



THE POPPIES OF INDIAN REGION

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The Poppies of Indian Region by H. S. Debnath, M.Sc., Ph.D. and M. P. Nayar, M.Sc., Ph.D. (London), F.L.S. is a monograph on taxonomical studies of the family Papaveraceae of Indian region. In this book the family Papaveraceae is circumscribed as per the modern concept and the genera included in the sub-families Fumarioideae and Hypecoideae are considered as separate families. The genus *Hypecoum* is treated under a separate family Hypecoaceae on the basis of study of palynology and seed morphology. A detailed taxonomic account of this genus is also given. In order to understand the taxonomy of the family Papaveraceae of Indian region, detailed work on distribution, phenology and ecology of some of the species in its natural habitat have been studied. These studies include pollen and seed morphological study with scanning electron microscope.

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THE POPPIES OF INDIAN
REGION
(PAPAVERACEAE)



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FOREWORD

The family Papaveraceae, commonly known as Poppy family, based on the genus *Papaver* is one of the colourful families not only in their colourful flowers which are of ornamental value, but also from time immemorial, some of the species of *Papaver* are used in medicine and narcotic. The latex of *Papaver somniferum* contains some dangerous alkaloids. While other species of the family are mainly cultivated for ornamental value.

As a result of this work, it is established that the subfamily Hypecoideae deserves family rank as suggested by Takhtajan. The Fumitory family (Fumariaceae) previously treated as a subfamily Fumarioideae of the family Papaveraceae is now generally accepted as a separate family.

Meconopsis is the largest genus having twenty two species in the Indian region and they are growing mainly in the temperate Himalayan ranges. Some of the species of *Meconopsis* are introduced in European gardens. Sir George Taylor monographed the genus *Meconopsis* during 1934. The present study of the family encompasses the taxonomy of the family, the morphology of seeds and palynology. This work was done by Himadri Sekhar Debnath, Research Scholar working under my guidance for his Ph.D. The authors have undertaken high altitude collection tours in Sikkim and several endemic species were collected.

Botanical Survey of India is bringing out monographs on several families with illustrations for Flora of India work.

Calcutta
20th August, 1986.

M. P. NAYAR
Director
Botanical Survey of India

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GENERAL INTRODUCTION

The species of the family Papaveraceae, the name derived from the genus *Papaver*, commonly known as Poppies have become a part of human civilisation from time immemorial through their beautiful ornamental flowers, their utility in medicine, and their drug value as narcotic and hallucinogenic agents.

The family Papaveraceae comprises about 26 genera and 200 species and they occur in temperate and subtropical regions of the Old and New World. They are mainly herbs excepting the genus *Bocconia* (a small tree). The members of this family grow from sea level to 5800 m altitude and the species include pantropical weed like *Argemone mexicana* and endemic species of *Meconopsis* of restricted distribution.

The family Papaveraceae because of the above mentioned qualities has received a fair share of attention from the herb gatherers, narcotic dealers and quack medicine practitioners. But its taxonomy, cytology, biochemistry and palynology which throw light on the speciation patterns did not receive appropriate attention until recently.

The family Papaveraceae first received taxonomical attention by Jussieu (1791) who included the following genera: *Argemone*, *Bocconia*, *Chelidonium*, *Fumaria*, *Glaucium*, *Hypocoum*, *Papaver*, *Sanguinaria*. Linnaeus (1753) in his *Species Plantarum* included six genera.

In general the family Papaveraceae has been treated as a primitive family, though taxonomists placed the family in different orders. Bentham & Hooker f. (1862) placed it under the order Parietales. Later Engler & Prantl (1936) placed it under a separate order Papaverales which is also supported by Takhtajan (1966) and Cronquist (1968). Hutchinson (1959) classified this family under the order Rhoeadales, while Thorne (1968) placed it under the order Berberidales.

The revision of the family Papaveraceae for the Indian region was done by Hooker & Thomson (1872) in *Flora of British India*, and they considered 5 genera and 16 species for an area comprising India, Tibet, Pakistan and Afghanistan. Recent monographic studies on the genera *Argemone* by Ownbey (1958) and *Meconopsis* by Taylor (1934) have helped the better understanding of the family Papaveraceae of Indian region. Since then more specimens and data have become available due to fresh collections. Recent studies on cytology by Hrishi (1960), Grover (1970), Malik (1974), Malik et Grover (1973), Malik et Mary (1973, 1975), Malik *et al.* (1979), Mary et Malik (1973), Mary *et al.* (1974) have helped the understanding of the speciation patterns of some of the genera.

In this study the family Papaveraceae is circumscribed as per the modern concept and the genera included in the sub-families Fumarioideae and Hypecoideae are considered as separate families and hence not included. The family Papaveraceae now under consideration includes following genera: *Argemone*, *Dicranostigma*, *Eschscholtzia*, *Glaucium*, *Meconopsis*, *Papaver* and *Roemeria*. In this study the genus *Hypecoum* is treated under a separate family Hypecoaceae on the basis of study of palynology and seed morphology. A detailed taxonomic account of the genus *Hypecoum* is also given.

In order to understand the taxonomy of the family Papaveraceae of Indian region, detailed study on distribution, phenology and study of some of the species in its natural habitat have been undertaken. These studies include pollen and seed morphological study with scanning electron microscope.

Taxonomic revision of the family Papaveraceae of Indian region is presented in three Chapters: 1. Taxonomy. 2. Pollen morphology. 3. Seed morphology.

Following are the main objectives of this study :

- 1) To study and understand the taxonomy of the family Papaveraceae of the Indian region with its nomenclatural status and their distribution.
- 2) To classify the family Papaveraceae of the Indian region after study of the taxonomy aided by pollen and seed morphology.

CHAPTER 1: TAXONOMY

1.1. INTRODUCTION

Since the work of Hooker et Thomson (1872) on the Papaveraceae of India there is no other comprehensive account of the Indian Papaveraceae at present. In this taxonomic study it is proposed to reassess the family Papaveraceae with reference to taxonomic status and patterns of distribution, alliances, nomenclature and synonymy.

1.1.1. General Survey of Principal literature of the family Papaveraceae

It was Jussieu in 1791, who first proposed the family Papaveraceae and divided the family into two groups: (1) Indefinite stamens—On which genera *Argemone*, *Bocconia*, *Chelidonium*, *Glaucium*, *Papaver*, *Sanguinaria* are included (2) Definite stamens—the genera are *Hypecoum* and *Fumaria*.

Linnaeus (1753) included the family in his Polyandria Monogynia and he recognised the following two genera *Papaver* and *Argemone*, occurring in India.

A. P. De Candolle's description of Papaveraceae in *Prodromus systematis naturalis Regni Vegetabilis* 1: (1824) was the first major account of this family on a World basis and he recognised the following three genera *Argemone*, *Meconopsis* and *Papaver* occurring in India.

The first revision of the family Papaveraceae for the Indian region was done by Hooker & Thomson (1872) in the *Flora of British India* and they considered 5 genera and 16 species.

The most recent monograph of the family Papaveraceae for the World is that of Friedrich Fedde in "*Das Pflanzenreich*" published in 1909. He divided the family into two subfamilies Hypecoideae and Papaveroideae and recognised 28 genera.

Popov in *Flora USSR* 7: (1937) divided the family Papaveraceae into three subfamilies Hypecoideae, Papaveroideae, Fumarioideae.

Jafri et Qaiser (1974) in *Flora West Pakistan* considered 7 genera and 21 species. He also included the genus *Hypecoum* in the family Papaveraceae.

Debnath et Nayar (1984) in the *Flora of India* considered 5 genera and 26 species and treated the genus *Hypecoum* under a separate family Hypecoaceae.

1.1.2. Historical Review of the Taxonomic literature of the genera

ARGEMONE Linn.

It was Tournefort in 1694, who first established the generic name *Argemone*, based on one species *Argemone mexicana*. This taxon was first described by Casper Bauhin (1596) under the name *Papaver spinosum*. A year later Bauhin's description was followed by Gerard (1597) who described the same species under the name *Carduus chrysanthemus peruanus*. Tournefort (1694) referred Bauhin's *Papaver spinosum* and coined the name *Argemone mexicana*.

In 1753 Linnaeus in his *Species Plantarum* listed three species *Argemone armeniaca*, *A. mexicana* and *A. pyrenaica* and he included the genus *Argemone* in his *Polyandria Monogynia*. According to all subsequent authorities *Argemone armeniaca* and *A. pyrenaica* belong to the genus *Papaver*.

Prain's paper (1895) embodied the first detailed study of the genus *Argemone*. He revised the genus and recognised six species and five varieties.

In 1903 Rose published a brief account of the Mexican species of *Argemone*. In that account he recognised eleven species.

In 1909 Friedrich Fedde published a revision of *Argemone* for the World in *Das Pflanzenreich*. He recognised nine species and twelve varieties.

The most recent comprehensive monographic treatment of the genus *Argemone* for North America and the West Indies is "Monograph of the genus *Argemone* for North America and the West Indies" by Gerald B. Ownbey (1958). Ownbey reviewed Fedde's treatment of the genus *Argemone* and he added modifications of the existing treatment. He recognised twenty three species and ten additional subspecies.

Ownbey (1961) in his latest revision, on the genus *Argemone* of South America and Hawaii, recognised six species.

DICRANOSTIGMA Hook. f. & Thoms.

The first species of the genus *Dicranostigma* was described by Hooker and Thomson in 1855 from Himalaya, under the name *Dicranostigma lactucoides*. Due to the identical fruit character Bentham and Hooker (1862)

referred this genus to *Stylophorum* which was supported by Baillon (1871) and adopted by Hooker and Thomson (1872).

Prain's paper "Revision of the genus *Chelidonium*" (1895) embodied detailed study of the genus *Dicranostigma*. He then considered the genus *Dicranostigma* as a section under the genus *Chelidonium*.

Fedde 1909, referred *Dicranostigma* as a distinct genus and considered three species.

ESCHSCHOLTZIA Cham.

In 1820 Chamisso first established the genus *Eschscholtzia*, in honour of Johann Friedrich Eschscholz, 1793—1831, physician and naturalist, with the type species *Eschscholtzia californica*.

In 1909 Friedrich Fedde published a revision of the genus *Eschscholtzia* for the World in "Das Pflanzenreich". He recognised one hundred and twenty three species.

GLAUCIUM Miller

The genus *Glaucium* was well known to the pre-Linnean botanists as horned poppy. The name *Glaucium* was first coined by Tournefort in 1719.

The nomenclatural history of this plant begins with Linnaeus (1753) who gave it the name of *Chelidonium glaucium*.

In 1789 Jussieu gave a clear definition of the genus *Glaucium* which helped in distinguishing the genus *Glaucium* from *Chelidonium sensu stricto*.

Crantz in 1763 defined *Chelidonium* and *Glaucium* as separate genera, admonishing Linnaeus for errors in both generic and specific descriptions.

In 1909 Friedrich Fedde in his account of the genus *Glaucium* in Das Pflanzenreich described twenty one species for the World.

MECONOPSIS Vig.

The first species of *Meconopsis* known to science was *Meconopsis cambrica* which was proposed by Viguiier in 1814. It was based on the single species *Papaver cambricum* which was previously described by Linnaeus in 1753. On the basis of differentiated characters from typical *Papaver* i.e. presence of distinct style and the complete absence of a sessile, stigmatic disc surmount-

ing the ovary, Viguiet proposed his new genus *Meconopsis* and considered it as intermediate between *Papaver* and *Argemone*.

In 1824 De Candolle described *Meconopsis napaulensis*, the first asiatic representative of the genus *Meconopsis*.

In 1852 W. J. Hooker described one species under the name *Meconopsis wallichii* due to apparent difference in flower colour and supposed geographical isolation from *Meconopsis napaulensis*. Taylor (1934) on the basis of Nepal collections, relegated *Meconopsis wallichii* to a synonym of *Meconopsis napaulensis* as they are conspecific.

The next two additions to the genus *Meconopsis* was made by Hooker and Thomson in 1855. Of these two new species, one of which *Meconopsis robusta* and the other one is *Meconopsis horridula* based on the Hooker's specimens.

The first detailed study of the genus *Meconopsis* was done by David Prain in 1896. He considered twelve species for India, of which two species were newly described by him.

In 1825 D. Don described yellow flowered *Papaver paniculatum* on which he also included *Meconopsis napaulensis* as a synonym. But according to Prain the identification of these two new species was quite erroneous. Prain stated that the plant generally known as *Meconopsis napaulensis* was really the original *Papaver paniculatum* which is transferred to the genus *Meconopsis* in 1896.

A more comprehensive review of *Meconopsis* was that prepared by Prain, published in 1906. He recognised a total of twenty seven species. On the basis of trichome characters Prain considered the genus *Meconopsis* to be composed of two sections (i) *Eumeconopsis* of which the species have simple trichomes and (ii) *Polychaetia* of which the species bear the barbellate trichomes. Under these two sections he arranged nine subordinate groups under which he considered twenty seven distinguishable species.

Prain's treatment was supported by Fedde (1909) in his account of the Papaveraceae in Das Pflanzenreich but he treated Prain's sections as subgenera and the subordinate groups as sections.

In 1915 Prain added nine species of *Meconopsis* in his revision of the genus which comprises a total of forty three species for the World.

The most recent revision of *Meconopsis* for the World is "An account

of the genus *Meconopsis* by George Taylor (1934). He recognised forty one species for the World, four of which were newly described and two of which were transferred by him from *Cathcartia* to *Meconopsis*. Taylor added modifications of the existing classification and suggested the establishment of two sub-genera *Eumeconopsis* and *Discogyne* on the basis of stylar disc, under the genus *Meconopsis*. On the basis of habit, flower colour and pubescence, he recognised three sections *Cambricae*, *Eucathcartia* and *Polychaetia*. *Eucathcartia* comprises two series *Chelidonifolae* and *Villosae*. *Polychaetia* divided into two subsections—*Eupolychaetia* which comprises two series and other *Cumminsia* which is composed of six series.

PAPAYER Linn.

The first species of *Papaver* known to science was *Papaver somniferum* which was described by Linnaeus in 1753.

In 1754 Linnaeus described this genus in his *Genera Plantarum*.

The most comprehensive monographic treatment of the genus *Papaver* for the World is that of Elkan in 1839.

In 1909 Friedrich Fedde published revision of *Papaver* for the World in *Das Pflanzenreich*. He recognised ninety-nine species and many varieties under nine sections.

Popov in 1937 described fifty two species under eight sections for U.S.S.R.

Jafri et Kaiser in 1974 described nine species for West Pakistan.

ROEMERIA Medic.

It was Medicus who first established the genus *Roemeria*.

In 1824 De Candolle in his *Prodromus systematis naturalis Regni Vegetabilis* described three species *Roemeria hybrida*, *R. refracta* and *R. bivalvis*.

In 1909 Friedrich Fedde in *Das Pflanzenreich* published a revision of the genus *Roemeria* for the World. He recognised nine species and nine varieties.

1.2. PROCEDURE

For the study of the family Papaveraceae an assessment of the data pertinent to the literature references, study of herbarium specimens and field observation of living specimens have been undertaken.

Literature references which the authors have consulted is given in the bibliography.

Field trips have been undertaken in Sikkim Himalaya, Kumaon and also Nepal Himalaya. Several species of *Meconopsis* and *Papaver* have been observed in their natural habitat.

A key to the genera of the family Papaveraceae of the Indian region and key to the species of the each genus are presented. The keys are intended to indicate, as far as practicable, the natural affinities of the taxa by placing those with the most characters in common, closest together.

The revision gives synonymes, exhaustive literature references, keys, descriptions, habitat of each species, local names wherever known and distributions. Also the types are mentioned. Lectotypes and neotype have been selected for some species where original description gave syntypes and for those species where the holotype has been lost or destroyed. Specific descriptions have been given after study of herbarium specimens and details of field notes have been taken into consideration. For most of the species line drawings have been prepared.

In this chapter 40 species, 1 subspecies and 1 forma have been described under 7 genera of the family occurring in India and adjacent countries : Pakistan, Nepal and Bhutan.

The abbreviations/acronyms of Herbaria are used according to *Index Herboriorum* (ed. 5, 1964).

1.3. GEOGRAPHIC DISTRIBUTION

The Papaveraceae are found mostly in temperate and subtropical regions of northern hemisphere, including western North America and eastern Asia.

The genus *Argemone* is an exclusively American genus with the exception of one species (*Argemone glauca* Linn. ex Pope) which is restricted to the Hawaii Islands, but some species are naturalized as weeds in most of the warm countries of the World.

The genus *Dicranostigma* is distributed in Himalaya and western China.

The majority of the species of the genus *Eschscholtzia* are extensively distributed in North America.

The genus *Glaucium* is distributed chiefly in the Mediterranean and central Asian regions.

Western Europe is the home of the type species of the genus *Meconopsis*. All other members of the genus *Meconopsis* occur in the Himalayan belt and they are distributed in south-central Asia from the southern boundary, extending from Chitral and Kashmir and intervening ranges to northern Yunnan, southern Tibet and the province of Szechuan to southern Kansu, central Shensi and western Hupeh.

The species of the genus *Papaver* are distributed mostly in temperate Europe and Asia.

The genus *Roemeria* is found in south west Europe, Asia and north Africa.

1.4. GENERAL CHARACTERS OF THE FAMILY PAPAVERACEAE

The family Papaveraceae consisting of about 26 genera and about 200 species form a natural and well defined group exhibiting a number of common features. In habit they are mainly annual, biennial or perennial herbs with milky or coloured latex. Certain genera are shrubby (*Dendromecon*) or arborescent (*Bocconia*).

The leaves are alternate, rarely opposite or whorled, petiolate or sessile, with varied length of the petiole. Stipules are absent. The leaves are entire or pinnately or palmately cleft.

The stems and leaves are usually provided with indumentum of small or barbellate hairs or pubescence or rarely glabrous. Hairs are simple, setose-villous, stellate or barbellate.

Metcalf and Chalk (1957) studied the anatomy and some of the salient general features are given below "..... The stem of most Papaveraceae exhibits, in transverse sections, a single ring of widely spaced vascular bundles, which are nearly always collateral. The xylem groups frequently tend to be V-shaped. Several rings of bundles sometimes present in *Papaver*. Hairs scanty, uniseriate, biseriate or multiseriate. Shaggy hairs occasional. Glandular hairs absent. Stomata ranunculaceous. Petiole, in transverse sections, commonly exhibiting an arc of vascular bundles not accompanied by sclerenchyma. Various coloured latex present, sometimes in articulated laticiferous tubes, but elsewhere in cells or sacs, the latter sometimes arranged in longitudinal rows. Crystals of calcium oxalate recorded only in *Bocconia frutescens* Linn., but said to be present in the floral leaves of a few other species. Cluster crystals also noted in *Romneya*. Alkaloids are common in the family. These include such well-known substances as morphine and codeine. Berberin, which is characteristic of Berberidaceae, is known to occur in *Argemone mexicana* Linn."

Inflorescences are cymose, mostly solitary, rarely subumbellate or paniculate.

Flowers are usually showy, large, bisexual, regular, hypogynous. Bracts are present.

Calyx are of 2, rarely 3 sepals. Sepals are free or rarely compactly united, imbricate, caducous at flowering, covering the entire bud.

Corolla are large, showy, imbricate, sometimes crumpled in bud. Petals are of 4-6 (rarely 8-12) in number, arranged in 1-2, rarely 3 whorls, free and the petal colours are mainly yellow, blue, red, purple, and white.

Stamens are numerous, in several whorls and free. Anthers are dithecal, dehiscing lengthwise. Filaments are filiform to winged, often coloured.

Pollens are usually from oblate to prolate, rarely square shape in polar view (*Papaver decaisnei*).

The ovary is superior, unilocular, rarely bilocular, 2-many carpels. Ovules are numerous in each locule. The placentation is parietal, rarely solitary and basal, anatropous or campylotropous. Styles are usually one or obsolete. Number of the stigmas are as many as carpels. Stigmas are disc like, capitate, 2-partite or 2-lobuled.

The fruits are capsular, dehiscent or indehiscent, dehiscent by 2-valves, rarely 3-6 valved or of many carpels and also by pores opening below the disc like stigma (*Papaver*).

Seeds are usually small, smooth or striate, rugose or reticulate, pitted, with or without aril. Embryo is minute. Endosperm is oily and mealy.

1.5. KEY TO THE GENERA

- 1a. Stigma lobes alternate to placentas. Capsules opening throughout its length:
 - 2a. Leaves ternately dissected into narrow segments. Sepals forming a hood or calyptra like cap. Stigmas 4-6 ... *Eschscholtzia* 3
 - 2b. Leaves pinnatifid-pinnatipartite. Sepals not forming any hood or calyptra like cap. Stigmas bifurcate ... *Dicranostigma* 2
- 1b. Stigma lobes opposite to placentas. Capsules usually opening by pores or by short valves, rarely throughout its length:

- 3a. Capsules linear, at least ten times as long as broad:
- 4a. Stigmas 2, conical. Capsules with 2 horns at the apex, 2-valved
... *Glaucium* 4
- 4b. Stigmas 3-4, capitate. Capsules without horns, 3-4 valved
... *Roemeria* 7
- 3b. Capsules oblong or subglobose, less than ten times as long as broad:
- 5a. Styles absent. Stigmas discoid. Capsules opening by pores just
beneath the persistent stigmas ... *Papaver* 6
- 5b. Styles present or inconspicuous. Stigmas not discoid. Capsules opening
by usually short valves:
- 6a. Styles distinct, conspicuously broad and large. Stigmas forming a
globular mass over the ovary ... *Meconopsis* 5
- 6b. Styles inconspicuous (rarely very short). Stigmas not forming globular
mass over the ovary ... *Argemone* 1

1.6. TAXONOMIC STUDIES

ARGEMONE

[Tournef., Elem., p. 204, t. 121. 1694; Inst. Rei Herb. 1: 239, 2: t. 121. 1700]; Linn., Sp. Pl. 1: 508-509. 1753 (excluding *A. armeniaca* Linn. & *A. pyrenaica* Linn.); Gen. Pl., ed. 5: 225. 1754; Lamarck, Encycl. Meth. 1: 247. 1783; Gaertn., Fruct. et Sem. Pl. 1: 287, t. 60. 1788; Jussieu, Gen. Pl. p. 236. 1789; Lamarck, Planches 2: t. 452. 1797; Tournef., Elem., ed. aug. (Jolyclere) 2: 12, 5: t. 121. 1797; Nutt., Gen. 2: 9. 1818; DC., Reg. Veg. Syst. Nat. 2: 85. 1821; DC., Prodr. 1: 120. 1824; Bernb., in Linnaea 8: 461. 1833; Endl., Gen. Pl., p. 856. 1836-1840; Meisner, Pl. Vasc. Gen., Pars prior, p. 7, pars altera, p. 9. 1836-1843; Gray, Gen. Pl. U.S. 1: 111, t. 47. 1849; Benth. & Hook. f., Gen. Pl. 1: 52. 1862; Baillon, Hist. Pl. 3: 112-113, figs. 125-127. 1871; Prain, in Journ. Bot. 33: 129. 1895; Gray, Syn. Pl. N. Am. 1.1: 87-88. 1895; Rose, in Contrib. U.S. Nat. Herb. 8: 23-27. 1903; Fedde, in Engler, Pflanzenr. 4. 104: 271. 1909; Fedde in Engler & Prantl, Nat. Pflanzenfam. ed. 2, 17b: 105. 1936; Ownbey, Mem. Torrey Bot. Club 21. 1: 1-159. 1958; Ownbey, Brittonia 13: 103. 1961; Cullen, in Rechinger f., Fl. Iran. 34: 23.

1966; Jafri et Qaiser in Nasir et Ali, Fl. W. Pak. 61: 20. 1974; Debnath et Nayar, Fasc. Fl. Ind. 17: 2. 1984.

Type: Argemone mexicana Linn., Sp. Pl. 1: 508. 1753.

Erect, prickly, often glabrous, annual herbs with yellow latex. Leaves epetiolate, inciso-pinnatifid, sinuate-lobulate, middle and upper elliptic-oblong, lower obovate or oblanceolate, margin toothed, terminated into prickles, smooth to prickly. Buds subspherical to elliptical, oblong or obovate. Flowers white, yellow or orange, terminal solitary, pedunculate. Stamens numerous; filaments filiform; anthers linear, 2-loculed, basifixed. Ovary ovate-oblong or subfusiformis, unilocular, parietal placentas; ovules numerous; styles very short or obsolete; stigmas radiating, 3-7 lobed, lobes opposite the placental strands. Capsules elliptical to oblong, lanceolate or ovate, prickly (except *A. mexicana* f. *leiocarpa*), dehiscent by 3-6 short valves. Seeds numerous, subspherical-spherical, pitted.

Generic Synonyms of *Argemone*

Ectrus Lour., Fl. Cochinch. 1: 344. 1790.

Enomegra Nels., Analyt. Key Fl. Pl. Rocky Mt. Reg., p. 27. 1902; Nels., in Bot. Gaz. 34: 365. 1902.

Generic Relationships

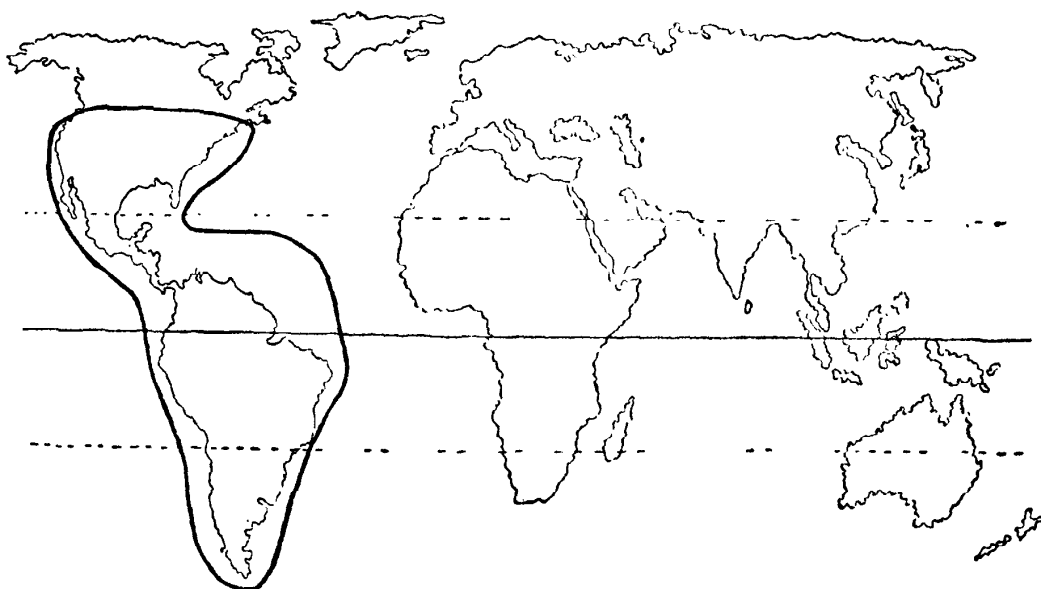
The genus *Argemone* is closely allied to the genera *Papaver* and *Meconopsis*. It is possible to set apart *Argemone* from other genera by using a combination of characters rather than any single character. The presence of sepal horns, basically trimerous arrangement of sepals and petals, united styles and the mode of dehiscence of capsules distinguish the genus *Argemone* from its allied genera *Papaver* and *Meconopsis*.

The genus *Argemone* appears to be most closely related to the genus *Papaver*. For example, trimerous flowers and horned sepals are found in both genera. But the distinguishing character of the stigma (the stigma concrete in *Papaver* whereas the lobes remain discrete in *Argemone*) is noteworthy.

The dehiscence mechanism of capsules and united styles are similar in both the genera *Argemone* and *Meconopsis*. However, in the genus *Meconopsis* the flowers are commonly dimerous, whereas in the genus *Argemone* the flowers are trimerous. In *Meconopsis* the sepals are without any horn-like appendage, while it is present in the species of *Argemone*.

Geographical Range of *Argemone*

The species of *Argemone* are indigenous to America excepting *Argemone glauca* which is restricted or endemic to the Hawaiian Islands. In North America the species of *Argemone* are found along the coastal areas of south-eastern and southern United States to Texas, westward to the Pacific and northward across the Great Plains to western south Dakota and southern Montana. In central America *Argemone* is present throughout Mexico, throughout the islands of the West Indies and southward along both coasts to the Isthmus of Panama. There are six recognisable species found in Chile, Argentina, Uruguay, Paraguay and Bolivia of South America (Map 1).



Map 1. Geographical distribution of the genus *Argemone*

In Indian region the species of this genus occur as adventive weeds exclusively in low rainfall regions at elevations from sea level to 2500 m.

Argemone mexicana is native to the West Indies and according to Ownbey (1958) it is probably also native in parts of central America and Florida. At present this species has become a pantropical weed throughout tropical and subtropical parts of the World. In the native area *Argemone mexicana* is a common weed in fields and sea port cities. The spread of this weed to the other tropical parts of the World might have taken place through import of agricultural crops.

Probably *Argemone ochroleuca* ssp. *ochroleuca* which is native to Mexico, has come to India due to the activities of man. Ownbey (1958) stated that in America the habitat and distribution of *Argemone ochroleuca* ssp. *ochroleuca*

and *A. mexicana* are different. But in India the above mentioned adventive weeds grow in the same habitat.

Argemone mexicana f. *leiocarpa*, the glabrous form of *Argemone mexicana*, was also introduced into India from its native area southern Florida, Keys and Dry Tortugas.

Argemone subfusiformis ssp. *subfusiformis* was recorded from Udaipur (Malik & Grover, 1969). It is native to South America and described from Argentina.

Ecology

In Indian region the species of this genus occur as weeds in the disturbed and waste places along roadways, fields and inter-mountain plains from sea level to 2500 m.

KEY TO THE TAXA

- 1a. Flowers bright yellow; stigmatic lobes closely crowded together and appressed to the style at anthesis; styles inconspicuous, 0-1 mm long in fruit:
- 2a. Plant spinescent ... *A. mexicana* 1
- 2b. Plant glabrous, devoid of any spines except leaf margin ... *A. mexicana* f. *leiocarpa* 1a
- 1b. Flowers white (turning pale yellowish with age), very pale yellow; stigmatic lobes are divergent and not appressed to the style; styles conspicuous in fruit, 1-3 mm long:
- 3a. Capsules lanceolate or ovate-lanceolate. Sepal horns 6-8 mm long. Leaves whitish green, whitish tinge prominent along the midribs and veins ... *A. ochroleuca* subsp. *ochroleuca* 2
- 3b. Capsules subellipsoid to subfusiformis. Sepal horns 10-14 mm long. Leaves pale green ... *A. subfusiformis* subsp. *subfusiformis* 3

1. *Argemone mexicana* [Tournef. Elemens de Bot., p. 204. t. 121. 1694; Tournef. Inst. Rei Herb., 1: 239, 2: t. 121. 1700]; Linn., Sp. Pl. 1: 508. 1753; Syst. Nat., ed. 10, 2: 1073, 1759; Miller, Gard. Dict., ed. 7. 1759; Miller, Figures 1: 33, t. 50. 1759; Lamarck, Encycl. Meth. 1: 247. 1783; Gaertn., Fruct. et Sem. Pl. 1: 287, t. 60. 1788; Walter, Fl. Carol. p. 153. 1788; Aiton, Hort. Kew., ed. 1, 2: 225. 1789; Curtis, Bot. Mag. 7. t. 243, 1794; Lamarck, Planches 2: t. 452. 1797; Lestib., Bot. Belg. ed. 2, pt. 3, 2: 131. 1799; Willd., Sp. Pl. 2: 1148. 1799; Pers., Syn. Pl. 2: 62. 1807; Aiton Hort. Kew., ed. 2, 3: 290. 1811; Lunan, Hort. Jamaic. 2: 312. 1814; Hornem., Hort. Hafn., p. 489. 1815; Nutt., Gen. 2: 9. 1818, excluding white-flowered species; DC., Reg. Veg. Syst. Nat. 2: 85. 1821; DC., Prod. 1: 120. 1824; Elliott, Bot. Carol. & Georg. 2: 13. 1824, excluding white-flowered variety; Roxburgh, Fl. Ind. 2: 571. 1832; Hook., in Journ. Bot. 1: 190. 1834, as to Drummond 15; Graham, J., Cat. Pl. Geo. in Bomb. & Vic. 6. 1839; Wight, Ill. Ind. Bot. 1: t. 11. 1840; Walp., Rep. 1: 109. 1842, excluding varieties; Voigt, Hort. Sub. Cal., 6. 1845; Hook. f. & Thoms., Fl. Ind. 1: 251. 1855; Oliv., Fl. Trop. Afr. 1: 54. 1868; Hook. f. & Thoms. in Hook. f., Fl. Brit. Ind. 1: 117. 1872; Cooke, Fl. Pres. Bomb. 1: 27. 1901 (Repr. ed. 1: 29. 1958); Duthie, Fl. Upper Gang. Pl. 1: 36. 1903 (Repr. ed. 1: 37. 1960); Prain, Beng. Pl. 1: 216. 1903 (Repr. ed. 1: 142. 1963); Strachey, Cat. Pl. Kumaon 8. 1906; Fedde, in Engler, Pflanzenr. 4. 104: 273, 274, fig. 36B. 1909; Gamble, Fl. Pres. Madr. 1: 35. 1915 (Repr. ed. 1: 25. 1957); Haines, Bot. Bih. & Or. 1: 23. 1921 (Repr. ed. 1: 24. 1961); Kanjilal, Fl. Assam. 1(1): 66. 1934; Fedde in Engler & Prantl, Nat. Pflanzenfam. ed. 2, 17b: 107. 1936; Van Steenis, Fl. Malesiana, 1.5: 114-115. 1955-1958; Ownbey, Mem. Torrey Bot. Club 21.1: 1. 159. 1958. Ownbey, Brittonia 13: 103. 1961; Backer *et al.*, Fl. Java, 1: 177. 1963; Mowat, in Tutin *et al.* in Fl. Europ. 1: 251. 1964; Hara in Hara, Fl. East. Him. 1: 103. 1966; Cullen, in Rechinger f., Fl. Iran. 34: 23. 1966; Jafri, Fl. Karachi, 129. 1966; Jafri et Qaiser in Nasir et Ali, Fl. W. Pak. 61: 21. 1974; Saldanha *et al.*, Fl. Hassan Dist. 71. 1976; Bhandari, Fl. Ind. Desert, 30-31. 1978; Debnath et Nayar, Fasc. Fl. Ind. 17: 3. 1984. *A. mexicana* var. *typica* Prain in Journ. Bot. 33: 308. 1895. *A. mexicana* var. *ochroleuca* Britton, Man., p. 439. 1901 not *A. ochroleuca* Sweet. Fig. 1

Common Names: In Gerard (1597) *Argemone mexicana* is termed "The golden Thistle of Peru". *A. mexicana* was referred to by various authors by various names. It is commonly called as "Mexicana Prickly Poppy" or "Prickly Poppy." In India *Argemone mexicana* is termed as *Baroshial Kanta*, *Sial-Kanta* (Beng.); *Darudi* (Guj.); *Bharbhand*, *Piladhutura*, *Farangi-dhutura*, *Ujar-kanta*, *Sial-Kanta* (Hind.); *Brahma-danti* (Mal.); *Kandiari*, *Bialkanta*, *Bhatmil Satyanasa*, *Bherbhand*, *Katci*, *Bhat Kateya* (Punj.); *Srigala kanta*, *Brahmadandi* (Sans.); *Gokhulajanum* (San.); *Birama-dandu*, *Kurukkum ckedi* (Tam.); *Brahma-dandi-chettu* (Tel.); *Baramdandi* (Urdu); *Kantu-Kusam* (Oriya).

In West Pakistan, according to Jafri et Qaiser (1974) *A. mexicana* is termed as *Pilawala dhatura*, *Bhat Katia*.

Annual, erect, prickly herbs, latex yellow. Stems 30-125 cm tall, divaricately branched, armed with 0-6 perpendicular or slightly reflexed prickles per square cm of surface or devoid of any spines (in *f. leiocarpa*). Leaves sessile, alternate, semiamplexicaul, elliptic oblong, variegated green and white, the light blue markings over the veins, 3-22 × 2-8 cm broad, pinnatifid, sinuate-lobulate, ultimate segments, the segments inciso-dentate, margin acute, toothed with spines, lower surfaces of the leaves sparingly prickly on the main veins, about 0-3 prickles per cm of vein, the upper surfaces wholly smooth or very distantly prickly, prickles very sharp, yellow, prickle 2-10 mm long or both upper and lower surfaces of the leaves totally smooth (in *f. leiocarpa*). Buds subspherical, 9-24 × 6-12 mm, very sparingly prickly or totally smooth (in *f. leiocarpa*). Flowers bright yellow, 4-7 cm diameter, sessile, subtended by 2-3 foliaceous bracts. Sepals 8-12 × 5-7 mm, each sepal with an acute terete horn, about 6-9 mm long, very sparsely prickly outside, imbricate, caducous. Petals 4-6, usually bright yellow, obovate, imbricate, cuneiform, more or less crumpled in aestivation. Stamens indefinite, 8-10 mm long; filaments pale lemon yellow; anthers 2 mm long, yellow. Ovary ovate, 8-15 mm long (including stigma), 3-6 mm broad covered with long soft spines; stigmas purple, 3-6 lobed, lobes usually broad, closely crowded together and appressed to the style at anthesis. Capsules oblong or elliptic-oblong, 1.0-3.9 cm long (including stigma), 0.5-2.1 cm broad, with rounded ribs, covered with sharp erect 10-21 spreading spines per valve, the largest spines commonly 4-9 mm long or the surface totally smooth (in *f. leiocarpa*). Seeds many, blackish brown to deep brown, more or less rounded, 1.6-2.0 mm long, deeply reticulate-suborbiculate.

Type: Holotype: Mexico, Jamaica, Carribies & S. Europe, Herb. Linn. No. 670/1 (Linn.).

Fls.: February—March.

Frts.: March—May.

Distrib.: INDIA: Throughout India, between sea level to 2500 m; PAKISTAN; NEPAL; BHUTAN.

Uses: The yellow juice of this plant is used as a medicine for dropsy, jaundice and cutaneous affections. It is also diuretic, relieves blisters, heals and ulcers.

The seed oil is used as a medicine for ulcers and eruptions.

Note: While studying the genus *Argemone* L. Debnath et Nayar (1980) had come across an interesting specimen of *Argemone mexicana* L. with green

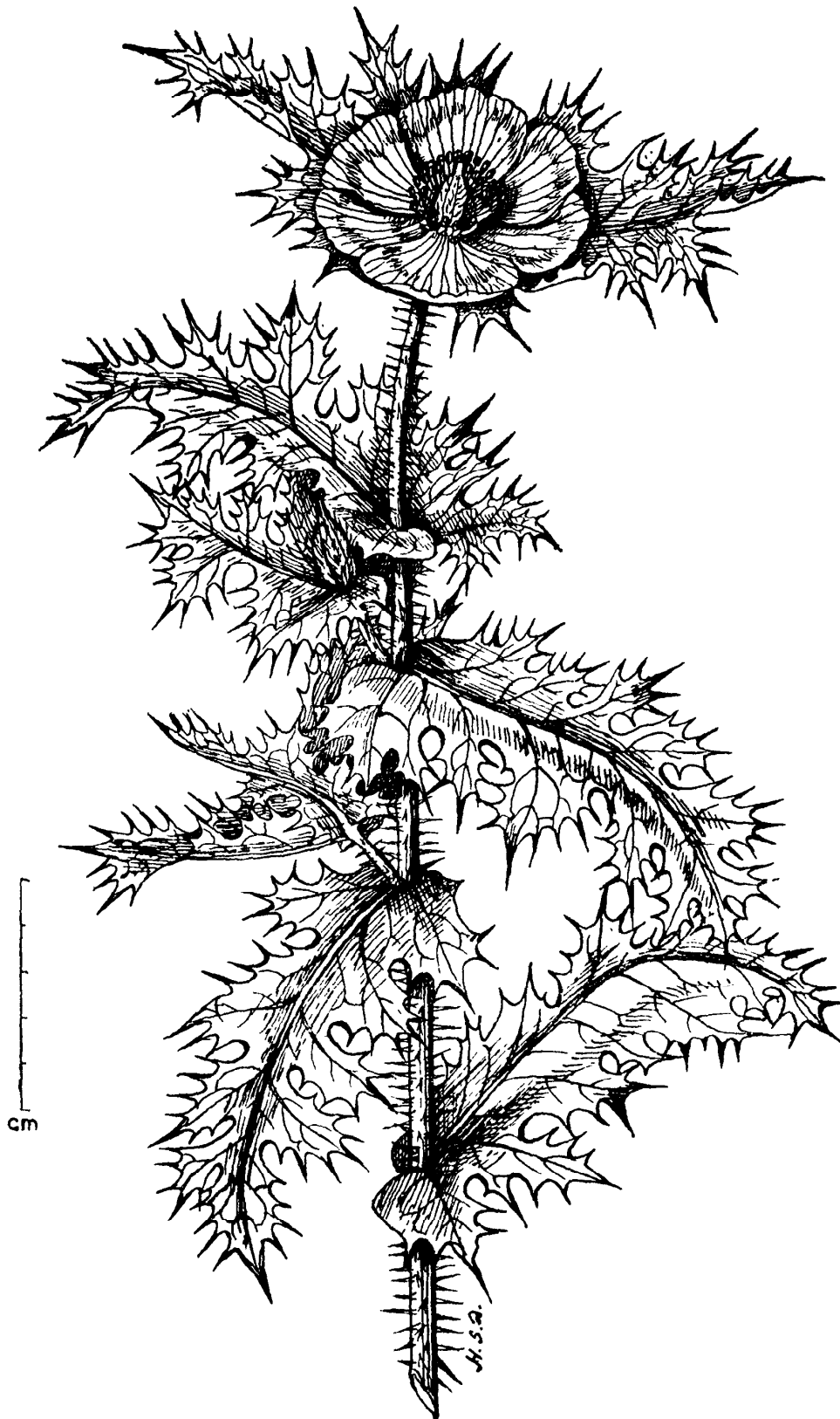


Fig. 1. Habit of *Argemone mexicana* Linn.