L. L. Narayana* & Digamber Rao*: Contributions to the floral anatomy of Linaceae 6**

L. L. ナラヤナ*・D. ラオ*: アマ科の花部解剖学的研究 6

The earlier published reports on the floral anatomy of the family were those by Narayana (1964); Narayana and Rao (1966, 1969, 1971, 1973, 1974a, 1974b). The present contribution, the sixth in the series deals with the floral morphology and vascular anatomy of four species of Linum, viz., L. flavum Linn., L. lewisii Pursh., L. perenne Linn., and L. usitatissimum Linn.

Morphology of the flower The flower is pedicellate pentacyclic, pentalumerous, heterochlamydeous, regular, bisexual and hypogynous (Figs. 1, 8-11, 14, 15, 23, 24, 28, 33, 39, 46, 47). The quincuncial sepals are free (Figs. 7, 8, 32, 45) except in L. lewisii where they are basally connate (Fig. 20). The polypetalous corolla shows contorted estivation (Figs. 9-11, 14, 23, 24; 32-35, 39, 47). The monadelphous androecium consists of five fertile stamens with as many non-vascularised staminodes alternating with them (Figs. 9-11, 23, 34, 35, 46, 47). Staminodes are absent in L. lewisii (Fig. 24). In L. perenne two of the five stamens show the presence of glands at the base (Figs. 28, 32). The gynoecium is 5-carpellary, syncarpous (Figs. 11, 24-27, 35-37, 46, 47), with ten loculi at the base due to the development of false septum from the mid-region of the ovary wall (Figs. 24, 25, 35, 46). The septum recedes at a higher level when the ovary becomes five locular (Figs. 11, 12, 26, 36, 37, 47). There are two pendulous anatropous, bitegmic ovules in each loculus (Figs. 1, 11, 15, 26, 28, 37, 46, 47). The ovary becomes unilocular towards the top (Figs. 13, 38); styles are free in Linum flavum and L. usitatissimum and each shows a ventral groove lined by glandular cells (Figs. 1, 14). In L. perenne there is basal connation of the styles (Fig. 39) while in L. lewisii the union extends to nearly half the length of the style (Fig. 15). The stigmatic lobes are covered by glandular hairs (Figs. 1, 15, 28).

* Department of Botany, Post-Graduate Centre, P. O. Vidyaranyapuri-506009, Warangal, A. P. India.
Floral anatomy The stele in the pedicel shows a ring of five bundles (Figs. 2, 16, 29), except in *L. usitatissimum*, where it consists of a ring of discrete bundles (Fig. 13). The stele expands in the receptacle and it becomes a closed ring (Fig. 17). In *Linum flavum* and *L. lewisii* ten traces depart from the central stele, of which five function as sepal midribs and the remaining five as common sepal lateral traces (Figs. 3, 18). The latter undergo radial splitting to demarcate the lateral traces of adjacent sepals (Figs. 4, 5, 19). In *L. usitatissimum* the sepal midrib and lateral traces arise independently from the main stele (Fig. 41). In *L. perenne*, the petal traces arise conjointly with the common sepal lateral traces (Figs. 30, 31). In *L. flavum*, *L. lewisii* and *L. usitatissimum*, the petal traces arise independently (Figs. 5, 19, 42).

After the emergence of the petal traces, the main stele gives off five staminal traces along the sepal radii (Figs. 6, 20, 21, 32, 43).

In *L. flavum* and *L. usitatissimum* there is adnation between the staminal traces and the common median lateral traces (Figs. 7, 8, 44). The common stamen median lateral traces divide tangentially and demarcate the five common median lateral bundles towards the inside (Figs. 8, 44). In *L. lewisii* and *L. perenne* the common median lateral traces arise independently from the main stele (Figs. 22, 23, 33, 34). The five dorsal carpellary traces in *L. flavum* and *L. usitatissimum* arise at the level where the petals separate from the thalamus (Figs. 8, 44). The remaining stele forms five common ventral bundles (Figs. 24, 25, 35, 36, 44, 45). At this level the staminal tube and the ovary separate (Figs. 8, 45). In *Linum lewisii* and *L. perenne*, the five common median lateral traces are followed by five dorsal carpellary traces (Figs. 22, 23, 33, 34). The remaining stele forms five ventral bundles (Figs. 24, 25, 35, 36, 44, 45). In the placental region each common ventral bundle splits into two and these supply the ovules in adjacent loculi (Figs. 11, 12, 26, 27, 36, 37, 46, 47). Only the dorsal carpellary bundles traverse the styles and terminate below the stigmatic lobes (Figs. 1, 14, 15, 28, 39).

Summary and conclusions The quincuncial sepals are three-traced; while there is connation between lateral traces of adjacent sepals in *Linum flavum* and *L. lewissi*, the lateral traces show independent origin in *L. usitatissimum*. The petals are contorted, free and single traced; the
petal traces show independent origin except in *L. perenne*, where they are adnate with common sepal lateral traces. The monadelphous androecium shows five fertile antisepalous, single traced stamens alternating with as many sterile, non-vascularised, antipetalous staminodes except in *L. lewisii* where they are absent. The five carpellary, syncarpous ovary shows two pendulous, anatropous ovules in each loculus. The carpels are 5-traced. The common median lateral traces are adnate with the staminal traces in *Linum flavum* and *L. usitatissimum* while in *L. lewisii* and *L. perenne*
show independent origin. The placentation is anatomically parietal and the common ventral bundles are completely utilised in ovular supply. In *Linum flavum* and *L. usitatissimum* the styles are free, while there is basal connation in *L. perenne* and connation upon half the length in *L. lewisii*. The dorsal carpellary bundles continue in the style and end below the stigmatic lobes.

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**Literature cited**


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アマ属の4種: *Linum flavum, L. Lewisii, L. perenne* および *L. usitatissimum*についての花部の解剖学的研究をした。特に花部諸器官への維管束導入の経路を明らかにして，4種の間の異同を述べた。