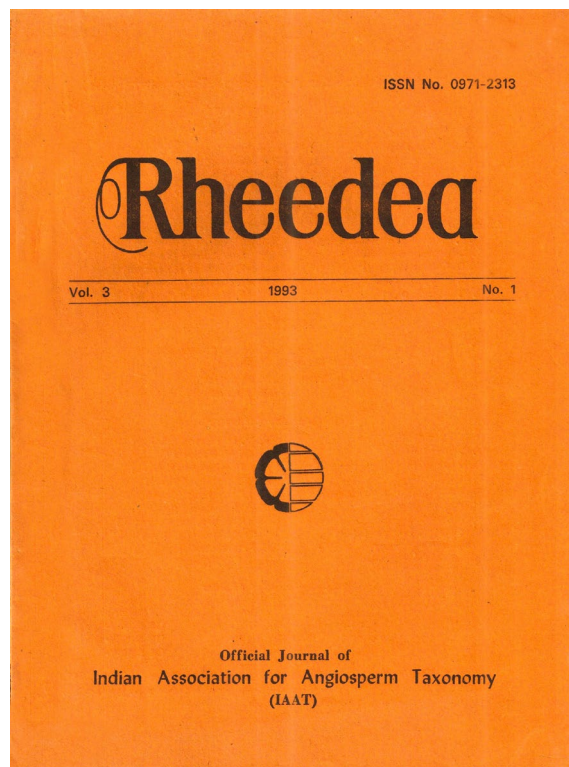




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Seedling morphology of some members of the Polygonaceae and its taxonomic implications

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Abstract

Seedling morphology of six species belonging to the genera *Antigonon*, *Fagopyrum*, *Polygonum* and *Rumex* of the Polygonaceae have been studied. The taxonomic implications of seedling features are discussed.

INTRODUCTION

Seedlings are rarely preserved as permanent specimens and are thus generally unavailable for necessary study and identification work. Moreover, the seedlings of many taxa, particularly herbs, are so small and escape attention in their native habitats. Despite these obstacles, several workers have made use of data from seedlings in recent taxonomic treatments. Naidu and Shah (1981) investigated the stomata and trichomes found on the cotyledons of 34 species of Lamiaceae and suggested the use of these features for delimitation of genera and species. Ladiges *et al.* (1981, 1984) used seedling characters to investigate the relationships of various taxa of *Eucalyptus*. Hill (1982) illustrated and discussed briefly the variations in cotyledon morphology in *Malvastrum*. Austin and Staples (1980) used cotyledon morphology as an aid to generic delimitation of some members of Convolvulaceae, while Sampathkumar (1982) stressed the use of cotyledon morphology at the generic, specific, and varietal levels in this family. A study by Canne (1983) on seedlings of 18 species of *Agalinis* (Scrophulariaceae) indicates that seedling features are often distinctive at the species level and correlate well with data from other sources with regard to sectional and subsectional placement of species within the genus. It is in this context that the present work on the morphology of seedlings of some commonly occurring members of the Polygonaceae was undertaken.

MATERIALS AND METHODS

In the present investigation, seedlings of different stages representing possible infraspecific diversity were collected from different natural habitats in and around Calcutta (except *Fagopyrum esculentum* which were collected from

Jorethang, Sikkim). They were compared and identified with the help seedlings raised from identified seeds. At least five to ten specimens were studied from various habitats and localities. The seedlings were dried, made into herbarium specimens and are deposited in the Calcutta University Herbarium (CUH). The morphology was described following the terminology proposed by Burger (1972), Hickey (1973) and Vogel (1980). For morphological diagnoses of seedlings, the characters of cotyledons or paracotyledons, eophylls (first few leaves) and hypocotyl were taken into consideration.

OBSERVATIONS

Antigonon leptopus Hook. & Arn. (Fig. 1)

Germination hypogeal, phanerocotylar. *Taproot* short, 1.82-cm, greyish. (Five coralline, membranous-scarious, persistent perianth members present just above soil surface). *Hypocotyl* slightly curved, terete, much reduced, 0.2 to 0.3cm, enveloped by petiolar sheath of paracotyledons, brown. *Paracotyledons* two, rarely three, opposite, persistent up to 3-5 leaved stage, exstipulate, petiolar, bases extend and unite to form a hollow tubular structure enclosing the first internode, tube to 3cm long, glabrous, white; blade 1.6×0.7 cm, oblong-elliptic, size to base cuneate, apex acute or obtuse margin entire, primary veins three, of which middle one thick and extended, secondaries inconspicuous. *Internodes* straight, terete, pale green, first internode ± 5.2 cm long, later internodes longer. *First two leaves* alternate, simple, petiolate, glabrous; blade cordate, size of first leaf to 2.8×2.3 cm, base cordate, apex acuminate, margin entire; primary vein one, secondary veins 5-6 pairs, subopposite or alternate; stipules ochreate, thin, rudimentary. *Subsequent leaves* alternate, simple, exstipulate, other characters same as that of first two leaves, except undulate margin.

Fagopyrum esculentum Moench. (Fig.2)

Germination epigeal, phanerocotylar. *Taproot* 2.5 to 3cm long, brown. *Hypocotyl* straight, terete, 5 to 5.6cm long, brown. *Paracotyledons* two, opposite, persistent up to 9-leaved stage, exstipulate; petiole ± 2 cm; blade fleshy, size to 2cm, rhombic-obovate, base cordate-auriculate, apex obtuse, margin entire; primary veins five of which middle one is thicker than others, secondaries inconspicuous. *Internodes* straight, terete, glaucous-green, fleshy, length of first internode to 4.8cm, other internodes shorter. *First two leaves* alternate, simple, petiolate, pale green, glabrous; blade cordate, size of first leaf to 4×3 cm and second leaf to 3.8×3 cm, apex acuminate, margin entire, fleshy; primary veins 5-8, secondary veins inconspicuous; stipules ochreate, thin, membranous, *Subsequent leaves* alternate, simple, stipulate (ochreate), other characters same as that of first two leaves.

Seedling morphology of Polygonaceae

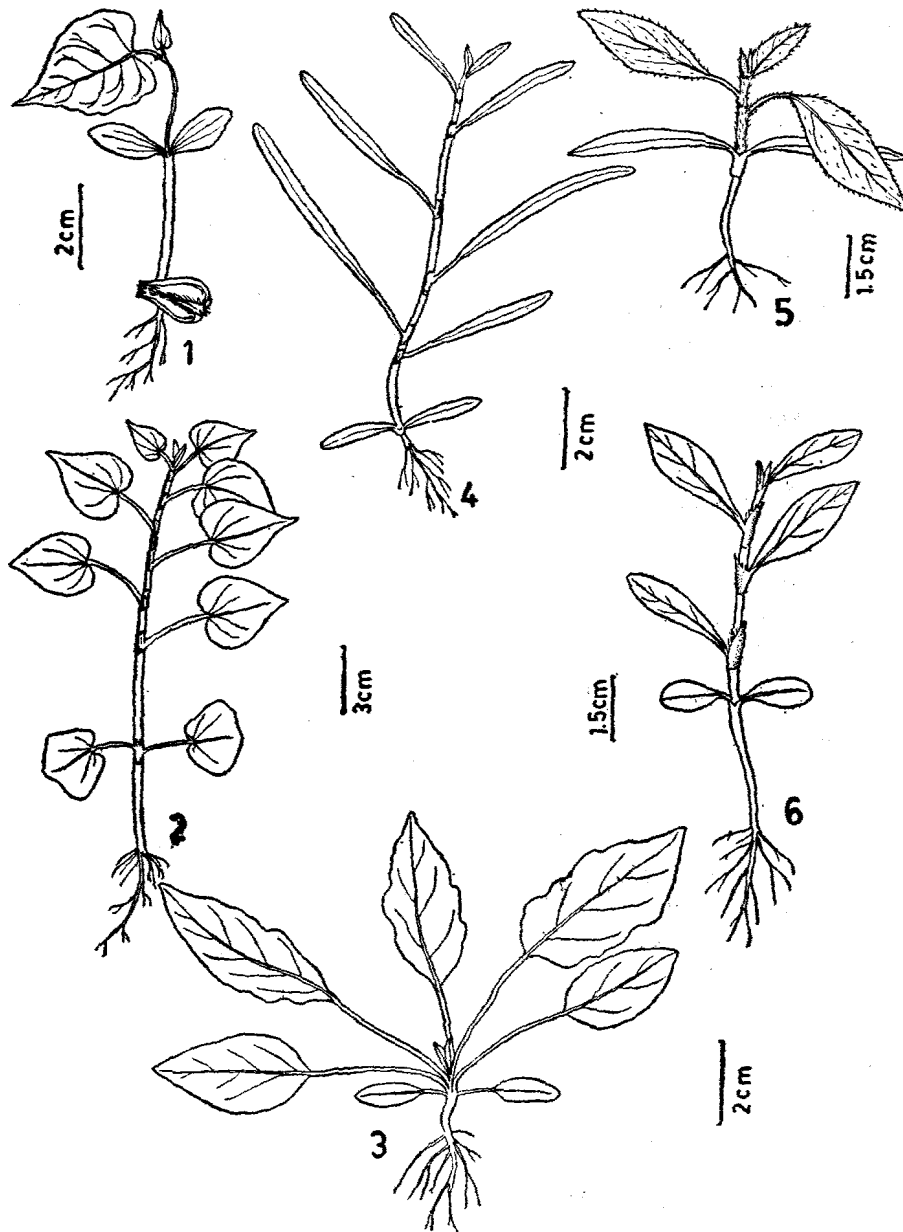


Fig. 1: *Antigonon leptopus* Hook. & Arn. Fig. 2: *Fagopyrum esculentum* Moench. Fig. 3: *Rumex dentatus* Linn. Fig. 4: *Polygonum plebejum* R. Br. Fig. 5: *Polygonum orientale* Linn. Fig. 6: *Polygonum hydropiper* Linn.

Rumex dentatus Linn. (Fig. 3)

Germination epigeal, phanerocotylar. *Taproot* reduced, 0.9-1.2cm, creamy-white. *Hypocotyl* slightly curved, terete, 0.5 to 0.6cm, pale green. *Paracotyledons* two, opposite, persistent up to 6th-7th leaved stage, exstipulate; petiole to 0.5cm; blade to 1.5×0.3 cm, narrowly oblong, base cuneate, apex rounded, margin entire; primary vein one, secondaries indistinct. *Internodes* straight, much reduced (± 0.1 cm), terete. *First two leaves* sub-opposite, petiolate, glabrous; blade ovate lanceolate, size of first leaf $2-2.5$ cm \times $0.8-1$ cm, base rounded or attenuate, apex acute, margin entire; primary vein one, secondary veins 4-6 pairs, alternate; stipules ochreate, scale-like, thin, hyaline, deciduous. *Subsequent leaves* alternate, simple, stipulate (ochreate), leaves gradually becoming radical and hence internodes appearing inconspicuous. Other characters same as that of first two leaves.

Polygonum plebejum R. Br. (Fig. 4).

Germination epigeal, phanerocotylar. *Taproot* 1.2 to 1.5cm, brownish-white. *Hypocotyl* straight, terete, much reduced (0.1 to 0.2cm), basal region pale-white, upper region brown. *Paracotyledons* two, opposite, persistent up to 7th-8th leaved stage; exstipulate, petiolar bases united forming a cup-like structure; cup 0.1cm in length, brown; petiole to 0.1cm; blade linear, size $\pm 0.6 \times 0.1$ cm, base narrowed to petiole, apex obtuse, margin entire; primary vein one, secondary veins inconspicuous. *Internodes* almost straight, terete, brown, first and second internodes to 0.4cm, 0.2cm respectively. *First two leaves* alternate, simple, petiolate, glabrous; blade linear, size of first leaf to 1.3×0.1 cm and second leaf to 2×0.14 cm, base long attenuate, apex acute or obtuse, margin entire; primary vein one, secondary veins inconspicuous; stipules ochreate, tubular fimbriate. *Subsequent leaves* alternate, simple, stipulate (ochreate); other characters same as that of first two leaves.

Polygonum orientale Linn. (Fig. 5)

Germination epigeal, phanerocotylar. *Taproot* shortly elongating (2.4 to 3.7cm), creamy-white. *Hypocotyl* straight, terete, 1.5 to 2cm, lower region deep-purple, upper greenish-purple. *Paracotyledons* two, opposite, persistent upto 6th-7th leaved stage, exstipulate, petiolar bases completely ensheathing node forming a cup-like structure (± 0.3 cm in length); cup pale red; petiole (± 0.4 cm); blade linear, $\pm 2.5 \times 0.3$ cm, base narrowed to petiole, apex acute, margin entire, dorsal surface pale brown, ventral pale brown to red; primary vein one, secondary veins inconspicuous. *Internodes* straight, terete, brownish-green, hirsute, length of first and second 0.5cm and 0.2cm respectively. *First two leaves* alternate simple, petiolate, hirsute; blade elliptic-lanceolate, size of first leaf $\pm 3.2 \times 0.9$ cm and second leaf $\pm 2.5 \times 0.8$ cm, base

attenuate, apex acute or obtuse; margin entire; primary vein one, secondary veins conspicuous; stipules ochreate, mouth ciliate. *Subsequent leaves* alternate, simple, stipulate (ochreate), petiolate, other characters same as that of first two leaves.

***Polygonum hydropiper* Linn. (Fig. 6)**

Germination epigeal, phanerocotylar. *Taproot* short, 2.3m, reddish-brown. *Hypocotyl* straight, terete, 2 to 2.5cm, lower part white, upper red. *Paracotyledons* two, opposite, persistent upto 6th-7th leaved stage; exstipulate, petiolar bases completely sheathing the node forming a distinct cup; cup \pm 2.5cm long, pale red; petiole to 0.2cm; blade to 1cm \times 0.6cm, obovate, base sub-cuneate, apex rounded, margins entire, lower surface reddish-green, upper green; primary vein one, secondary veins indistinct. *Internodes* almost straight, terete, green, length of first and second, internodes 0.8cm, and 1cm, respectively. *First two leaves* alternate, simple; coriaceous, petiolate, glabrous; blade to 2 \times 0.6cm, elliptic-lanceolate, base attenuate, apex mucronate, margin entire; primary vein one, secondary veins alternate; stipules ochreate with bristles. *Subsequent leaves* alternate, simple, stipulate (ochreate); other characters same as that of first two leaves.

DISCUSSION

The seedling features revealed in the present study show correlation of juvenile characters with some adult characters. The data obtained in the present study help in the demarcation of the genera. Basically, the shape of eophylls and number of primary veins in paracotyledons differentiate *Antigonon* and *Fagopyrum* on the one hand and *Rumex* and *Polygonum*, on the other. However, *Antigonon* (Fig. 1) is characterised by rudimentary stipules, oblong-elliptic paracotyledons and long, tubular sheath enveloping the first internode. In sharp contrast, *Fagopyrum* (Fig. 2) is devoid of such a sheath; paracotyledons are rhombic-ovate in shape and stipules are ochreate. *Rumex* (Fig. 3) and *Polygonum* (Fig. 4, 5 & 6) can be easily distinguished by the shape of paracotyledons, those of the former being oblong and those of the latter linear to obovate. The present study also reveals that seedling morphological characters, especially the shape of paracotyledons and eophylls would be quite useful for species level classification; in the genus *Polygonum*. Probably, more extensive studies on seedling features covering all member genera and species of the family would be of great use in understanding interrelationships within the family and would help in improving the current classification.

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