

## Taxonomy and leaf anatomy of the genus *Ehrharta* (Poaceae) in southern Africa: the Dura group

G.E. GIBBS RUSSELL\* and R.P. ELLIS\*

**Keywords:** Capensis, *Ehrharta*, leaf anatomy, Mountain Fynbos, Poaceae, taxonomy

### ABSTRACT

The Dura species group in the genus *Ehrharta* Thunb. is differentiated morphologically by the perennial habit and the very large, awned, subglabrous spikelets and anatomically by the occurrence of tanniniferous cells and wax platelets obscuring the stomatal pores. The Dura group consists of two species, *E. dura* Nees ex Trin. and *E. microlaena* Nees ex Trin., which occur only in Mountain Fynbos. The group shows no clear morphological or anatomical relationship with other species groups in the genus in southern Africa.

### UITTREKSEL

Die Dura-spesiegroep in die genus *Ehrharta* Thunb. word morfologies deur die meerjarige groeiwyse en die besonder groot, genaalde, ylbehaarde blompakkies onderskei en anatomies deur die aanwesigheid van tannien-selle en wasplaatjies wat die huidmondjieporieë verberg. Die Dura-groep bestaan uit twee spesies, *E. dura* Nees ex Trin. en *E. microlaena* Nees ex Trin., wat slegs in Bergfynbos voorkom. Die groep vertoon geen duidelike morfologiese of anatomiese verwantskap met ander spesiegroepe in die genus in suidelike Afrika nie.

### INTRODUCTION

Previous papers in this series have outlined the seven provisional species groups for *Ehrharta* in southern Africa, and dealt with the Setacea and Villosa groups (Gibbs Russell & Ellis 1987; Ellis 1987a, 1987b; Gibbs Russell 1987a, 1987b). The Dura group is a small, apparently isolated group composed of only two species, *E. dura* Nees ex Trin. and *E. microlaena* Nees ex Trin. The two species are distinguished morphologically from other *Ehrharta* species by correlation of perennial habit, large spikelets 9–17 mm long and awned sterile lemmas with glabrous sides, keel and margins. The spikelet plan of the Dura group is shown in Figure 1. Anatomically the Dura group is distinguished within *Ehrharta* by the presence of tanniniferous cells and by wax platelets obscuring the stomatal pores. The spikelets and leaves of the species have a characteristic olive-green colour that is distinctive and may result from the dark tannins in the intercostal long cells of the epidermis. The species differ from each other principally in awn length and in leaf blade shape and width. Both species occur only in Mountain Fynbos.

The two species in the group present no nomenclatural difficulties because they were described by Trinius (1839) in the same publication, and other authors have consistently followed this treatment (Nees 1841; Steudel 1853; Stapf 1900; Chippindall 1955); thus neither species has synonyms. The same treatment is followed here. This singularly simple situation is undoubtedly a reflection of the distinctness of the Dura group within *Ehrharta* and the unusually low degree of intraspecific variation present. It is more difficult to assess to what degree the simplicity of treatment also results from the infrequent collection of the species due to their restrict-

ed and specialized distribution and habitat and the fact that they are apparent in vegetation only after fire.

However, lectotypification of the names is necessary. Trinius (1839) published descriptions of both species in his treatment of the tribe Phalarideae without citing any specimens. However, Trinius ascribed both names to Nees, presumably because he had obtained specimens from Nees with manuscript names. Two years later, Nees (1841) also published descriptions, for which he claimed authorship, in his treatment of all southern African grasses. Specimens of both species clearly labelled in Nees' handwriting exist in several herbaria. The Drège specimen of each species in the Herbarium, Komarov Botanical Institute, Leningrad (LE) is designated as lectotype, because these specimens were seen by Trinius who first published a description.

Two previous studies, Engelbrecht (1956) and Tateoka (1963), have covered some aspects of leaf anatomy of this group, and their findings are in accord with the detailed results presented here.

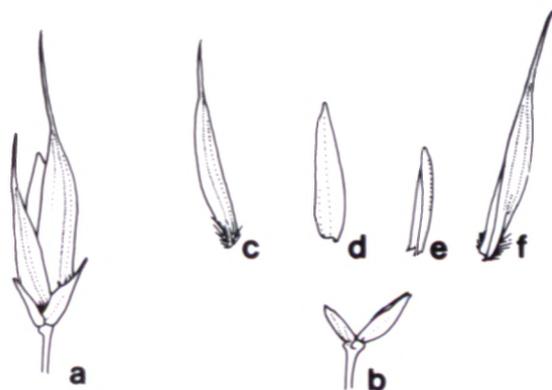


FIGURE 1.—Spikelet of *E. dura* (Ellis 5457, PRE): a, whole spikelet; b, glumes; c, first sterile lemma; d, lemma of fertile floret; e, palea of fertile floret; f, second sterile lemma; all  $\times 2$ .

\* Botanical Research Institute, Department of Agriculture and Water Supply, Private Bag X101, Pretoria 0001.

## METHODS

Methods adopted for previous papers in this series were followed here, both for the taxonomic and the anatomical studies. The descriptions and keys were prepared through the DELTA computer system for handling descriptive data (Dallwitz 1984).

## TAXONOMY

## Key to species

- Leaves with blades expanded, 4–10 mm across, lanceolate; basal sheaths persistent, hard, reddish brown; awns 2–16 mm long . . . . . *E. dura*  
 Leaves with blades reduced, setaceous, to 1 mm across; basal sheaths eventually deciduous, membranous, light brown or whitish; awns 13–25 mm long . . . . . *E. microlaena*

1. *Ehrharta dura* Nees ex Trin. in Phalaridea, Mémoires de l'Académie impériale des Sciences de St-Petersbourg, sér. 6, 5: 13 (of reprint) (1839); Nees: 218 (1841); Steudel: 5 (1853); Stapf: 665 (1900); Chippindall: 37 (1955); Smook & Gibbs Russell: 55 (1985). Type: Drège, Du Toit's Kloof, 3 000 ft, (LE!, lecto., here designated; K!, P!).

Perennial, erect, forming large leafy tufts, rarely long-rhizomatous. Rhizomes woody, with glabrous, thickened cataphylls. Culms several to many, to 800 mm long, 4 mm across, herbaceous, crowded, unbranched, hollow. Young shoots intravaginal. Leaves mostly basal, culm leaves with blades well developed, sheaths not overlapping; leaves auriculate, auricles produced from top of sheath; basal sheaths flabellate and slightly twisted, tight, persistent, hard, reddish brown, bearing blades; ligule a membrane fringed with hairs or sometimes nearly glabrous, 1.5–3.0 mm long; leaf blades persistent, erect, herbaceous, glabrous, lanceolate, 4–10 mm across, flat or folded, becoming rolled from margins when dry; blade bases folded, thickening with age, persistent and conspicuous often even in burned plants; blade tips gradually tapering. Inflorescence a panicle, open, 70–200 mm long, considerably overtopping leaves; main axis straight, often closely subtended or enveloped below by uppermost leaf sheath; numerous spikelets, spikelets appressed to the axes and held nearly erect but somewhat secund. Spikelets pedicellate, distinctly compressed laterally, 9–16 mm long, 3 mm across laterally (above glumes), olive-green. Rhachilla prolonged beyond fertile floret. Glumes not keeled, the lower  $\frac{1}{2}$  or more the length of the upper,  $\frac{1}{4}$ – $\frac{1}{2}$  as long as spikelet, white, or green, appressed to lemmas at maturity. Lower glume 2.5–6.5 mm long, 3–5-nerved, acute. Upper glume 3.5–7.0 mm long, 5–9-nerved, truncate apically. Florets with lemmas decidedly firmer than the glumes, keeled. Sterile lemmas laterally compressed, sides flat, similar in shape, texture and ornamentation; with keel and margins parallel; base not stipitate, without auriculate appendages, shortly bearded, sides scabrous or sometimes with short hairs, dull, with 3–11 strong or fairly distinct longitudinal ribs; tip tapering gradually from body of lemma to an arista or awn. Awn 2–16 mm long. First sterile lemma about  $\frac{1}{2}$  to  $\frac{2}{3}$  length of second sterile lemma. Fertile floret shorter than second sterile lemma. Lemma of fertile floret differing from sterile lemmas, strongly

laterally compressed and sides unornamented, faintly 3–5-nerved, sides glabrous, tip truncate with a tuft of minute hairs. Palea thinner than lemma,  $\frac{3}{4}$  or more as long as lemma, keeled, 1-nerved. Lodicules 2, membranous, 2-lobed, margins ciliate. Stamens 4 or 6. Anthers 7 mm long, yellow. Ovary glabrous. Stigmas white. Caryopsis 9 mm long, laterally flattened.

*E. dura* is distinguished from southern African *Ehrharta* species in other groups by the perennial habit and the large nearly glabrous mucronate to awned spikelets. It is distinguished from closely related *E. microlaena* by the broad leaves and the broad, brown, flabellate bases. It grows in mesophytic to seasonally moist open habitats in Mountain Fynbos in sandy or loam soils over sandstone or granite at altitudes of 430 to 1 300 m. A single specimen (Boucher 2028) came from an altitude of 30 m at Kogelberg State Forest. All but a few of the specimens seen were collected after a burn. *E. dura* extends along mountain ranges from Stellenbosch and Worcester to Humansdorp (Figure 2), and has a much wider distribution than *E. microlaena*. Most *Ehrharta* species show considerable variation in habit and leaf development, and it is possible to recognize ecotypes and local variants. In contrast to this common pattern, *E. dura* is remarkably constant in its appearance from the eastern to the western ends of its range, with no geographically correlated infraspecific variation. Flowering occurs from September to December.

Vouchers: Acocks 22817; Bond 1611; Taylor 4211, 10256; Zeyher 4513.

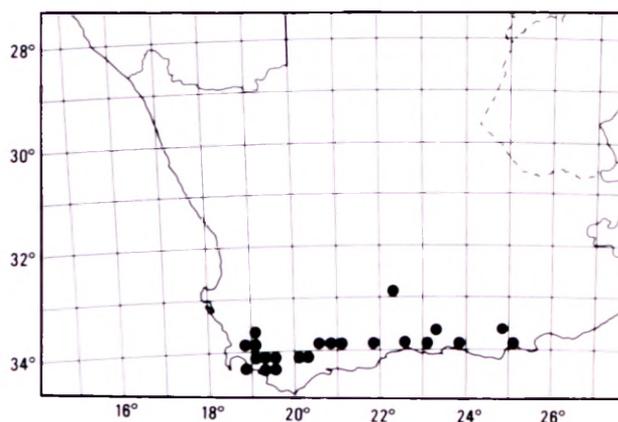


FIGURE 2.—Distribution of *E. dura*.

2. *Ehrharta microlaena* Nees ex Trin. in Phalaridea, Mémoires de l'Académie impériale des Sciences de St-Petersbourg, sér. 6, 5: 13 (of reprint) (1939); Nees: 218 (1841); Steudel: 5 (1853); Stapf: 665 (1900); Chippindall: 37 (1955); Smook & Gibbs Russell: 55 (1985). Type: Drège, Du Toit's Kloof (LE!, lecto., here designated; K!, SAM!).

Perennial, erect, tufted, apparently lacking long rhizomes. Culms several, to 1 100 mm long, 2.5 mm across, herbaceous, crowded, unbranched, hollow. Young shoots intravaginal. Leaves mostly basal, culm leaves with blades reduced, sheaths not overlapping. Leaves auriculate, the auricles produced from the base of the blade and adnate to the margins of the ligule. Basal sheaths somewhat flabellate, tight, eventually deciduous, membranous, light brown, or whitish, bearing blades. Ligule a glabrous

membrane to 8 mm long. Leaf blades persistent, erect, curved slightly outward from middle, herbaceous, glabrous, linear, reduced, setaceous, to 1 mm across; blade tips gradually tapering. *Inflorescence* a panicle, open, or somewhat contracted, 6–18 mm long, considerably overtopping leaves; main axis straight, usually exerted from uppermost leaf sheath; of numerous spikelets, spikelets spreading and somewhat secund. *Spikelets* pedicellate, distinctly compressed laterally, 13–15 mm long, to 2,5 mm across laterally (above glumes), with conventional internode spacing. Rachilla prolonged beyond fertile floret. Glumes not keeled, the lower  $\frac{1}{2}$  or more the length of the upper,  $\frac{1}{4}$ – $\frac{1}{3}$  as long as spikelet, green, appressed to lemmas at maturity. Lower glume 2,5–3,0 mm long, 3-nerved, acute. Upper glume 4–5 mm long, 7-nerved, truncate apically. *Florets* with lemmas decidedly firmer than the glumes, keeled. Sterile lemmas laterally compressed, sides flat, similar in shape, texture and ornamentation; with keel and margins parallel; base not stipitate, without auriculate appendages, sparsely and shortly bearded at base; sides glabrous or puberulous, dull, with 5–7 longitudinal ribs; tip tapering gradually from body of lemma into a long awn. Awn as long as or longer than body of lemma, 13–25 mm long. First sterile lemma about  $\frac{1}{2}$  length of second sterile lemma. Fertile floret shorter than second sterile lemma. Lemma of fertile floret differing from sterile lemmas, strongly laterally compressed and sides unornamented, obscurely 5–7-nerved, sides glabrous, tip truncate with a tuft of minute hairs. Palea thinner than lemma,  $\frac{3}{4}$  or more as long as lemma, keeled, 1-nerved. Lodicules 2, membranous, 2-lobed, margins ciliate and lacinate. Stamens 4. Anthers 7 mm long, yellow. Ovary glabrous. Stigmas white. *Caryopsis* 8 mm long, laterally flattened.

*E. microlaena* is easily distinguished from all other *Ehrharta* species by the perennial habit, the large, glabrous, long-awned spikelets and the setaceous leaf blades. It is hydrophytic, and grows on streamsides and in damp peaty places in Mountain Fynbos. Like *E. dura*, most of the specimens seen were collected after fire. However, the distribution of *E. microlaena* is more restricted than that of *E. dura*, extending from the Kogelberg Forest Reserve north through Paarl, Bain's Kloof, Du Toit's Kloof and Ceres to Tulbagh (Figure 3) at altitudes of 400 to 1 330 m. There is little intraspecific variation, and specimens from throughout the range are similar in appearance. Flowering occurs from December to February.

Vouchers: *Adamson* 3603; *Boucher* 173, 1838; *Esterhuysen* 28427, 35600.

#### 1. LEAF ANATOMY OF *E. DURA*

##### *Transverse section*

The leaf blade is open and expanded (Figure 4A) but has the ability to inroll from the margins under adverse moisture conditions. The midrib is not structurally distinguishable from the lateral first order vascular bundles and is not associated with colourless parenchyma. Successive first order bundles are separated by three smaller bundles, usually two third order bundles with a single second order bundle between them (Figure 4A) although this pattern is not always consistent (Figure 4B).

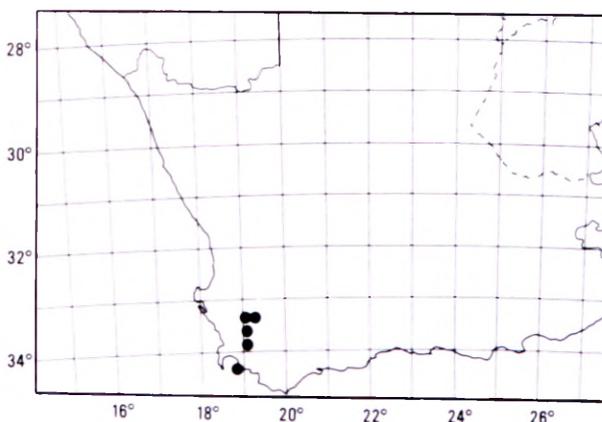


FIGURE 3.—Distribution of *E. microlaena*.

Well developed, rounded to slightly flattened adaxial ribs are located over all the vascular bundles (Figure 4A–C). These ribs generally are all the same size but the smallest third order bundles may be associated with smaller ribs (Figure 4B). The furrows between adjacent ribs are deep, narrow and steep-sided and tend to become cleft-like with leaf inrolling. Conspicuous bulliform cells occur at the bottom of these furrows (Figure 4C).

The mesophyll tissue is irregularly arranged. The chlorophyll cells are larger than the bundle sheath cells, angular and fitting tightly together with the chloroplasts concentrated around the cell circumference (Figure 4C). The walls are straight with no arm cell-like invaginations. No large intercellular air spaces are visible. Colourless parenchyma is absent between the bundles although colourless adaxial bundle sheath extensions are associated with the smaller bundles (Figure 4B, C). The vascular bundles are surrounded by two bundle sheaths, an outer sheath of many (up to 26) small colourless cells and a distinct mesostome sheath of cells with uniformly thickened secondary walls (Figure 4C). All the epidermal cells contain conspicuous, dark, resin-like deposits distributed evenly across the entire width of the blade (Figure 4B, C).

##### *Abaxial epidermis*

Costal and intercostal zones are differentiated (Figure 4D, E). The intercostal long cells are rectangular with slightly wavy anticlinal walls (Figure 4D, E) and inflated outer walls (Figure 5A–C). All contain black tanniferous deposits generally filling the entire cell lumen (Figure 4E). Adjacent long cells in a file are separated by single or paired short cells (Figure 4D, E). Cell size and arrangement is uniform across each intercostal zone.

Stomata occur in a single file on either side of each intercostal zone, immediately adjacent to the costal zones (Figure 4E). Successive stomata are separated by single interstomata and neither the subsidiary cells nor the interstomata contain tanniferous deposits. The subsidiary cells are low dome-shaped and not sunken below the general level of the epidermis (Figure 5C, D). The stomatal pores are obscured by dense accumulations of wax platelets (Figure 5D).

The costal silica bodies are irregularly dumbbell-shaped and alternate with similarly shaped short cells. Small prickle-hairs with very short barbs are interspaced at

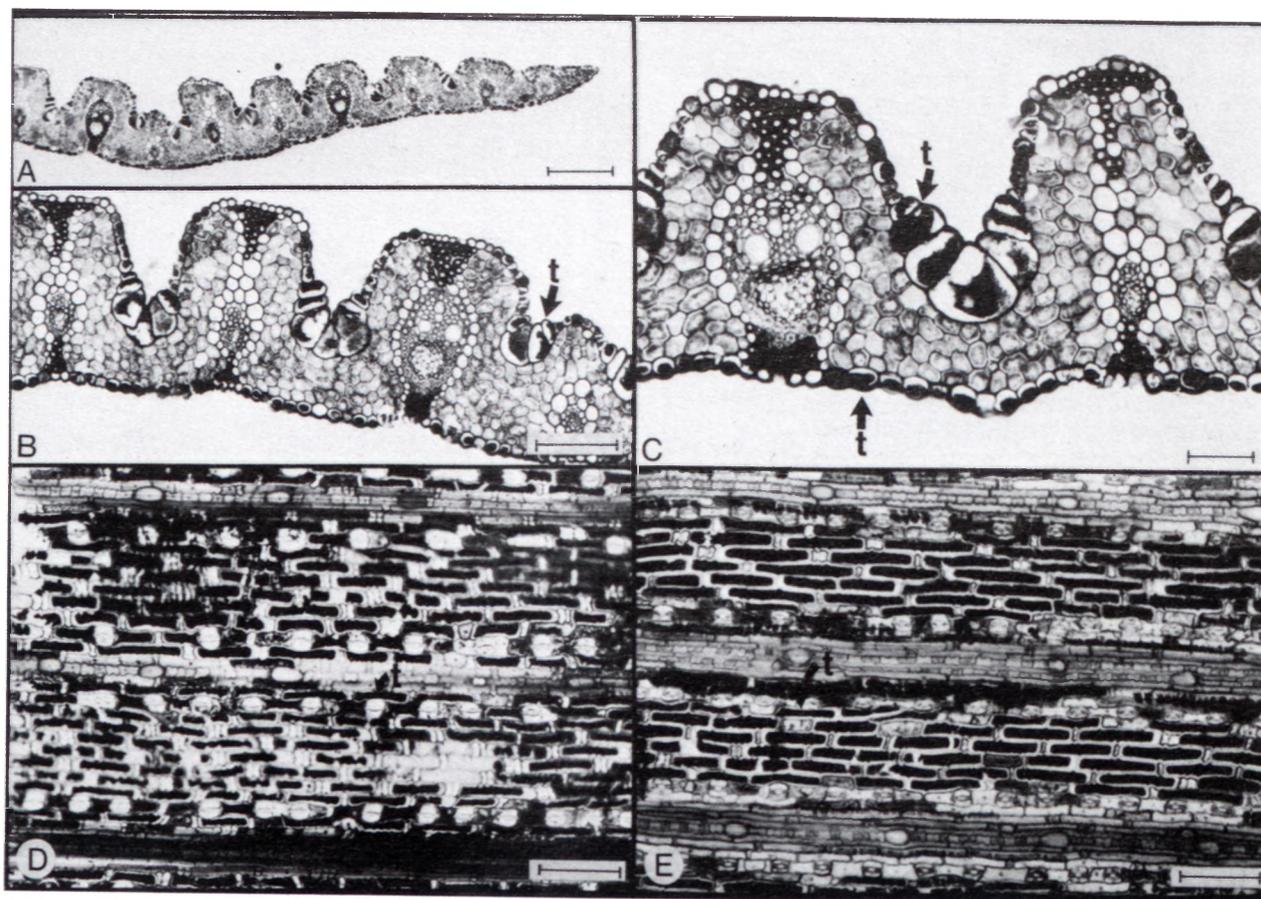


FIGURE 4.—Leaf anatomy of *Ehrharta dura*. A–C, leaf in transverse section, *Ellis 4695*: A, outline showing absence of keel, scale = 20  $\mu\text{m}$ ; B, prominent adaxial ribs and deep furrows, scale = 10  $\mu\text{m}$ ; C, detail of chlorenchyma and tanniniferous epidermal cells (t), scale = 5  $\mu\text{m}$ . D–E, abaxial epidermis: D, *Ellis 4695*, epidermal zonation and tanniniferous intercostal long cells (t), scale = 10  $\mu\text{m}$ ; E, *Ellis 4696*, all intercostal long cells with tanniniferous deposits (t), scale = 10  $\mu\text{m}$ .

intervals along the costal zones (Figures 4D, E). Microhairs were not observed with the light microscope but are clearly visible with the SEM (Figure 5C, E). These hairs have a short basal cell with a blunt distal cell (Figure 5E). Small pointed, single-celled intercostal macrohairs are very rare (Figure 5F).

#### Specimens examined

CAPE.—3318 (Cape Town): Stellenbosch (–DD), *Taylor 10256*. 3320 (Montagu): Grootvadersbos (–DD), *Ellis 5554*. 3321 (Ladismith): Cloetes Pass, Langeberge (–DD), *Ellis 4695, 4696*. 3322 (Oudtshoorn): Robinson Pass, Outeniqua Mts (–CC), *Ellis 5457*. 3324 (Steytlerville): Groot Winterhoek Mts, Cockscomb Peak (–DB), *Ellis 5615*. 3419 (Caledon): Rivier-sonderend Mts, Die Galg (–BA), *Ellis 5568*.

## 2. LEAF ANATOMY OF *E. MICROLAENA*

### Transverse section

No fresh leaf blade material of this taxon was available for anatomical study, and consequently the transectional anatomy was not examined. Engelbrecht (1956) has shown that the leaf blade is cylindrical in section with the interior containing colourless parenchyma tissue. This structure appears to result from the fusion of the two margins and not from a reduction of the lamina on either side of the midrib with the resultant blade being only a rounded keel. This specialized blade needs detailed anatomical study as it represents an interesting adaptation within the genus.

### Abaxial epidermis

Herbarium leaf blade material was used to prepare abaxial epidermal scrapes of this species. The epidermal structure is very similar to that of *E. dura*, and reference should be made to the description above. Both species have the diagnostic tanniniferous intercostal long cells which dominate the epidermis and are unique to this species group in *Ehrharta*.

### Specimens examined

CAPE.—3319 (Worcester): Hex River Mts, Milner Peak (–AD), *Ellis 5524*; Du Toit's Kloof (–CA), *Boucher 1838*.

## DISCUSSION AND CONCLUSIONS

The two species in the Dura group are the only awned perennial *Ehrharta* species in southern Africa. Three other species have awns, but all are annual: *E. longiflora* and *E. triandra* in the Erecta group and *E. pusilla* in the closely related Calycina group. These three species grow near ephemeral water bodies, and each is apparently most closely related to the unawned perennial species within their group. Awns are therefore probably the result of parallel or convergent evolution in different species groups. Therefore, no phylogenetic relationship between the Dura group and the annual awned members of the Erecta and Calycina groups should be inferred on the basis of awn occurrence.

The spikelet size of the Dura group species, excluding the awns, is only equalled in the three taxa of the Villosa group: *E. thunbergii*, *E. villosa* var. *villosa* and *E. villosa* var. *maxima* (Gibbs Russell 1987b). However, the shape and vesture of the sterile lemmas differ and are distinctive for both groups, and size alone is poor evidence upon which to speculate relationship.

The spikelets of the Dura group are distinctive in other respects as well, and therefore the Dura group cannot be shown to have a close similarity with any other species group on the basis of spikelet structure (Gibbs Russell & Ellis 1987). However, the consistent occurrence of four stamens in *E. microlaena* and four or six stamens (the usual number for southern African *Ehrharta* species) in *E. dura*, suggests that relationships

for the Dura group might be sought within the Australian species formerly assigned to *Tetrarrhena* (Willemse 1982). *Tetrarrhena* is characterized by the presence of four stamens, a most unusual condition in the Poaceae.

The Dura species group has distinctive leaf anatomy that separates it from the other groups in the genus in southern Africa (Gibbs Russell & Ellis 1987). In transection the leaf blade lacks a keel, has well developed, flattened adaxial ribs and furrows and the mesophyll consists of large angular chlorenchyma cells with no definite pattern of arrangement. The tanniniferous epidermal cells, particularly the bulliform cells, are diagnostic for this group. This anatomy superficially resembles the Villosa group but the two groups can be separated by the flat ribs and tanniniferous cells of the Dura group and the



FIGURE 5.—Ultrastructure of the abaxial epidermis of *E. dura*. A, *Ellis 4695* with inflated, thick-walled intercostal long cells, stomatal file and costal zone with row of prickles,  $\times 200$ ; B, *Ellis 4696* showing intercostal long cells, stomata and a prickle,  $\times 100$ ; C–E, *Ellis 4695*: C, more intercostal long cell detail with microhairs and stomata visible,  $\times 150$ ; D, stoma with dense accumulation of wax platelets overlying the pore,  $\times 500$ ; E, microhair with short basal cell and longer blunt distal cell,  $\times 500$ ; F, *Ellis 4696* showing small intercostal macrohair,  $\times 500$ .

tendency towards semi-radiate chlorenchyma with abaxial palisade-like cells in the Villosa group (Ellis 1987). The Setacea (Ellis 1987) and Ramosa groups and the Longifolia subgroup all lack keels but differ from the Dura group in many other respects (Gibbs Russell & Ellis 1987).

The abaxial epidermis is differentiated into costal and intercostal zones with rectangular long cells, low dome-shaped subsidiary cells, irregularly dumbbell-shaped silica bodies, prickles with short barbs and microhairs with blunt distal cells. Epicuticular wax is absent except in association with the stomatal apertures where wax platelets obscure the pores. This combination of epidermal attributes is distinctive and serves to distinguish the Dura group from the others (Gibbs Russell & Ellis 1987). Rectangular long cells are shared with the Villosa and Ramosa groups but the stomata, silica bodies and microhairs differ between these three groups.

The unique tanniferous epidermal cells found in the species of the Dura group are of great interest because these represent the only known C<sub>3</sub> grasses which possess this type of cell (Ellis in prep.). No bambusoids, pooids or other arundinoids are known to have this type of epidermal cell which is also rare in the chloridoids and panicoids, except the Andropogoneae and Arundinelleae, where many species and genera exhibit tanniferous cells. The colour and texture of the contents of the epidermal cells of *E. dura* and *E. microlaena* are consistent with that of the tanniferous cells observed in these C<sub>4</sub> grass taxa and it is presumed that they contain the same chemical substance. All 90 South African grass species in which this type of cell has been observed are unpalatable species from oligotrophic soils and it is inferred that these cellular contents are polyphenols which function as a chemical defence against herbivores (Ellis in prep.). Their presence in the Dura group may represent a separate and similar adaptation to which no phylogenetic importance should be attached.

The anatomical observations of this study generally agree with previous reports but for a minor exception. Tateoka (1963) described the subsidiary cells of *E. dura* as being almost parallel-sided, whereas here they are shown to be low dome-shaped. However, the distinction between these two stomatal types is only slight and a difference in interpretation may have resulted in this apparent inconsistency. The work of Engelbrecht (1956) is in full agreement with this study.

It is of interest that in one of the five specimens of *E. dura* examined by Engelbrecht (1956) a distinct keel, incorporating five vascular bundles with extensive adaxial parenchyma, was observed. This appears to be an intermediate condition between *E. dura* and the cylindrical blade of *E. microlaena*. It appears as if the cylindrical leaf blade of *E. microlaena* represents an adaptation to hygrophilous habitats and the intermediate specimen probably came from a damp locality. Unfortunately it is not possible to deduce which specimen displayed this anatomy from the work of Engelbrecht (1956). Nevertheless, this represents the first possible intermediate between these two species which are otherwise so clearly separated anatomically and morphologically.

*E. dura* and *E. microlaena* are undoubtedly closely related to each other, yet have very little in common

with any other species of *Ehrharta* in southern Africa. Both spikelet morphology and leaf anatomy indicate that they occupy an isolated position within the genus and are not linked to any of the other species groups. The two taxa are treated at the level of species because they are differentiated by both vegetative and spikelet characteristics, have very different transectional leaf blade anatomy and their habitats are somewhat different. In addition, although the two taxa occur sympatrically, they flower at different times and no morphologically intermediate specimens have been observed.

#### ACKNOWLEDGEMENTS

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#### SPECIMENS EXAMINED

*Acocks* 22817 (1) PRE. *Adamson* 3603 (2) PRE.

*Bolus* 4225 (1) BOL, PRE. *Bond* W662 (1) NBG; 1611 (1) PRE. *Boucher* 173 (2) STE; 1838 (2) PRE. STE; 2028 (1) PRE, STE. *Burchell* 7184 (1) K.

- Drège s.n.* (1) K, LE (lectotype), P, PRE; *s.n.* (2) K, LE (lectotype), P, PRE, SAM. *Du Toit 2027* (1) PRE, STE.
- Ecklon s.n.* (2) P. *Ecklon & Zeyher s.n.* (1) LE, SAM; *s.n.* (2) LE. *Ellis 4695* (1) PRE; *4696* (1) PRE; *5457* (1) PRE. *Esterhuysen 7083* (1) BOL; *13657* (1) PRE; *28427* (2) BOL, PRE; *32827a* (1) BOL, PRE; *34491* (1) BOL; *35600* (2) BOL, PRE.
- Fourcade 2479* (1) BOL, K, PRE, STE; *2852* (1) PRE, STE.
- Gill s.n.* (1) K.
- Haynes 526* (1) K, PRE, STE.
- Keet 13-3-1919* (1) PRE. *Kensit 14649* (1) BOL.
- Ledebour s.n.* (2) LE.
- MacOwan 2074* (1) SAM; *2126* (1) K.
- Paterson 2484* (1) BOL.
- Schlechter 3611* (1) PRE; *9809* (1) BOL, K, LE, P, PRE.
- Taylor 3221* (1) PRE, STE; *4081* (1) PRE, STE; *4211* (1) JF, PRE, STE; *5598* (1) PRE; *10256* (1) PRE, STE. *Thorne Oct. 1926* (1) SAM.
- Zeyher 4513* (1) BOL, K, P, PRE, STE; *s.n.* (1) BOL, LE; *s.n.* (2) SAM. *Zeyher & Ecklon s.n.* (1) P.
- SPECIMENS OF THE VILLOSA GROUP OF *EHRHARTA* EXAMINED IN BOTHALIA 17,2: 191–194 (1987)**
- Acocks 14809* (1) PRE; *15185* (1) PRE; *23393* (1) PRE. *Adamson 1116* (1) PRE; *1240* (2a) BOL; *1360* (2a) PRE; *1362* (2a) BOL. *Andreae 1314* (1) PRE. *Archibald 3664* (2b) PRE.
- Barker 2718* (2a) NBG. *Bohnen 4541* (2a) PRE, STE. *Bond 248* (1) NBG; *1672* (1) NBG; *1685* (1) NBG; *9566* (1) NBG; *9644* (1) NBG. *Booyesen 2239* (1) NBG. *Boucher 662* (2a) STE; *1689* (2b) PRE, STE; *3325* (2a/2b) STE; *3983* (2a) PRE, STE; *4724* (1) PRE, STE. *Boucher & Shepherd 5665* (1) PRE. *Britten 444* (2b) PRE; *778* (2b) PRE; *1890* (2b) PRE; *1941* (2b) PRE. *Buys 6.10.78* (2b) STE.
- Cleghorn 3122* (2a) PRE, STE. *Compton 6262* (1) NBG; *9343* (2a) NBG; *14187* (2a) NBG; *17530* (2b) NBG; *22228* (1) NBG, PRE, STE. *Crook 1038* (2a) BOL, NBG, PRE; *2260* (2a) PRE. *Curator, Pretoria 131* (2a) PRE.
- Dahlstrand 156* (2b) J, PRE. *Dinter 3968* (1) PRE. *Dixon 151* (2a) STE. *Downing 400* (2a) PRE. *Duthie 1642* (1) BOL. *Du Toit 1651* (1) PRE, STE; *1668* (1) PRE, STE.
- Ecklon Oct. 1838* (1) NBG, SAM. *Ecklon & Zeyher 409* (2b) BOL, NBG, SAM, STE. *Ellis 601* (2b) PRE, STE; *708* (1) PRE; *1145* (1) PRE; *1152* (1) PRE; *1284* (2a) PRE; *1651* (1/2a) PRE; *1686* (2a) PRE; *1700* (1) PRE; *4626* (1) PRE; *4633* (1) PRE; *4635* (1) PRE; *4640* (1/2a) PRE; *4642* (1) PRE; *4648* (1) PRE; *4665* (2a) PRE; *4693* (1/2a) PRE; *5102* (1) PRE; *5130* (1) PRE. *Emdon 200* (1/2a) PRE, STE. *Esterhuysen 3244* (1) PRE; *3670* (1) BOL; *9320* (1) BOL; *22123* (1) PRE; *32243* (1) BOL, PRE; *32496* (1) BOL, PRE; *34024* (1) BOL; *34080* (2a) BOL.
- Fairale 343* (1) PRE.
- Gibbs Russell 5589* (1) PRE; *5591* (1) PRE; *5594* (1) PRE; *5596* (1) PRE; *5601* (1) PRE; *5611* (1/2a) PRE; *5614* (1) PRE; *5619* (1) PRE; *5624* (1) PRE; *5628* (1) PRE; *5630* (1) PRE; *5631a* (1) PRE; *5638a* (1) PRE; *5648* (2a) PRE; *5670* (1/2a) PRE; *5680* (1) PRE; *5689* (1) PRE. *Gluckmann 26/11/38* (2a) J. *Grant 4996* (1) PRE.
- Hubbard 261* (2a/2b) STE.
- Kruger 959* (1) JF, STE; *1681* (1) JF.
- Le Maitre 291* (1) JF. *Levy's Oct. 1923* (2b) SAM. *Liebenberg 4015* (1/2a) PRE; *4224* (1) PRE; *4229* (2a) STE; *4260* (2a) STE; *4272* (2a) STE; *4274* (1) STE; *6551* (1) PRE, STE.
- Marloth 3046* (2a) PRE, STE; *3712* (2a) PRE; *6024* (2a) PRE. *Merxmüller & Giess 28299* (1) PRE. *Moss 3.1.18* (2a) J. *M.R.L. 3594* (1) BOL.
- Olivier 165* (1) STE.
- Pappe Oct. 1838* (1) BOL. *Parker 3621* (2a) BOL, NBG. *Paterson 1097* (2a) BOL. *Pearson 5121* (1) BOL, PRE. *Phillips 11903* (1) SAM. *Pillans 7519* (1) BOL. *Prior April 1903* (2a) SAM.
- Schlechter 2098* (1) PRE; *9058* (1) BOL, PRE; *10208* (1) BOL, PRE. *Smith 4969* (2a) PRE. *Stocks s.n.* (2b) STE. *Story 4328* (1) PRE.
- Taylor 10167* (2b) PRE, STE. *Theron 1108* (2b) PRE. *Thoday Nov. 1921* (2a) BOL. *Tyson 607* (1) BOL, NBG; *8598* (2b) PRE, STE; *14870* (2b) BOL; *17549* (2b) PRE.
- UPE Staff 158* (2b) PRE.
- Van Breda 4* (1) PRE. *Van Breda & Joubert 2175* (1) STE. *Van der Byl Sept. 1927* (2a) SAM, STE. *Van der Merwe 1201* (1/2a) PRE. *Van Rensburg 111* (1) PRE, STE; *216* (1) STE.
- Walgate 639* (2b) NBG. *Walker Dec. 1976* (2a) J. *Wolley Dod 3229* (2a) BOL.
- Zeyher 167* (1) BOL, PRE, SAM; *4509* (1) PRE; *45096* (2a) PRE. *Zinn 67672* (1) SAM.