REVIEW OF LITERATURE

After establishment of generic name *Abutilon* by Miller (1754), Sweet’s (1826) provision of considering it as separate genus from *Sida* with more than one seed in a carpel lead to sound attention of the genus in subsequent studies. As there are no valid species names included in Miller’s Gardeners Dictionary (1754), none of the species name in *Abutilon* is authorized by Miller and type cannot be assigned to the genus from this work.

Subsequent to Sweet many researchers did further critical investigation of the genus, major contributions are by Thomas Kearny, Paul Fryxell, Benedict Hochreutiner, Antonio Krapovickas, Borssom Waalkes, David Bates etc.; all of them have done extensive studies on Malvaceae for different geographical areas. For Indian Malvaceae massive inputs were added by Tapas Kumar Paul, V. V. Sivarajan and Ayilliath K. Pradeep. Details of their work has been discussed further in the review.

In the first edition of Hortus Britanicus, Sweet (1826) has published 33 names under genus *Abutilon* and in second edition (1830) three more were added. Burmann (1768) in his Flora Indica enlisted species with multi-seeded carpel under genus *Sida*, same is also executed by Roxburgh (1832). Unknowingly or coincidently, both Burmann (1768) and Roxburgh (1832) in their work described same plant with multiseeded carpel from different localities with different names viz., *Sida persica* and *S. polyandra* respectively, now known as *A. persicum*.

Meanwhile Gaertner (1791) had also enlisted the generic name *Abutilon* but the species (*A. avicennae*) he described under the genus is with superfluous name. Subsequently, George Don (1831) has given significant account of dichlamyphalous plants arranged according to natural orders, which is mainly based on Miller’s Gardeners Dictionary and Botanists Dictionary, Candolle’s Regni Vegetabilis Systema Naturale and Prodromus, some of the records from description of plants which never been published mainly from Lambertian Herbarium, etc. He enumerated 83 species of *Abutilon* dividing them in two sections viz., *Oligocarpae* and *Polycarpae*, with many new descriptions. Don also made many new combinations of names for the species which were previously been in *Sida*, more of them described by Cavanilles (1785) and Candolle (1824).

Guillemin et al., (1831) in credentials of flora of West African country Senegambia enlisted seven species of *Abutilon* with inclusion of some new
combinations. Wight and Arnott (1834) in their work on flora of east peninsular India recorded eight species of *Abutilon*, of which *A. periplocifolium* and *A. crispum* are now transferred to *Wissadula* and *Herissantia* respectively. Presl (1835) while describing remaining of Haenke’s work, enumerated 12 species of *Abutilon* divided in two sections viz., sect. *Mutica* including *Abutilon* sp. with character of umbilicate membranous carpels forming ball like fruits, and sect. *Armata* described with group of species having angular and pointed carpels forming truncated cone like fruit. Many of the species names are new combinations and some of them are newly described species. Torrey and Gray (1838) in their work of flora of North America enlisted three species of *Abutilon* of which two are newly described viz., *A. nuttallii* and *A. texense*. The genus is enlisted by Bentham and Hooker (1862) in Genera Plantarum with a comment that species of *Abutilon* are distributed in warmer regions of both hemispheres of world; some are spread far and wide. In his another documentation, Bentham (1863) with the assistance of Mueller has given description of plants from Australian territory, he enlisted 18 species of *Abutilon*, three of which are widely distributed over tropical Asia and Africa, and 12 species are endemic to Australia. Bentham stated that the genus *Abutilon* is chiefly American.

Masters (1868) in his treatment of family Malvaceae in Flora of tropical Africa enlisted 14 species of *Abutilon*. On the word of him genus *Abutilon* is artificially separated from *Sida*, with uncertain mark of distinction. Besides, he stated that *Abutilon* spp. (except *A. fruticosum*) bloom in evening and the *Sida* flower in daytime. East African species of *Abutilon* studied by Mattei (1915), in his work 26 species of *Abutilon* treated with infrageneric classification of genus, applying terms stirps and substirps for rank of sections and subsections. He enlisted widespread and endemic taxa, some of them also described newly, mentioning that the genus is not diverse in the sense of vegetative characters.

Hochreutiner (1902) studied Malvaceae, title of his work ‘new or little-known Australasian Malvaceae’, with enumeration of 19 species of *Abutilon*, of which seven new species and three new varieties and two new combinations. Hochreutiner (1955) while studying flora of Madagascar included *Abutilon* with details of six species, with a comment on tropical and subtropical distribution of the genus.

Schumann (1891) in Brazilian flora enumerated more than 60 species of *Abutilon* divided in sections and series. Takeuchi and Esteves (2012) reported number
of Abutilon species in Brazil is 48 and 40 of which are endemic. They have given synopsis of Abutilon for the state of Sao Paulo enumerating 18 species with a new species (A. costicalyx), three new records and three new synonyms. Schumann (1895) also contributed for family Malvaceae in Engler and Prantl’s documentation on natural plant families along with their genera and more important species. He reported about 80 species of Abutilon in tropical hemispheres, few exceed tropics and some are widespread as weed. Here Schumann also put light on introduction of A. theophrasti (=A. avicennae) in Europe, Northern Asia, America and Australia, also discussed about its medicinal and fiber producing properties.

Kearney (1951) discussed about Abutilon in his study of Malvaceous genera of America, reported 125 species from North and South America. He mentioned the genus as more generalized and may be primitive of genera of Malvaceae which have many seeded carpel and show absence epicalyx. In this study the genus is discussed for large variation in dehiscence of carpel. After 45 year to Kearney, Fryxell (1997) again discussed about American genera of Malvaceae, for Abutilon he made valuable comments on its history, distribution, general characters, chromosome number and infrageneric classification. Kearney (1955) also provided tentative key which is artificial but useful for North American species of Abutilon with addition of remark on its challenging diversity and he was of the opinion that lot of has to be investigated.

A well-known work done by Borssom Waalkes (1966) entitled ‘Malaysian Malvaceae Revised’, put forth many interesting interpretations regarding treatment given to family and also to the genus Abutilon. Borssom refuses the origin of the genus as American, as many species are apparently of Old world origin such as A. indicum, A. hirtum, A. pannosum, A. theophrasti, and one of them i.e. A. persicum is restricted to tropical Asia. Extraction of genus Herissantia from Abutilon is not accepted by him. Intraspecific classification of A. indicum given by Borssom is followed in many Indian floristic studies. Sectional or infrageneric classification of the genus is not applied in his work because according to him treatment given by previous researchers worldwide doesn’t appear satisfactory for the subdivision of genus and included Malaysian species.

Malvaceae of Mexico revised by Fryxell (1988), treating 55 genera and 372 species. Endemism, diversity, and classification of family are discussed here excellently. Fryxell is of the opinion that Mexico is one of the centers of diversity and
reported 184 species of Malvaceae are endemic to Mexico. He treated genus *Abutilon* with six sections of which two are newly described viz., sect. *Mexabutilon* and sect. *Pluriovolata*. In this work typification and etymology of genus name is reviewed and 45 species of the genus are enlisted. The treatment given to the genus is followed by Sivarajan and Pradeep (1996) for an account of South Indian *Abutilon* spp.

Systematic studies on genus *Abutilon* from Pakistan is carried out by Syed and Syed (1974), enumerating 10 species. Taia (2009) revised the genus *Abutilon* for Saudi Arabia recording five species with a glimpse of general view of family Malvaceae, its taxonomic position and classification.

Records of *Abutilon* for India taken together by Paul and Nayar (1988) and Paul (1993) while assigning Malvaceae in flora of India. Before this many researchers have enumerated the genus in regional studies which is discussed further in detail. Paul (1993) reported 13 species from India, two of which viz., *A. grandifolium* and *A. striatum* are introduced and cultivated in garden for ornamentation. Paul also followed infraspecific classification proposed by different researchers with three subspecies and nine varieties six taxa are endemic to different regions of India. Afterwards an excellent account of south Indian Malvaceae is provided by Sivarajan and Pradeep (1996). Taxa from Andhra Pradesh, Karnataka, Kerala and Tamil Nadu are reviewed in this analysis. They recorded seven species and two subspecies of *Abutilon* treated in three sections proposed in previous studies. Before and after these two important studies as milestones for *Abutilon* in Indian Malvaceae, many other significant studies have enumerated *Abutilon* spp.

Catalogue of Plants from Bombay and vicinity including cultivated and introduced plants was given by Graham (1839), with enumeration of four species of *Abutilon*. After 22 years of Graham (1839), Dalzell and Gibson (1861) enlisted plants from Bombay with many new descriptions. They enlisted four species of *Abutilon*, one of them is newly described *A. sidoides* (=*A. ramosum*). Graham (1839) and Dalzell & Gibson (1861) were adhered to area of the then Presidency of Bombay.

Maxwell Masters who studied Malvaceae for Flora of tropical Africa (1868) also did same for Flora of British India (1874). He recorded 11 species from India including Sindh (Pakistan), Bengal (Some part in Bangladesh now) and Ceylon. Further he added a note on introduction Javanese plant *A. auritum* in India, which according to him can be met with an escape from Gardens. After Masters (1874), Woodrow and Stapf (1894) published a critically endangered and endemic species *A.
ranadei, based on collection of N. B. Ranade, ex Herbarium Keeper of College of Science, Pune. Subsequent to this, Cooke (1903) had come with enormous work as Flora of the Bombay Presidency. Divisions of the Presidency are Konkan, Dekkan, Gujarat, Southern Maharatta Country and Sind; to which Cooke was adhered as being most convenient. Belgaon and Dharwad of Karnataka were considered in Southern Maratha country and Kanara is in Konkan. Cooke enumerated 11 species of Abutilon from the Presidency and in addition an introduced and ornamental species i.e. A. striatum. More or less concurrently to Cooke, Duthie (1903) also did Flora of whole of the Upper Gangetic Plain up to the border of Bengal, and also includes Siwalik range of Hills and Sub-Himalayan tracts from Jamuna to the Gandak. In this work, Duthie has enumerated five species of Abutilon including a rare species i.e. A. ramosum. In 1976, Raizada came to bring out the supplement to Duthie’s work, with addition of two more species of Abutilon from the area, i.e. A. glaucum (=A. pannosum) and A. theophrasti.

While describing ‘Bengal Plants’ with the list of phanerogams, ferns and fern-allies indigenous or cultivated in Trihut, Bihar, Chhota Nagpur, Orissa, West-East-North-Central Bengal and Chittagong, Prain (1903) enlisted three species of Abutilon. Gamble did outstanding work as a floristic account of the Presidency of Madras. In author’s note it is mentioned that the Flora falls into 4th (Malabar) and 5th (Deccan) provinces, as given in ‘Sketch of the flora of British India’ by Sir Joseph Hooker (1904), but other subdivisions of the floristic study area are given by Gamble viz., 1. The Sal region 2. The Dekkan region 3. The Semi Desert region 4. The Wet region and 5. The Alpine region. First part of the flora was completed by Dunn (1915) which includes Malvaceae, enumerating eight species of Abutilon including A. crispum (as in Cooke, 1903).

In addition, many studies restricted to different states and districts also been carried out. Some important of them are discussed below.

In documentation of plants of Punjab Bamber (1916) has given details of two species, while Parker (1956) reported five species of Abutilon from Forest flora of Punjab with Hazara and Delhi. Kanjilal et al (1934) in work on flora of Assam reported a species of Abutilon i.e. A. indicum. Haines (1961) in his study of Botany of Bihar and Orissa reported three species of the genus. In floristic studies of Saurashtra, a peninsular region of Gujarat state the genus is represented with seven species by Santapau (1962) whereas, Bole & Pathak (1988) came up with record of five species
from same region. Maheshwari (1963) recorded 4 species of *Abutilon* in work entitled ‘The Flora of Delhi’. From Gujarat five species are reported along with two subspecies (Shah, 1978) while Patel et al. (2011) enlisted eight species from Kachchh. Osmanston (1978) in study of forest flora of Kumaon reported two species. Deb (1981) in floristic account of Tripura state, counts on with one species i. e. *A. indicum*, same is resulted from work on Flora of Nallamalais (Ellis, 1987). Nair and Henry (1983) enlisted 9 species of *Abutilon* including two subspecies and two cultivated species in analysis of Flora of Tamil Nadu. Sharma et al. (1984) enlisted eight species from Karnataka. From Meghalaya only one species i. e. *A. indicum* is reported (Haridasan and Rao, 1985). Investigation of flora of Rajasthan by Shetty and Singh (1987) resulted into record of eight species. Before this, Bhandari (1978) in his floristic account of Indian desert reported seven species. Niranjan Sharma (2002) in his Flora of Rajasthan enlisted six species and in floristic account of South and South-East region of Rajasthan four species and two subspecies are recorded (Tiagi and Aery, 2007). *A. indicum*, the only species reported from Corbett national Park, Uttarakhand (Pant, 1986). Verma et al. (1993) has given account of four species in exploration of flora of Madhya Pradesh. Saxena and Brahmam (1994) recorded three species of *Abutilon* from Orissa. Hajra et al (1996) in material for the flora of Arunachal Pradesh reported two species, a common *A. indicum* and a rare species *A. ramosum*. Pullaiiah and Chennaiah (1997) reported six species from Andhra pradesh. From Maharashtra state nine species of *Abutilon* are recorded by Venkanna and Das Das (2002) along with an introduced one i. e. *A. auritum*. Before this Almeida (1966) in his floristic study of Maharashtra reported 11 species of *Abutilon*. Singh et al. (2002) have reported four species from Jammu and Kashmir, two of which are of rare or occasional occurrence in India viz., *A. theophrasti* or *A. ramosum*. Before two decades of Singh et al. (2002), Sharma and Kachroo (1981) were effective to record two species of the genus from Jammu and neighborhood. Meanwhile Naqshi et al. (1988) studied Malvaceae of Jammu and Kashmir state, enumerating four species of *Abutilon* same as further recorded by Singh et al. (2002). In Flora of Eastern Ghats (Pullaiiah and Rao, 2002) five species and two subspecies of the genus are reported. Singh et al. (2002) reported *A. persicum* in Flora of Mizoram. In analysis of floristic diversity of Chhattisgarh Khanna et al. (2005) enlisted four species. Mohanan and Rao (2005) have given details of the genus with seven species from Kerala. The genus is represented by three species from Cold Desert of Western Himalaya (Shrivastava

Apart from this many floristic studies carried out at district level or smaller geographical areas which include details of respective number and distribution of Abutilon spp.

Abutilon indicum is reported by ENVIS in their checklist of plants of Andaman and Nicobar Islands. However the genus Abutilon is not reported from Andaman and Nicobar islands, from the forest flora of north-west and central India (Brandis, 1972), from Forest flora of Andaman Islands (Parkinson, 1972). Hajra et al. (1999) also haven’t reported the genus from Andaman and Nicobar islands.

Many researchers proposed classification of genus Abutilon as Presl (1835), Grisebach (1864), Schumann (1891), Mattei (1915) and Fryxell (1988). Of which Mattei used terms ‘stirps’ and ‘substirps’ instead of ‘sections’ and ‘subsections’; Schumann used terms ‘section’ and ‘series’ for ‘subsection’. Section Armata Presl. revised by Fryxell (1976) with Mexican species with description of 3 new species. In this revision he discussed about characteristics of section Armata and its natural grouping, along with inventory of Central American species of Abutilon belong to the section. With elevation (from Sida sect. Abutilon subsect. Oligocarpae DC.) and revision of section Oligocarpae, John A. Fryxell (1983) described a new species of Abutilon i.e. A. mucronatum from western Mexico.


Concerning nomenclatural studies on genus, Fryxell (2002) put forth a milestone in the form of his document entitled ‘An Abutilon Nomenclator’, in which he brought together names under genus on a global basis considering it as step ahead toward resolving the complexity existed in genus. Fryxell has enlisted 25 infrageneric names, 500 names at specific rank, and many names in infraspecific rank with type details as possible as for most of the names, also proposed five new combinations. More than 70 names are lectotypified and two are neotypified in this publication. Synonyms are indicated wherever he felt and interpreted as. After this some of the
names concern to Indian inventory are typified (Verdcourt, 2003; Nalawade et al., 2015; Nimbalkar et al., 2018).

**Cytology**-
Details for base chromosome number of *Abutilon* spp. from different geographical areas is assembled in ‘Index to Plant chromosome number’ (Goldblatt and Johanson, 2010). Some other reports are brought together by Marhold (2009, 2012) and Marhold & Kucera (2016). Chromosome count in genus *Abutilon* is also examined by many researchers as a part of cytological investigation of selected plant or plant groups (Skovsted, 1935; Survase et al., 2012; Gill and Kaur, 2015; Verma et al., 2018).

**Anatomy**-
Metcalfe and Chalk (1950) has explained many common and special anatomical features of Malvaceae as for many other angiosperm families. Some characteristic features explained by them are xylem form closed ring in some species of *Abutilon*, cluster crystals are definitely present, some small vessels are with spiral thickening, etc. Inamdar et al., (1983) contributed excellently to details of internodal vessels of Malvaceae. 3 species of *Abutilon* are included in their study. Evert (2006) in Esau’s plant anatomy emphasized on floral nectaries made up of multicellular trichomes, present on lower inner surface of fused sepals in *A. striatum*. These nectary trichomes secrete sucrose, fructose and glucose. Aysegul et al. (2003) studied *A. theophrasti* by transverse sections of root, stem and leaves. Anatomical study of some of the *Abutilon* spp. from West Bengal carried out by Naskar (2016). Micromorphological variation in leaf epidermal characters of *Abutilon* spp. from Indian Thar desert studied by Bano and Deora (2017) to examine its taxonomic relevance. Kartikeyan et al. (2012) studied anatomy of leaves of *A. indicum*. Chachad & Vaidya (2016) and Chavan et al. (2014) studied stomata and trichomes of some *Abutilon* sp. in the view of its taxonomic implications respectively. Survase and Kare (2018) examined important anatomical features of an endangered species *A. ranadei* which will be helpful for its identification from vegetative parts.

Phytochemical and pharmacognostic studies and research activities against various diseases and microbes are carried out by various workers on different species of *Abutilon* (Dinu, 2012; Mohite et al., 2012; Pavlovic et al., 2007; Beha et al, 2004; Kuo et al, 2008; Reddy et al., 2011; Alshymma et al. 2016)
Palynology-

As pollen morphological studies are contributing to great extent in resolving taxonomic complexes, many researchers carried out the investigation for Malvaceae (Lang, 1937; Hanks and Fryxell, 1979; Erdtman, 1952; Saad, 1960; Christensen, 1986; Shaheen et al., 2009a; Shaheen et al., 2010; Bibi, 2010). Representatives of *Abutilon* are included in their studies. Scanning Electron Microscopy is adopted as a major tool to observe the characters. Christensen (1986) and Saad (1960) accept the correlation between pollen size and chromosome number, also agree with taxonomic importance of aperture number as a character. Erdman (1952), Punt et al. (1994, 2007), Hesse et al. (2009) provided glossary of spore and pollen terminologies which is helpful to describe spore or pollen grains with accuracy in perception. Hosni and Araffa (1999) in their pollen morphological studies of Malvaceae in flora of Egypt examined five species of *Abutilon*. Nagger (2004) assessed taxonomic value of pollen morphology of Egyptian genera of Malvaceae, concluded as size of pollen surface is also a useful taxonomic character along with spine and aperture characteristics and exine stratification. Shaheen et al. (2009b) studied pollen morphological characters of seven species of *Abutilon* along with some *Hibiscus* Sp., with discussion on variable thickness of exine, nexine and sexine.

Seed Morphology-

Applicability of seed surface characters in classification is explained by Barthlott (1981) and he commented on its evolutionary attributes. In this study characters to describe seed or seed epidermis are categorized in different kinds such as cellular pattern, shape of cells i.e. primary sculpture, secondary sculpture, tertiary sculpture which includes waxes and related substances. Scanning Electron Microscopy is used as effective measure for these investigations. Many studies for seed surface analysis are carried out for taxonomic evaluation in different plant groups, few record are also available for Malvaceae. Seed structure of *Hampea nutricia* is analyzed by Singh and Chauhan (1984), results of which supports its inclusion in Malvaceae. Nagger (2001) assessed taxonomic application of seed coat characters in Malvaceae. Macro- and micro-morphological details of seed in *Abelmoschus* are investigated by Patil et al (2015) to analyze taxonomic importance. Thakor (2009) studied primary seed morphological characters (LM) of Malvaceae such as shape, color, hilum shape, and weight of seed from Gujarat state. Abid et al.
(2016) carried out an extensive work on morphology of seeds of 75 taxa belonging to Malvaceae including nine species of *Abutilon*. According to them the study has intensified the assessments within the family Malvaceae at different levels. Fawzi (2018) examined seeds of five species of *Chorchorus* (Tiliaceae) for application of morphological characters in classification.

**Molecular taxonomy**

Phylogenetic analysis of species is revolutionized enormously, as molecular sequence data serving a lot. Since three decades revolutionary hypotheses are supported by utility of sequences of genes and spacers. Use of the sequences is now routine procedure due to pronounced effect of molecular data on plant systematics. Soltis and Soltis (2000), Alvarez and Wendel (2003), Small et al., (2004) provided comprehensive reviews interpreting the use and influence of studies of molecular evolution in plant systematics.

Family Malvaceae is extensively explored for its evolutionary trend and delimitation of taxa with molecular evidences. Chloroplast genome from 23 genera of Malvaceae is mapped (La Duke & Doebley, 1995), from this study it is revealed that representatives of Hibisceae and Malvavisceae exhibit polyphyly whereas members of Malveae and Gossypieae are appears as monophyletic. Baum et al. (1998) studied floral evolution and biogeography of *Adansonia* spp. by using morphological characters and other three information sets viz. ITS, cp rpl 16 intron and cp DNA restriction sites. Garcia et al. (2009) investigated reticulate evolution within Malva alliance by using five regions of nuclear and plastid genome. As stated by them the group is defined with substantial morphological homoplasy, especially with a fusion of epicalyx bracts which evolved in extensive homoplasious way. Their results showed that fruit morphology is in accordance with groups which are molecularly defined. Gene duplication in *Hibiscus* is investigated to study congruent phylogenetic pattern produced by duplicates of rpb2 gene by Pfeil et al. (2004). *Sida* generic alliance is analyzed for phylogenetic relationship by means of ITS sequence of nrDNA (Fuertes Aguilar, 2003); results obtained from the study are compared with previous circumscription. Baum et al. (2004) assessed phylogenetic relationship between Bombacoideae and Malvoideae which according to previous studies (Bayer et al., 1999; Alverson et al. 1999) form a well-supported clade which is named as Malvatheca (Baum et al., 1998). According to them Malvoideae is neotropical in
origin and a taxon which occurs as associate of mangroves dispersed through Pacific, finally up to Australasia and evolved into more than 1500 species of Malvaceae s.s.. Two chloroplast regions \( ndhF \) and \( trnK/matkK \) were sequenced for the analysis. Rizk and Soliman (2014) looked into the molecular genetics and biochemical characterization of six species of the family Malvaceae. In another research (Judd and Manchester, 1997) morphological, palynological, anatomical and biochemical data is used for primary cladistics survey which determined the limitations of Malvaceae. Additionally many other studies are carried out systematics and phylogenetic relationship within Malvaceae s. l. by using molecular sequence data, many of them focused on members tribe Malveae, because of its highly polyphyletic circumscription (Fuertes Aguilar et al., 2002; Andreasen and Baldwin, 2003; Nyffeler et al. 2005; Duarte et al., 2011; Aresces-Berazain and Ackerman, 2016).

Most leading analysis in tribe Malveae was carried out by Tate et al. (2005) who marked out phylogenetic correlation within the tribe concluded from ITS sequence. According to them hybridization, polyploidization and aneuploid reduction appear as imperative evolutionary process from this group. Apart from this Fryxell (2002) stated that pluriovulate (4-6 or more seeds per carpel, included in sect. \( Pluriovulata \) Fryxell, 1988) species of \( Abutilon \) form the group isolated from pauciovulate (3 seeds) species \( Abutilon \) s.s. Pluriovulate species are with base chromosome number eight whereas others with seven. With this insight Fryxell specified that the pluriovulate species have to be raised at generic rank along with further investigation for more distinguishing characters. Postulating this hypothesis, Donnell et al. (2012) recognized a new genus \( Callianthe \) including pluriovulate \( Abutilon \) spp. and species previously been represented as \( Bakeredesia \) subg. \( Dipteron \).

The genus \( Callianthe \) is based on toothed and/or lobed leaves, petals with impressed veins, four or more ovules per carpel, base chromosome number eight and ITS sequences with 25 bp deletion in ITS 2 region. Neotropical \( Abutilon \) sp. which are introduced and cultivated in India for ornamentation in gardens viz. \( A. striatum \), \( A. pictum \) also transferred to \( Callianthe \). \( A. striatum \) is treated under \( Abutilon \) sect. \( Pluriovulata \) by Fryxell (1988). The treatment is followed by Sivarajan and Pradeep (1996); along with \( A. striatum \) they included \( A. persicum \) (restricted to tropical Asia) under sect. \( pluriovulata \) with the recommendation to include \( A. ranadei \) (endemic to Maharashtra state) under it as both possess four or more ovule per carpel. This needs further investigation.