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Recent study on aquatic monocots of Vizianagaram district, Andhra Pradesh, India

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Abstract

Vizianagaram district, one of the northern districts of Andhra Pradesh lies on the East Coast of India. The district is located between 17°-15'-- 19°-15' N and 83°-00'--83°-45' E. Agriculture is the principle occupation of the people of this district. Geographically Vizianagaram district divided in to 3 regions. i.e 1) The hilly region 2) The plains 3) The coastal.

The present study is about the Aquatic monocots of the Vizianagaram district. The plains cover major part of the district and within the network of the perennial rivers like Nagavali, Janjavathi, Suvarnamukhi, Vagavathi, Vattigedda, Champavathi and Gosthani. The tanks at Vizianagaram, Bondapalli (near Gajapathinagam), Lakkavarapukota, Bobbili, Parvathipuram, Venkamma peta (near Makkuva), Chinamerangi road, Seemalaguda road, Bhiripuram (Annamma cheruvu) and reservoirs at Vattigedda and Tatipudi. The aquatic monocots are divided into 5 categories on the basis of ecological classification namely free floating (*Lemna*, *Pistia*, *Spirodela*), Submerged but not rooted (*Hydrilla*, *Najas*, *Potamogeton*), Submerged and rooted (*Ottelia*, *Vallisneria*) Floating but rooted (*Aponogeton*, *Sagittaria*, *Tenagocharis*) and Marginal emergent hydrophytes (*Typha*).

Keywords: Aquatic monocots, Free floating, Submerged, Rooted, Marginal emergent, Vizianagaram.

Introduction

Vizianagaram district, one of the northern districts of Andhra Pradesh lies on the East Coast of India. The district is located between 17°-15'-- 19°-15' N and 83°-00'--83°-45'E and bounded on the south by the Bay of Bengal, on the north by Koraput district of Odisha and Visakhapatnam district of Andhra Pradesh. On the west by Koraput and Visakhapatnam districts and on the east Srikakulam district and Bay of Bengal. The district with the area of 6,537.9 Sq. Kms and in the density of population 23, 44,000.

Agriculture is the principle occupation of the people of this district. Geographically Vizianagaram district divided in to 3 regions. i.e 1) The hilly region 2) The plains 3) The coastal. The plains cover major part of the district and within the network of the perennial rivers like Nagavali, Janjavathi, Suvarnamukhi, Vegavathi, Champavathi and Gosthani. Apart from rivers there are many ponds, tanks, ditches, streams and few stagnant watery areas. As the Vizianagaram district lies on the coast with good rainfall, good variety of aquatic vegetation occurs from algae to monocots. The tanks at Vizianagaram, Bondapalli near Gajapathinagam, Lakkavarapukota, Bobbili, Parvathipuram, Venkamma peta near Makkuva, Chinamerangi road, Seemalaguda road, Bhiripuram (Annamma cheruvu) and reservoirs at Vattigedda and Tatipudi with few aquatic species like *Pistia*, *Spirodela*, *Hydrilla*, *Najas*, *Ottelia*. Hydrophytes are unaffected by climatic and seasonal changes. Many ponds are seasonal, lasting just a couple of months (such as sessile pools). They dried up during pre-monsoon. Until this period aquatic vegetation going to dormant stage to protect their life. In the monsoon period they germinate and grows abundantly.

Materials and Methods

Regular field trips have been undertaken into the aquatic regions of the district and collected the Hydrophytes. The collected Hydrophytes are identified with the help of regional floras and Herbarium, BSI, Coimbatore.

Enumeration

The aquatic monocots are divided into 5 categories on the basis of ecological classification namely:

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1. Free floating.
2. Submerged but not rooted.
3. Submerged and rooted.
4. Floating but rooted and
5. Marginal emergent hydrophytes. All are arranged in alphabetically in each group.

1. Free Floating

Eichhornia crassipes Solms

DC.Mon.Pharm.4:527.1883; Backer, Fl. Males.1, 4:259, 1951; Subr.70.1962. *Pontederia crassipes* Mart. Nov.Gen. Sp.Pl. 1:9, t. 4. 1823.

Family: Pontederiaceae.

Floating herbs 30 to 50 cm high; main stems short, leafy; stoloniferous roots fibrous, long, pinkish, leaves obovate, apex is rounded or obtuse, base cordate; petioles swollen, inflorescence of spikes, 15-30 cm long, enclosed by irregular, mucilaginous sheaths; flowers 8-35 lilac or pale violet, funnel-shaped, trimorphic, heterostyled, capsules ovoid.

Lemna gibba (Linn.)

Linn.Sp.pl.970, 1753; FBI 6: 556; Gam vol 3.1593; *L.perpusilla* J. Torrey. Fl. New York 2:245.1843; *Wolffiaglobosa* (Roxb) Hortog & Blumea 18:367.1970; *Lemnaglobosa* Roxb.1832; *Wolffiaarrhiza* auct non Horkel ex wimmer 1857.

Family: Lemnaceae

Single root, 1-1.5cm long, fronds 3-4, obovate, 0.2-0.3cm long, 0.2cm wide; upper and lower surfaces both light green colour, spongy.

Uses: Fishes feed on the plant, introduced in carp nurseries as it destroys algae and promotes growth of zooplanktons.

Pistia stratiotes L.

Sp.pl.963.1753; FBI 6:497.1893; Bomb Fl 328; Subr. 75.1962; Gam vol 3:1573; Maha Fl.219; MV 191.

Family: Araceae.

Free floating hydrophytes, stem stoloniferous, tufted roots, simple white fibers clothed with fibrillae; root pockets acute; leaves 3-10cm long, rosette, obovate, cuneate, rounded or retuse at apex, densely and closely pubescent on both surfaces; spathes small 1.3cm long, white, among the leaves; obliquely campanulate, gibbous and closed below, contracted above the middle, dilated and nearly orbicular above.

Uses: Excellent food for fishes. Leaves cooked and eaten, rich in Vitamin A, B and C. Ash rich in potassium salts, valued as manure and applied to the ringworm of the scalp.

Spirodela polyrhiza L.

Schleid. in Linnaea 13:392.1839; Subr. 77.1962; Hartog & Vander plas in Blumea 18:360.1970; Vander plas in Steenis.Fl.Males 1.7:224.f.1A-B, 2.197.1971; Maha Fl.232.

Family: Lemnaceae.

Fresh water free floated small plants, 3-4 frondstogether, reniform, round or obovate, 5-7 nerved on lower surface; fronds 0.5-0.7cm long, 0.5-0.7cm wide; roots 8-10,1-1.2cm long, pinkish; fronds upper surface green, lower surface dark purple or brown; flowers minute in marginal clefts of fronds; spathe 2-lipped, male flowers in pairs, female flowers solitary; fruits slightly winged at margins; seeds 1-2.

Wolffiaarrhiza Wimmer,

FBI 6:557; Subr. 79.1962 Hartog & Vander plas in Blumea 18:367.1970; Vander plas in Steenis, Fl. Males. 1, 7:237, f.8.C.C, 1971. Hepper in Dasan & Fosb. Rev. Handb. Fl. Ceylon 2:402.f.399.4A-4B.1981. *Lemnaarrhiza* L. Mant.

294.1771; MahaFl.232.

Family: Lemnaceae.

Plants floating in still water in the forms of thick, green, granular masses, flowers opening on the surface from simply median pit.

2. Submerged but not rooted

Hydrilla verticillata (Lin.f)

Royle, III.Bot.Him.t.3; 376.1839.FBI.659; Gam vol 3.1395; Bot.Bihar & Orissa 893; V.189. *Serpiculaverticillata* Linn.f. Suppl.416. *Vallisneria verticillata* Roxb.Fl.Ind.3; 517.1832; MV.178; HS.449; Maha Fl 3; Subr.54.1962.

Family: Hydrocharitaceae.

A submerged floating herb, rhizome very small covered by brown scales, tip spinous, black, rhizome slightly curved, roots 1-3,15cm long silky arise from the nodes, stem slender branched, leaves whorled 3-4, simple, small, linear oblong, margin toothed, flowers unisexual, protandrous, male flowers minute, single, small pedicel, perianth membranous, tip spinous or muricate anthers 3, sessile, ditheous, pollen round, an alga oedogonium grows on this species.

Uses: Used in aquarium, it is good oxygenator, also eaten by some fishes and snails. It is also used as green manure.

Najas indica (Willd.)

Cham.in Linnaea 4:501.1829; de Wilde in Steenis, Fl.Males.1, 6: 166, f.2 (1).1962; Subr.Aquat.Ang.101.1962. *Caulina indica* Willd.in Mem.Ac.R.Sc.Ber 1.89, f.3.1801. *Najas minor* Sensu; FBI 6:569. pro majore parte non All.1785; Bomb Fl.352. *N.tenuis* A.Br.ex Magnus, Beitr.Najas.7.1870 non *Zosteratenuis* Reut.1854; Maha Fl.243; Rendle vol 1:200; Gam vol 3.1603.

Family: Najadaceae.

Submerged herbs, stems slender, dichotomously branched, leaves 3, linear, whorled, 5-6 leaves at the end of the branch, margin spinescent, sheathing base broad, sheaths 2-auricled; female flowers solitary, spathaceous, pedicelled, spathe pink, developed at forks of branching, styles 2 and plants rough to touch.

Potamogeton nodosus

Poir.in Lamk. Encycl. Meth. Bot. Suppl. 4: 535. 1816. *P. indicus* Roxb: non-Roth ex R&S.1818; Gam vol 3:1598; Maha Fl.240; MV.192; HS.490.

Family: Potamogetonaceae.

Floating herbs, leaves all broad and petioled; upper floating leaves elliptic, lanceolate, coriaceous; submerged leaves linear to elliptic lanceolate, longer than the floating leaves, membranous, stem terete, branched; peduncles axillary or leaf opposed, 2-9 cm long, spikes 1-3 cm long, dense flowered; flowers small; drupelets oblique, shortly beaked.

Uses: Food for snails and fishes.

Potamogeton octandrus Poir.

In Lam., Encycl.Suppl.4:517.1816.*P.javanicus* Hassk. Acta Soc.Ind.-Neerdl.8:26.1856; FBI 6:566; Gam vol 3.1600; AP. Fl 1037.

Family: Potamogetonaceae.

Submerged or floating herb; stem slender; submerged leaves linear or filiform, petiole absent, floating leaves membranous, elliptic or ovate oblong, petioles short, stipules free; peduncle slender, axillary or leaf opposed, spike lax flowered, sepals orbicular-obovate; drupelets semiglobose with a hooked beak, ribs toothed and tubercled.

***Potamogeton perfoliatus* L.**

Sp.126.1753; FBI 6:566; Gam vol 3.1600; AP Fl 1038.

Family: Potamogetonaceae.

Submerged herb, stem stout, terete, slightly branched; leaves undulate, entire, 5-9 nerved, sessile, ovate-lanceolate, obtuse, membranous, translucent, amplexicaul, base cordate, margin wavy, stipules small, caducous; peduncle axillary, rather stout, spike dense flowered, sepals elliptic-obovate, clawed; drupelets compressed-globose with short curved beak, smooth.

3. Submerged and Rooted***Ottelia alismoides* (L)**

Pers. Syn.Pl.1:400; FBI 5.662. *Damasonium indicum* Willd; Roxb.cor.pl.t.185; Gam vol 3.1398; Bom Fl.173, Maha Fl 4; AP Fl. 927; Subr.61.1962.

Family: Hydrocharitaceae.

Herbs annual, submerged rooted, flacid leaves of two kinds, submerged leaves shortly petioled, narrow or oblong tapering to base, floating ones oblong or orbicular cordate or rounded at base, 7-11 nerved; flowers solitary developed on quadrangular peduncle striate among the leaves, perianth double, sepals 3, linear valvate, green; petals 3, free, ovate or orbicular white with yellow blotched base, stamens 8, fertile filaments hirsute, anthers dithecous, shorter than styles, ovary inferior, ornamented, carpels 8, unilocular, styles 8, each style bifid, stigma long, styles longer than the stamens.

Uses: Leaves used as vegetable, fruits edible, plant rubefacient, leaves also used to cure hemorrhoids.

***Vallisneria natans* (Lour.)**

Hara.Jour.jap.Bot.49.136.1974. *Physkium natans* Lour.Fi.cochin ch.663.1790. *Vallisneria spiralis* auct. (non-Linn); wt.Ill.t.23&24.1840; FBI 5; 660(PP); Gam vol 3.977; Bot. Bihar & Orissa 3:894; Subr.57.1962.

Family: Hydrocharitaceae.

A submerged rooted herb, tufted, stoloniferous, stolons transparent, slender, leaves long, linear, ribbon shaped, apex obtuse, margin serrulate; flowers unisexual; male flowers many, developed at base of the plant, on short peduncles when male flower matures it open by a pore and pollen released as masses and floats like white blooms, perianth one whorled, sepals 3, small, thalamus long; female flowers single, peduncle coiled, long reached to surface of water, perianth double 3+3, inferior ovary.

Uses: stomach-ache, refrigerant and femulent, also used in leucorrhoea, young leaves eaten with salads.

4. Floating but Rooted***Aponogeton natans* (Linn.)**

Engler & Kranse pflanzenr.24; 11.1906; Gam vol 3:1597. *Saururus natans* Linn. Mant.pl.Alt.2:227.1771. *Aponogeton monostachyan* Linn.f.suppl.214.1781; FBI 6:564; Bomb Fl.348; Maha Fl.237; MV 191.

Family: Aponogetonaceae

Rooted herbs, submerged, leaves floating, linear lanceolate, acute or obtuse, base cordate; inflorescence spike, dense flowered, flowers sessile, pink, sepals 2, spoon shaped, pink; stamens 6(3+3), longer than sepals, anthers purple, dithecous, rounded, basifixed, longitudinal dehiscence; carpels 3, free, styles 3, pink, ovules 4-5 in each carpel; fruit follicle, beaked, surface reticulate; seeds 4-5, striped.

Uses: Starchy rootstocks edible.

***Aponogeton crispus* Thunb**

FBI Vi.564; Gam vol 3:1597.

Family: Aponogetonaceae.

Stem rhizomatous, rhizome black, thick, covered with black numerous root hairs, leaves submerged or floated, 2 types, short obovate and long linear, long petioled, 6-7 nerves, upper surface green, lower surface purple or pink; inflorescence spike, flowers lax, sessile, perianth segments 3, white; stamens 6, filaments pink, broad, anthers purple, longitudinal dehiscence; carpels 3, free, ovules 1-2; stamens and style shorter than the perianth.

Uses: Tuberous rootstocks edible.

***Linnophyton obtusifolium* (L)**

Miq.Fl.Ind.Bot.3:242.1856; FBI 6:560; Bomb Fl.345; Hartg in Steenis.Fl.Males.1, 5:324, f.4.1957; Subr.3:86, t.3.1962. *Sagittaria obtusifolia* L. Sp.Pl.993.1753; Gam vol 3.1595.

Family: Alismaceae.

Rooted hydrophytes, robust, scapigerous, stem rhizomatous, thick, brown, leaves radical, 15-30 x 10-20cm, long petioled, petiole upto 60cm long, lamina broadly sagittate or hastate, sub-acute or rounded tip, basal lobes long, tapering to a fine point, margin wavy, scape developed from the leaf bases, scape stout angular; inflorescence panicle, 60-100cm long; flowers greenish white, many in whorls at the nodes of the branches of the panicles; flowers polygamous, bracteate, pedicellate, pedicel 2cm long, perianth double, outer 3 green, small, inner 3 white, rounded or ovoid, stamens 6, shorter than the petals, extrorse, dorsifixed or versatile, longitudinal dehiscence, filaments white, pollen round; apocarpous, carpels many, superior, 10-14 ovules, style lateral; stamens 2-fid, feathery; fruit achenesobovoid, wrinkled, base cuneate, 0.4-0.8cm long with a fine reticulation of scarious ribs, shortly beaked; seeds 0.4cm long, one seed curved.

***Monochoria hastata* (Linn)**

Solms. A. DC.Mon. Phan. 4:523. 1883; FBI 6:363; G.3: 1068; H.3; 1150; Subramanyam 1c, 69. *Pontederia hastata* Linn. Sp. PL.288.1753; Subr.69.1962.

Family: Pontederiaceae.

Marshy herb, root stock elongate, creeping; upto 25 cm height, leaves radical, hastate or sagittate, nerves very close; flowers beautiful, blue, crowded perianth campanulate, tube 0; stamens 6, one usually longer than the rest with its filament horned on one side, anthers basifixed, dehiscing by a terminal, ultimately elongate slit, ovary 3-celled, ovules many in each cell.

Uses: Tender stalks and leaves eaten as vegetables. Root stock used as feed for cattle and pigs.

***Monochoria vaginalis* (Burm.f.)**

C. Press Res. Haenk.1:128.1827, in obs; FBI 6:363; *Pontederia vaginalis* Burm. f.Fl.Indica 80, 1768.

Family: Pontederiaceae.

An annual erect aquatic herb, root stock short; leaf solitary, ovate or sub reniform, nerves not very close, acute or acuminate, base or cordate; flowers blue in axillary condensed racemes; fruit ellipsoid; seeds ribbed.

Uses: Aerial parts eaten as a vegetable; roots taken for stomach and liver complaints, asthma and tooth-ache.

***Sagittaria trifolia* L.**

Sp.Pl.993.1753; Katthik *et al.* Fl.Ind. Enum. Monocot. 3. 1989. *S.sagittifolia* L.op.cit; Hook.f. FBI 6:561. 1893. Bomb Fl 3:645; Subr.87.1962. *S.sagittifolia* ssp. *Leucopetala* (Miq.)Hartog in Steenis, Fl.Males.1, 5: 332.1957; Maha Fl.235.

Family: Alismaceae.

Aquatic herbs, scapigerous; rhizomes thick, tuberous, stoloniferous, leaves 4-21.5 X 0.8-1.2 cm, hastate or sagittate,

basal lobes usually diverging narrower and often longer than the rest of the blade; flowers 1-1.9 cm across, white with a purple claw, in 3-5 whorls along the scape with 3-5 flowers in each whorl, the lower whorls female, nearly sessile with staminodes, the upper male with longer pedicels, hermaphrodite flowers rare, achenes obliquely ovate, apiculate, wing broad, entire or subcrenate.

Tenagocharis latifolia (D. Don)

Buchen. Abh. Naturw. ver. Bremen 2:2, 3, 6, 1868; van Steenis in Fl. Males. 1, 5:118, f.1, 1954. *Butomus latifolius* D. Don, Prodr. Fl. Nep. 22, 1825. *Butomopsis lanceolata* Kunth, Enum. Pl. 3:165, 1841; FBI. 6:562, 1893; Maha Fl. 237; Subr. 88.1962.

Family: Butomaceae.

Aquatic herb, leaves long petioled, blade elliptic, thick, leathery; inflorescence developed from rootstock, umbellate, 8-10 flowers in each umbel, peduncle triangular, longer than the petioles, flowers bracteate, bracts whorled, pedicelled, pedicel long, triangular, bisexual, white, sepals 3, green, channeled, persistent; petals 3, white, deciduous; stamens 20-25, anthers sagittate, dorsifixed, dithecal, pollen minute; apocarpous, single basal ovule. Viviparous germination.

Uses: Tubers consumed after boiled or fried. Young leaves eaten like spinach. Juice of the petioles used as an astringent and styptic.

5. Marginal Emergent Hydrophytes

Colocasia antiquorum Schott.

FBI. Vi. 523, Wt. Ic. t. 786. *Arum nymphaeifolium* Roxb; Wt. Ic. t. 786; Gam vol 3.1580.

Family: Araceae.

Tubers up to 6 in. diam, milky latex, latex cream colour; leaf large, ovate to cordate, 6-20 cm long 3-12 cm wide, apiculate or spinulose, basal sinus triangular, margin undulate, upper surface dark green, lower surface white; main veins 10-12; spadices 4-5 from the leaf axis, spadix 40-45 cm long, peduncle 20-25 cm long, spathe 20-25 cm long; tube oblong, green, closed, limb open, narrowly lanceolate, acuminate, pale yellow, 2-4 times longer than the tube; spadix upper part male flowers, lower part female flowers are separated by neuters; female part embedded within the tube; male part 11 cm, neuters 6 cm, female part 3 cm; stamens 10 formed into synandrium; pollen released thread like; carpel ovoid, 8-10 ovules 8-10, parietal; funicle long, lateral ovule, sub orthotropous.

Uses: All parts of the plants are eaten.

Colocasia esculenta (L)

Schott in Schott & Endl. Meletem. Bot 1:18.1832. *Arum esculentum* L. Sp Pl. 965.1753. *C. antiquorum* Scholt in Scholt & Endl. Op. cit. FBI 6:523.1983; Bomb. Fl. 340.1958, Blatt. in J. Bom nat. Hist. Soc. 35:29.1931.

Family: Araceae.

Stem underground, corm conical; leaves thinly coriaceous, peltate ovate, cordate at base, petiole erect black or dark brown; peduncles much shorter than the petioles; spathe yellow, tube green, spadix much shorter than the spathe, rather slender.

Uses: Tubers consumed after boiled or fried. Young leaves eaten like spinach. Juice of the petioles used as an astringent and styptic.

Cyanotis axillaries Roem. & Sch.

Gam vol 3.1549; Bom Fl. 301;

Family: Commelinaceae

Annual herbs; prostrate or creeping, grows in wet localities,

leaves linear long, sheathing base, stem stout, leafy, glabrous or minutely hairy, leaf lower side dotted or scaberulous, mouth of the leaf sheath or leaf base ciliate, inflorescence cymes, axillary, bracteoles linear lanceolate hidden, flowers solitary; flowers blue or white; sepals 3, sub equal; petals 3 sub equal often united into a tube below, stamens 6, all are perfect, sub equal, filaments bearded, anthers oblong, ovary 3-celled, 2 ovules in each cell, one erect, other pendulous; style long linear bearded or naked, upper part coiled; stigma broad, fruit 3-valved capsule, seeds usually 2, rugose or pitted.

Typha angustata Bory et Chaub

Exp. Sc. Mor. 338.1832; FBI 6:489; Gam vol 3.1571; MV 190; HS 482; Maha Fl 207; Subr 3.74.1962.

Family: Typhaceae.

A robust perennial herb, occurring in marshes, leaves long linear, thick up to 15 cm long, 2 cm wide, male and female spikes separated by a considerable interval yellowish brown scales; female flowers mixed with clavate sterile pistillode.

Uses: Leaves used for making chair bottoms, hassocks, mats, baskets and roof for huts.

6. Conclusion

Aquatic monocots play a vital role in the nature in many ways. Example food for human beings, feed for animals and fishes, manure, source of energy, pollution control, soil binders etc. Generally ponds and pools having more vegetation than lakes and rivers. In the recent study, the authors observed that pools are going to deplete or near to threat. Majority of road side pools and ditches are in danger because of road widenings and constructions of buildings. The authors request the Government of Andhra Pradesh and NGO's to implement or undertake programmes to conserving the potential aquatic bodies and their flora and fauna.

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