Biolife 4(2):327-332
AN INTERNATIONAL QUARTERLY JOURNAL OF BIOLOGY & LIFE SCIENCES
ISSN (online): 2320-4257
www.biolifeiournals.com
BIOLIFE RESEARCH ARTICLE

Morphological studies of medicinally important plants Of *Gisekia Pharnaceoides* Linn. and *Corbichonia Decumbens* (Forssk.) Exell of Molluginaceae From Thar desert of Rajasthan, India

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ABSTRACT

The present article is comprised of morphological studies on two medicinally important plants belonging to family Molluginaceae. Morphologically, the characters of leaves, stems, roots, fruits and seeds were observed .The plants were found to be well adapted to the local environment of sandy & rocky habitat. Some specific morphological adaptations were observed in both plants as a result of environmental & habitat stress. Enormous differences were observed in morphological features of both the plants, as the structure of leaf was quite different in both plants .Difference of habitat is most attracting feature, most probably making them morphologically different and adaptive in stressed conditions. In both plants leaves bear hairs on abaxial surface. Surface of leaves remain fully expanded, cuticle is thick, stomata are deeply sunken. Water storing channels are observed throughout the length of the plant. It was observed that both the plants are well adapted to harsh & dry conditions of the area under study. The current Functional perspective has reached a limit and now needs original inputs from descriptive morphology.

Key Words: Medicinal plant, Morphology, Molluginaceae, Habitat, Abaxial, Channels.

INTRODUCTION

Thar region enjoyed a semiarid climate, and it stretches from the western fringes of Aravalli Mountains to the Indus River. It is spread over four Indian states i.e. Gujarat, Haryana, Punjab, and Rajasthan. Rajasthan is identified as the "Desert State of India", it spread across the western winds blow to form shifting sand dunes part of India. The soil of the Thar remains dry for much of the year and high velocity. Much of it has scanty rainfall and extreme of temperature with high evaporation and low relative humidity. The vegetation of the region is sparse as the plants with xerophytic adaptations can survive only.

How to Site This Article:
Arora S. and Saini M. 2016. Morphological Studies Of Medicinally Important Plants Of *Gisekia Pharnaceoides* Linn. and *Corbichonia Decumbens* (Forssk.) Exell Of Molluginaceae From Thar Desert Of Rajasthan, India. *Biolife*. 4(2), pp 327-332
doi:10.17812/blj.2016.4218

Published online: 24 May, 2016

Medicinal plants become one of the major objects of interest as these are gifts of nature to cure limitless number of diseases in human beings (Busha and Ganga,2003; Nair and Henry, 1983) .Various medicinal properties have been attributed to natural herbs, about 60-80% of world population still rely on plants based medicines (Santhi et.al.,2011). Morphology of plants species is a source of correct identification of plants taxa, because without it no one can understand about the plant and its characters (Bibi et al., 2014). Molluginaceae consists of about 14 genera and 120 species of plants which are annual or perennial, sub-shrubs, herbs and shrubs (Vishnoupriya et al., 2013). Taxonomic placement of genera of Molluginaceae has been problematic and they have been considered members of the Aizoaceae, Nyctaginaceae or Phytolaccaceae (Ikram, 1983). *Gisekia pharnaceoides* linn. is recognized for its medicinal values, it is predominant in West African regions,commonly distributed in the tropical and drier regions (Hutchinson,1968). In India it is found in sandy places, is a bitter kitchen herb and commonly known as Manalikeerai in Tamil (Sambasivam, 1994 and Yoganarasimhan, 2000). The Genus is one of the

sources for controversial drug "Elavaluka" used in Ayurvedic system of Medicine (Mishra et al.,1986).Traditionally the plants is used for the treatment of swellings and asthma.

Only two species of *Corbichonia* are known so far (Alexander et al., 2015). *Corbichonia decumbens* is an annual or short-leaved perennial (Forsskål, 1775 and Exell, 1935). It has an extended distribution pattern in the tropical regions of Africa, Arabia and Indian subcontinent (Nazir, 1973 and Ghazanfar et al., 1998). It is commonly known as pater-chatti, found in rocky areas (Bhandari, 1978).This plant is used to cure kidney stone problems; it is used as a tonic and also used in gonorrhoea (Uma et al., 2013).

Morphological data are applied to improve classification and can often be used in making identification. Comparative morphology is an important tool to understand basic botany. The study was done to explore plant adaptations in xeric conditions

MATERIAL AND METHODS

Rajasthan is located on the Northwestern part of India, is the biggest state, comprising of 11% of the total geographical area of the country. Jodhpur is centrally situated in the western region of the state, and covers a total geographical area of 22850 Sq. Kilometers. It lies between 26° 0' and 27° 37 'north latitude and 72° 55' and 73° 52' east longitude. . The district lies at a height of 250-300 meters above sea level.

Survey and collection of plant specimens:

The surveys of the study area were conducted during July-Oct. 2015. The specimens of *Gisekia* were collected from different area of Jodhpur district (Mandor, Mathania and Ossian).It was also collected from Pali, Barmer ,Churu, and Jhunjhunu districts of the state . Another plant specimen i.e. *Corbichonia* was collected from different area of Jodhpur (Beriganga, Machia Safari, Bheem-bhadak, and Ossian).

Photomicrographs of the plant in its original habitat were taken in the field to display the surface features of the leaf, stem, root and flower. These organs were photographed in closer views. The plant with complete features was authenticated by Prof. PK Kasera, The specimens of both plant species were packed in air-tight poly bags for preparing herbarium sheets.

Drying and Preservation of Plant Specimens*:*

The plants were sprayed with fungicide & pesticides. After treating them against germs, the specimens were mounted on herbarium sheets for further identification and authentication.

Taxonomical Validation:

The proper identification of plants was carried out with the help of available literature. The identification of both plants was first confirmed by consulting "The flora of Indian Desert" (Bhandari, 1978). Further identification & authentication was done by Botanical survey of India (BSI), Jodhpur.

Morphological Studies

For morphological studies flowering twigs & herbarium samples were examined through the conventional taxonomical procedure adopted by Bentham and Hooker (1873) and Prain (1903). Morphological parameters of taxonomic value were determined.

RESULTS

The study showed valuable differences in morphology of two representatives of same family. Remarkable differences were observed in their habit, habitat, height, leaf appearance (size, shape and colour) and in floral appendages.

Botanical Name*:*

Gisekia pharnaceoides* L.var*. pharnaceoides

Local name: Sareli, Morang, Balu-ka –sag.

Global Distribution

Drier parts of Northern and Western India and Deccan Peninsula., Sri Lanka, South Africa, Pakistan (Sind), China and Arabia.

Indian distribution

Kerala, Punjab, Gujarat, Tamilnadu and Rajasthan.

Habit

Common creeping and well branched annual herb of sand dunes, sandy soils, cultivated land and ruderal places in Rajasthan. Diffuse-ascending, prostrate to procumbent, semi-succulent and glabrous (Fig.1).

Figure 1. *Gisekia pharnaceoides* Linn.

Root

10 specimens from different locations were used for recording texture, type and measurement by calculating mean value. It is strong tap root with profuse branching, 2-8cm long, light pale colored (Fig.2).

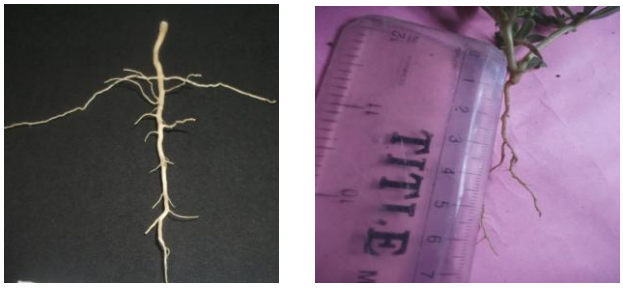


Figure 2. Root of *Gisekia pharnaceoides* Linn.

Stem

Morphlogical features and measurements were recorded using 10 specimens from different locations and data were analysed; pale-coloured, smooth, cylindrical, profusely branched at point of emergence on substratum with nodes at unequal distances, trailing, decumbent, length variable, reaches up to 60-70 cm (Fig.3).

Figure 3. Stem of *Gisekia pharnaceoides* Linn.

Leaf

Leaf measurement (length and width) were recorded using 10 leaves of same plant. Mean value was undertaken. The details of morphological parameters and dimensions are as follows; develop on nodal region of the stem, abaxial surface dark green, adaxial pinkish green showing presence of xanthophyll, carotenoides together with chlorophyll, subsessile, simple, fleshy with thin small hairs, lamina expanded . Stipule small, foliar, greenish white, free between adjacent leaves .Irregular slightly opposite, or verticillate, maximum 8 leaves are present in a whorl. Blade linear-elliptic , Size varies between 0.2-6.5cm ×0.5mm, circinate , pinnate, margin undulate, apex acute- mucronate. (Fig.4).

Figure 4. Leaves of *Gisekia pharnaceoides* Linn.

Flower

Floral diameter was recorded with 10 specimens from same plant. The details of measurement and floral features is as follows; inflorescence pedunculate, terminal as well as lateral, cymose, 4-15 flowered length of peduncles varies between 2-20mm, cymosely branched. Pedicels almost equal in length, i.e.9-10mm, flower small , regular ,hermaphrodite, actinomorphic, pentamerous, purplish at top and white at base with yellow tinge, sepals petaloid ,5 ,free at tips , fused at base,2-3mm long, glabrous ,apex acute, stamen 5, opposite to sepaline, anthers yellowish pink. Ovary superior, pentacarpellary, apocarpous with axile placentation, stigma 5, papillate (Fig.5).

Figure 5. Flowers of *Gisekia pharnaceoides* Linn.

Fruit

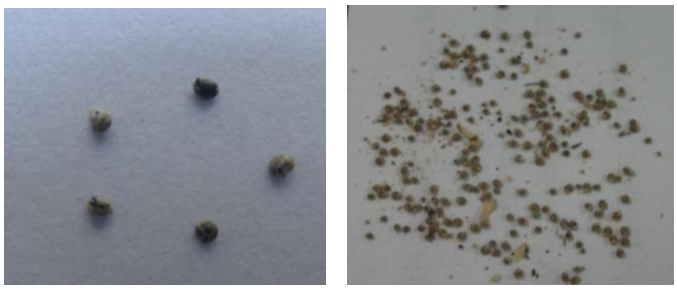
Non-flashy, dehiscent, many celled, many seeded, capsule, brownish at early stage and black at maturity (Fig.6).

Figure 6. Fruits of *Gisekia pharnaceoides* Linn.

Seed

Almost pyriform, pitted, non-endospermic, black, very light in weight, wind pollinated (Fig.7).

Figure-7; Seeds of *Gisekia pharnaceoides* Linn.



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Botanical Name:
Corbichonia decumbens (Forssk.) Exell

(The species is named decumbens as the stems are lying on the ground and tending to rise at the end)

Local name: Pater-chatti

Global Distribution

Tropical Africa, Arabia, Iran, Pakistan, India and W. Asia.

Indian distribution

Karanataka ,Upper Gangetic plains, Punjab and Rajasthan.

Habit

Decumbent to prostrate ,erect at end of branches , an annual or short-lived, dwarf subshrub up to 50 cm length , glabrous , sometimes with woody stem bases , found in rocky places,on sandy stones in dry hot areas (fig.1).

Figure1. *Corbichonia decumbens* (Forssk.) Exell

Root

10 specimens from different locations were used for recording texture, type and measurement by calculating mean value. It is strong tap root with less branching, 2-10cm long, 2-3mm in diameter, dark brownish coloured (Fig.2).

Figure-2.Root of *Corbichonia decumbens* (Forssk.) Exell

Stem

Morphological features and measurements were recorded using 10 specimens from different locations and data were analysed; light green when young, turns brownish at later stages, smooth, cylindrical , profusely branched with alternating nodes and internodes with thin ridges, rigid, succulent ,length of branches variable reaches up to 45-50 cm ,branches generally terminating with a flower(Fig.3).

Figure 3. Stem of *Corbichonia decumbens* (Forssk.) Exell

Leaves

Leaf measurement (length and width) were recorded using 10 leaves of same plant. Mean value was undertaken. The details of morphological parameters and dimensions are as follows; develop on nodal region of the stem, dark green, fleshy, petiolate, maximum length of petiole is 7mm, sheathing leaf base simple, tri-tetra foliate, lamina expanded, more undulate at upper half, mucronate apices, entire margin, exstipulate, alternate as well as verticillate, size varies between 5-5.5cm×2-2.5cm, circinate , pinnate venation, apex mucronate (Fig.4).

Figure 4. Leaves of *Corbichonia decumbens* (Forssk.) Exell

Flower

Floral diameter was recorded with 10 specimens from same plant. The details of measurement and floral features is as follows; inflorescence pedunculate, terminal as well as pseudolateral making a cyme , cymosely branched, many flowered ,pedicels 2–4 mm long, flowers small, regular, actinomorphic, hermaphrodite, sepals 5, polysepalous ,quinquintial, free at tips , fused at base, 2-3mm long, glabrous ,apex acute with purplish margin and green at centre, petal magenta, polypetalous, larger than sepals 20-21 in no. stamen many, stminodes present, pink or purple, conspicuous, opposite to petals, anthers yellowish pink,

ovary superior, pentacarpellary, with axile placentation, stigma pentafid, style filiform (Fig.5).

Figure 5. Flowers of *Corbichonia decumbens* (Forssk.) Exell

Fruit

Dehiscent capsule, papery, 4-5 mm broad, dehiscing by 5 valves, many seeds, turns black at maturity (Fig.6).

Figure 6. Fruits of *Corbichonia decumbens* (Forssk.) Exell.

Seed

Almost pyriform, pitted, non-endospermic with membranous perisperms and white aril inside seed coat, shiny black, very light in weight, wind pollinated (Fig.7).

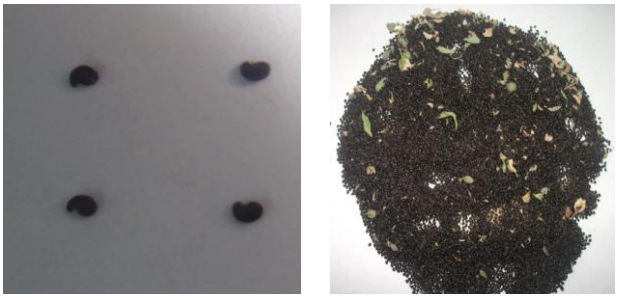

Figure 7.Seeds of *Corbichonia decumbens* (Forssk.) Exell

DISCUSSION AND CONCLUSION

Gisekia pharnaceoides Linn. and *Corbichonia decumbens* (Forssk.) Exell under study provided specific parameters that will be useful in scientific evaluation, identification and authentication. The research revealed that both the plants can be explored for the isolation of bioactive compounds and secondary metabolites.

The study of morphology today is a major biological discipline,although it was traditionally more focused in animal systems. Increased accent in plant development may open original perspectives.A functional view has been predominant in the analysis and description of all morphological processes.

In the absence of precise descriptions of plant morphology,development is often seen from a perspective where morphology is replaced by a secondary aspect.It is true that molecular data provide good information in relation with morphology ,but it is also true that the role played by genes and proteins in the maintenance or stability of shapes will be better understood once a sufficient description of plant froms has been done.This needs a strong theroretical basis but does not always need sophisticated experimentation.The identification and appreciation of each particular developmental process as an independent entity may contribute to new work in plants, may open ways to understand the general principles of development in living beings.The accurate morphological approach may be a fundamental aspect in the identification of such processes and their role for the integration of plant development.

The description of plant shapes is an aspect of traditional importance in the history of botany.From early times,emphasis was made in the geometrical appearance of plant organs and subsequently ,many genera and species were named according to their morphological characteristics.(Cervantes and Juana,2010).

Many authors have studied these plants in different ways but no one reported attention towards the detailed morphological descriptions which is an important tool to understand the basic botany.

Both the plant showed certain typical modifications i.e.strong tap root system, expended lamina,production of light and enormous amount of seeds,that are perpheps due to intense and harsh climatic conditions of the area under study.The plant under study revealed certain morphological differences,i.e.habitat, structure and shape of root,leaf and stem.Still lots of similarities were observed,i.e. habit,nature of root, phyllotaxy, nature and structure of flower, fruit and seed,justifying their placement in same family.

Being either simple or complex, it is very important to search for accurate morphological description of plants.They may provide the basis for understanding development as the integration of modular processes of independent origins .In this context ,this work could lead to development of an efficient protocol to study the morphological relationship between two representatives of same family.

ACKNOWLEDGEMENTS

The authors are thankful to Prof.P.K.Kasera for providing academic support and the CAS Department of Botany JNV Univ.,Jodhpur(Rajasthan) for providing infrastructure and technical support.

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DOI: https://dx.doi.org/10.5281/zenodo.7317861
Received: 5 April 2016;
Accepted; 23 May 2016;
Available online : 5 June 2016