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Cyathial Characteristics of Some Prostrate Euphorbias Common in India

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With 13 Figures

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Summary

MISHRA D. P. & SAHU T. R. 1985. Cyathial characteristic of some prostrate Euphorbias common in India. — *Phyton* (Austria) 25 (1): 43—49. — English with German summary.

Seven prostrate species of *Euphorbia* i. e. *E. cristata* HEYNE ex ROTH, *E. thymifolia* L., *E. prostrata* AIT., *E. heyneana* SPRENG., *E. clarkeana* HOOK. f., *E. indica* LAM. and *E. hirta* L. have been studied for cyathial characteristics including the hair types. The study of the cyathia reveals the distinctiveness of all the species.

Zusammenfassung

MISHRA D. P. & SAHU T. R. 1985. Cyathium-Merkmale einiger niederliegender, in Indien häufiger Euphorbien. — *Phyton* (Austria) 25 (1): 43—49. — Englisch mit deutscher Zusammenfassung.

Sieben niederliegend wachsende *Euphorbia*-Arten, nämlich *E. cristata* HEYNE ex ROTH, *E. thymifolia* L., *E. prostrata* AIT., *E. heyneana* SPRENG., *E. clarkeana* HOOK. f., *E. indica* LAM. und *E. hirta* L. sind auf die Merkmale ihrer Cyathien und auf die an diesen vorkommenden Trichom-Typen untersucht worden. Die gefundenen Merkmale unterstreichen die Eigenständigkeit der behandelten Arten.

Introduction

Euphorbiaceae, one of the largest and most diverse families of angiosperms comprises some 5,000 species in about 300 genera under

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5 sub-families and 52 tribes (WEBSTER 1975). *Euphorbia* L., the largest genus contains 40% of the species of the family (WILLIS 1966) showing a remarkable variability in their habit and habitats. This genus is held together by the unique cyathial feature. Herbs, shrubs and trees with diverse habit predominantly occur in tropical and frequently in temperate regions. In India, *Euphorbia* is represented by 52 species of which only 15 are of either prostrate or prostrate-ascending habit (HOOKER 1887). In various regional floras this number does not exceed than seven species (GAMBLE & FISCHER 1957, COOKE 1958, DUTHIE 1960, HAINS 1961, MAHESWARI 1963, SALDANHA & NICOLSON 1976, BABU 1977 and OOMMACHAN 1977). As the amplitude of morphological variation in this family is so great that it is difficult to characterize the family, these species of prostrate habit also create much confusion in their identification with one or the other due to tremendous diversity in habit, leaf morphology, chromosome number and pollen configuration etc. (WEBSTER 1967). Therefore, an attempt is made to identify these forms of *Euphorbia* on the basis of cyathial morphology.

Material and Methods

Seven prostrate species of *Euphorbia* i. e. *E. cristata* HEYNE ex ROTH, *E. thymifolia* L., *E. prostrata* AIT., *E. heyneana* SPRENG. *E. clarkeana* HOOK. f., *E. indica* LAM. and *E. hirta* L. collected from different parts of India, have been studied for the following cyathial characteristics: 1. Number of cyathia per axil, 2. Involucre lobe apices, 3. Limb of gland, 4. Gland type, 5. Hairs on the involucre, 6. Hairs on the capsule, and 7. Cocci.

In the first instance, the species are divided into four groups on the basis of habit, vegetative characters, and number of cyathia in each axil, and their surface (glabrous or pubescent). The later distinction of the species within each group is made on the basis of involucre (apex type, presence or absence of hair), limb, coccus type etc. It may be emphasized that it is usually a group of characteristics which will determine a particular species.

Identification of these species was also supplemented by the presence or absence of hairs on cyathial parts and their types.

Reference specimens are deposited in the herbarium of Botany Department, Doctor Harisingh Gour Vishwavidyalaya, Sagar, M. P., India.

Observations and Discussion

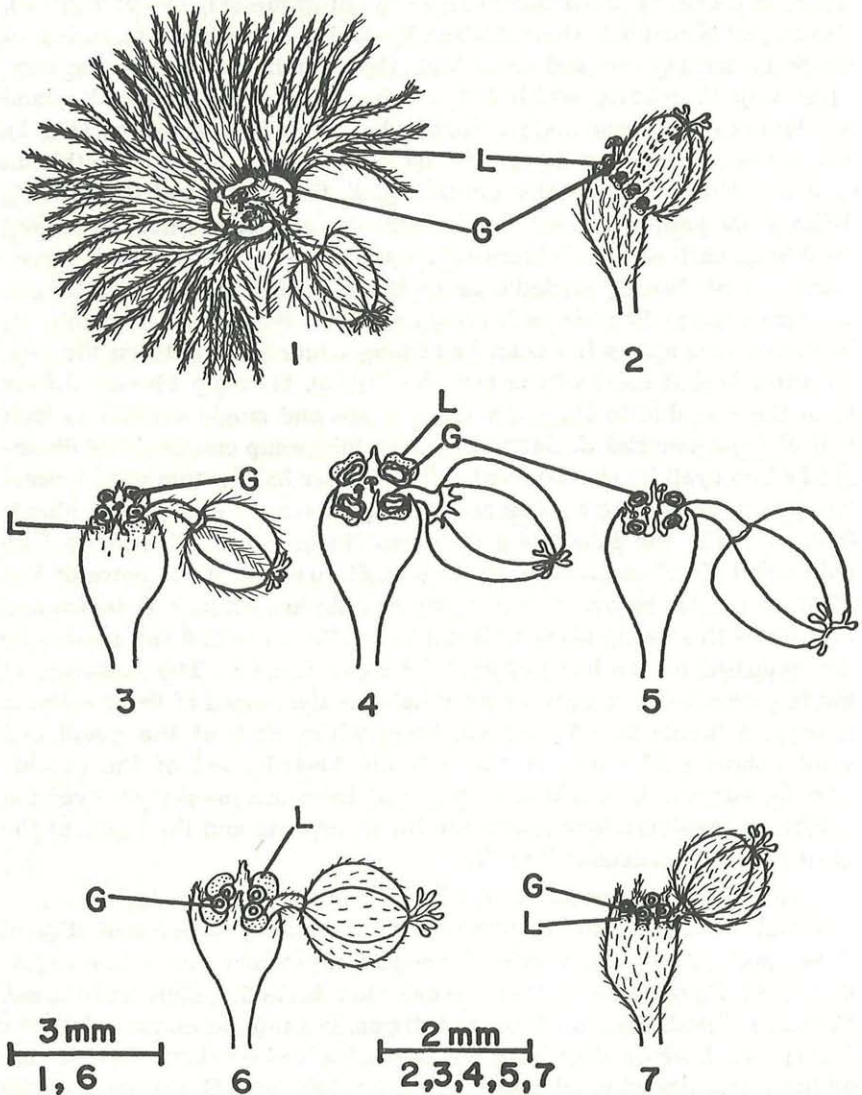
At once these seven species, on the basis of morphological appearance and vegetative characters, can be put into four groups: 1. Plant prostrate, densely covered with long flexuous hairs; leaf 1—1.5 cm long,

cordate, e. g. *E. cristata*, 2. Prostrate, hairy; leaf less than 1 cm long e. g. *E. thymifolia* and *E. prostrata*, 3. Prostrate, glabrous; leaf less than 1 cm long e. g. *E. heyneana* and *E. clarkeana*, 4. Prostrate or prostrate-ascending, hairy; leaf 2—4 cm long e. g. *E. indica* and *E. hirta*.

The study of cyathia reveals the distinctiveness not only of these groups but also between the species of each group (Fig. 1—7; Table 1). The first group is characterised by a single cyathium in each axil which is densely covered with long flexuous hairs. This group contains only *E. cristata* which has involucre lobes 2—3 teethed; gland sessile; limb very large and pectinately lacinate with many arms (Fig. 1). The second group is marked by the presence of 2—3 cyathia in each axil. The species of this group i. e., *E. thymifolia* and *E. prostrata* differ from each other, as the former one possesses three pubescent cyathia in each axil; involucre lobe apices linear-ligulate; limb inconspicuous and obtusely keeled cocci on the capsule (Fig. 2). The latter one has two cyathia in each axil; scanty hairs at the mouth of involucre, involucre lobe apices lanceolate and long white hairs only on the prominently keeled cocci of the capsule (Fig. 3). Group three differs from the rest due to their glabrous nature and single cyathia in each axil. *E. heyneana* and *E. clarkeana* under this group can easily be distinguished on cyathial characteristics. The former has cyathia with lanceolate apices of involucre lobes and an inconspicuous limb of the glands (Fig. 4) while the latter one possesses linear-ligulate involucre lobe apices and glands without limb (Fig. 5). Group four is more or less identical due to the presence of many cyathia in each axil. *E. indica* and *E. hirta* of this group show well marked differences and can readily be distinguished on the basis of cyathial characteristics. The cyathium of the former species possesses scanty hairs at the mouth of the involucre, lanceolate involucre lobe apices, large white limb of the gland and scanty short stiff hairs on the obtusely keeled cocci of the capsule (Fig. 6), whereas in the latter, appressed hairs are present all over the cyathium, involucre lobe apices are linear-ligulate and the limbs of the glands are inconspicuous (Fig. 7).

The study of trichome types (Figs. 8—13) and their organographic distribution on the cyathium also provide and aid to the differentiation of these species (Table 2). *E. cristata* shows multicellular uniseriate rugose hairs (Fig. 11) on every part of the cyathium including style and stigma. Presence of such hairs on style and stigma, is a unique characteristic for this species because they have not been observed on these parts in any of the remaining studied species. *E. thymifolia* and *E. prostrata* differ to each other in having multicellular uniseriate rugose hairs and bicellular uniseriate rugose hairs respectively. *E. heyneana* shows very sparse unicellular rugose (Fig. 8) and bicellular uniseriate rugose hairs. (Fig. 9)

on the inner side and on the apices of the involucre lobes only, while *E. clarkeana* of the same group devoid of any hairs. In *E. indica* bicellular uniseriate rugose hairs frequently present on various parts of the cyathium and multicellular uniseriate rugose hairs (Figs. 10 & 12) are restricted to the female pedicel, but scanty. *E. hirta* differs from



Figs. 1—7. Cyathia of some prostrate species of *Euphorbia*. — Fig. 1. *E. cristata*. — Fig. 2. *E. thymifolia*. — Fig. 3. *E. prostrata*. — Fig. 4. *E. heyneana*. — Fig. 5. *E. clarkeana*. — Fig. 6. *E. indica*. — Fig. 7. *E. hirta*

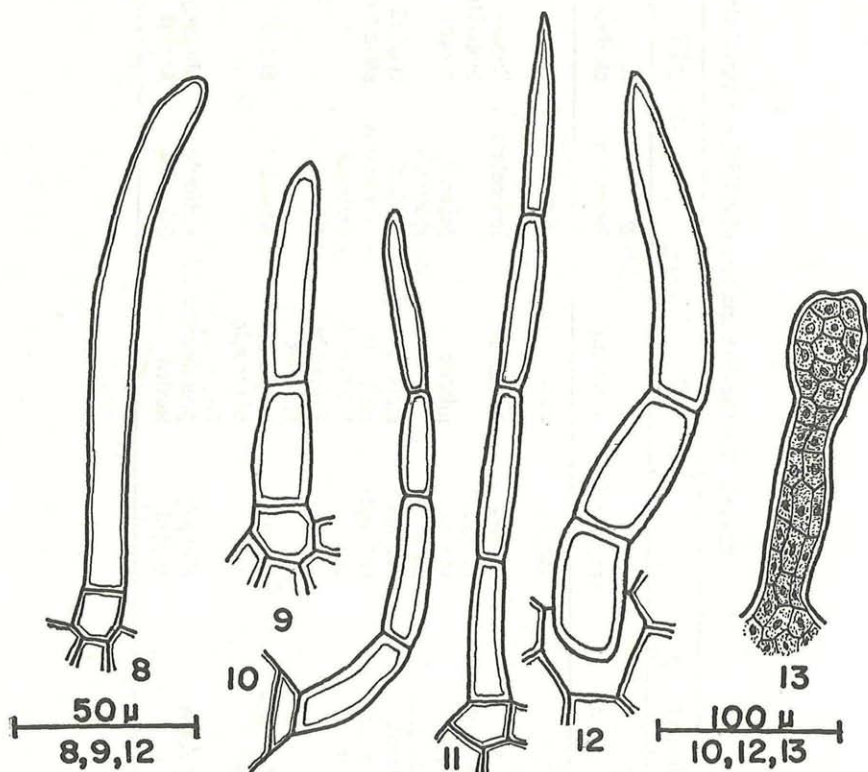
Table 1. Comparative analysis of cythial characteristics

Character	Group I		Group II		Group III		Group IV	
	<i>E. cristata</i>	<i>E. thymifolia</i>	<i>E. prostrata</i>	<i>E. heyneana</i>	<i>E. clarkeana</i>	<i>E. indica</i>	<i>E. hirta</i>	
No. of cyathia per axil	one	three	two	one	one	many	many	
Involucre lobe apices	2-3 teathed large, fimbriate	linear-lingulate	lanceolate	lanceolate	linear-lingulate	lanceolate	linear-lingulate	
Limb of gland	large, fimbriate	inconspicuous stalked	minute	inconspicuous stalked	absent	large, white stalked	minute stalked	
Gland	Sessile	through-out	stalked	very scanty on inner side	absent	scanty at the margin of lobe	through-out	
Hairs on the involucre	through-out	through-out	scanty at the mouth & margin of lobes on the keel of capsule	absent	absent	through-out	through-out	
Hairs on the capsule	through-out	through-out	only prominently keeled	obtusely keeled	obtusely keeled	obtusely keeled	obtusely keeled	
Cocci	globose	obtusely keeled	keeled	obtusely keeled	obtusely keeled	obtusely keeled	obtusely keeled	

E. indica in having multicellular uniseriate rugose hairs on all the parts of the cyathium except style and stigma. Further distinction between both these species can also be made on the basis of glandular hairs (Fig. 13). They are present on the apices of the involucre lobes of *E. hirta* and found to be absent in *E. indica*.

Thus detailed investigation on the cyathial morphology in different prostrate species of *Euphorbia* might prove valuable, not only for easy identification but also in assessing the relationship among them, when taken into consideration along with other characteristics.

P. S. — Authors observed two distinct forms of *E. prostrata* commonly occurring in Central India i. e., one is perfectly green and the other some has reddish stems and bluish-green leaves. Both forms



Figs. 8—13 Trichome types of different *Euphorbia* species. — Fig. 8. from the ovary of *E. prostrata*. — Fig. 9. from the stipule of *E. prostrata*. — Fig. 10. from the stem of *E. indica*. — Fig. 11. from the involucre of *E. cristata*. — Fig. 12. from the leaf margin of *E. indica*. — Fig. 13. from the stipule of *E. hirta*

Table 2. Trichome types and their distribution on the cyathia

(A = unicellular rugose, B = bicellular uniseriate rugose, C = multicellular uniseriate rugose, D = glandular, one gland at each apex. + = scanty, ++ = many, +++ = abundant, - = absent)

Name of species	Involucre			Female stalk	Ovary	Style and stigma
	outside	inside	Apices			
<i>E. cristata</i>	C ₊₊₊	C ₊₊₊	C ₊₊₊	C ₊₊₊	C ₊₊₊	C ₊₊
<i>E. thymifolia</i>	C ₊₊₊	C ₊₊	C ₊₊₊	C ₊₊	C ₊₊₊ B ₊₊₊ B ₊₊ A ₊₊	-
<i>E. prostrata</i>	B ₊	B ₊₊	B ₊₊₊	B ₊	B ₊₊ A ₊₊	-
<i>E. heyneana</i>	-	A ₊ B ₊	A ₊ B ₊	-	-	-
<i>E. clarkeana</i>	-	-	-	-	-	-
<i>E. indica</i>	B ₊₊	-	B ₊	C ₊	B ₊₊	-
<i>E. hirta</i>	C ₊₊₊	C ₊₊	C ₊₊ D	C ₊	C ₊₊₊	-

occur side by side and there are no intermediate forms bridging these differences. This species requires further investigation.

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