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THE GENETICS OF HETEROSTYLY IN *HYPERICUM AEGYPTICUM*

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Hypericum aegypticum L. (Hypericaceae) is a shrubby distylous species of north-western Africa and a few Mediterranean islands. It and two other species constitute section *Adenotrias*, the only section of a large genus of *c.* 400 species in which heterostyly is known to occur (Ornduff, 1975). In the few families for which the genetics of distyly has been worked out, there is a one-locus two-allele system that governs the trait. The long-styled (pin) flowers are produced by the homozygous recessive genotype (*ss*) and the short-styled (thrum) flowers are produced by the heterozygous genotype (*Ss*, or occasionally *SS* in some self-compatible species).

A selfing and crossing programme was carried out using three pin and four thrum plants of *H. aegypticum* collected in the mountains *c.* 19 km north-west of Agadir on the Atlantic coast of Morocco. Because of a slight self-compatibility of both morphs, a few seeds were obtainable from each cross (table). All progenies of the crosses thrum × thrum or of thrum selfed were composed of thrum individuals (table). All pin × pin crosses or pin selfs produced progenies with pins and thrums. Although the proportion of pins to thrums varied from progeny to progeny, when considered collectively, the ratio of pins : thrums in the F_1 was 3 : 1 (table). Thus, for *Hypericum aegypticum* pins are *Ss* and thrums are *ss*.

The genetic basis of distyly has been determined for several species of *Primula* (Primulaceae; *e.g.* Bateson and Gregory, 1905; Mather, 1950; see

TABLE

Style forms of progeny of crosses of Hypericum aegypticum

Cross	Style forms of progeny: Pin	Thrum
Pin-A selfed	23	8
Pin-B selfed	46	20
Pin-D selfed	19	8
Pin-B × Pin-D	12	2
Total	100	38 [$\chi^2 = 0{\cdot}473$]
Thrum-E selfed	0	46
Thrum-H selfed	0	10
Thrum-E × Thrum-F	0	4
Thrum-E × Thrum-H	0	7
Thrum-F × Thrum-E	0	8
Thrum-G × Thrum-E	0	4
Total	0	79

Lewis, 1949); *Pulmonaria officinalis* (Boraginaceae; based on data given by Darwin, 1877); *Amsinckia* spp. (Boraginaceae; Ray and Chisaki, 1957), *Fagopyrum esculentum* (Polygonaceae; Althauser, 1908; Dahlgren, 1922; Garber and Quisenberry, 1927); *Linum* (Linaceae; Laibach, 1923); *Psychotria warneckei* and *Uragoga* spp. (Rubiaceae; Baker, 1958); *Gelsemium sempervirens* (Loganiaceae; Ornduff, unpub.); and probably *Nivenia* (Iridaceae; Ornduff, unpub.; see von Ubisch, 1925; Lewis, 1949, 1954, for general reviews of the genetics of heterostyly). In all these taxa, pins are homozygous recessive (*ss*) and thrums are normally *Ss*. Only in *Hypericum*, discussed herein (and possibly also in the distylous *Limonium vulgare*, Plumbaginaceae; Baker, 1966) is the genetic situation reversed with pins the heterozygous morph and thrums the homozygous morph. Thus, out of eleven genera in nine angiosperm families, only one genus (and possibly a second) has the " *Hypericum* system " and nine have the " *Primula* system " of genetic control of distyly. There is no obvious explanation for the prevalence of the second genetic system for distyly over the first. Charlesworth and Charlesworth (pers. comm.) have suggested that in the model leading to the evolution of the type of distyly with the " *Primula*-type " genetics, the more self-compatible form is dominant, but in *Hypericum aegypticum*, with the reverse genetic system, this is also true (based on data in Ornduff, 1975, table 2).

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References

ALTHAUSER, G. 1908. Zur Frage die Vererbung der langgriffeligen and kurzgriffeligen Blütenform beim Buchweizen und zur Methodik der Veredelung dieser Pflanzen. *Zhurn. Opuitn. Agron.*, *9*, 561-568.

BAKER, H. G. 1958. Studies in the reproductive biology of West African Rubiaceae. *J. West African Sci. Assoc.*, *4*, 9-24.

BAKER, H. G. 1966. Evolution, functioning and breakdown of heteromorphic incompatibility systems. I. The Plumbaginaceae. *Evolution*, *20*, 349-368.

BATESON, W., AND GREGORY, R. P. 1905. On the inheritance of heterostylism in *Primula*. *Proc. Royal Soc. London*, *B 76*, 581-586.

DAHLGREN, K. V. O. 1922. Vererbung der Heterostylie bei *Fagopyrum* (nebst einige Bemerkungen über *Pulmonaria*). *Hereditas*, *3*, 91-99.

DARWIN, C. 1877. *The Different Forms of Flowers on Plants of the Same Species*. John Murray, London.

GARBER, R. J., AND QUISENBERRY, K. S. 1927. Self-fertilisation in buckwheat. *J. Ag. Res.*, *34*, 181-183.

LAIBACH, F. 1923. Die Abweichungen vom " mechanischen " Zahlenverhältnis der Long- und Kurzgriffel bei heterostylen Pflanzen. *Biol. Zentralbl.*, *43*, 148-157.

LEWIS, D. 1949. Incompatibility in flowering plants. *Biol. Rev.*, *24*, 472-496.

LEWIS, D. 1954. Comparative incompatibility in angiosperms and fungi. *Adv. Genetics*, *6*, 235-287.

MATHER, K. 1950. The genetical architecture of heterostyly in *Primula sinensis*. *Evolution*, *4*, 340-352.

ORNDUFF, R. 1975. Heterostyly and pollen flow in *Hypericum aegypticum* (Guttiferae). *Bot. J. Linn. Soc.*, *71*, 51-57.

RAY, P. M., AND CHISAKI, H. F. 1957. Studies on *Amsinckia*. I. A. synopsis of the genus, with a study of heterostyly in it. *Amer. Jour. Bot.*, *44*, 529-536.

UBISCH, G. VON. 1925. Genetisch-physiologische Analyse der Heterostylie. *Bibliogr. Genetica*, *2*, 287-342.