoz M. 1977. Las piezas estériles de la flor en la tribu Brassiceae (Cruciferae): su valor taxonómico. Tesis Doctoral. Universidad Politécnica de Madrid. 378 p.
49. Clemente-Muñoz M. 1980. Caracteres morfotaxonómicos de la tribu Brassiceae. *Monografías de la Escuela T. S. de Ingenieros Agrónomos, Madrid* 40:1–70.
50. Crespo MB, Lledó MD, Fay MF, Chase MW. 2000. Subtribe Vellinae (Brassicaceae, Brassicaceae): a combined analysis of ITS nrDNA sequences and morphological data. *Annals of Botany* 86:53–62.
51. Crouch JH, Lewis BG, Lydiat DJ, Mithen R. 1995. Genetic diversity of wild, weedy and cultivated forms of *Brassica rapa*. *Heredity* 74:491–496.
52. Crouch JH, Lewis BG, Mithen RF. 1994. The effect of a genome substitution on the resistance of *Brassica napus* to infection by *Leptosphaeria maculans*. *Plant Breeding* 112:265–278.
53. De Leonardi W, De Santis C, Fichera G. 2002. Seed and pollen study of taxa belonging to the genus *Eruca* Miller in relation to some characters present in species of the genus *Diplotaxis* DC. *Taeckholmia* 22(2):177–187.
54. Deol JS, Shivanna KR, Prakash S, Banga SS. 2003. *Enarthrocarpus lyratus*-based cytoplasmic male sterility and fertility restorer system in *Brassica rapa*. *Plant Breeding* 122:438–440.
55. Durán JM, Martín I, Risueño MT, Pita JM. 1984. Effect of light and temperature on the germination of *Amaranthus* spp. seeds. *Proceedings of the EWRS 3rd. Symposium on Weed Problems in the Mediterranean Area*. pp. 56–72.
56. Durán JM, Tortosa ME. 1985. The effect of mechanical and chemical scarification on germination of charlock (*Sinapis arvensis* L.) seeds. *Seed Science and Technology* 13:155–163.
57. Durán JM. 1980. Mecanismos de dormición en mostaza silvestre (*Sinapis arvensis* L.). Tesis Doctoral. Universidad Politécnica de Madrid. 400 p.
58. Ellis PR, Kift NB, Pink DAC, Jukes PL, Lynn J, Tatchell GM. 2000. Variation in resistance to the cabbage aphid (*Brevicoryne brassicae*) between and within wild and cultivated *Brassica* species. *Genetic Resources and Crop Evolution* 47:391–401.
59. Ellis PR, Pink DAC, Barber NE, Mead A. 1999. Identification of high levels of resistance to cabbage root fly, *Delia radicum*, in wild *Brassica* species. *Euphytica* 110:207–214.
60. Ellis RH, Hong TD, Martín MC, Pérez-García F, Gómez-Campo C. 1993. The long-term storage of seeds of seventeen crucifers at very low moisture contents. *Plant Varieties and Seeds* 6:75–81.
61. Eschmann-Grube G, Hurka H, Neuffer B. 2003. Species relationships within *Diplotaxis* (Brassicaceae) and the phylogenetic origin of *D. muralis*. *Plant Systematics and Evolution* 243:13–29.
62. Faulkner K, Mithen R, Williamson G. 1998. Selective increase of the potential anticarcinogen 4-methyl-sulphanyl-butyl glucosinolate in broccoli. *Carcinogenesis* 19:605–609.
63. Field B, Wilkinson A, Furniss C, Mithen R. 2006. Expression of a *Brassica* isopropylmalate synthase gene in *Arabidopsis* perturbs both glucosinolate and amino acid biosynthesis. *Plant Molecular Biology* 60(5):717–727.
64. Francisco-Ortega J, Fuertes-Aguilar J, Gómez-Campo C, Santos-Guerra A, Jansen RK. 1999. Internal transcribed spacer sequence phylogeny of *Crambe* L. (Brassicaceae): molecular data reveal two Old World disjunctions. *Molecular Phylogenetics and Evolution* 11:361–380.
65. Gallardo F. 1981. Mecanismos de dormición en semillas de *Conringia orientalis* L. Tesis de Licenciatura. Fac. de Ciencias Biológicas, Universidad Complutense, Madrid, Spain. 186 p.

66. Gasper A, Al-Janobi A, Smith J, Bacon J, Fortun P, Atherton C, Taylor M, Hawkey CJ, Barrett D, Mithen R. 2005. Glutathione S-transferase M1 polymorphism and metabolism from standard and high glucosinolate broccoli. *American Journal of Clinical Nutrition* 82:1283–1291.
67. Giamoustaris A, Mithen R. 1996. Genetics of aliphatic glucosinolates. IV. Side chain modification in *Brassica oleracea*. *Theoretical and Applied Genetics* 93:1006–1010.
68. Giamoustaris A, Mithen R. 1997. Glucosinolates and disease resistance in oilseed rape (*Brassica napus* ssp. *oleifera*). *Plant Pathology* 46:271–275
69. Giamoustaris A, Mithen RF. 1995. The effect of modifying the glucosinolate content of leaves of oilseed rape (*Brassica napus* ssp. *oleifera*) on its interaction with specialist and generalist pests. *Annals of Applied Biology* 12:347–363.
70. Giberti GC. 1984. Heteroarthrocarpy in *Trachystoma* and *Ceratocnenum* (Cruciferae) from Morocco. *Webbia* 38:705–708.
71. Giberti GC. 1984. Morfología y modo de crecimiento del fruto en los géneros *Trachystoma* O.E.Schulz y *Ceratocnenum* Coss. & Bal. *Anales del Jardín Botánico de Madrid* 41(1):59–89.
72. Gómez-Campo C, Delgado, L. 1964. Radioresistance in crucifers. *Radiation Botany* 4:479–483.
73. Gómez-Campo C, Herranz-Sanz JM, Montero-Riquelme F. 2001. The genus *Coincya* Rouy (Cruciferae) in S.C. Spain revisited: morphometric analysis of population structure. *Botanical Journal of the Linnean Society* 135:125–135.
74. Gómez-Campo C, Martínez Laborde J. 1998. Reajustes taxonómicos y nomenclaturales en la tribu Brassiceae (Cruciferae). *Anales del Jardín Botánico de Madrid* 56(2):379–381.
75. Gómez-Campo C, Tortosa ME, Tewari I, Tewari JP. 1999. Epicuticular wax columns in cultivated *Brassica* species and in their close wild relatives. *Annals of Botany* 83(5):515–519.
76. Gómez-Campo C, Tortosa ME. 1974. The taxonomic and evolutionary significance of some juvenile characters in the tribe Brassiceae (Cruciferae). *Botanical Journal of the Linnean Society* 69:105–124.
77. Gómez-Campo C. 1977. Clinal variation and evolution in the *Hutera-Rhynchosinapis* complex of the Sierra Morena (south-central Spain). *Botanical Journal of the Linnean Society* 75(2):119–140.
78. Gómez-Campo C. 1978. Studies on Cruciferae: IV. Chorological notes. *Anales del Jardín Botánico de Madrid* 34:485–496.
79. Gómez-Campo C. 1980. Cruciferae. In: A. Löve (editor). *Chromosome Number Reports LXVII*. *Taxon* 29:350.
80. Gómez-Campo C. 1980. Studies on Cruciferae: V. Chromosome numbers of twenty-five taxa. *Anales del Instituto Botánico A. J. de Cavanilles* 35:177–182.
81. Gómez-Campo C. 1980. Studies on Cruciferae: VII. A leaf shape mutant in *Brassica nigra* (L.) Koch. *Anales del Instituto Botánico A. J. de Cavanilles* 36:115–118.
82. Gómez-Campo C. 1981. Taxonomic and evolutionary relationships in the genus *Vella* L. (Cruciferae). *Botanical Journal of the Linnean Society* 82:165–179.
83. Gómez-Campo C. 1982. Studies on Cruciferae: IX. *Erucastrum rufanum* (Emb. & Maire) Gómez-Campo comb. nov. *Anales del Jardín Botánico de Madrid* 38:352–356.
84. Gómez-Campo C. 1983. Studies on Cruciferae: X. Concerning some west Mediterranean species of *Erucastrum*. *Anales del Jardín Botánico de Madrid* 40:63–72.
85. Gómez-Campo C. 1984. Studies on Cruciferae: XI. *Erucastrum ifniense* Gómez-Campo sp. nov. and its allies. *Anales del Jardín Botánico de Madrid* 41:83–85.
86. Gómez-Campo C. 1990. A germ plasm collection of crucifers. 9th edition. *Monografías Instituto Nacional de Investigaciones Agrarias, Madrid* 22:1–55.
87. Gómez-Campo C. 2000. Comparative resistance to frost and drought of thirty perennial *Sedum* species. *Botanika Chronika* 13:437–440.
88. Gómez-Campo C. 2000. *Erucastrum varium* (Durieu) Durieu en Marruecos, Argelia y Túnez. *Candollea* 55:179–185.
89. Gómez-Campo C. 2003. Morphological characterisation of wild *Eruca vesicaria* (Cruciferae) germplasm. *Bocconea* 16(2):615–624.
90. González-Andrés F, Ceresuela JL 1998. Chemical composition of some Iberian Mediterranean leguminous shrubs potentially useful for forage in seasonally dry areas. *New Zealand Journal of Agricultural Research* 41:139–147.
91. González-Benito ME, Albert MJ, Iriondo JM, Varela F, Pérez-García F. 2004. Seed germination of four thyme species after short-term preservation at low temperatures at several moisture contents. *Seed Science and Technology* 32:247–254.
92. González-Benito ME, Fernández-Llorente F, Pérez-García F. 1998. Interaction between cryopreservation, rewarming rate and seed humidification on the germination of two Spanish endemic species. *Annals of Botany* 82:683–686.
93. González-Benito ME, Iriondo JM, Pérez-García F. 1998. Seed cryopreservation: an alternative method for the conservation of Spanish endemics. *Seed Science and Technology* 26:257–262.
94. González-Benito ME, Núñez-Moreno Y, Martín C. 1998. A protocol to cryopreserve nodal explants of *Antirrhinum microphyllum* by encapsulation-dehydration. *CryoLetters* 19:225–230.
95. González-Benito ME, Pérez C. 1994. Studies on the cryopreservation of nodal explants of *Centaureum rigualii* Esteve, a threatened endemic species, through vitrification. *Botanic Gardens Micropropagation News* 1:82–84.
96. González-Benito ME, Tapia J, Rodríguez N, Iriondo JM. 1996. Micropropagation of commercial and wild genotypes of snapdragon (*Antirrhinum* spp.). *Journal of Horticultural Science* 71:11–15.
97. González-Benito ME, Viviani AB, Pérez C. 1997. Cryopreservation of nodal explants of an endangered plant species (*Centaureum rigualii* Esteve) using the encapsulation-dehydration method. *Biodiversity and Conservation* 6:583–590.
98. González-Benito ME. 1998. Cryopreservation as a tool for preserving genetic variability: Its use with Spanish wild species with possible landscaping value. *Acta Horticulturae* 457:133–142.
99. Hakki MI. 1974. Embryologische und morphologische beobachtungen an *Succowia balearica* (L.) Medik. (Brassicaceae). *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 94(3):360–382.
100. Hall C, McCallum D, Prescott A, Mithen R. 2001. Biochemical genetics of glucosinolate modification in *Arabidopsis* and *Brassica*. *Theoretical and Applied Genetics* 102:369–374.
101. Hammer K, Knüpfer H, Laghetti G, Perrino P. 1992. Seeds from the past. A catalogue of crop germplasm in S. Italy and Sicily. CNR, Istituto del Germoplasma, Bari, Italy. 173 p.
102. Harberd DJ, McArthur ED. 1980. Meiotic analysis of some species and genus hybrids in the Brassiceae. In: S Tsunoda, K Hinata and C Gómez-Campo (editors). *Brassica* crops and wild allies. *Japan Scientific Society Press, Tokyo*. pp. 65–87.
103. Harberd DJ. 1972. A contribution to the cyto-taxonomy of *Brassica* (Cruciferae) and its allies. *Botanical Journal of the Linnean Society* 65(1):1–23.
104. Harberd DJ. 1976. Cytotaxonomic studies of *Brassica* and related genera. In: JG Vaughan, AJ MacLeod and BMG Jones. (editors). *The Biology and Chemistry of the Cruciferae*. Academic Press, London, UK. pp. 47–68.
105. Hernández-Bermejo JE, Clemente-Muñoz M. 1977. Significado ecológico de la heterocarpia en diez especies de la tribu Brassiceae. El caso de *Fezia pterocarpa* Pitard. *Anales del Instituto Botánico A. J. de Cavanilles* 34(1):279–302.
106. Hernández-Bermejo JE, Clemente-Muñoz M. 1986. El análisis de información en taxonomía numérica: aplicación al estudio de la tribu Brassiceae (Cruciferae). *Anales del Jardín Botánico de Madrid* 41(2):313–331.
107. Horn PJ, Vaughan JG. 1983. Seed glucosynolates of fourteen wild *Brassica* species. *Phytochemistry* 22:465–471.
108. Hosaka K, Kianian SF, Macgrath JM, Quirós CF. 1990 Development and chromosomal localization of genome-specific DNA markers of *Brassica* and the evolution of amphidiploids and n=9 diploid species. *Genome* 33:131–142.
109. Hurka H, Mummenhoff K, Schoppmann C. 1992. Chromosome numbers in the genus *Lepidium* (Brassicaceae). *International Organization of Plant Biosystematists (IOPB) Newsletter* 18/19:8–9.

110. Inaba R, Nishio T. 2002. Phylogenetic analysis of Brassiceae based on the nucleotide sequences of the S-locus related gene, SLR1. *Theoretical and Applied Genetics* 105:1159–1165.
111. Inomata N. 1991. Intergeneric hybridization in *Brassica juncea* × *Sinapis pubescens* and *B. napus* × *S. pubescens*, and their cytological studies. *Cruciferae Newsletter* 14/15:10–11.
112. Inomata N. 1994. Intergeneric hybridization between *Brassica juncea* and *Diplotaxis virgata* and their cytology. *Cruciferae Newsletter* 16:30–31.
113. Inomata N. 1994. Intergeneric hybridization between *Brassica napus* and *Sinapis pubescens*, and the cytology and crossability of their progenies. *Theoretical and Applied Genetics* 89:540–544.
114. Inomata N. 1998. Production of the hybrids and progenies in the intergeneric cross between *Brassica juncea* and *Diplotaxis erucoides*. *Cruciferae Newsletter* 20:17–18.
115. Inomata N. 2000. Interspecific hybridization between *Brassica spinescens* and the cytogenetic analysis of their progenies. Intergeneric hybridization between *Brassica rapa* and *Coincya pseuderucastrum* and the meiotic behaviour. *Cruciferae Newsletter* 22:13–14.
116. Inomata N. 2001. Intergeneric hybridization between *Brassica juncea* and *Erucastrum virgatum* and the meiotic behaviour of F<sub>1</sub> hybrids. *Cruciferae Newsletter* 23:17–18.
117. Inomata N. 2002. Production of intergeneric hybrids between *Brassica napus* and *Diplotaxis virgata* and meiotic chromosome association of the F<sub>1</sub> hybrids. *Cruciferae Newsletter* 24:29–30.
118. Inomata N. 2003. Production of intergeneric hybrids between *Brassica campestris* and *Diplotaxis virgata* and cytology and crossability of their hybrids. *Cruciferae Newsletter* 21:39–40.
119. Inomata N. 2003. Production of intergeneric hybrids between *Brassica juncea* and *Diplotaxis virgata* through ovary culture, and the cytology and crossability of their progenies. *Euphytica* 133:57–64.
120. Inomata N. 2004. Intergeneric hybridization between *Brassica rapa* and *Coincya pseuderucastrum* and the meiotic behaviour. *Cruciferae Newsletter* 25:19–20.
121. IPGRI [International Plant Genetic Resources Institute]. 1999. Descriptors for rocket (*Eruca* spp.). IPGRI, Rome, Italy. 52 p.
122. Iriondo JM, Pérez C. 1990. Micropropagation of an endangered plant species: *Coronopus navasii* (Brassicaceae). *Plant Cell Reports* 8:745–748.
123. Iriondo JM, Pérez C. 1991. *In vitro* storage of three endangered species from S.E. Spain. *Botanic Gardens Micropropagation News* 1:46–48.
124. Iriondo JM, Pérez C. 1991. Use of image analysis techniques for developmental studies in *in vitro* regenerated plants of *Lavatera oblongifolia*. *Acta Horticulturae* 289:335–336.
125. Iriondo JM, Pérez C. 1996. Micropropagation and *in vitro* storage of *Centaurium rigualii* Esteve (Gentianaceae). *Israel Journal of Plant Sciences* 44:115–123.
126. Iriondo JM, Pérez C. 1996. Somaclonal variation in *Lavatera*. In: YPS Bajaj (editor). *Somaclonal Variation in Crop Improvement II. Biotechnology in Agriculture and Forestry*. Springer-Verlag, Berlin, Germany. Vol. 36 pp. 280–295.
127. Iriondo JM. 1991. Aplicación de técnicas de cultivo *in vitro* a la conservación de *Coronopus navasii* Pau, *Lavatera oblongifolia* Boiss. y *Centaurium rigualii* Esteve, tres especies endémicas de la Península Ibérica en peligro de extinción. Tesis Doctoral. Universidad Politécnica, Madrid, Spain. 399 p.
128. Iriondo JM, Prieto C, Pérez-García F. 1995 *In vitro* regeneration of *Helianthemum polygonoides* Peinado *et al.*, an endangered salt meadow species. *Botanic Gardens Micropropagation News* 2(1):2–5.
129. Ishikawa S, Bang SW, Kaneko Y, Matsuzawa Y. 2003. Production and characterization of intergeneric somatic hybrid between *Moricandia arvensis* and *Brassica oleracea*. *Plant Breeding* 122:233–238.
130. Janeja HS, Banga SK, Bhasker PB, Banga SS. 2003. Alloplasmic male sterile *Brassica napus* with *Enarthrocarpus lyratus* cytoplasm: introgression and molecular mapping of an *E. lyratus* chromosome segment carrying a fertility restoring gene. *Genome* 46:792–797.
131. Jones DA. 1985. *Moricandia* × *Brassica* hybridization experiments (mimeographed). 11 p.
132. Kadry NE, Abdel Khalik. 2002. Biosystematic studies on Brassicaceae (Cruciferae) in Egypt. A phylogenetic analysis with MatK gene. Ph.D. Thesis. Wageningen University, The Netherlands.
133. Kianian SF, Quirós CF. 1991. Novel variations in the n=9 *Brassica* species. *Cruciferae Newsletter* 14/15:10–11.
134. Kianian SF, Quirós CF. 1993. Trait inheritance, fertility, and genomic relationships of some n=9 *Brassica* species. *Genetic Resources and Crop Evolution* 39:165–175.
135. Kirti PB, Narasimhulu SB, Prakash S, Chopra VL. 1992. Somatic hybridization between *Brassica juncea* and *Moricandia arvensis* by protoplast fusion. *Plant Cell Reports* 11:318–321.
136. Kirti PB, Prakash S, Chopra VL. 1991. Interspecific hybridization between *Brassica juncea* and *B. spinescens* through protoplast fusion. *Plant Cell Reports* 9:639–642.
137. Kjaer A, Larsen PO. 1973. Non-protein amino-acids, cyanogenic glycosides, and glucosinolates. In: TA Geissman (editor). *Biosynthesis*. The Chemical Society, London, UK. pp. 71–105.
138. Koch M, Al-Shehbaz I, Mummenhoff K. 2003. Molecular systematics, evolution and population biology in the mustard family (Brassicaceae). *Annals of the Missouri Botanical Garden* 90:151–171.
139. Koch M, Bernhardt K-G. 2004. Comparative biogeography of different cytotypes of the European annual *Microthlaspi perfoliatum* (Brassicaceae): refugia, diversity centres and post glacial colonization. *American Journal of Botany* 91(1):115–124.
140. Koch M, Haubold B, Mitchell-Olds T. 2001. Molecular systematics of the Brassicaceae: evidence from coding plastidic matK and nuclear Chs sequences. *American Journal of Botany* 88(2):534–344.
141. Koch M, Hurka H, Mummenhoff K. 1996. Chloroplast DNA restriction site variation and RAPD-analyses in *Cochlearia* (Brassicaceae). *Biosystematics and speciation processes*. *Nordic Journal of Botany* 16(6):585–604.
142. Koch M, Hurka H, Mummenhoff K. 1998. Molecular biogeography and evolution of the *Microthlaspi perfoliatum* s.l. polyploid complex (Brassicaceae): chloroplast DNA and nuclear ribosomal DNA restriction site variation. *Canadian Journal of Botany* 76:382–396.
143. Koch M, Hurka H. 1999. Isozyme analysis in the polyploid complex *Microthlaspi perfoliatum* (L.) F.K. Meyer: morphology, biogeography and evolutionary history. *Flora* 194:33–48.
144. Koch M, Mummenhoff K, Hurka H. 1999. Molecular phylogenetics of *Cochlearia* L. and allied genera based on nuclear ribosomal ITS DNA sequence analysis contradict traditional concepts of evolutionary relationships. *Plant Systematics and Evolution* 216:207–230.
145. Koch M, Mummenhoff K, Zunk K. 1993. Isoelektrische Fokussierung der Untereinheiten der Rubisco in *Thlaspi* (Brassicaceae): Weitere Hinweise auf eine Formengattung. *Feddes Repertorium* 104:371–381.
146. Koch M, Mummenhoff K. 2001. *Thlaspi* s.str. (Brassicaceae) versus *Thlaspi* s.l.: morphological and anatomical characters in the light of ITS nrDNA sequence data. *Plant Systematics and Evolution* 227:209–225.
147. Koch M, Plantholt U, Zunk K, Mummenhoff K, Hurka H. 1993. Chloroplasten-DNA als Marker zur Sippendifferenzierung. In: K-G Bernhardt and H Hurka. (Hrsg.). *Natur und Wissenschaft*, Solingen, Germany. pp. 85–100.
148. Koch M. 2003. Molecular phylogenetics, evolution and population biology in the Brassicaceae. In: AK Sharma and A Sharma. (editors). *Plant Genome: Biodiversity and Evolution*. Vol. 1: Phanerogams. Science Publishers Inc., Enfield, N. Hampshire, USA. pp. 1–35.
149. Koul KK, Nagpal R, Raina SN. 2000. Seed coat microsculpturing in *Brassica* and allied genera (subtribes Brassicinae, Raphaninae, Moricandinae). *Annals of Botany* 86:385–397.
150. Lambdon PW, Hassall M, Boar RR, Mithen R. 2003. Asynchrony in the nitrogen and glucosinolate leaf-age profiles of *Brassica*: is this a defensive strategy against generalist herbivores? *Agriculture, Ecosystems and Environment* 97:205–214.

151. Lannér C, Bryngelsson T, Gustafsson M. 1996. Genetic validity of RAPD markers at the intra- and inter-specific level in wild *Brassica* species with  $n=9$ . Theoretical and Applied Genetics 91:9–14.
152. Lannér C. 1997. Genetic relationships within the *Brassica oleracea* cytodeme. Comparison of molecular marker systems. Ph.D. Thesis. Acta Universitatis Agriculturae Sueciae. Agraria/Swedish University of Agricultural Sciences, Svalöv, Sweden. 39 p.
153. Lannér C. 1998. Relationships of wild *Brassica* species with chromosome number  $2n = 18$ , based on comparison of the DNA sequence of the chloroplast intergenic region between trnL (UAA) and trnF (GAA). Canadian Journal of Botany 71:228–237.
154. Lannér-Herrera C, Gustafsson M, Fält A-S, Bryngelsson T. 1996. Diversity in natural populations of wild *Brassica oleracea* as estimated by isozyme and RAPD analysis. Genetic Resources and Crop Evolution 41:13–23.
155. Lázaro A, Aguinalgalde I. 1996. Molecular characterization of *Brassica oleracea* and wild relatives ( $n=9$ ) using RAPDs. Cruciferae Newsletter 11:24–25.
156. Lázaro A, Aguinalgalde I. 1996. Phylogenetic relationships between the wild taxa of the *Brassica oleracea* L. group ( $2n=18$ ) using random amplified polymorphic DNA assay. Scientia Horticulturae 61:219–227.
157. Lázaro A, Aguinalgalde I. 1998. Genetic diversity in *Brassica oleracea* L. (Cruciferae) and wild relatives ( $2n=18$ ) using isozymes. Annals of Botany 81:821–828.
158. Lázaro A, Aguinalgalde I. 1998. Genetic diversity in *Brassica oleracea* L. (Cruciferae) and wild relatives ( $2n=18$ ) using RAPD markers. Annals of Botany 81:829–833.
159. Lázaro A. 1997. Evaluación de la diversidad genética en el complejo *Brassica oleracea* L. (Cruciferae) y espontáneas relacionadas de  $n = 9$ . Tesis Doctoral. Escuela T. S. Ing. Agrónomos, Universidad Politécnica, Madrid, Spain. 216 p.
160. Leadlay EA, Heywood VH. 1990. The biology and systematics of the genus *Coincya* Porta Rigo (Cruciferae). Botanical Journal of the Linnean Society 101:313–398.
161. Lee J.-Y, Mummenhoff K, Bowman JL. 2002. Allopolyploidizations and evolution of species with reduced floral structures in *Lepidium* L. (Brassicaceae). Proceedings of the National Academy of Sciences of the United States of America 91:16835–16840.
162. Leppik EE, White GA 1975. Preliminary assesment of *Crambe* germplasm resources. Euphytica 21:681–689.
163. Magrath R, Bano F, Morgner M, Parkin I, Sharpe A, Lister C, Dean C, Turner J, Lydiate D, Mithen R. 1994. Genetics of aliphatic glucosinolates. I. Side chain elongation in *Brassica napus* and *Arabidopsis thaliana*. Heredity 71:290–299.
164. Magrath R, Herron C, Giamoustaris A, Mithen, R. 1993. The inheritance of aliphatic glucosinolates in *Brassica napus*. Plant Breeding 111:55–72.
165. Magrath R, Mithen R. 1993. Maternal effects on the expression of individual aliphatic glucosinolates in seeds and seedlings of *Brassica napus*. Plant Breeding 111:249–252.
166. Manzanares P, Gómez-Campo C, Tortosa ME. 1983. Estudio sobre el indumento de las especies ibéricas y baleáricas del género *Teucrium* L. (Lamiaceae). Anales del Jardín Botánico de Madrid 40:93–106.
167. Martín C, Martínez-Laborde JB, Pérez, C. 1998. The use of X-ray radiography in the assesment of conserved seeds of six halophytic species of *Limonium*. Journal of Arid Environments 31:245–253.
168. Martín C, Pérez C. 1992. Multiplication *in vitro* of *Limonium estevei* Fdez. Casas. Annals of Botany 70:165–167.
169. Martín C, Pérez C. 1997. Micropropagación de distintas especies del género *Limonium* en peligro de extinción. In: JE Hernández-Bermejo *et al.* Acta Etnobotánica-91 Córdoba, Spain. pp. 169–173.
170. Martín C, Pérez C. 1994. The use of RAPD to determine the genetic variability of micropropagated plants from endangered species – application to the Spanish endemism *Limonium estevei* Fdez. Casas. Phytón – International Journal of Experimental Botany 51:65–72.
171. Martín C, Pérez C. 1995. Micropropagation of five endemic species of genus *Limonium* from the Iberian Peninsula. Journal of Horticultural Science 70:97–103.
172. Martín C. 1993. Micropropagación y conservación *in vitro* de seis especies del género *Limonium* endémicas de la Península Ibérica. Tesis Doctoral. Escuela T. S. Ing. Agrónomos, Universidad Politécnica, Madrid, Spain. 298 p.
173. Martín JP, Sánchez-Yélamo MD. 2000. Genetic relationships among species of the genus *Diplotaxis* (Brassicaceae) using inter-simple sequence repeat markers. Theoretical and Applied Genetics 101(8):1234–1241.
174. Martínez-Laborde JB, Gómez-Campo C. 1993. Infra-specific variability in *Diplotaxis virgata* (Cruciferae). In: H Demiriz and N Özhatay (editors). Proceedings of the 5th OPTIMA Meeting. Istanbul, Turkey. pp. 679–681.
175. Martínez-Laborde JB, Pita JM, Pérez-García F. 1998. Seed germination and cryopreservation of rocket, *Eruca vesicaria* (L.) Cav. (Cruciferae). Plant Genetic Resources Newsletter 111:47–48.
176. Martínez-Laborde JB. 1988. El género *Diplotaxis* (Cruciferae) en España. Lagasalia 11:243–248.
177. Martínez-Laborde JB. 1988. Estudio sistemático del género *Diplotaxis* DC. (Cruciferae-Brassicaceae). Tesis Doctoral, Universidad Politécnica de Madrid, Spain. 407 p.
178. Martínez-Laborde JB. 1988. Studies on the hybridization and evolution of *Diplotaxis* DC. (Cruciferae, Brassiceae). Cruciferae Newsletter 11:14–15.
179. Martínez-Laborde JB. 1991. *Diplotaxis harra* (Forsk.) Boiss. in Europe. In ME Newton (editor). Notulae Systematicae Fl. Eur. Spec. ser.2 n.4. Botanical Journal of the Linnean Society 106(1):67–71.
180. Martínez-Laborde JB. 1991. Notes on the taxonomy of *Diplotaxis* DC. (Brassicaceae). Botanical Journal of the Linnean Society 101:67–71.
181. Martínez-Laborde JB. 1991. Two additional species of *Diplotaxis* (Cruciferae, Brassiceae) with  $n=8$  chromosomes. Willdenowia 21:63–68.
182. Martínez-Laborde JB. 1992. Caracteres taxonómicos de cotiledones y pétalos en *Diplotaxis* DC. (Cruciferae, Brassiceae). Parodiana 7(1-2):41–53.
183. Martínez-Laborde JB. 1992. *Diplotaxis siifolia* G. Kunze (Cruciferae-Brassicaceae). Posición sistemática y variabilidad infraespecífica. Anales del Jardín Botánico de Madrid 49(2):231–244.
184. Martínez-Laborde JB. 1998. A new report on the vascular flora of the island of Alborán (Spain). Flora Mediterranea 1:37–39.
185. Maselli S, Díaz-Lifante Z, Aguinalgalde I. 1995. The Mediterranean populations of *Brassica insularis*, a biodiversity study. Biochemical Systematics and Ecology 24(2):165–170.
186. Maselli S, Pérez-García F, Aguinalgalde I. 1999. Evaluation of seed storage conditions and genetic diversity of four crucifers endemic to Spain. Annals of Botany 81:207–212.
187. Maselli S. 1997. Evaluación del estado de conservación y de la diversidad genética de semillas de crucíferas depositadas en el banco de germoplasma de la Escuela T. S. de Ing. Agrónomos de la UPM de Madrid. Tesis Doctoral, Escuela T. S. Ing. Agrónomos, Universidad Politécnica, Madrid, Spain. 233 p.
188. Mata J. 2002. The Mediterranean island of Alborán: a review of its flora and vegetation. Fitosociología 31:15–21.
189. Matsuzawa Y, Mekiyanon S, Kaneko Y, Bang SW, Wakui K, Takahata Y. 1999. Male sterility in alloplasmic *Brassica rapa* L. carrying *Eruca sativa* cytoplasm. Plant Breeding 118:82–84.
190. Matsuzawa Y, Minami T, Bang SW, Kaneko Y. 1997. A new *Brassicoraphanus* ( $2n=36$ ): the true-breeding amphidiploid line of *Brassica oxyrrhina* Coss. ( $2n=18$ ) × *Raphanus sativus* L. ( $2n=18$ ). Bulletin of the College of Agriculture of Utsunomiya University 16(3):1–7.
191. Minami H, Takahata Y, Hogetsu D. 1995. Mass isolation of pollen protoplasts in *Brassica* crops and wild allies. Plant Tissue Culture Letters 12:139–144.
192. Mithen R, Faulkner K, Magrath R, Rose P, Williamson G, Marquez J. 2003. Development of isothiocyanate-enriched broccoli, and its enhanced ability to induce phase 2 detoxification enzymes in mammalian cells. Theoretical and Applied Genetics 101:727–734.

193. Mithen R, Raybould AF, Giamoustaris A. 1995. Divergent selection for secondary metabolites between wild populations of *Brassica oleracea* and its implications for plant-herbivore interaction. *Heredity* 71:472–484.
194. Mithen R. 1992. Leaf glucosinolate profiles and their relationship to pest and disease resistance in oilseed rape. *Euphytica* 61:71–83.
195. Mithen RF, Herron C. 1991. Transfer of disease resistance to oilseed rape from wild *Brassica* species. In: DI McGregor (editor). Proceedings of the 8th GCIRC International Rapeseed Congress. Saskatoon, Canada, 9–11 July 1991. 1: 244–249.
196. Mithen RF, Lewis BG, Heaney RK, Fenwick GR. 1987. Glucosinolates of wild and cultivated *Brassica* species. *Phytochemistry* 26(7):1969–1973.
197. Mithen RF, Lewis BG, Heaney RK, Fenwick GR. 1987. Resistance of leaves of *Brassica* species to *Leptosphaeria maculans*. *Transactions of the British Mycological Society* 81:525–531.
198. Mithen RF, Lewis BG. 1988. Resistance to *Leptosphaeria* in hybrids of *Brassica oleracea* and *Brassica insularis*. *Journal of Phytopathology* 121:253–258.
199. Mithen RF, Magrath R. 1992. Glucosinolates and resistance to *Leptosphaeria maculans* in wild and cultivated *Brassica* species. *Plant Breeding* 101:60–68.
200. Mohapatra T, Kirti PB, Dineshkumar V, Prakash S, Chopra VL. 1998. Random chloroplast segregation and mitochondrial gene recombination in somatic hybrids of *Diplotaxis catholica*+*Brassica juncea*. *Plant Cell Reports* 17: 814–818.
201. Moreno JC, Mota F, Gómez-Campo C. 2005. *Diplotaxis siettiana*. In: B Montmollin and W Strahm. (editors). The top 50 Mediterranean island plants. International Union for the Conservation of Nature. pp. 8–9.
202. Mummenhoff K. 1995. Should *Cardaria* (L.) Desv. be classified within the genus *Lepidium* L. (Brassicaceae)? Evidence from subunit polypeptide composition of Rubisco. *Feddes Repertorium* 101:25–28.
203. Mummenhoff K, Brüggemann H, Bowman J. 2001. Chloroplast DNA phylogeny and biogeography of *Lepidium* (Brassicaceae). *American Journal of Botany* 81:2051–2063.
204. Mummenhoff K, Eschmann-Grupe G, Zunk, K. 1993. Subunit polypeptide composition of Rubisco indicates *Diplotaxis viminea* as maternal parent species of amphiploid *Diplotaxis muralis*. *Phytochemistry* 31:429–431.
205. Mummenhoff K, Franzke A, Koch M. 1997. Molecular data reveal convergence in fruit characters used in the classification of *Thlaspi* s.l. (Brassicaceae). *Botanical Journal of the Linnean Society* 121:183–199.
206. Mummenhoff K, Franzke A, Koch M. 1997. Molecular phylogenetics of *Thlaspi* (Brassicaceae) based on chloroplast DNA restriction site variation and sequences of the internal transcribed spacers of nuclear ribosomal DNA. *Canadian Journal of Botany* 71:469–482.
207. Mummenhoff K, Hurka H. 1991. IEF analysis of Rubisco in *Lepidium* (Brassicaceae), sections *Lepia*, *Lepiocardamon* and *Cardamon*. *Biochemical Systematics and Ecology* 11:47–52.
208. Mummenhoff K, Koch M. 1994. Chloroplast DNA restriction site variation and phylogenetic relationships in the genus *Thlaspi* sensu lato (Brassicaceae). *Systematic Botany* 11:73–88.
209. Mummenhoff K, Kuhnt E, Koch M, Zunk K. 1995. Systematic implications of chloroplast DNA variation in *Lepidium* sections *Cardamon*, *Lepiocardamon* and *Lepia* (Brassicaceae). *Plant Systematics and Evolution* 191:75–88.
210. Mummenhoff K, Zunk K. 1991. Should *Thlaspi* (Brassicaceae) be split? Preliminary evidence from isoelectric focusing analysis of Rubisco. *Taxon* 40:427–434.
211. Mummenhoff K. 1994. Subunit polypeptide composition of Rubisco as a taxonomic tool in separating critical *Lepidium* species. *Phytochemistry* 31:683–684.
212. Nanda Kumar PBA, Shivanna KR, Prakash S. 1988. Wide hybridization in *Brassica*: crossability barriers and studies on hybrids and synthetic amphidiploids of *B. fruticulosa* × *B. campestris*. *Sexual Plant Reproduction* 1:234–239.
213. Narasimhulu SB, Kirti PB, Bhat SR, Prakash S, Chopra VL. 1994. Intergeneric protoplast fusion between *Brassica carinata* and *Camelina sativa*. *Plant Cell Reports* 14:593–597.
214. Norverto CA, González-Andrés F, Ortiz JM. 1994. Leaf and stem anatomy of species of *Cytisophyllum*, *Cytisus*, *Chamaecytisus*, *Genista* and *Genista* Sect. *Teline* (Fabaceae: Genisteae) as an aid for taxonomy. *Israel Journal of Plant Sciences* 41:213–225.
215. Palaniswamy P, Bodnaryk RP. 1994. A wild *Brassica* from Sicily provides trichome-based resistance against flea beetles, *Phyllotreta cruciferae* (Goeze) (Coleoptera: Chrysomelidae). *The Canadian Entomologist* 121:1119–1130.
216. Panda S, Martín JP, Aguinalde I. 2003. Chloroplast and DNA studies in a few members of the *Brassica oleracea* L. group using PCR-RFLP and ISSR-PCR markers: a population genetic analysis. *Theoretical and Applied Genetics* 101:1122–1128.
217. Parkin I, Magrath R, Keith D, Sharpe A., Mithen R, Lydiate D. 1994. Genetics of aliphatic glucosinolates. II. Hydroxylation of alkenyl glucosinolates in *Brassica napus*. *Heredity* 71:594–598.
218. Pérez-García F, Durán JM. 1989. Germinación de especies endémicas de las regiones mediterránea occidental y macaronésica. *Investigación Agraria: Producción y Protección Vegetales* 1:25–33.
219. Pérez-García, F, González-Benito ME, Gómez-Campo C. 2007. High viability recorded in ultra-dry seeds of 37 species of Brassicaceae after almost 40 years of storage. *Seed Science and Technology*, 35:143–153.
220. Pérez-García F, González-Benito ME, Pérez C, Gómez-Campo C. 1996. Effect of cryo-preservation on *Brassica* seeds germination. *Acta Horticulturae* 401:225–260.
221. Pérez-García F, Iriondo JM, Martínez-Laborde JB. 1995. Germination behaviour in seeds of *Diplotaxis erucooides* (L.) DC. and *D. virgata* (Cav.) DC. (Brassicaceae). *Weed Research* 31:495–502.
222. Pérez-García F, Iriondo JM, González-Benito ME, Carnes LF, Tapia J, Prieto C, Plaza R, Pérez C. 1995. Germination studies in endemic plant species of the Iberian Peninsula. *Israel Journal of Plant Sciences* 41:239–247.
223. Pérez-García F. 2005. Seed germination of different populations of wild (n=9) *Brassica montana* and *B. oleracea*. *Spanish Journal of Agricultural Research* 3(3):331–334.
224. Pistrick K, Jarvis CE. 1987. Zur typisierung von *Raphanus sativus* L. (Cruciferae). *Feddes Repertorium* 98(9–10):477–483.
225. Pistrick K. 1987. Untersuchungen zur systematik der gattung *Raphanus* L. *Kulturpflanze* 31:225–321.
226. Pita JM, Durán JM 1984. Germinación en el género *Amaranthus* L.: I. Luz y temperatura. *Información Técnica Económica Agraria (ITEA)* 51:17–28.
227. Pita JM, Durán JM 1986. Germinación en el género *Amaranthus* L.: II. Papel del fitocromo en *A. retroflexus* L. *Información Técnica Económica Agraria (ITEA)* 61:61–69.
228. Pita JM, Martínez-Laborde JB, Pérez-García F. 2002. Time of seed collection and germinability in rocket, *Eruca vesicaria* (L.) Cav. (Brassicaceae). *Genetic Resources and Crop Evolution* 45:47–51.
229. Pita JM. 1988. Germinación de especies endémicas de las islas Canarias. *Investigación Agraria* 1:39–43.
230. Pita JM. 1989. Nota sobre el efecto de las giberelinas sobre la germinación de algunas especies endémicas de las islas Canarias. *Investigación Agraria* 4(1):19–23.
231. Polatschek A. 1978. Die Arten der Gattung *Erysimum* auf der Iberischen Halbinsel. *Annalen des Naturhistorischen Museums, Wien* 881:325–362.
232. Polatschek A. 1983. Chromosomenzahlen und Hinweise auf Systematik und Verbreitung von Brassicaceae-Arten aus Europa, Nordafrika, Asien und Australien. *Phyton* 21:127–139.
233. Ponce Díaz P, Zwart JL, Martín JP, Sánchez-Yélam MD. 1999. A preliminary consideration about species relationships in Vellinae and Savignyinae (Cruciferae). *Cruciferae Newsletter* 21:23–24.
234. Ponce Díaz P. 1998. Relaciones bioquímicas y moleculares en el género *Vella* L. y especies afines de la tribu Brassicaceae (Cruciferae). Tesis Doctoral. Escuela T. S. Ingenieros Agrónomos, Universidad Politécnica, Madrid, Spain. 258 p.



235. Pradhan AK, Prakash A, Mukhopadhyay A, Pental D. 1992. Phylogeny of *Brassica* and allied genera based on variation in chloroplast and mitochondrial DNA patterns: molecular and taxonomic classifications are incongruous. *Theoretical and Applied Genetics* 81:331–340.
236. Prakash S, Chopra VL. 1990. Male sterility caused by cytoplasm of *Brassica oxyrrhina* in *B. campestris* and *B. juncea*. *Theoretical and Applied Genetics* 79: 285–287.
237. Prakash S, Kirti PB, Bhat SR, Gaikwad K, Dineshkumar V, Chopra VL. 1998. A *Moricandia arvensis*-based cytoplasmic male sterility and fertility restoration system in *Brassica juncea*. *Theoretical and Applied Genetics* 97:488–492.
238. Prakash S, Ahuja I, Uprety HC, Kumar VD, Bhat SR, Kirti PB, Chopra VL. 2001. Expression of male sterility in alloplasmic *Brassica juncea* with *Erucastrum canariense* cytoplasm and development of fertility restoration system. *Plant Breeding* 120:178–182.
239. Prakash S, Chopra VL. 1988. Synthesis of alloplasmic *Brassica campestris* as a new source of cytoplasmic male sterility. *Plant Breeding* 101:235–237.
240. Prina AO. 1998. The status of *Crambe alutacea* Hand.-Mazz. (Cruciferae, tribe Brassiceae). *Flora Mediterranea* 1:25–29.
241. Prina AO. 2000. A taxonomic revision of the genus *Crambe* L., sect. *Leptocrambe* (Brassicaceae). *Botanical Journal of the Linnean Society* 131:509–524.
242. Prina AO. 2000. Revisión taxonómica del género *Crambe* (Brassicaceae, Brassicaceae). Tesis Doctoral. Escuela T.S. Ing. Agrónomos, Universidad Politécnica, Madrid, Spain. 274 p.
243. Quirós CF, Ochoa O, Douches DS. 1988. Exploring the role of  $x=7$  species in *Brassica* evolution: hybridization with *B. nigra* and *B. oleracea*. *Journal of Heredity* 71:351–358.
244. Quirós CF, Ochoa O, Kianian SF. 1986. Hybridization of two cultivated *Brassica* species with wild relatives of  $x=7$  chromosomes. *Cruciferae Newsletter* 11:16.
245. Ramiro MC, Pérez-García F, Aguinalde I. 1995. Effect of different seed storage conditions on germination and isozyme activity in some *Brassica* species. *Annals of Botany* 71:579–585.
246. Rashid H, Toriyama K, Hinata K. 1996. Transgenic plant production from leaf discs of *Moricandia arvensis* using *Agrobacterium tumefaciens*. *Plant Cell Reports* 15:799–803.
247. Razmjoo K, Toriyama K, Ishii R, Hinata K. 1996. Photosynthetic properties of hybrids between *Diplotaxis muralis* DC, a  $C_3$  species, and *Moricandia arvensis* (L.)DC, a  $C_3-C_4$  intermediate species in Brassicaceae. *Genes and Genetic Systems* 71:189–192.
248. Rouxel T, Kollmann A, Bouldard L, Mithen RF. 1991. Abiotic elicitation of indole phytoalexins and resistance to *Leptosphaeria maculans* within Brassicaceae. *Planta* 181:271–278.
249. Sahuquillo E, Aguinalde I, Gómez Campo C. 2001. Assessment of the *ex situ* available genetic diversity of three species extinct in Nature using RAPDs. *Bocconea* 11:599–603.
250. Salmeen O. 1979. A systematic revision on the genus *Brassica* L. in the Mediterranean region. Ph.D. Thesis, University of Reading, UK. 310 p.
251. Sánchez-Yélamo MD, Martínez-Laborde JB. 1991. Chemotaxonomic approach to *Diplotaxis muralis* (Cruciferae, Brassicaceae) and related species. *Biochemical Systematics and Ecology* 19(6):477–482.
252. Sánchez-Yélamo MD, Ortiz JM, Gogorcena Y. 1992. Comparative electrophoretic studies of seed proteins in some species of the genera *Diplotaxis*, *Erucastrum* and *Brassica* (Cruciferae-Brassicaceae). *Taxon* 41:477–483.
253. Sánchez-Yélamo MD, Torres ME, Martín JP. 2004. A chemotaxonomic approach to *Moricandia* DC (Brassicaceae) using seed globulin electrophoretic patterns. *Cruciferae Newsletter* 21:15–16.
254. Sánchez-Yélamo MD. 1990. Relaciones quimiotaconómicas y evolutivas en el complejo *Diplotaxis-Erucastrum-Brassica* (Cruciferae-Brassicaceae) mediante análisis cromatográficos y electroforéticos. Tesis Doctoral. Universidad Politécnica de Madrid, Spain. 354 p.
255. Sánchez-Yélamo MD. 1992. Isoenzyme electrophoretic studies among some species of the genus *Erucastrum* and *Hirschfeldia incana* (Cruciferae-Brassicaceae) with reference to their chemotaxonomic relationships. *Biochemical Systematics and Ecology* 20(7):631–637.
256. Sánchez-Yélamo MD. 1994. A chemosystematic survey of flavonoids in the Brassicaceae: *Diplotaxis*. *Botanical Journal of the Linnean Society* 111:9–18.
257. Sánchez-Yélamo MD. 2000. Occurrence of phenolic compounds in *Erucastrum* and *Brassica* (Brassicaceae). *Cruciferae Newsletter* 21:9–10.
258. Sánchez-Yélamo MD. 2001. Study of flavonoid patterns in some species of *Erucastrum* (Brassicaceae). *Cruciferae Newsletter* 21:5–6.
259. Sánchez-Yélamo MD. 2002. Comparative analysis of phenolic compounds among some species of the genus *Brassica* from Sect. *Sinapistrum* and Sect. *Micropodium*. *Cruciferae Newsletter* 21:19–20.
260. Sánchez-Yélamo MD. 2004. Taxonomic relationships among *Erucastrum* and *Brassica* species based on flavonoid compounds. *Cruciferae Newsletter* 21:13–14.
261. Segarra-Moragues JG, Iriando JM, Catalán P. 2005. Genetic fingerprinting of germplasm accessions as an aid for species conservation: a case study with *Borderea chouardii* (Dioscoreaceae), one of the most critically endangered Iberian plants. *Annals of Botany* 91:1283–1292.
262. Sharma G, Bhat SR, Prakash S, Chopra VL. 2002. *Brassica* coenospecies: a rich reservoir for genetic resistance to leaf spot *Alternaria brassicae*. *Euphytica* 125:411–417.
263. Shu GG, Amaral W, Hileman LC, Baum DA. 2000. LEAFY and the evolution of rosette flowering in violet cress (*Jonopidium acaule*, Brassicaceae). *American Journal of Botany* 87(5):634–641.
264. Singh R, Ellis PR, Pink DAC, Phelps J. 1994. An investigation of the resistance to cabbage aphid in *Brassica* species. *Annals of Applied Biology* 121:457–465.
265. Sobrino-Vesperinas E. 1978. Serie cromosómica euploide en el género *Moricandia* DC. (Cruciferae). *Anales del Instituto Botánico A. J. Cavanilles* 31:411–416.
266. Sobrino-Vesperinas E. 1979. Some interspecific hybrids between wild Brassicaceae. *Proceedings of the 1979 Cruciferae Conference*. Wageningen, The Netherlands. pp. 41–45.
267. Sobrino-Vesperinas E. 1983. Estudio biosistemático del género *Moricandia* (Brassicaceae-Cruciferae). Tesis Doctoral. Universidad Politécnica de Madrid, Spain. 569 p.
268. Sobrino-Vesperinas E. 1985. Some experimental hybrids on *Diplotaxis harra* (Forsk.) Boiss. complex. *Cruciferae Newsletter* 10:24–25.
269. Sobrino-Vesperinas E. 1988. Obtainment of some new intergeneric and interspecific hybrids between wild Brassicaceae. *Candollea* 41:499–504.
270. Sobrino-Vesperinas E. 1991. Experimental hybrids in the complex *Hutera-Rhynchosinapis* (Cruciferae) of Sierra Morena (Spain). *Cruciferae Newsletter* 14/11:8–9.
271. Sobrino-Vesperinas E. 1993. Revisión taxonómica de dos especies del género *Diplotaxis* endémicas de las islas de Cabo Verde. *Candollea* 41:137–144.
272. Sobrino-Vesperinas E. 1995. Diferencias morfológicas e interfertilidad entre las especies arvenses *Eruca vesicaria* (L.) Cav. y *Eruca sativa* Miller. *Actas Congreso Sociedad Española de Malherbología*. pp. 153–156.
273. Sobrino-Vesperinas E. 1996. Posición taxonómica de *Diplotaxis cretacea* Kotov (Cruciferae). *Anales del Jardín Botánico de Madrid* 51:182–188.
274. Sobrino-Vesperinas E. 2001. Interfertility and siliqua morphology of hybrids in the genus *Coincya* Rouy (Cruciferae, Brassicaceae). *Bocconea* 11:467–471.
275. Song K, Osborn TC, Williams PH. 1988. Phylogenetic relations of *B. rapa* and *B. oleracea* and their wild allies revealed by nuclear restriction fragments length polymorphisms (RFLPs). *Cruciferae Newsletter* 11:18–19.
276. Song K, Osborn TC, Williams PH. 1990. *Brassica* taxonomy based on nuclear restriction fragment length polymorphisms (RFLPs). *Theoretical and Applied Genetics* 71:497–506.
277. Srinivasan K, Malathi VG, Kirti PB, Prakash S, Chopra VL. 1988. Generation and characterization of monosomic chromosome addition lines of *Brassica campestris*-*B. oxyrrhina*. *Theoretical and Applied Genetics* 97:976–981.

278. Takahata Y, Hinata K. 1978. A description of the genetic stocks in subtribe Brassicinae by chromosome number and numerical characters. *Cruciferae Newsletter* 3: 47–51.
279. Takahata Y, Hinata K. 1980. A variation study of subtribe Brassicinae by principal component analysis. In: S Tsunoda *et al.* (editors). *Brassica Crops and Wild Allies*. Japan Scientific Societies Press, Tokyo, Japan. pp. 33–49.
280. Takahata Y, Hinata K. 1983. Studies on cytodemes in subtribe Brassicinae (Cruciferae). *Tohoku Journal of Agricultural Research* 33:111–124.
281. Takahata Y, Hinata K. 1986. A consideration of the species relationships in subtribe Brassicinae (Cruciferae) in view of cluster analysis of morphological characters. *Plant Species Biology* 1:79–88.
282. Takahata Y, Hinata K. 1986. Application of pattern analysis (quantification method III) for the isozyme relations in crop Brassicas. *Cruciferae Newsletter* 11:12–13.
283. Takahata Y, Hinata K. 1992. Comparison of species relationships in the subtribe Brassicinae based on morphology, cytogenetics and isozymes. *Journal of Genetics and Breeding* 46:193–198.
284. Takahata Y, Takeda T, Kaizuma N. 1993. Wide hybridization between *Moricandia arvensis* and *Brassica* amphidiploid species (*B. napus* and *B. juncea*). *Euphytica* 69:155–160.
285. Takahata Y, Takeda T. 1990. Intergeneric (intersubtribe) hybridization between *Moricandia arvensis* and *Brassica* A and B genome species by ovary culture. *Theoretical and Applied Genetics* 80:38–42.
286. Takahata Y, Tsunoda S. 1981. [Difference in salt tolerance among species of *Brassica* and allied genera with special reference to their photosynthetic response.] (in Japanese with English summary). *Japan Journal of Breeding* 31:383–394.
287. Takahata Y. 1990. Production of intergeneric hybrids between a C<sub>3</sub>–C<sub>4</sub> intermediate species *Moricandia arvensis* and a C<sub>3</sub> species *Brassica oleracea* through ovary culture. *Euphytica* 46:259–264.
288. Tanabe M, Izui K, Toriyama K. 2000. Production and analysis of transgenic C<sub>3</sub>–C<sub>4</sub> intermediate *Moricandia arvensis* expressing a maize C<sub>4</sub> phosphoenolpyruvate carboxylase gene. *Plant Biotechnology* 17:93–98.
289. Tewari JP, Bansal VK, Tewari I, Gómez-Campo C, Stringam GR, Thiagara-Jah MR. 1996. Reactions of some wild and cultivated accessions of *Eruca* against *Leptosphaeria maculans*. *Cruciferae Newsletter* 11:130–131.
290. Toriyama K, Hinata K, Hinata K. 1987. Ability of callus growth and shoot regeneration in the wild species of Brassicaceae. *Plant Tissue Culture Letters* 4:75–78.
291. Toriyama K, Hinata K, Kameya T. 1987. Production of somatic hybrid plants, '*Brassicomoriscandia*', through protoplast fusion between *Moricandia arvensis* and *Brassica oleracea*. *Plant Science* 48:123–128.
292. Toriyama K, Kameya T, Hinata K. 1987. Selection of a universal hybridizer in *Sinapis turgida* Del. and regeneration of plantlets from somatic hybrids with *Brassica* species. *Planta* 170:308–313.
293. Toriyama K, Kameya T, Hinata K. 1994. Somatic hybridization between *Brassica* and *Sinapis*. In: YPS Bajaj (editor). *Biotechnology in Agriculture and Forestry*. Springer-Verlag, Germany. vol. 27 pp. 334–341.
294. Toriyama K, Kameya T, Hinata K. 1989. Somatic hybridization between *Moricandia* and *Brassica*. In: YPS Bajaj (editor). *Biotechnology in Agriculture and Forestry*. Springer-Verlag, Germany. Vol. 8 pp. 389–396.
295. Toriyama K, Tanabe M, Rashid H. 2001. Transgenic *Moricandia*. In: YPS Bajaj (editor). *Biotechnology in Agriculture and Forestry*. Springer-Verlag, Germany. Vol. 48 pp. 352–358.
296. Toriyama K, Yanagino T, Razmjoo K, Ishii R, Hinata K. 1988. Chloroplast DNA and CO<sub>2</sub> compensation point of somatic hybrid plants between *Brassica oleracea* and *Moricandia arvensis*. *Japan Journal of Breeding* 63:543–547.
297. Ueno O, Bang SW, Wada Y, Kondo A., Ishihara K, Kaneko Y, Matsuzawa Y. 2003. Structural and biochemical dissection of photorespiration in hybrids differing in genome constitution between *Diplotaxis tenuifolia* (C<sub>3</sub>–C<sub>4</sub>) and *Raphanus sativus* (C<sub>3</sub>). *Plant Physiology* 132:1550–1559.
298. Ueno O, Wada Y, Wakai M, Bang SW. 2006. Evidence from photosynthetic characteristics for the hybrid origin of *Diplotaxis muralis* from a C<sub>3</sub>–C<sub>4</sub> intermediate and a C<sub>3</sub> species. *Plant Biology* 55:253–259.
299. Uprety DC, Prakash S, Abrol YP. 1995. Variability for photosynthesis in *Brassica* and allied genera. *Indian Journal of Plant Physiology* 38(3):207–213.
300. Vioque J. 1992. Estudio fitoquímico del género *Coincya* Rouy en la Península Ibérica y sus implicaciones taxonómicas. Tesis Doctoral. Universidad de Sevilla, Spain. 374 p.
301. Warwick SI, Black LD, Aguinalde I. 1992. Molecular systematics of *Brassica* and allied genera (Subtribe Brassicinae, Brassicaceae) – chloroplast DNA variation in the genus *Diplotaxis*. *Theoretical and Applied Genetics* 81:839–850.
302. Warwick SI, Black LD. 1991. Molecular systematics of *Brassica* and allied genera (Subtribe Brassicinae, Brassicaceae) – chloroplast genome and cytodeme congruence. *Theoretical and Applied Genetics* 81:81–92.
303. Warwick SI, Black LD. 1993. Molecular relationships in subtribe Brassicinae (Cruciferae, tribe Brassiceae). *Canadian Journal of Botany* 71:906–918.
304. Warwick SI, Black LD. 1994. Evaluation of the subtribes Moricandiinae, Savignynae, Vellinae and Zillinae (Brassicaceae, tribe Brassiceae) using chloroplast DNA restriction site variation. *Canadian Journal of Botany* 72:1692–1701.
305. Warwick SI, Black LD. 1996. Phylogenetic implications of chloroplast DNA restriction site variation in subtribes Raphaninae and Cakilinae (Brassicaceae, tribe Brassiceae). *Canadian Journal of Botany* 75:960–973.
306. Warwick SI, Gugel RK. 2003. Genetic variation in the *Crambe abyssinica* – *C. hispanica* – *C. glabrata* complex. *Genetic Resources and Crop Evolution* 50:291–305.
307. Warwick SI, Sauder CA. 2005. Phylogeny of tribe Brassicaceae (Brassicaceae) based on chloroplast restriction site polymorphisms and nuclear ribosomal internal transcribed spacer and chloroplast trnL intron sequences. *Canadian Journal of Botany* 81:467–483.
308. Warwick SI. 1997. Molecular phylogenies: from theory to application in *Brassica* and allies (Tribe Brassicaceae, Brassicaceae). *Opera Botanica* 131:159–168.
309. Yanagino T, Takahata Y, Hinata K. 1987. Chloroplast DNA variation among diploid species in *Brassica* and allied genera. *Japanese Journal of Genetics* 62:119–125.
310. Yoon HS, Baum DA. 2004. A test of parallelism in plant morphological evolution. *Proceedings of the National Academy of Sciences of the United States of America* 101:6524–6529.
311. Zunk K, Mummenhoff K, Hurka H. 1999. Phylogenetic relationships in tribe Lepidieae (Brassicaceae) based on chloroplast DNA restriction site variation. *Canadian Journal of Botany* 71:1504–1512.
312. Zunk K, Mummenhoff K, Koch M, Hurka H. 1996. Phylogenetic relationships of *Thlaspi* s.l. (subtribe Thlaspidinae, Lepidieae) and allied genera based on chloroplast DNA restriction site variation. *Theoretical and Applied Genetics* 91:375–381.