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Taxonomic systematic investigation on the family- cucurbitaceae at Braj mandal region of western Uttar Pradesh (India)

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Abstract

Systematic taxonomic investigation were carried out on the family - Cucurbitaceae growing throughout the Braj Mandal region situated in the western Uttar Pradesh (India) was carried out. A total of 24 species under 13 genera of the family-Cucurbitaceae were collected and identified. A complete taxonomic account of each species has been given along with their current name, local name, brief description, phenology, basic chromosome number and voucher number. A new system of classification of the family-Cucurbitaceae has been proposed on the basis of morphological, cytological and floral characteristic and systematic studies.

Keywords: systematic toxonomic investigation, cucurbitaceae, braj mandal region, UP. India

Introduction

Family- ucurbitaceae is a medium sized and botanically highly specialized family of mainly climbing plants. Cucurbitaceae is a fairly large family containing about 100 genera and 800 species which are mainly tropical or subtropical in distribution, with a few species extending into temperate climate [1]. The cultivated species investigated in this study belong to the genera *Benincasa, Citrullus, Cucumis, Cucurbita, Lagenaria, Luffa, Momordica and Trichosanthes.* These are used as fruits, vegetables and most of them have considerable economic value [2]. Many species of this family are the sources of Indian system of medicine. Some are widely cultivated in the field for vegetable and food. A few taxa are also grown as ornamental plants. Cucurbitaceae is the largest group of summer vegetable crops. These include *Cucumber, musk melon, water melon, tinda, bottle gourd, luffa, and bitter gourd, pumpkin, squashes, parwal and snake gourd.* Most of the members of the Family- Cucurbitaceae are monoecious and a few are dioecious. A number of hermaphrodite and andromonoecious cultivars are also available in some crops. They are all summer season crops and are susceptible to frost and systematic cytogenetic and its uses of *Cucumis* species [4] and cytogenitical in *Citrullus* and *Cucurbita* Species [5] have already been studies.

Materials and Methods

Systematic taxonomic investigation on the family-Cucurbitaceae growing throughout the Braj Mandal region of western Uttar Pradesh (India) was carried out. The study area of Braj Mandal region of western Uttar Pradesh (India) in cludes Eight districts: Agra, Mathura, Mainpuri, Aligarh, Firozabad, Kasganj, Etah, Hathras A total of 24 species under 13 genera of the family-Cucurbitaceae were collected and identified. A survey on the determination of the location of different species was made and a list was prepared to be acquainted with the Cucurbitaceae available in the selected area. All the species were noted and from time to time the areas were visited to see when they flowered. For the morphological study, different types of species were examined again and again in order to see if there was any variation or not. They were collected at flowering stages and herbarium specimens were prepared as vouchers. In this practice standard method was followed. In this regard different types of plant species were collected from different habitats. All the collected plant specimens were kept in the Herbarium, Department of Botany, School of life Sciences, Dr. Bhimrao Ambedkar University, Khandari Campus, Agra, U.P. (India) The collected specimens were identified by referring to the related taxonomic books and booklets from the library of Dr. Bhimrao Ambedkar University, Agra. The major collected materials were identified and described up to species with the help of [6, 7, 8, 9, 10]. In some cases [11, 12, 13, 14] were consulted. For the current name and up to date nomenclature [15, 16] were also consulted.

Results and Discussion

Systematic investigation on the family-Cucurbitaceae growing through Braj Mandal region situated in the western parts of Uttar Pradesh (India) was carried out. A total of 24 species under 13 genera of the family-Cucurbitaceae were collected and identified. A complete taxonomic account of each species has been given along with their current name, local name, brief description, phenology, basic chromosome number and voucher number. Most of the cultivated species were grown in all districts of Uttar Pradesh (India). Some of the species which were sometimes cultivated and sometimes wild were

grown in particular area. Most of the species were distributed all over the study areas, *Benincasa hispida, Citrullus lanatus, Coccinia grandis, Cucumis melo, Cucumis sativus, Cucurbita maxima, Cucurbita moschata, Cucurbita pepo, Lagenaria siseraria, Luffa acutangula, Luffa cylindrica, Momordica charantia, Momordica cochinchinensis, Melothria maderaspatana, Trichosanthes anguina, Trichosanthes cucumerina, Trichosanthes bracteata and Trichosanthes dioica.* One species growing in one district of the study area, i.e. *Thladiantha cordifolia*, populated at Aligarh roadside of bushes. *Gymnopetalum cochinchinense* and *Diplocyclos palmatus* were very rare species in the study area. *Momordica dioica* was collected from Aligarh and Kasganj districts. *Cucumis callosus* was collected from Mainpuri and Etah districts. *Trichosanthes cordata* was collected from Aligarh and Mathura districts. *Gymnopetalum cochinchinense* was collected from Aligarh and Agra district. On the basis of morphological, cytological and floral characteristics a new system of classification of the family - Cucurbitaceae has been proposed as follows:

1. **Benincaseae:** Ovule many horizontal, fruit usually smooth or indehiscent. i.e. *Benincasa*, *Lagenaria, Luffa.*
2. **Cucurbiteae**: Stamens 5, apparently 3, anther lobes sigmoid S or U-shaped. Ovules erect or horizontal. Fruit fleshy, indeiscent and 1to many seeded. i.e. *Cucurbita*.
3. **Cucumerinae:** Ovule horizontal, stamens free. i.e. Cucumis, Citrullus, Coccinea, Diplocyclos, Gymnopetalum. Tribe-4: Jolifeieae-Petals fringed or with ventral scales. i.e. *Momordica*.
4. **Jolifeical:** Petals fringed or with ventral scales ie. *Mamorfica*.
5. **Melothrieae:** Stamens usually 5, but apparently 3, rarely 2 or 4, anther lobes straight or slightly curved. i.e. *Melothria.*
6. **Thladiantheae:** Stamens free or only connate at base, 5 rarely 4. i.e. *Thladiantha*.
7. **Trichosantheae:** Petals entire or with fimbricate margin. Ovules horizontal. Fruit fleshy or dry, dehiscing by three valves. i.e. *Trichosanthes*.

By examining the plant materials collected from the study area using the identification methods, systematic information was accumulated and described below.

1. ***Citrullus lanatus*** **(Thunb.) mart and nakai:** Climbing herbs, stems are angular villose. Leaves are triangular ovate, cordate, deeply individed, glabrous and hardly scabrid. Flowers are yellow. Male flower-peduncles elongate, vilous, calyx-tube broadly campanulate, corolla greenish, villose. Female flower-calyx and corolla as in the male, ovary long. Fruits subglobose or ellipsoid, smooth, flesh rose to red, pulp sweet, red or yellow. Seeds are ovate, black or red, locally called as Turmuz Phenology from January to May and Chromosome Number: 2n=22 [17].

2. ***Benincasa hispida*** **(Thunb.) cogn:** A large, softly hairy climber, tendrils long, 3-branched. Leaves cordate, reniform, orbicular, 7-8 lobed, petiole length 12.5 cm, without glands. Flowers large, yellow, monoecious, all solitary, sepals 5, free, petals 5, obovate, slightly connate. Stamens 3, anthers exserted, 2 large, carpel 3, fruit large, covered with white waxy substances, length 30 cm. breadth 36 cm and commonly called as Chal kumra, sada kumra, chuna kumra Phenology: March to October Chromosome Number: 2n=24 [17].

3. ***Coccinea grandis*** **(L.) voigt:** A climbing herb, stems are much branched, glabrous or white scaly, petiole and tendrils are slender. Flowers are white. Male flowers-peduncle jointed below the flowers. Calyx-tube linear oblong, corolla white, triangular. Female flower-peduncles slender, staminodes 3, ovary smooth, glabrous, stigma densely papilose. Fruits fusiform ovoid, cylindrical, smooth, bright scarlet. Seeds oblong-ovoid, smooth, locally called as Telackucha Phenology, march to December and Chromosome number: 2n =24 [18].

4. ***Cucumis sativus*** **L:** Climbing herbs, stem scabrous. Leaves 5-angualr or slightly lobed, lobes acute hispidulous on both surface and also often with soft hairs. Leaves 7.5-12.5 cm, petiole 5-7.5 cm. petals 1.5 cm., female peduncle sometimes 5 cm., young ovary muricate with rigid prickles. Fruit glabrous sometimes tuberculated commonly elongated, cylindric 30.5 by 3.7 cm. the cucumber, locally called as Sasha, Khira, Phenology from January to December and Chromosome Number: 2n=14 [17].

5. ***Cucumis melo*** **L:** Stems are scabrous, leaves are orbicular reniform 5-angular or lobed lobes neither deep nor acute scabrid on both surfaces and also often with soft hairs. Female peduncle sometimes 5 cm. petals 4.06 cm. Fruit glabrous of somewhat hairy not spinous nor tuberculate, spherical ovoid elongate or contorted, commons called as Phuti, Bangi, Kurbuz, Phenology from January to May and Chromosome Number: 2n=24 [17].

6. ***Cucumis callosus*** **L:** Stem slender, angular, hirsute. Petioles slender, hispid, lamina cordate, suborbicular, deeply palmately 5-7 lobed, scabrid. Tendril simple. Male flower-generally solitary long peduncled, calyx-tube narrow campanulate, corolla yellow, oblong, acute, stamina filament short. Female flower-ovary densely hairy, stigmas converging. Fruit smooth, obovoid, seeds oblong, white. Commons called as Bangumak Phenology from June to October and Chromosome Number: 2n=24 [17].

7. ***Cucurbita maxima*** **duch:** Annual, with long trailing, soft stems, more or less round in cross section. Leaves large, dark-green and cordate. Male flower-It carried on long, cylindrical peduncles, sepals 5, petals 5, stamens 3, anthers 3, fused. Female flower-it is larger than the males, short peduncles, petals 5, carpels 3, style short, stigmas 3, fruit variable in size and colour, round, flattened or oval, commonly called as Bitati, mistikumra Phenology from January to December and Chromosome Number: 2n=40 [17].

8. ***Cucurbita pepo* L:** Annual, with a long trailing, angular, prickly stem and large roughly triangular leaves, 5-lobed sinus between the lobes broad. Fruiting peduncle woody strongly grooved. Male peduncle 10 cm. or more, female 3.2 cm. corolla 5-10 cm. Fruits vary greatly in size, colour and shape among different cultivars, some being long, round and smooth, while others are flattened or more or less spherical. commonly called as Mistikadu, Bilati Phenology from November to June and Chromosome Number: 2n=40 [17].

9. ***Cucurbita moschata* (Duch. ex Lam.) duch:** Annual with long trailing, soft stems without prickly hairs and palmately divided lobes. Fruit variable, usually large, globular, cylindrical, seeds with a thin or ragged margin, scalloped or shredded in appearance, the margin more deeply coloured than the body of the seed, which is 16-20 mm. long, commonly called as Mistikadu, Bilati Phenology from November to June and Chromosome Number: 2n=40 [17].

10. ***Diplocyclos palmatus* (L.) jeffrey:** Stem slender, much branched, glabrous. Petioles 2-6 cm. long, lamina suborbicular in outline, 3-lobed, lobes elliptic acuminate, base cordate. Flowers white or yellowish. Male flower-calyx-tube broadly campanulate, corolla campanulate, stamens 3, anther loculi, linear, slightly flexuous. Female flower-calyx and corolla as in male, staminodes 3, ovary subglobose, with 3-placentas, stigma 3, fruit globose or ovoid, seeds ovate, commonly called as Mala, Phenology from November to April and Chromosome Number: 2n=24 [18].

11. ***Gymnopetalum cochinchinense* (Lour.) kurj:** Stems scandent, petioles slender,lamina ovate, swallowly 3-lobed, acuminate, base deeply cordate, margin toothed. Flowers white. Male flower- solitary or in racemes of 3-8 flowers, bracts ovate-oblong, deeply toothed, calyx tube subcylindric, corolla lobes white, oblong-ovate, anthers both ends acute. Female flower-peduncle 1-4 cm. long, fruits ovoid-oblong, ribbed and commonly called as Kaubuti Phenology from November to April and Chromosome Number: 2n=22 [18].

12. ***Lagenaria siceraria* (Molina) standl:** Brief description: Pubescent, tendrils 2-fid. Leaves ovate or orbicular, cordate, dentate, petiole long, with two glands at it apex. Flowers large, white, solitary, monoecious or dioecious, the males long, the females short, petals 5, free, obovate, stamens 3, anthers connate. Female flower-calyx and corolla as in the male, ovary oblong, ovules many, horizontal, placentas 3, vertical. Fruit large, ultimately thick membranous or almost woody, indehiscent. Seeds many, horizontal, compressed, smooth and commonly called as Panilau, Lau, Panikadu Phenology from January to December and Chromosome Number: 2n=22 [17].

13. ***Luffa acutangula* (L.) roxb:** Brief description: Stout monoecious climber, foetid and when bruised. Leaves 5 angled or swallowly lobed, pale green beneath, scabrous, 10-25 cm. Male flower in racemes of several flowers; female flower solitary, ovary inferior, filiform, with 10 longitudinal ribs on which are swollen glands, style short, stigmas 3. Fruit elongate, club-shaped, crowned by enlarged sepals and style angled, 10 ribbed, many seeded and commonly known as Toroy, Jhinga Phenology from June to October and Chromosome Number: 2n=26 [17].

14. ***Luffa cylindrica* (L.) roem:** Brief description: Extensively climbing hairy, stem 5-angled tendrils 2-3 fid or more. Leaves 10 cm. reniform, orbicular, 5-angled, dentate. Male peduncle 15 cm., flowers often approximate near the summit, petals 5, yellow, stamens 5. Female flowers solitary, fruit elongate clavate smooth 10-ribbed or somewhat 10-angular, seed usually black, very narrowly winged, smooth or very sparingly tubercled and commonly called as Dhundol Phenology from June to November and Chromosome Number: 2n=26 [17].

15. ***Melothria maderaspatana* (L.) cogn:** Stems are slender, angular hispid or scabrous. Petioles are filiform, lamina 3-5 lobed, acute or subacuminate, tendrils slender. Male flower in cluster, peduncle short, calyx narrow, corolla hairy outside connective of stamens produced. Female flowers- solitary or subfascicled, fruiting peduncles almost absent, calyx hairy. Fruit globes, red and glossy at maturity, seeds ovoid, grey, turgid and commonly called as Agmuki Phenology from November to April and Chromosome Number: 2n=22 [18].

16. ***Momordica cochinchinensis* (Lour.) spreng:** Dioecious, leaves 10-12.5 cm. cordate ovate, usually 3-lobed, glabrous or a little pubescent, petioles glandular, flower large white, petals 2.5-5 cm., white tinged with yellow, 3 with black spots at the base 2 with yellow glands. Female peduncle 2.5-5 cm. bract small about the middle. Fruit muricated, ovate, pointed, very fleshy, horizontal, ovate, compressed and commonly called as Kakrol, Phenology from March to September and Chromosome Number: 2n=22 [17].

17. ***Momordica charantia* L:** Monoecious, bract about the middle of the male peduncle orbicular entire, leaves 2.5-7.5 cm., orbicular glabrous or slightly pubescent. Male peduncle 5-10 cm., slender, calyx-lobes ovate, acute. Petals 1-2 cm. yellow. Female peduncle 5-10 cm., slender, bracteates near the base, ovary fusiform, muricate. Fruit ovoid narrow to both ends many-ribbed covered with triangular tubercles. Seeds compressed and Karala from Phenology and January to December Chromosome Number: 2n=22 [17].

18. ***Momordica dioica* roxb:** Stems are slender, petioles 1-2 cm. long, lamina ovate, acuminate, base cordate, glabrous. Tendrils filiform, simple, flowers yellow. Male flower- solitary, peduncles slender, bracteate at apex,

corolla lobes yellow, oblong, veins black grey. Female flowers- peduncles ebracteate, bract small, near the base, ovary ovoid, oblong, densely coarse-hairy. Fruits ovoid, densely soft echinate, seeds are pale-yellow, broadly ovoid and commonly called as Gheekorolla Phenology from June to October and Chromosome Number: 2n=22 [17].

19. ***Thladiantha cordifolia* (Bl.) cogn:** Stems are sulcate, pubescent, petiole slender, villose, lamina ovate, acuminate, base deeply cordate rounded. Tendrils simple, flower golden yellow. Male flowers-many, approximate at the summit of long peduncle, calyx lobes linear oblong, corolla yellow, lobes ovate, stamens 5, anther one celled, straight. Female flowers-peduncles one flowered, slender, villous, ovary oblong, villose, stigma reniform, fruit oblong, seeds ovoid and commonly called as Dabilata Phenology from May to October and Chromosome Number: 2n=18 [18].

20. ***Trichosanthes cordata* roxb:** An extensive climber, dioecious, leaves often 15-20 cm. acute or obscurely angular-lobed hair beneath, bracts elongate obovate entire or scarely serrate, tendrils usually 3 fid. Male peduncles usually paired, the racemed one often 20 cm. stout, bracts pubescent, calyx-tube 3.5 cm. densely hairy without segments finely acuminate. Fruit globose, size of small orange, seeds 1-2 cm. scarcely angular on the margin and commonly called as Bhuikakra Phenology from May to October and Chromosome Pumber: 2n=22 [17].

21. ***Trichosanthes dioica* roxb:** Stems twining extensively, more or less wooly and scabrous, dioecious. Leaves cordate, oblong, acute, petiole scabrous wooly, tendrils 2-fid. Male flowers- not racemed woolly without, anthers free. Male peduncles paired, the second-flowering carrying a raceme of about 12 flowers. Calyx-tube 3.8 cm. narrow. Fruit 8.9 cm., oblong or nearly spherical, acute, orange-red. Seeds half-ellipsoid, compressed, corrugateon the margin and commonly called as Potol, Phenology from November to April and Chromosome Number: 2n=22 [17].

22. ***Trichosanthes anguina* L:** Monoecious climbing annual herb, 5-angled, furrowed, tendrils branched. Leaves cordate subreniform 5 lobed or 5-angular lobes, not acuminate pubescent or puberulous on both surface, fruit elongate cylindric sometimes contorted, seeds corrugate and commonly called as Chichinga, Phenology from November to April and Chromosome Number: 2n=22 [17].

23. ***Trichosanthes cucumerina* L:** Stems are slender glabrous or slightly hairy. Petioles 2-7 cm. long, lamina suborbicular reniform or broadly ovate. Tendrils 2-3 fid, flowers white. Male flowers-peduncles in pairs, the earliar 1-flowered, calux-tube narrowed to the base, anthers oblong. Female flowers-calyx-tube gradually dilated upwards, lower part often hairy, ovary oblong, style filiform. Fruits are ovoid, conica, smooth, seeds are ovate oblong and commonly called as Banchichinga Phenology from June to November and Chromosome Number: 2n=22 [17].

24. ***Trichosanthes bracteata* (Lamk.) Voigt:** Stems are woody below, robust, stout branching sulcate, pubescent. Petioles striate, lamina broadly ovate or suborbicular. Tendrils 3-fid, flowers white. Male flower-racemed, peduncles robust, apex 5-10 flowered, calyx-tube longitudinally striate, acuminate. Female flower-axillary, solitary, calyx-tube segment, acuminate, style long. Fruit globose, not acute, seeds ovate oblong, embedded in black pulp and commonly called as Makal, Makalphal, Phenology from July to December and Chromosome Number: 2n=22[17].

Systematic taxonomic investigation was carried out on the family-Cucurbitaceae growing throughout the Braj Mandal region situated in the westren parts of Uttar Pradesh (India) was carried out. A total of 24 species under 13 genera of the family-Cucurbitaceae were collected and identified. A new system of classification of the Family - Cucurbitaceae has been proposed on the basis of taxonomic morphological, cytological and floral characters.

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