Original Research Article

Leaf Morphometric Studies in some *Ipomoea* species of Convolvulaceae family

ABSTRACT

Eight species of *Ipomoea* (Convolvulaceae) were morphometrically studied upon their leaf characters, with the help of taxonomical analysis to solve the relationship between these species. On the basis of taxonomical component analysis, among the studied species, it has been disclosed that the numerical characters such as leaf length, petiole length, leaf breadth and lamina length are positively correlated to resolved taxonomical relation of different species of the same genus. Contribute important role in bringing together the species within a genus using principal component analysis results of five quantitative characters based on similarity matrix reveals significantly the correlation between leaf length to leaf breadth, leaf base nerve number, and the ratio of leaf lamina length to petiole length significantly separates the species from each other. Morphometric characters provided justification for the existing classification of the *Ipomoea* genus. It also indicates the component matrix after extraction of the characters that contributed strongly in similarity between the selected *Ipomoea* species. Three characters which include Leaf length, leaf breadth, and the ratio of leaf length to leaf breadth contributed significantly to the delimitation of the species of *Ipomoea* studied. Morphometric analysis of eight species of *Ipomoea quamoclit* L.; *Ipomoea batatas* (L.) Lam.; *Ipomoea cairica* (L.) Sweet; *Ipomoea hederacea* Jacq.; *Ipomoea obscura* (L.) Ker Gawl.; *Ipomoeacordatotriloba* Dennst.; *Ipomoea lacunosa* L. and *Ipomoea hederifolia* L. Using five different quantitative characters provided justification for the existing classification of the *Ipomoea* genus. This characters which, contributed significantly to the delimitation of the species of *Ipomoea*

studied. We recommend an application of this method in an elaborate taxonomic study of the genus *Ipomoea* in the future study.

Key-words: *Ipomoea*, leaf, morphometric studies, taxonomy

INTRODUCTION:

The convolvulaceae is one of the major family of flowering plants known as morning glory family with approximately 3,625 species and of 57 genera from all over the world (The Plant List, 2010). Major numbers of species are incorporated in the genera *Ipomoea* (Cronquist, 1988). Approximately 600-700 species of *Ipomoea* have been mentioned from the entire world (Meira et al., 2012). India is represented by the reportedly 59 species of *Ipomoea* from the entire country (Shimpale & Amrapali, 2019).

Ayurveda is an alternative medicine system. Total thirteen Ayurvedic preparations prepared from some species *Ipomoea* and that used for various diseases and abnormalities and treatments such as hypertension, kidney ailments, diabetes, dysentery, constipation, fatigue, arthritis, rheumatism, hydrocephalus, meningitis, and inflammations. *Ipomoea* species exhibit great medicinal importance and other uses such as ornamental plants, food and have religious faith in different religions (Khare, 2007; Meira et al., 2012). Pharmaceutical properties have some *Ipomoea* species and Ethno-medicinal uses of some *Ipomoea* species parts such as leaves, root, bark, seed and some time whole plant. That medicinaly important plant parts used in making Ayurvedic preparations and that preparations used for curing various disease in medical field (Londhe et al., 2017). As being the Ethno-medicinal important plants, proper identification, nomenclature and identification of *Ipomoea* is essential. Morphometric studies reveal the numerical analysis and comparison between closely related taxa. Distinct separation and grouping of the closely related plant species can be executed with the help of morphometric analysis and principal component analysis in studied *Ipomoea*

species with similarity matrix. Such type of studies has been performed in *Terminalia*, *Cassia*, *Clerodendrum* and *Caesalpinia* (Soladoye et al., 2010; Deshmukh et al., 2012; Deshmukh, Labhane, et al., 2013; Deshmukh, Waghmare, et al., 2013). The quality of conventional taxonomy has been improved by numerical taxonomy as more and better characters are used in the latter (Heywood, 1964).

MATERIALS AND METHODS:

Study area- Some selected regions of Nashik district such as Nashik and Dindori taluka (Fig. 1, Table 1). Eight *Ipomoea* species (Convolvulaceae) where collected from the Nashik district during the year 2021 to 2022 (Fig. 2. a - p). The collected species where identified as per different Floras and other literature (Singh et al., 2000; Singh et al., 2001).

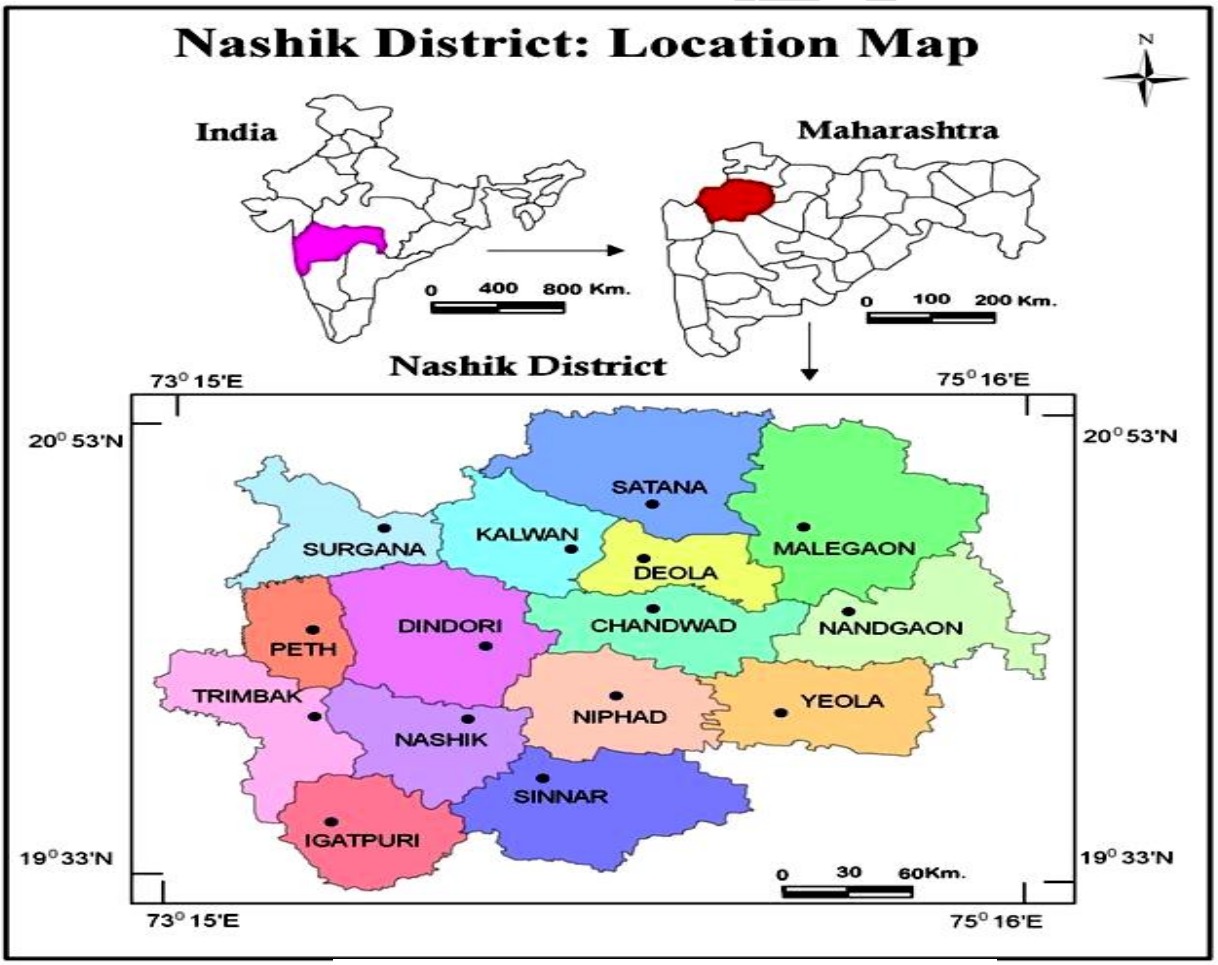

Fig.- 1 Study area

Quantitative characters of Leaf viz. leaf length, leaf breadth, leaf base nerve number, petiole length and leaf lamina length was measure with the help of line ruler (Tables 2). The twenty sample from each sample where proceed with the use of measures of central tendency and values of median.

Table 1: *Ipomoea* Species studied from Nashik, Maharashtra (India)

Sr. No.	Species Name	Location	Geographic coordinates
1.	*Ipomoea quamoclit* L.	Chandshi, Nashik, Maharashtra	20°01'54.4"N 73°45'38.3"E
2.	*Ipomoea batatas* (L.) Lam	Chandshi, Nashik, Maharashtra	20°01'51.6"N 73°45'37.1"E
3.	*Ipomoea cairica* (L.) Sweet	Nashik , Maharashtra	20°20'34.9"N 73°37'23.9"E
4.	*Ipomoea hederacea* Jacq.	Makhmalabad, Nashik, Maharashtra	20°03'16.4"N 73°46'13.3"E
5.	*Ipomoea obscura* (L.) Ker Gawl.	Jambutke, Maharashtra	20°18'36.4"N 74°00'39.2"E
6.	*Ipomoea cordatotriloba* Dennst.	Makhmalabad, Nashik, Maharashtra	20°03'42.0"N 73°46'44.9"E
7.	*Ipomoea lacunosa* L.	Jambutke, Maharashtra	20°18'46.4"N 74°00'49.4"E
8.	*Ipomoea hederifolia* L.	Jambutke, Maharashtra	20°18'42.1"N 74°00'49.5"E

Figure 2.(a-p)- Selected *Ipomoea* species morphology

Fig 2. a- *I. quamoclit*

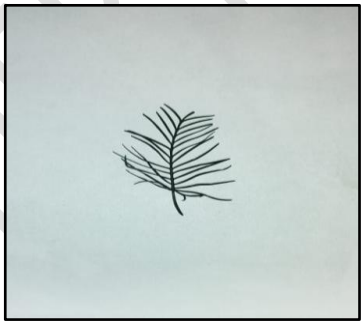

Fig 2.b- leaf of *I. quamoclit*

Fig 2. c- *I. batatas*

Fig 2.d- leaf of *I. batatas*

Fig 2. e- *I. cairica*

Fig 2. f- leaf of *I. cairica*

Fig 2. g- *I. hederacea*

Fig 2.h- leaf of *I. hederacea*

Fig 2. i- *I. obscura*

Fig 2.j- leaf of *I. obscura*

Fig 2. k- *I. cordatotriloba*

Fig 2.l- leaf of *I. cordatotriloba*

Fig 2. m- *I. lacunosa*

Fig 2.n- leaf of *I. lacunosa*

Fig 2. o- *I. hederifolia*

Fig 2.p- leaf of *I. hederifolia*

RESULTS AND DISCUSSION:

Leaf morphometric analysis of eight species of *Ipomoea quamoclit* L.; *Ipomoea batatas* (L.) Lam.; *Ipomoea cairica* (L.) Sweet; *Ipomoea hederacea* Jacq.; *Ipomoea obscura* (L.) Ker Gawl.; *Ipomoea cordatotriloba* Dennst.; *Ipomoea lacunosa* L. and *Ipomoea hederifolia* L. Five distinct Leaf morphometric characters provided justification for the existing classification of the *Ipomoea* genus. Five leaf quantitative characters of *Ipomoea* species which include Leaf length, Leaf breadth and ratio of leaf length to leaf breadth contributed significantly to the delimitation of the species of *Ipomoea* studied (Tables 2). Present study deals with eight *Ipomoea* L. species from Nashik district such as Nashik and Dindori taluka. Principal component analysis results of five quantitative characters based on similarity matrix reveals significantly the correlation between leaf length, leaf breadth, ratio of leaf length to leaf breadth, leaf base nerve number, petiole length, leaf lamina length and ratio of leaf lamina length to petiole length as shown in (Tables 3).

The two techniques (Principal component analysis with Similarity Matrix and Cluster analysis) used in this work used in numerical taxonomy have used about 31 *Ficus* species (Sonibare et al., 2004).

During the study we used eight *Ipomoea* species for Principal component analysis with Similarity Matrix. 31 *Ficus* species used the hierarchical classification and visual interpretation of the taxonomic relationship in the existing traditional classification of the *Ficus* genus, these techniques also used for in the morphometric analysis and phytochemical of the genus *Acalypha* (Soladoye et al., 2008). The results outputs from these taxonomical techniques are often used as unbiased indicators of the similarity or differrences existing characters between the taxa of same *Ipomoea* genus, which are in turn used to arrange taxa in the hierarchical order for plants classification (Agbagwa & Okoli, 2005). Generally any species identification or classification time needed plants reproductive parts means flower or inflorescence (G. Singh, 2010). With the help of leaf morphometry characters used in this study, it is possible to distinguish between the eight species of *Ipomoea* studied even when they are not in their flower or inflorescence period.

This work has helped in bringing out the leaf morphometry characters that contributed greatly in differentiating within same genus individual species. However, during the study numerical methods "numerical taxonomy" (Soladoye et al., 2010). *Ipomoea* is a ethnobotanical importance used for various diseases and abnormalities and treatments such as hypertension, kidney ailments, diabetes, dysentery, constipation, fatigue, arthritis, rheumatism, hydrocephalus, meningitis, and inflammations (Khare, 2007; Meira et al., 2012).

Table 2: Leaf quantitative characters of *Ipomoea* species (Mean values in cm).

	I1	**I2**	**I3**	**I4**	**I5**	**I6**	**I7**	**I8**
LL	2.8	4.2	4.1	12	4.7	6.2	3.2	6.2
LB	1.6	4.9	4.5	10.6	5.8	6.5	1.7	6.4
LL/LB	1.75	0.85	9.11	1.13	0.81	0.95	1.88	0.96
LBNN	1	8	5	5	8	7	5	6
LLL	0.4	0.7	1.4	1.7	1.2	1	0.5	1
PL	1.2	2.5	4.7	12.3	3.3	5	1.8	2.8
LLL/PL	0.33	0.28	0.29	0.13	0.36	0.2	0.27	0.35

Abbreviations: LL: Leaf length; LB: leaf breadth; LL/LB: ratio of leaf length to leaf breadth; LBNN: leaf base nerve number; PL: petiole length; LLL: leaf lamina length; LLL/PL: ratio of leaf lamina length to petiole length.

I1: I. quamoclit; I2: I. batatas; I3: I. cairica; I4: I. hederacea; I5: I. obscura; I6: I. cordatotriloba; I7: I. lacunosa and I8: I. hederifolia

Table 3: Principal component analysis in studied *Ipomoea* species with Similarity Matrix.

	LL	**LB**	**LL/LB**	**LBNN**	**LLL**	**PL**	**LLL/PL**
LL	1	0.322444	0.561452	0.629489	0.343801	0.525037	0.456568
LB	0.322444	1	0.224167	0.483692	0.991041	0.905605	0.888217
LL/LB	0.561452	0.224167	1	0.155365	0.196019	0.229338	0.452034
LBNN	0.629489	0.483692	0.155365	1	0.576248	0.808479	0.356243
LLL	0.343801	0.991041	0.196019	0.576248	1	0.94559	0.841389
PL	0.525037	0.905605	0.229338	0.808479	0.94559	1	0.76188
LLL/PL	0.456568	0.888217	0.452034	0.356243	0.841389	0.76188	1

Abbreviations: LL: Leaf length; LB: leaf breadth; LL/LB: ratio of leaf length to leaf breadth; LBNN: leaf base nerve number; LLL: leaf lamina length; PL: petiole length; LLL/PL: ratio of leaf lamina length to petiole length.

CONCLUSION:

Morphometric analysis of eight species of *Ipomoea quamoclit* L.; *Ipomoea batatas* (L.) Lam.; *Ipomoea cairica* (L.) Sweet; *Ipomoea hederacea* Jacq.; *Ipomoea obscura* (L.) Ker Gawl.; *Ipomoeacordatotriloba* Dennst.; *Ipomoea lacunosa* L. and *Ipomoea hederifolia* L. Using 5 different quantitative characters provided justification for the existing classification of the *Ipomoea* genus. This characters which, leaf length, leaf breadth, leaf base nerve number, petiole length and leaf lamina length contributed significantly to the delimitation of the species of *Ipomoea* studied. We recommend an application of this method in an elaborate taxonomic review of the genus *Ipomoea* in the future (Tables 2).

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