

CHAPTER V

DISCUSSION AND CONCLUSION

Taxonomy of *Argyreia* Lour.

From the present study, the sporophytic characters of *Argyreia* exhibit more tremendous diversity. Both vegetative and reproductive organs play an important role in recognizing its generic character down to the level of species. Even though, pollen morphology is one of the most significant characters in the classification of Convolvulaceae. (Erdtman, 1952 and van Ooststroom, 1953). According to the present investigation, it is however very uniform or displays much less variation in the pollen of *Argyreia*. Thus, pollen morphology seems to be not such a good supporting data for the identification in species level within this genus, at least in Thai species.

From the literature reviews, it can be seen that the *Argyreia* had some taxonomic problems, in the beginning of its history, on its generic delimitation. However, from the last five decades, some taxonomists had been trying to clarify this problem. They have considered and mentioned the difference of its characteristics which are of sufficient magnitude to warrant its separation into a distinct genus from its morphologically resembling genera, i.e. *Ipomoea*, *Lepistemon*, *Mina*, *Stictocardia* and *Turbina*. (van Ooststroom, 1953)

A combination of characters that can be used in recognizing the majority of *Argyreia* is woody climber habit, almost all of vegetative parts (stem, leaf blade, petiole) more or less, with indumentum, calyx distinctly enlarged in fruit, campanulate or funnellform corolla, midpetaline bands usually hairy outside, fleshy or leathery indehiscent fruit and echinate pollen grain.

Table 4. Comparison of *Argyreia* Lour. with other related genera. (van Ooststroom, 1953)

| Characters | <i>Argyreia</i> | <i>Ipomoea</i> | <i>Lepistemon</i> | <i>Mina</i> | <i>Stictocardia</i> | <i>Turbina</i> |
|----------------------|--|--|-----------------------------------|------------------------------------|---|---|
| Habit | Woody twiners | Woody twiners or prostrate | Herbaceous or woody twiners | Herbaceous or twiners | Woody or herbaceous | Herbaceous or subwoody twiners |
| Indumentum | Mostly of all parts hairy | Mostly of all parts glabrous | Usually hairy | Mostly of all parts glabrous | Mostly of all parts hairy | Mostly of all parts glabrous |
| Leaf blade | Without dots glands | Without dots glands | Without dots glands | Without dots glands | With dots glands | Without dots glands |
| Calyx | Enlarge in fruits | Often more or less enlarged in fruits | Not enlarge in fruits | Not enlarge in fruits | Enlarged in fruit and completely enclosing the ripe fruits | Not or slightly enlarged in fruits |
| Shape of corolla | Campanulate, funnelform or tubular- campanulate | Usually funnelform or campanulate | Urceolate rather small | Narrowly urceolate | funnelform | Usually funnelform |
| Midpetaline bands | Mostly hairy, rarely glabrous | Mostly glabrous, rarely hairy | Mostly hairy | Mostly glabrous | Somewhat hairy and minute glands like the leaf | Mostly glabrous or sparsely hairs |
| Fruit | Fleshy, leathery, indehiscent | Capsule, dehiscing | Capsule | Capsule | Fleshy, pericarp thin with two wings | Woody pericarp, indehiscent |

Habit and Habitat

According to the data collected from specimens in various herbaria and field observation, most of *Argyreia* species in Thailand are mainly found in opened space with

plentiful of sunlight, usually at the margin of the forests or on the grassy lands in high altitude from sea level (Table 2.). Sometimes they may be found in the crowded areas in the forests but then they grow up to the canopy and flowering up there.

They are all climbers, usually by using stem coiling or spiraling around other plants, however, *A. henryi* (Craib) Craib performs, more or less, shrubby-scandent habit. Sometimes they can be found in a more crowded part in the forest while all twiner species is noticeably found growing on other plants along the edge of the forests, but some particular species, viz. *A. stenophylla* (Kerr) Staples & P. Traiperm comb. nov. (ined.) and *A. osyrensis* (Roth) Choisy are typically found to be a creeper on opened grassland. The stems of these two species are usually not coil or spiral.

Leaves

Leaves of *Argyreia* are varied in shape and size. However their margin are always entire, unlike its closely related genus *Ipomoea*, which lobate or dissected margin occurs in many species, such as *I. triloba* Linn., *I. nil* (L.) Roth, *I. pes-trigridis* Linn., etc. (เสริมเกียรติ ลอวีระอมรพันธ์, 2527). Leaves of all species are always hairy on the lower surface. Upper surface in most species are also hairy, except in *A. henryi* (Craib) Craib, *A. lanceolata* Choisy, *A. maymyo* (W.W. Smith) Raizada, *A. mollis* (Burm. f.) Choisy, *A. nervosa* (Burm.f.) Boj., *A. splendens* (Hornem.) Sweet, *A. wallichii* Choisy and unidentified *Argyreia* species no.1 and no.2, which their upper surfaces of leaves are glabrous or hairy only on the midrib and veins.

Flower

Flower of *Argyreia* are bracteate, persistent, occasionally caducous in some species. Persistent bracts are usually large and or rather showy such as in *A. nervosa* (Burm.f.) Boj.

Calyx of *Argyreia* are quincuncial. The third one usually has an irregular or oblique form. They are usually glabrous inside and densely hairy outside, except in *A.*

breviscapa (Kerr) Ooststr., *A. collinsae* (Craib) B. Na Songkhla & P. Traiperm comb. nov. (ined.) and unidentified *Argyreia* species no. 1, which their sepals are glabrous on both sides. Margin of sepal is normally entire, but distinctly undulate in *Argyreia splendens* (Hornem.) Sweet

Petals of the *Argyreia* are united and forming a gamopetalous flower like Rubiaceae, Apocynaceae or Acanthaceae etc. However, the fusion of petals occurs nearly completely along the whole length of the petals, leave only small tips free apart. Thus most species of *Argyreia* have entire or shallowly corolla lobes. The main part of the corolla limb that widely spread is then the part of corolla tube, which is different from other gamopetalous flower where corolla limb is mostly corolla lobe. However, I found that some particular *Argyreia* species have distinctly, deeply 5-lobed, i.e. *A. fulvocymosa* C.Y. Wu var. *fulvocymosa*, *A. osyrensis* (Roth) Choisy, *A. roseopurpurea* (Kerr) Ooststr., *A. thorelii* Gagnep. and unidentified *Argyreia* no. 3. It is noticeable that these species have comparatively small-sized flowers.

When we consider the living specimens, we will find that most species of *Argyreia* have thin and delicate papyraceous corolla. However, some particular species, viz. *A. collinsae* (Craib) B. Na Songkhla & P. Traiperm comb. nov. (ined.), *A. kerrii* Craib, *A. cf. laotica* Gagnep., *A. nervosa* (Burm. f.) Boj., *A. osyrensis* (Roth) Choisy, *A. thorelii* Gagnep. and unidentified *Argyreia* species no.1 and no. 2 distinctly develop rather thick, fleshy corolla. This character may be use as a character in key to species, but it disappears when specimen is dried.

As mentioned above that midpetaline bands of most *Argyreia* are hairy outside. However, three species in this study, i.e. *A. breviscapa* (Kerr) Ooststr., *A. kerrii* Craib and unidentified *Argyreia* species no. 1, have completely glabrous corolla.

Stamen and pistil seem to be organs that have less variation in *Argyreia*. In androecium, the base of filament usually dilated and hairy above the insertion of filament

on corolla tube, except in *A. adpressa* (Choisy) Boerl. and *A. roseopurpurea* (Kerr) Ooststr. where the bases of filaments are glabrous.

Distribution

In over view, *Argyreia* can be found in the whole country, especially *A. capitiformis* (Poir.) Ooststr., *A. obtecta* C.B. Clarke, and *A. osyrensis* (Roth) Choisy which distribute in every floristic region. However, some species seems to be limited in a particular area, i.e. *A. adpressa* (Choisy) Boerl. and *A. roseopurpurea* (Kerr) Ooststr. which are recorded only in southern provinces. There is no record of these two species in any Floras of northern areas like China (Fang & Staples, 1995), Burma (Kurz, 1877), India (C.B. Clarke) or Indochina (Gagnapain & Courchet, 1915) too. The same situation is found in *A. henryi* (Craib) Craib, *A. ionantha* (Kerr) C. Khunwasi & P. Traiperm comb. nov. (ined.), *A. kerrii* Craib, *A. roxburghii* Choisy, which seem to be found in the northern floristic regions only. (Table. 2). These species have never been reported in Floras of the peninsular regions, like Malaysia (van Ooststroom, 1943, 1945, 1950, 1952, 1953) or Indonesia (Backer & Bakhuizen, 1965)

Kerr (1954) reported the occurrence of 28 species of *Argyreia* in Thailand (Table 5.). However, I could not find 4 species those he previously mentioned, i.e. *A. atropurpurea* (Wall.) Raizada, *A. confusa* Prain, *A. hookeri* C.B. Clarke, *A. maymyensis* (Lace) Raizada, *A. obtusifolia* Lour., even in their original localities. Furthermore there is no specimen determined under these names, deposited in any herbaria in Thailand, except one specimen for *A. hookeri* C.B. Clarke from Singapore collected by Holttum deposited in BK herbarium. However, two species from my study, are new recorded to Thailand, i.e. *A. fulvocymosa* C.Y. Wu var. *fulvocymosa* from Phitsanulok and *A. thorelii* Gagnep. from Ubon Ratchathani.

Table 5. Comparison of diversity of *Argyreia* Lour. in Thailand from Kerr, 1954; Smitinand, 2001 and the present investigation.

| Taxons | Kerr 1954 | Smitinand 2001 | This Research |
|---|--------------|--------------------------|--------------------------|
| 1. <i>A. adpressa</i> (Choisy) Boerl. | / | - | / |
| 2. <i>A. aggregata</i> Choisy | / | = <i>A. osyrensis</i> | = <i>A. osyrensis</i> |
| 3. <i>A. aggregata</i> Roxb. var. <i>osyrensis</i> | / | - | = <i>A. osyrensis</i> |
| 4. <i>A. atropurpurea</i> (Wall.) Raizada | / | - | - |
| 5. <i>A. brachypoda</i> (Kerr) Ooststr. | / | / | = <i>A. osyrensis</i> |
| 6. <i>A. breviscapa</i> (Kerr) Ooststr. | / | / | / |
| 7. <i>A. calcicola</i> (Kerr) Ooststr. | / | - | / |
| 8. <i>A. capitata</i> (Vahl) Choisy | / | = <i>A. capitiformis</i> | = <i>A. capitiformis</i> |
| 9. <i>A. capitiformis</i> (Poir.) Ooststr. | / | / | / |
| 10. <i>A. collinsae</i> (Craib) B. Na Sonkhla & P. Traiperm | / | - | / |
| 11. <i>A. confusa</i> Prain | / | - | - |
| 12. <i>A. fulvocymosa</i> C.Y. Wu var. <i>fulvocymosa</i> | - | - | / |
| 13. <i>A. henryi</i> (Craib) Craib | / | / | / |
| 14. <i>A. hookeri</i> C.B. Clarke | - | / | - |
| 15. <i>A. ionantha</i> (Kerr) C. Khunwasi & P. Traiperm | / | - | / |
| 16. <i>A. kerrii</i> Craib | / | / | / |
| 17. <i>A. lanceolata</i> Choisy | / | / | / |
| 18. <i>A. laotica</i> Gagnep. | / | - | / |
| 19. <i>A. maymyensis</i> (Lace) Raizada | / | - | / |
| 20. <i>A. maymyo</i> (W.W. Smith) Raizada | / | - | / |
| 21. <i>A. mekongensis</i> Gagnep. et Courchet | / | / | / |
| 22. <i>A. mollis</i> (Burm. f.) Choisy | - | / | / |
| 23. <i>A. nervosa</i> (Burm. f.) Boj. | / | / | / |
| 24. <i>A. oblecta</i> C.B. Clarke | / | = <i>A. mollis</i> | / |
| 25. <i>A. obtusifolia</i> Lour. | / | = <i>A. mollis</i> | - |
| 26. <i>A. osyrensis</i> (Roth) Choisy | - | / | / |
| 27. <i>A. roseopurpurea</i> (Kerr) Ooststr. | / | - | / |
| 28. <i>A. roxburghii</i> Choisy | - | / | / |
| 29. <i>A. roxburghii</i> Craib var. <i>siamica</i> | / | / | = <i>A. roxburghii</i> |
| 30. <i>A. splendens</i> (Hornem.) Sweet | / | / | / |

| Taxons | Kerr 1954 | Smitinand 2001 | This Research |
|--|--------------|-------------------|------------------|
| 31. <i>A. stenophylla</i> (Kerr) Staples & P. Traiperm | / | - | / |
| 32. <i>A. thorelii</i> Gagnep. | - | - | / |
| 33. <i>A. versicolor</i> (Kerr) Staples & P. Traiperm | / | - | / |
| 34. <i>A. wallichii</i> Choisy | / | - | / |
| 35. <i>Argyreia</i> sp. 1 | - | - | / |
| 36. <i>Argyreia</i> sp. 2 | - | - | / |
| 37. <i>Argyreia</i> sp. 3 | - | - | / |

Table 5. (Continued) Comparison of diversity of *Argyreia* Lour. in Thailand from Kerr, 1954; Smitinand, 2001 and the present investigation.

According to the present study, 8 species of *Argyreia* found to be endemic species to Thailand, i.e. *A. breviscapa* (Kerr) Ooststr., *A. calcicola* (Kerr) Ooststr., *A. collinsae* (Craib) B. Na Songkhla & P. Traiperm comb. nov. (ined.), *A. ionantha* (Kerr) C. Khunwasi & P. Traiperm comb. nov. (ined.), *A. kerrii* Craib, *A. roseopurpurea* (Kerr) Ooststr., *A. stenophylla* (Kerr) Staples & P. Traiperm comb. nov. (ined.) and *A. versicolor* (Kerr) Staples & P. Traiperm comb. nov. (ined.). Among these species, *A. roseopurpurea* (Kerr) Ooststr. was found only once and never be found again since then. Two of them, *A. stenophylla* (Kerr) Staples & P. Traiperm comb. nov. (ined.) and *A. versicolor* (Kerr) Staples & P. Traiperm comb. nov. (ined.), have only two specimens for each deposited in BK herbarium. No new or recent specimen can be collected any more. These three species together with those previously mentioned by Kerr but were not found in this present study may be also extinct from our country. This may result from the deforestation or disturbance of their natural habitat.

Some taxonomic problems in *Argyreia*

A. osyrensis (Roth) Choisy & *Argyreia brachypoda* (Kerr) Ooststr.

According to the Florae Siamensis Enumeratio, *A. brachypoda* (Kerr) Ooststr. (or *Lettsomia brachypoda* Kerr) was recorded as a true species. (Kerr, 1941). This name was firstly published in Kew Bulletin by A.F.G. Kerr in 1941 under the name *Lettsomia*

brachypoda Kerr, based on the specimen kept by Put no. 2190 deposited at BK. Later on van Ooststroom changed this name to *Argyreia brachypoda* (Kerr) Ooststr. and published in *Blumea* (van Ooststroom, 1952).

The name *A. osyrensis* (Roth) Choisy was published in 1845, based on its basionym *Ipomoea osyrensis* Roth. The name *A. aggregata* (Roxb.) Choisy was published in 1833 and later treated as a synonym of *A. osyrensis* (Roth) Choisy (van Ooststroom, 1953).

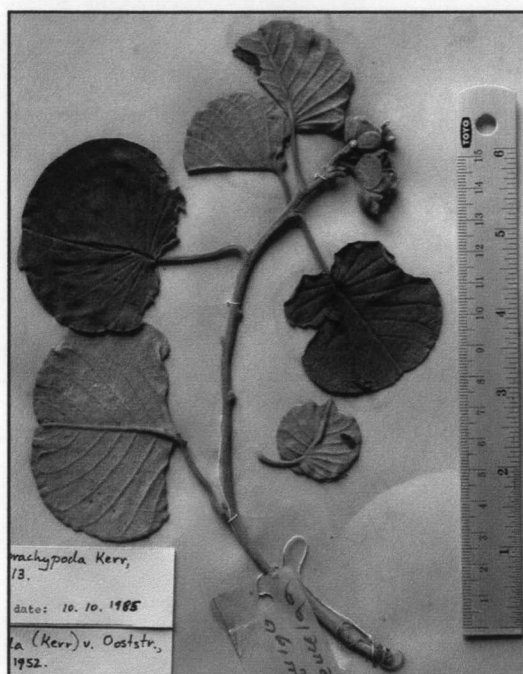


Plate 26. *Argyreia brachypoda* (Kerr) Ooststr.

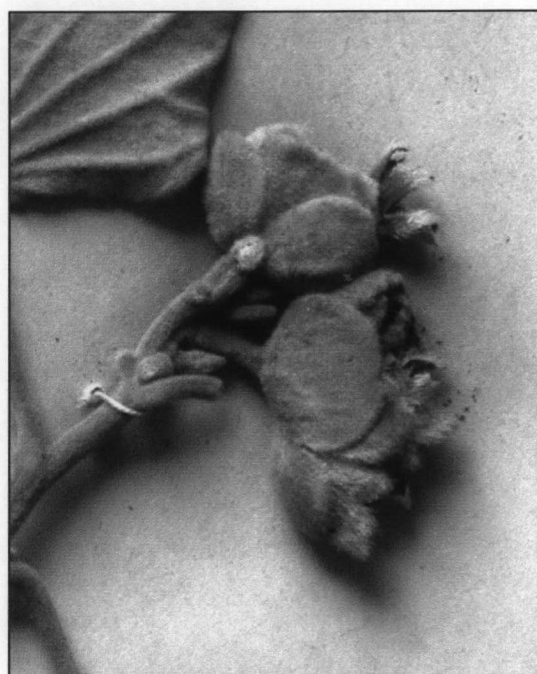


Plate 27. Inflorescence of *Argyreia brachypoda* (Kerr) Ooststr.

According to the available literatures in the present investigation, I found that there is no difference between the description of *Lettsomia brachypoda* describe by Kerr (1941) and *Argyreia osyrensis* (Roth) Choisy described by van Ooststroom (1953) in *Flora Malesiana* vol. 4. and specimen "Put 2190" (Plate 26. and Plate 27.) is fit with the description of *A. osyrensis* (Roth) Choisy too. Furthermore, all specimens examined that determined here as *A. osyrensis* (Roth) Choisy, were previously identified as *A.*

aggregata (Roxb.) Choisy (which is treated now as synonym of *A. osyrensis* (Roth) Choisy), and their characters are also in accordance with the description of *A. osyrensis* (Roth) Choisy in Flora Malesiana vol. 4. Thus in the present study, I may treat the name *A. brachypoda* (Kerr) Ooststr., with some hesitation as a synonym of *A. osyrensis* (Roth) Choisy since I have never seen the type specimen of *A. osyrensis* (Roth) Choisy and read its first publication.

***Argyreia obtecta* C.B. Clarke & *Argyreia mollis* (Burm.f.) Choisy**

Argyreia obtecta C.B. Clarke is treated as a synonym of *A. mollis* (Burm.f.) Choisy (van Ooststroom, 1953 and Smitinand, 2001). However, I have found that these two species should be separated from each other, according to the differences of indumentum on upper surface of leaves, sepal arrangement, shape of corolla, as shown in table 6. below.

Table 6. Comparison of *Argyreia obtecta* C.B. Clarke and *Argyreia mollis* (Burm.f.) Choisy

| Species | Leaves upper surface | Sepal arrangement | Shape of corolla |
|-----------------------------------|----------------------|-------------------|------------------|
| <i>A. obtecta</i> C.B. Clarke | appressed hairs | 3 outer / 2 inner | funnelform |
| <i>A. mollis</i> (Burm.f.) Choisy | glabrous | 2 outer / 3 inner | campanulate |

All specimens that I determined here as *Argyreia obtecta* C.B. Clarke or *A. mollis* (Burm.f.) Choisy will be, on one hand, identified as *A. obtecta* C.B. Clarke by Flora of British India vol. 4 and Flora Générale Indo-chine. On the other hand, they will be *A. mollis* (Burm.f.) Choisy by Flora Malesiana, since these two species have the same characters that used in key to identification (leave shape, shape and indumentum of sepal and pistil).

However, the first publication of description of *A. obtecta* C.B. Clarke described in Flora of British India is clearly stated that the upper surfaces of leaves are pilose (Clakre, 1885). The first publication of *A. mollis* (Burm.f.) Choisy (under the name

Convolvulus mollis Burm.f.) also described that upper surfaces of leaves are glabrous (Burm.f., 1768). It is clear that the indumentum between these two species is different. Additionally from my investigation, I found that both sepal arrangement in these two species and also shape of corolla, are different (Fig. 16 and 18). Thus I would like to separate these two species apart and deserve their own species status.

New combination

According to previously literatures there are four species, namely *A. collinsae* (Craib) B. Na Songkhla & P. Traiperm, **comb. nov.** (ined.), *A. ionantha* (Kerr) C. Khunwasi & P. Traiperm, **comb. nov.** (ined.), *A. stenophylla* (Kerr) Staples & P. Traiperm, **comb. nov.** (ined.), and *A. versicolor* (Kerr) Staples & P. Traiperm, **comb. nov.** (ined.) that are firstly removed from *Lettsomia* Roxb. to *Argyreia* Lour..

Dubious species

In this study, there are three species of *Argyreia* Lour. that can not determine to species level. Though attempts have been made to used key determination from the Flora of neighboring countries.

1. *Argyreia* sp. 1 is a woody climber in dry evergreen forest, climbing on small tree at 650 m alt. It is similar to *Argyreia kerrii* Craib, but their details of indumentum, leaves and sepals, such as, shape and size of lamina, lateral veins, shape and size of sepals and color of indumentum are different.

2. *Argyreia* sp. 2 is a woody climber in deciduous forest, climbing on tree at 1,250 m alt. It looks like *Argyreia splendens* (Hornem.) Sweet. This *Argyreia* sp. 2 has leaves subcoriaceous, margin of sepals undulate and corolla fleshy campanulate. These characters are different from *Argyreia splendens* (Hornem.) Sweet.

3. *Argyreia* sp. 3 is twining in open place, climbing on small tree at 1,250 m alt. It is a closed to *Argyreia roseopurpurea* (Kerr) Ooststr.. However, their filaments hairy at base and a number of lateral nerves are different.

It is actually essential to consult herbarium and or type specimens outside Thailand in order to get the right botanical names for these species.

Problem & Suggestion

1. In this study herbarium specimens were used in some species, it's should be better if fresh specimens are used to compare with dry specimens because dry specimens always change in size shape color etc. which can not complete the data.

2. Plants in this genus are very diverse in morphology, so that in the study specimens from different area should be used; on herbarium specimens should be used and compared.

3. According to the changing of ecosystem in Thailand, flowering period and fruit setting period are affected, in some area the habitat was disturbed, plants disappear from natural habitat or event extinct. So specimens from natural habitats can not collect.

4. In this study type specimens were not compare, or first publications were not study in some species. Therefore, plants specimen should be compare with type specimen or recheck with description in first publications. According to high morphological variation, additional morphological study should be conduct. This study can lead to change in taxonomic status.

5. For the complete of the study, anatomical, biological, cytological study, etc. should be more emphasize.

Benefits of this research

1. The find out will be the fundamental data for the revision study of the genus *Argyreia* Lour. for the Flora of Thailand project.

2. The find out also could be the fundamental data for the researcher that study Convolvulaceae or *Argyreia* Lour.