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ON THE TAXONOMIC POSITION OF *NYCTANTHES ARBOR-TRISTIS* L.

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THE systematic position of *Nyctanthes arbor-tristis* is not clear. It was placed in the Oleaceae by Bentham and Hooker[1]. A verbenaceous affinity for *Nyctanthes* is suggested by Stant[2]. Airy Shaw[3] assigned the genus to the sub-family Nyctanthoideae in the family Verbenaceae. In the present investigation an attempt has been made to compare the amino acid composition of the leaves of the genus *Nyctanthes* with some representative members of both Oleaceae and Verbenaceae for resolving the controversial position of this genus.

Leaves of all the taxa studied were collected locally. Methanolic extracts of leaves were applied directly to chromatographic paper. The solvent system used was *n*-butanol: acetic acid: water (4:1:5 upper layer). Detecting reagent was 3% ninhydrin solution. Different amino acids were identified with simultaneously run standards. A numerical assessment (matching coefficient) was made in the presence of absence of these amino acids.

The matching coefficient[4] $= \frac{p+n}{p+n+d}$

where p=positive match, n=negative match and d=mismatch

In *Nyctanthes arbor-tristis*, five amino acids were encountered on the chromatographic profile. Butyric acid was distributed throughout the families Oleaceae and Verbenaceae excepting *jasminum grandiflorum*. *Nyctanthes*, all the investigated members of the Verbenaceae except *Jasminum sambac*, all the investigated members of the Verbenaceae except *Callicarpa mactrophylla*, *phyla* nodiflora and *Gmelina asiatica* possess Dihydroxyphenlalanine. Members of the Oleaceae except *J. flexile* and *nyctanthes* resembled each other in lacking glutamic acid which was constantly present in Verbenaceae except *Callicarpa macrophylla*, *Phyla nodiflora* and *Gmelina asiatica*. Histidine, Hydroxyproline and Lysine which are attributed to *Nyctanthes* are variably distributed within Oleaceae and Verbenaceae.

The highest matching coefficient *i.e.*, 94.4% of *Nyctanthes* is with *Jasminum arborescence*. Next to this is an 88.8% association with *J. pubescence*, *J. auriculatum*, *J. humile* and *liqustrum nilgheriense*. With *J. grandiflorum*, *Nyctanthes* has a 77.7% association. *J. flexile* and *J. sambac* have a 72.2% association with *Nyctanthes*. The above results indicate a possible affinity of *Nyctanthes* with Oleaceous taxa as it has a high matching coefficient with them.

Members of Verbenaceae exhibit comparatively low matching coefficients with *Nyctanthes*. *Lantana camara* only has high *i.e.*, 72.2% association with *Nyctanthes*. This is followed by a 50% matching coefficient of *Nyctanthes* with *Caryopteris wallichiana*, *Callicarpa macrophylla* and *Phyla nodiflora*. Both the species of *Gmelina i.e.*, *G. arborea* and *G. asiatica* have a 38.8% associaton with *Nyctanthes*. With *Duranta plumeiri*, *Clerodendron phlomidis* and *Lantana indica*, *Nyctanthes* has 44.4%, 27.7% and 22.2% matching coefficients respectively. *Tectona grandis* exhibits a 33.3% association. The lowest matching coefficient *i.e.*, 16.6% is shown between *Verbena officinale* and *Nyctanthes*.

The majority of studied genera of the family Oleaceae show that they possess high matching coefficients with *Nyctanthes* which indicate a possible relationship of *Nyctanthes* with this family. On the other hand, *Nyctanthes* is far from Verbenaceae as it has comparatively low matching coefficients with verbenaceous members. The present study therefore suggests a better assignment of *Nyctanthes* to the family Oleaceae rather than the Verbenaceae thus supporting the earlier suggestion made by Das and Rao[5].

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TABLE 1

Amino acid distribution and percentage matching Coefficient in Oleaceae and Verbenaceae

Name of Amino acids	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
Alanine	−	−	−	+	+	+	+	−	+	+	+	+	+	+	+	+	−	+	−	−
Butryric acid	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+
Arginine	−	−	−	−	−	−	−	−	−	−	+	+	+	+	+	+	+	+	+	+
Aspartic acid	−	−	−	+	−	+	+	+	−	+	+	+	+	+	+	+	+	+	−	+
Cysteine	−	−	−	−	−	−	−	−	−	−	+	+	+	+	+	+	+	+	+	+
Dihydroxy-phenylalanine	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	−	+	−	−
Glumatic acid	−	−	−	+	−	−	−	−	−	+	+	+	+	+	+	+	−	+	−	−
Glycine	−	−	−	−	−	−	−	+	−	+	−	+	−	+	+	+	+	−	+	+
Histidine	+	+	+	−	+	+	+	−	+	+	−	+	+	−	−	−	−	−	−	−
Hydroxy-proline	+	+	−	+	+	+	−	+	−	+	+	+	+	−	−	−	−	−	−	−
Leucine	−	−	−	−	−	−	−	−	−	+	+	+	+	+	−	−	+	+	+	+
Lysine	+	−	−	+	+	+	+	−	+	+	−	+	−	+	−	+	+	+	−	+
Methionine	−	−	−	+	+	−	−	−	−	−	−	+	−	+	−	−	+	+	−	+
Phenyl-alanine	−	−	−	−	−	−	−	−	−	−	−	+	+	+	+	−	−	+	+	−
Proline	−	−	−	−	−	−	−	−	−	−	+	+	−	+	+	+	−	+	+	−
Serine	−	−	−	−	−	−	−	−	−	−	−	+	−	+	−	+	−	+	−	−
Threonine	−	−	−	−	−	−	−	−	−	−	−	+	+	+	+	+	−	+	−	−
Tryptophan	−	−	−	−	−	−	−	−	−	−	+	+	−	+	−	−	−	+	+	−
Percentage Matching Coefficient of Different Spp. with *Nyctanthes.*	94.4	88.8	72.2	88.8	88.8	77.7	72.2	88.8	72.2	44.4	27.7	50	16.6	33.3	38.8	50	22.2	38.8	50	

Explanation of letterings + = Present; − = Absent; A = *Nyctanthes arbor-tristis*; B = *Jasminum arborescence*; C = *J. pubescence*; D = *J. flexile*; E = *J. auriculatum*; F = *J. humile*; G = *J. grandiflorum*; H = *J. sambac*; I = *Ligustrum nilgheriense*; J = *Lantana camara*; K = *Duranta plumeiri*; L = *Clerodendrum phlomidis*; M = *Caryopteris wallichiana*; N = *Verbena officinale*; O = *Tectonagrandis*; P = *Gmelina arborea*; Q = *Callicarpa macrophylla*; R = *Lantana indica*; S = *Gmelina asiatica*; T = *Phylano diflora*

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A PRIMITIVE FLOWER IN THE PALM *LICUALA SPINOSA* THUNB.

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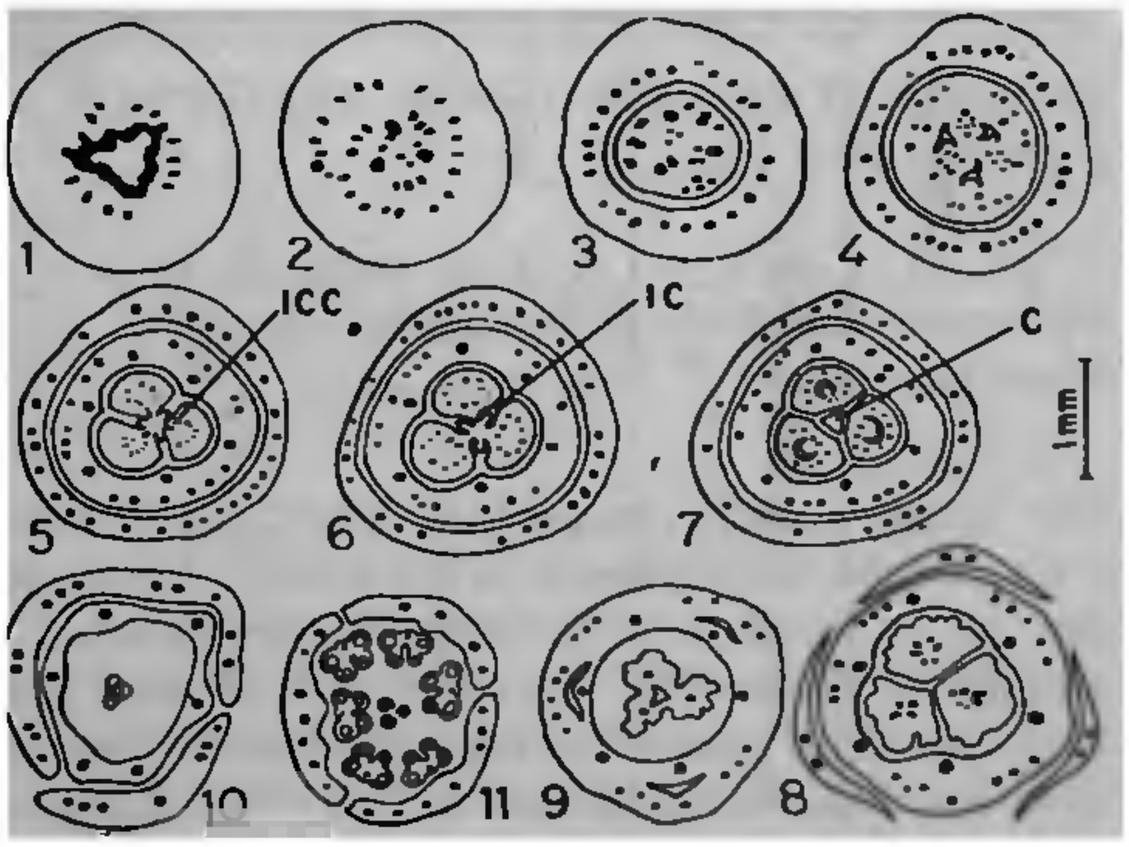
LICUALA spinosa Thunb. belongs to the Livistona alliance of the Coryphoideae, which is generally considered as the most primitive group of palms[1]. During a study of the floral anatomy of palms, an interesting gynoecial condition that has so far not been reported in any palm has been found in this species, which is reported here.

The materials were collected from the Indian Botanic Gardens, Calcutta and fixed in FAA. Customary methods of microtechnique and clearing were followed for taking serial transverse sections.

Floral Anatomy

About 10 vascular bundles arranged in the form of a broken ring enter the base of the flower, which unite to form a continuous ring at a slightly higher level. About 15 vascular traces get separated from the periphery of this ring, and supply the outer perianth (figure 1). Each outer tepel is supplied with a dorsal bundle, 2 ventrals and 2 secondary marginals, which divide once or twice at higher levels (figures 2–8). At a higher level, the central ring gives off 9 vascular bundles, a dorsal and 2 ventrals for each of the 3 inner tepels (figure 2). Of these, the ventrals divide once or twice forming secondary marginals. Each dorsal also divides once to separate towards the inner side the vascular supply of the inner stamen, which is adnate with it. The remaining central ring breaks up into 3 large vascular bundles and 9 smaller traces arranged in 3 groups of 3 bundles each. The larger bundles supply the stamens of outer whorl (figures 2–11). The 3 groups of smaller traces divide producing about 10 bundles in each group which form the carpellary supply. At this level the dorsal sides of all carpels are free except at the central region where they are united by their margins with 3 small, roughly triangular structures alternating with the 3 fertile carpels (figures 5 & 6). From each set of carpellary vasculature a single trace moves towards the centre (figure 5). Of the 9 remaining bundles of each carpellary supply (figure 6), one is the dorsal, 2 are ventrals, the other 3 pairs being secondary marginals. The ventrals and secondary marginals disappear in the stylar region. Only the dorsals enter the style (figures 7–9). The carpels are united at the stylar and stigmatic regions. The stylar canal opens to the surface of the stigma which is 3-fid (figures 10 and 11). The ovular supply is produced by the divisions of the ventrals, each ovule receiving 2 traces. The small triangular structures in the centre, which are fused with the margins of the 3 fertile carpels are vestigeal structures representing an inner ring of 3 aborted carpels. The 3 vascular traces going towards the centre (figure 5) are the compound carpellary bundles of the 3 aborted carpels. At a slightly higher level, the 3 central carpels get separated from the margins of the fertile carpels and fuse forming a column. The 3 compound vascular bundles entering this column traverse upwards for a short distance only, so that the upper part of the column is devoid of any vasculature (figure 7).



Figures 1–11. *Licuala spinosa*. Serial transections of a flower from below upwards. (C = column formed by the fusion of 3 inner carpels; IC = inner carpel; ICC = compound carpellary bundle of inner carpel).

Licuala spinosa shows all the typical characters of a Coryphoid palm. It is pleonanthic with interfoliar inflorescence. Flowers are bisexual. Perianth is biseriate with 6 tepels arranged in 2 whorls. Stamens are also 6 in number, originating in 2 whorls of 3 each. The formation of a completely coalescent ring of bundles at the base of the flower reflects a shortening of the floral axis, which is in conformity with this trend. The carpels here are free at their bases but are united at their stylar and stigmatic regions. A similar type of cohesion of carpels is found in *Nannorrhops* of Coty-