

Comparative Study Of Floral Morphology In Selected Species Of The Family Apocynaceae

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Abstract

In the present study the comparative floral morphological investigation was done by 5 species of the family Apocynaceae from Kanyakumari District. The species are *Adenium obesum* (Forssk.) Roem. & Schult., *Allamanda schottii* Pohl, *Kopsia fruticosa* (Roxb.) A.DC., *Pentalinon luteum* (L.) B.F.Hansen & Wunderlin and *Wrightia antidysenterica* (L.) R.Br. A complete taxonomic account of each species has been given along with quantitative and qualitative characters. Flowers of 5 species studied here showed large variations in shape, color and size of different parts.

Keywords: Apocynaceae, Morphology, Ornamental

INTRODUCTION

Apocynaceae Juss. belongs to the order Gentianales, which literally regarded as the dogbane family composed of trees, shrubs or vines and rarely subshrubs and herbs, with latex or rarely watery juice. Apocynaceae is one of the largest families of angiosperms, with 360 genera and approximately 5000 species, 25 tribes, 49 subtribes and five subfamilies: Apocynoideae, Rauvolfioideae, Asclepiadoideae, Periplocoideae and Secamonoideae (Meve, 2002; Endress, 2016). Ornamental plants are grown usually for the purpose of beauty, for their charming foliage, flowers and their pleasant smell. They play an important role in environmental planning of urban and rural areas for abatement of pollution, social and rural forestry, wasteland development, afforestation and landscaping of outdoor and indoor spaces (Kapoor and Sharga, 1993).

While analyzing the floral morphology of the Apocynaceae species in Kanyakumari District, it has been observed that the floral characters have greater taxonomic significance. Kanyakumari District is the Southernmost tip of Indian Peninsula. Location of the Kanyakumari District is bounded between 77°05' and 77°35' of the Eastern longitude and 8°05' and 8°35' of the Northern latitude. Plant morphology is beneficial in the visual identification of plants. Morphology is the most important basis for taxonomic description (Simpson, 2006). Proper recording of the morphological characters helps in easy identification and distinction of the species. The main objective of the present investigation is to study the comparative morphology of selected species of the family Apocynaceae in Kanyakumari District.

MATERIALS AND METHODS

The investigated Apocynaceae family species are *Adenium obesum* (Forssk.) Roem. & Schult., *Allamanda schottii* Pohl, *Kopsia fruticosa* (Roxb.) A.DC., *Pentalinon luteum* (L.) B.F.Hansen & Wunderlin and *Wrightia antidysenterica* (L.) R.Br. In the present study, fresh plants in each species were collected from different localities of Kanyakumari District, Tamil Nadu, during the month of January – May 2021. The species were identified by Dr. R. Raj Vikraman, Senior Scientist and Head, Division of Garden Management Education Extension and Training, JNTBGRI, Kerala.

Shoots of three plants in each species had been collected and used for floral morphology study. From these shoots, 20 flowers were randomly collected and measured the characteristics of the species. On each flower 26 traits had been measured and calculated. The flowers length and width were measured with a common ruler. The qualitative morphological traits of flowers such as flower shape, flower color, flower bud color, pedicel color, sepal lobe shape, calyx color, corolla lobe shape, anther shape, anther color, stigma shape, stigma color, style color and ovary color had been studied. The quantitative flower traits such as flower length, flower width, flower bud length, flower bud width, pedicel length, pedicel width, sepal length, sepal width, corolla length, corolla tube length, corolla tube width, androecium length and gynoecium length were also measured.

RESULT

A total of five species, such as *Adenium obesum*, *Allamanda schottii*, *Kopsia fruticosa*, *Pentalinon luteum* and *Wrightia antidysenterica* were collected and studied the comparative floral morphology. The investigated general information was described below (Table 1). The result obtained for the qualitative and quantitative traits of flowers are shown in Table 2 & 3. The morphological images are given in figure 1 - 6. The flower (Figure 1), L.S of flower (Figure 2), calyx (Figure 3), corolla cut open (Figure 4), androecium (Figure 5) gynoecium (Figure 6).

Table 1 Description of the species

| Sl. No | Species Name | Common Name | Habit | Propagation | Flowering & Fruiting |
|--------|--|----------------|---------|---------------------|----------------------|
| 1 | <i>Adenium obesum</i> (Forssk.) Roem. & Schult. | Desert Rose | Shrub | Seed and Vegetative | Throughout the year |
| 2 | <i>Allamanda schottii</i> Pohl | Bush Allamanda | Shrub | Vegetative | Throughout the year |
| 3 | <i>Kopsia fruticosa</i> (Roxb.) A.DC. | Shrub Vinca | Shrub | Vegetative | Throughout the year |
| 4 | <i>Pentalinon luteum</i> (L.) B.F.Hansen & Wunderlin | Wild Allamanda | Climber | Seed and Vegetative | June - October |
| 5 | <i>Wrightia antidysenterica</i> (L.) R.Br. | Arctic snow | Shrub | Seed | October - June |

Table 2 Qualitative Morphological traits of selected species

| Scientific Name | <i>Adenium obesum</i> | <i>Allamanda schottii</i> | <i>Kopsia fruticosa</i> | <i>Pentalinon luteum</i> | <i>Wrightia antidysenterica</i> |
|---------------------------|-----------------------|---------------------------|-------------------------|--------------------------|---------------------------------|
| Flower Shape | Funnel | Trumpet | Fan | Funnel | Star |
| Flower Color | Red | Yellow | Whitish Pink | Yellow | White |
| Flower Bud Color | Red | Brownish Yellow | Pink | Greenish Yellow | White |
| Pedicel Color | Red | Green | Green | Light Green | Light Green |
| Sepal lobe shape | Acute | Acute | Rounded | Acute | Rounded |
| Calyx Color | Red | Green | Pink | Light Green | Light Green |
| Corolla lobe shape | Rounded | orbicular | Rounded | Obtuse | Rounded |
| Anther Shape | Sagittate | Sagittate | Ovate | Sagittate | Sagittate |
| Anther Color | Pinkish White | Yellow | Yellow | Light Yellow | Yellow |
| Stigma Shape | Drum | Drum | Truncate | Round Cap | Conical |
| Stigma Color | Green | Green | Green | Greenish Yellow | Yellow |
| Style Color | Pink | White | White | White | White |
| Ovary Color | Green | Green | Green | Greenish Yellow | Light Green |

Table 3 Quantitative Morphological traits of selected species

| Scientific Name | <i>Adenium obesum</i> | <i>Allamanda schottii</i> | <i>Kopsia fruticosa</i> | <i>Pentalinon luteum</i> | <i>Wrightia antidysenterica</i> |
|----------------------------|-----------------------|---------------------------|-------------------------|--------------------------|---------------------------------|
| Flower Length | 7.2 - 7.9 | 6.2 - 7.8 | 5.1 - 6.7 | 6.1 - 7.1 | 3.4 - 4 |
| Flower Width | 3.9 - 4.9 | 2.8 - 4.4 | 3.8 - 5.8 | 3.9 - 4.6 | 1.9 - 2.8 |
| Flower Bud Length | 4.8 - 5.9 | 4.6 - 6.1 | 3.1 - 5.7 | 4.1 - 4.8 | 3 - 3.4 |
| Flower Bud Width | 1.1 - 1.5 | 0.9 - 1.5 | 0.3 - 0.6 | 0.7 - 0.9 | 0.6 - 0.7 |
| Pedicel Length | 0.4 - 0.7 | 0.2 - 0.6 | 0.2 - 0.5 | 0.6 - 0.9 | 0.4 - 0.8 |
| Pedicel Width | 0.3 | 0.2 | 0.1 - 0.2 | 0.1 | 0.1 - 0.2 |
| Sepal Length | 1.1 - 1.3 | 0.6 - 0.8 | 0.2 - 0.3 | 0.8 - 1 | 0.2 |
| Sepal Width | 0.3 - 0.4 | 0.3 - 0.4 | 0.2 | 0.1 | 0.2 - 0.3 |
| Corolla Length | 6.4 - 7.2 | 5.8 - 7.3 | 4.7 - 6.3 | 5.4 - 6.2 | 2.6 - 3.4 |
| Corolla Tube Length | 3.6 - 4.1 | 4 - 5 | 2.8 - 3.6 | 3.2 - 3.6 | 1.2 - 1.9 |
| Corolla Tube Width | 1.5 - 1.8 | 1.6 - 1.9 | 0.3 - 0.4 | 1.5 - 1.6 | 0.2 |
| Androecium Length | 3.5 - 4.4 | 0.4 - 0.5 | 0.3 | 1.6 - 1.7 | 0.6 - 0.7 |
| Gynoecium Length | 1.6 - 2.2 | 1.6 - 1.8 | 2.5 - 3.5 | 1.5 - 1.6 | 1.8 - 2.1 |

Note: Length and width were measured in centimeter.

The selected 5 species have some common attributes. The floral morphology similarities are cymose inflorescence, calyx aestivation, sympetalous corolla, corolla aestivation, anther shape and superior ovary. The variability of the selected species is color, shape and size of the flowers. The comparative differentiation of the 5 species are *Adenium obesum* and *Pentalinon luteum* have funnel shaped flowers, *Allamanda schottii* have trumpet shaped flowers, *Kopsia fruticosa* have fan shaped flowers and *Wrightia antidysenterica* have star shaped flowers. *Allamanda schottii* and *Pentalinon luteum* have yellow colored flowers, *Adenium obesum* red color flowers, *Kopsia fruticosa* whitish pink color flowers and *Wrightia antidysenterica* white color flowers (Table 2).

The flower bud color variability was red in the case of *Adenium obesum*, while brownish yellow in *Allamanda schottii*, pink in *Kopsia fruticosa*, whereas the color is greenish yellow in *Pentalinon luteum* greenish yellow and white color in *Wrightia antidysenterica*. The pedicel colors are green (2 species), light green (2 species) and red (*Adenium obesum*). The shape of the sepal lobe was acute (3 species) and rounded (2 species). The calyx color was light green in 2 species, red in *Adenium obesum*, green in *Allamanda schottii* and pink in *Kopsia fruticosa*. The shape of the corolla lobes are rounded (3 species), orbicular (*Allamanda schottii*) and obtuse (*Pentalinon luteum*) (Table 2).

The shapes of the anthers are sagittate in 4 species and ovate in *Kopsia fruticosa*. The anther color was yellow (4 species) and pinkish white color (*Adenium obesum*). The stigma was drum shaped in *Adenium obesum* and *Allamanda schottii*, truncate in *Kopsia fruticosa*, round cap in *Pentalinon luteum* and cylindrical in *Wrightia antidysenterica*. The stigma color was green in 3 species and yellow in 2 species. The style color was white (4 species) and pink (*Adenium obesum*). Ovary color was green in 3 species, greenish yellow in *Pentalinon luteum* and light green in *Wrightia antidysenterica* (Table 2). *Adenium obesum* have the largest flower length (7.2 - 7.9 cm) and *Wrightia antidysenterica* have the smallest length (3.4 - 4 cm). *Kopsia fruticosa* have the largest flower width (3.8 - 5.8 cm) and *Wrightia antidysenterica* have the smallest width (1.9 - 2.8 cm). Based on length, the largest flower bud was found in *Allamanda schottii* (4.6 - 6.1), while the smallest bud was *Wrightia antidysenterica* (3 - 3.4 cm). *Pentalinon luteum* have the largest pedicel length (0.6 - 0.9 cm) and *Kopsia fruticosa* have the smallest pedicel length (0.2 - 0.5 cm). *Adenium obesum* have the largest pedicel width (0.3 cm) and *Pentalinon luteum* have the smallest pedicel width (0.1 cm) (Table 3).

Adenium obesum have the largest sepal length (1.1 - 1.3 cm) and *Wrightia antidysenterica* have smallest length (0.2 cm). *Adenium obesum* and *Allamanda schottii* have the largest sepal width (0.3 - 0.4 cm) and *Pentalinon luteum* have smallest width (0.1 cm). *Allamanda schottii* have the largest corolla (5.8 - 7.3 cm) and *Wrightia antidysenterica* have smallest corolla (2.6 - 3.4 cm). *Adenium obesum* have the largest androecium length (3.5 - 4.4 cm) and *Kopsia fruticosa* have smallest length (0.3 cm). *Kopsia fruticosa* have the largest gynoecium (2.5 - 3.5 cm) and *Pentalinon luteum* have the smallest gynoecium (1.5-1.6 cm). These are the major morphological differences of the species (Table 3).

Taxonomic Description of the selected species

1. *Adenium obesum* (Forssk.) Roem. & Schult.

Inflorescence is terminal cyme, the salverform flowers have five spreading lobes and five protruding stamens. The sepals are oblong to ovate and quincuncial aestivation. The corolla is sympetalous, red, five petal lobes with funnel-shaped corolla tube. The interior of the corolla tube was yellow and slight red lines at the level of anthers. The androecium consists of 5 stamens, which are inserted close to the base of corolla tube (epipetalous), anthers forming a cone overlaying the pistil. Each anther have long and hairy apical appendages, they are 2.9 - 3.9 cm length. The gynoecium consists of 2 free carpels, however united by the style and superior ovary.

2. *Allamanda schottii* Pohl

The inflorescence was cymose panicle, which bears clusters of bell shaped yellow flowers. The sepals are lanceolate and showed quincuncial aestivation. The corolla was sympetalous, striped orange color at the throat, with a short and swollen tube angular at the base. The androecium consists of 5 stamens that are fused with the corolla tube. The anthers were introrse and adhere to the stigma through their adaxial surfaces. The filament is short, white and 0.1 cm length. The gynoecium consists of 2 free carpels, however united by using the single style and stigma.

3. *Kopsia fruticosa* (Roxb.) A.DC.

The terminal inflorescences are arranged in small clusters. The flowers are 5-petalled, which are soft pink in bud and pale to white with a red centre as they mature, the throat of the flowers are dark pink. The calyx consists of 5 unfused, red colored sepals. The corolla has oblong petals of pinkish white or pink. It has 5 united petals that are fused at the base forming a tube, which spreads at the open end. Corolla lobes are dextrorse in bud, mature corolla was salverform and twisted aestivation. The androecium consists of 5 epipetalous stamen, which are inserted near the corolla tube throat. Gynoecium is bicarpellary and superior ovary.

4. *Pentalinon luteum* (L.) B.F.Hansen & Wunderlin

Inflorescences are axillary or terminal cyme, with usually few large showy flowers. The flower is velvety yellow with green shade, funnel shaped, 5 united petals forming a corolla tube with 5 spreading lobes like saucer shape. The calyx consists of 5 unfused, pale green, elongated sepals. The corolla was sympetalous, the inner side of the tube shows slight reddish marks occur at the level of anthers. The androecium consists of 5 stamens that are fused to the innerside of the corolla tube. Each anther has distinctive long terminal appendages and these appendages are yellow in color and 1 - 1.1 cm length. The gynoecium consists of bicarpellary, superior and syncarpous ovaries.

5. *Wrightia antidysenterica* (L.) R.Br.

Wrightia antidysenterica were covered with white star-shaped flowers all year round. Flowers are white, in terminal corymbose cyme, tubular 5-petaled flowers with yellow centers (androecium). The calyx consists of 5 free, pale green colored sepals. The flower is salverform, the united 5 petals fused to form the corolla tube. Corolla lobes equal the tube, oblong and rounded at the apex. Each corolla lobe has white, hair like structure at the base. The androecium consists of 5 epipetalous stamens that are situated on the throat of the corolla tube. The filament was absent; the anther base was directly fixed to the corolla tube. The gynoecium consists of bicarpellary, superior, syncarpous ovary.

Figure 1 Floral Morphology of the selected species



DISCUSSION

Colombo *et al.* (2018) studied the floral morphology of *Adenium obesum* and Koptur *et al.* (2020) studied the floral morphology of *Pentalinon luteum*, these studies are similar to the present study.

CONCLUSION

Study of the external structure helps to identify and distinguish the species. Flowers of 5 species studied here showed large variations in shape, color and size of different parts. Based on these findings, the species are distinguished from one another as certain features. The overlapping similarities as well as distinguishing characteristics are observed among the species.

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