

CYTOGENETICS STUDY AND USES OF *Cucumis* SPECIES (CUCURBITACEAE) IN MAINPURI DISTRICT (U.P.)

Akhilesh Singh Chauhan

Department of Botany, School of Life Sciences
Dr. B.R. Ambedkar University, Khandari Campus, Agra - 282 002 (India)

(Received: September 09, 2005; Accepted: November 01, 2005)

ABSTRACT

Cucumis species (Cucurbitaceae) are annual monoecious or biannual herbaceous climbing plants and have rich in minerals and vitamins were collected from Mainpuri district (U.P.). *Cucumis sativus* have 7 pairs of chromosomes, while *Cucumis melo* and *Cucumis momordica* have 12 pairs of chromosomes. Fruits are used as salad, jams and vegetables purposes. Chromosomes pairs are represented in idiogram. The presence of chromosomes may be a reliable cytogenetic information for the screening and frequency. All these species of *Cucumis* showed the frequencies of half chiasma per chromosome. Anthers were stained by aceto-carmine for mitotic study and meristematic cells were scored. Root tips slides screened to determine the frequency of mitotic division of the *Cucumis* species.

Key words: Cytological feature, chromosome number, *Cucumis* sp.

INTRODUCTION

Cucumis melo, *Cucumis sativus* and *Cucumis momordica* belongs to the family Cucurbitaceae are an annual or biannual herbaceous vegetable crop widely cultivated in India particularly in Mainpuri district of Uttar Pradesh. *Cucumis melo* is known as Muskmelon, Sweet melon, Kharbooza and are silky pubescent, with simple tendrils and moderately 3,5 or 7 lobed are solitary. Corollas are yellow and stamens are three. Fruits of the cultivates forms are highly variable in size, shape, colour and making those of the wild variety are oblong to green. Seeds are white, oblong to elliptic, highly compressed, smooth and 10-12 mm long. It is cultivated throughout India, particularly in Mainpuri district and drier North Western areas. Fruit characteristics differ in size, shape, thickness, texture, colours, flavours of pulp, rings, being soft or hard, yellow, green, cream or orange. It grows well in sand river beds which are less suitable for most other crops. They are primarily

eaten as fruit, at an immature state they may be used in salads like cucumber or in curries. Flesh may be used to prepare a syrup or jams. Seeds slightly roasted are used like almonds or pistachios. The various shape and size of *Cucumis* fruits are collected from various parts of Mainpuri district (U.P.).

Cucumis sativus (Khira) the most common cultivated varieties are Kaliyanpur, Pusa sanyog and Puna Khira in Mainpuri district. It is a trailing climbing monoecious annual herb with stiff bristly hairs, stem strongly, four angled and tendrils unbranched. Leaves long petaloid, triangular, base deeply cordate, apex acuminate. Male and female flowers are fasciculate, borne in auxiliary clusters on slender pedicle. Calyx with 5 narrow lobes, corolla acute well shaped yellow deeply 5 hairy with stamens 3 filament free ending in thickened connective with anthers on outer face. There are 10-20 fruits observed in the plant. Fruit pedulous, variable in shape and size, yellowish green 30-40

cm long and seeds are flat whitish both ends pointed.

Cucumis momordica is known as Phunt, and is an annual monoecious, scabrous climbing herb. Leaves angular, 3.5 lobed tendrils, stem angular and flowers yellow usually small. Male flowers are many fasciculate rarely solitary while female flowers solitary, rarely fasciculate, calyx tube with 5 lobes. Corolla are rotate, 5 partite, stamens 3, free inserted at the calyx tube, filament short anther 3, free inserted at the calyx tube, filament short anther 3, oblong, curved, bifid, style short undivided, shortly cup shaped, stigma 3-5 obtuse, spherical. Fruit slender cylindrical, long 30-50 cm and diameter 10-20 cm, smooth skin fleshy, dehiscent, many seeded. Seeds are flat, whitish, apex is pointed and fruits at maturity. Soft and mushy, fleshy and are edible.

Cytogenetics methods have provided valuable information like evolution of reptan in Cucurbitaceae. *Cucumis melo* has 12 pairs of chromosomes^{1,2,3}, Bhaduri and Bose (1947) have advanced the suggestion that *Cucumis melo* with 12 pairs of chromosomes was derived from *Cucumis sativus* by fragmentation of particular chromosomes. The evidence for this theory rests upon the presumed thread like projection from the pointed end of the chromosomes in *Cucumis melo* and upon an involved argument regarding the equivalence of nucleoli and secondary construction after fragmentation. Batra (1952)⁵ made an extensive study over a period of 2 years of induced tetraploids in 9 cultivars of *Cucumis melo*. These results indicates that the quality of tetraploids is superior to that of diploids for e.g. the flesh is sweeter and of better texture than in comparable diploid cultivars. The tetraploids are fertile enough to be easily propagated from seed and fruits of tetraploids are smaller, flatter than those of diploid and tetraploid vines are probably less productive.

MATERIALS AND METHODS

The meiosis was carried out in dividing the pollen mother cells in cytological study of *Cucumis* species (Cucurbitaceae). The young flower buds are fixed in acetic alcohol in 1:3 molar ratio between 10-11 a.m and added few drops of ferric

chloride for fixation. Anthers were stained by the aceto-carmine squash method for mitotic study, more than 50 meristematic cells were scored and 10 slides prepared from root tips. Slides thoroughly screened to determine the frequency of mitotic divisions, abnormalities and nuclear aberrations in *Cucumis melo*, *Cucumis sativus* and *Cucumis momordica*. The cytogenetic studies of the various *Cucumis* species of the family- Cucurbitaceae has been described as follows:

- i. *Cucumis melo* (Kharbooja) : *Cucumis melo* has base chromosome number $X=12$. these are 24 chromosomes have been observed in the root tips cells. The length of chromosomes varies from 1.33μ to 2.22μ . Chromosome pair are represented in idiogram.
- ii. *Cucumis sativus* (Khira) : This root tip of *Cucumis sativus* show $2n=14$. This is the lower diploid number in the Cucurbitaceae. These are 3 pairs 5, 6 and 7 from the left in the idiogram have secondary construction.
- iii. *Cucumis momordica* (Phunt): The *Cucumis momordica* is a cultivated species having chromosome number $2n=24$. The somatic chromosomes are small in size. Chromosomes pairs are represent in idiogram.

RESULTS AND DISCUSSION

The cultivated plant have derived from the wild gene pool through selection. The cytogenetics study were also carried out in *Cucumis* species (Cucurbitaceae), collection from different place of Manipuri district of Uttar Pradesh. A improved varieties like *Cucumis melo*, *Cucumis sativus*, *Cucumis momordica* were commenced as early as 1915 by Mckey *et. al.*⁶ and Weishaar⁷. These problems have been studied by Pentzer *et al.*⁸ and Barger *et al.*⁹. Varieties of *Cucumis sativus* are Kaliyanpur Khira, Pusa sanyog, Puna Khira, Balam Khira have been collected from Mainpuri district. Variety Kaliyanpur Khira, Pusa Sanyog and Puna Khira are most abundantly cultivated in Bhogaon and Mainpuri Tehsil and five blocks of Mainpuri district (U.P.)

It has been able to produce buds, shoots or both from callus formed on either hypocotyle or

cotyledons¹⁰⁻¹¹. Cotyledons presently appear to be the better explant for use in organogenesis experiments¹².

The *Cucumis* species from Tarai region and Western Uttar Pradesh, Chhota Nagpur area, West Bengal, Assam, Karnataka and Coastal Andhra Pradesh and exhibit interesting variation. In *Cucumis melo* several fruits are large in size, which have been observed in M.P. and U.P. This may be due to the introversion of semi wild *Cucumis melo* with cultivated melons, Munger and Robinson¹³ suggested horticultural importance of melongrooves.

All cultivars of Cucumber (*Cucumis sativus*) have 7 pairs of chromosomes¹⁴. In addition to determine the number of chromosomes, a great

deal of effort has been developed to cytological work without commensurate increase in out fund of cytological information. The somatic studies bring out in *Cucumis momordica* have chromosome smaller than those in *Cucumis sativus* but the tendency to have more of submedian chromosome than median ones is evident in all three species. The 12 pairs of chromosomes in *Cucumis melo*, *C. momordica* and 7 pairs of chromosomes in *C. sativus* species.

In spite of differences in the number of 2n chromosomes amongst *C. sativus* (2n = 14) and *C. melo* and *C. momordica* (2n = 24). All three taxa showed the same frequency of half chromosome per chromosome and also frequency of bivalent in Cucurbitaceae.

REFERENCES

1. Kozukhov, Z.A., Karyological investigation of the genus *Cucumis*. *Bulletic Appl. Prot. Cent and Pl. Breed*, **23**, 257-265 (1930)
2. Whitaker, T.W., Chromosome number in cultivated Cucurbits, *Amer. J. Bot.*, **18**, 1033-1040 (1930)
3. Whitaker, T.W. and Bohn, G.W. The taxonomy, genetics, production and uses of the cultivated species of Cucurbits. *Econ. Bot.*, **4**, 52-81 (1950)
4. Bhaduri, P.N. and Bose, N., Cytogenetical investigation in some Cucurbits with special reference to fragmentation of chromosomes as a physical basis of specializations. *J. Genet.*, **48**, 237-256 (1947)
5. Batra, S. Induced tetraploidy in Muskmelon. *J. Hered.*, **43**, 141-148 (1952)
6. McKay, A.W., Fischer, G.L. and Nelson, A.E. The handling and transportation of *Cantaloupes*. *Fmr's Bull. V.S. Dept. Agric.*, 1145 (1921)
7. Weishaar, L.J., Testing the carrying quality of California *Cantaloupes* month. *Bull. Calif. St. Dept. Agric.*, **10**, 314-316 (1921)
8. Pentzar, W.T., Wiant, J.S. and Mc Gillivray, J.H. Market Quality and condition of California *Cantaloupes* as influenced by maturity, handling and pre cooling. *Gen. Bull.*, U.S. Deptt. Agri. 730 (1940)
9. Barger, W.R., Embree, G. and Mann, C.W., Report of transportation list with *Cantaloupes* and Honey Melons from impenal valley, California to New York City, U.S. Dept. Agri. *H.T. and S. Office report.*, **101**, 13 (1942)
10. Custers, I.B.M. and Buijs, L.S. The effect of illumination and explant polarity on adventitious bud formation in vitro of seedling explants of *Cucumis sativus*, *Cucurbits Gent. Coup. Rep.*, **2**, 2-4 (1979)
11. Novak, F.J. and Dolezelova, M. Hormons control of growth and differentiation in vitro cultured tissue of *Cucumis sativus*, *Biologia*, **37**, 283-290 (1982)
12. Bouaborallah, L. and Brancard, M., Regeneration of plants from callus cultures

- of *Cucumis melo*, *Z. Pflanzenzuent.*, **96**, 82-85 (1986)
13. Munger, H.M. and Robinson, R.W., Nomenclature of *Cucumis melo*, *Cucurbi Genet. Coup. Rep.*, **14**, 43 (1991)
14. Afify, A. Cytological studies in the Cucurbitaceae and their evolutionary, *J. Genetics*, **46**, 116-124 (1944)