

KARYOMORPHOLOGICAL COMPARISON IN FOUR VARIETIES OF *SOLANUM MELONGENA* L.

MST. RASHIDA AKTER AND ASHMA AHMED WARASY

Department of Botany, Jahangirnagar University,
Savar, Dhaka-1342, Bangladesh

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Abstract

The orcein stained karyomorphology of four varieties of *Solanum melongena* L. (BARI Begun-5, 6, 7 and 8) were compared. The staining property of interphase nuclei in BARI Begun-5, 7 and 8 were simple chromocentric type while it was diffuse type in BARI Begun-6. The prophase chromosomes of these four varieties showed gradual staining from one end to another. All these four varieties were found to possess $2n = 24$ chromosomes. BARI Begun-5 and BARI Begun-6 possessed most heterogenous karyotypes consisting of metacentric, submetacentric and acrocentric chromosomes. The other two varieties had metacentric and submetacentric chromosomes. Therefore, among the four varieties of *Solanum melongena* L., BARI Begun-5 and 6 are relatively advanced than BARI Begun-7 and 8.

Introduction

The genus *Solanum* belongs to Solanaceae consisting of about 1400 species (Cronquist 1981, Mabberley 1987). Most of the *Solanum* species have considerable economic importance. The economically important species of this genus are *Solanum tuberosum*, *S. lycopersicon* and *S. melongena* (Rowe 1969). *Solanum melongena* is commonly known as eggplant and an important crop consumed mainly as cooked vegetables besides the fruits are roasted, fried, stuffed, cooked as curry pickled in many countries all over the world particularly in Bangladesh, India, Srilanka, Indonesia, China, Bulgaria, Italy, France, USA and several African countries (Sidhu *et al.* 1980). Bangladesh Agricultural Research Institute (BARI) was able to release different cultivars and varieties of *S. melongena*. These were characterized solely on the basis of their morphological features. This type of characterization sometimes may create problem since due to phenotypic plasticity a specimen shows different morphology in various environment. This problem could be overcome by karyomorphological study because karyotypic features are specific for each specimen. In this research work, an attempt was undertaken to characterize four eggplant varieties released from BARI *viz.* BARI Begun-5, BARI Begun-6, BARI Begun-7 and BARI Begun-8 by karyomorphological features.

Materials and Methods

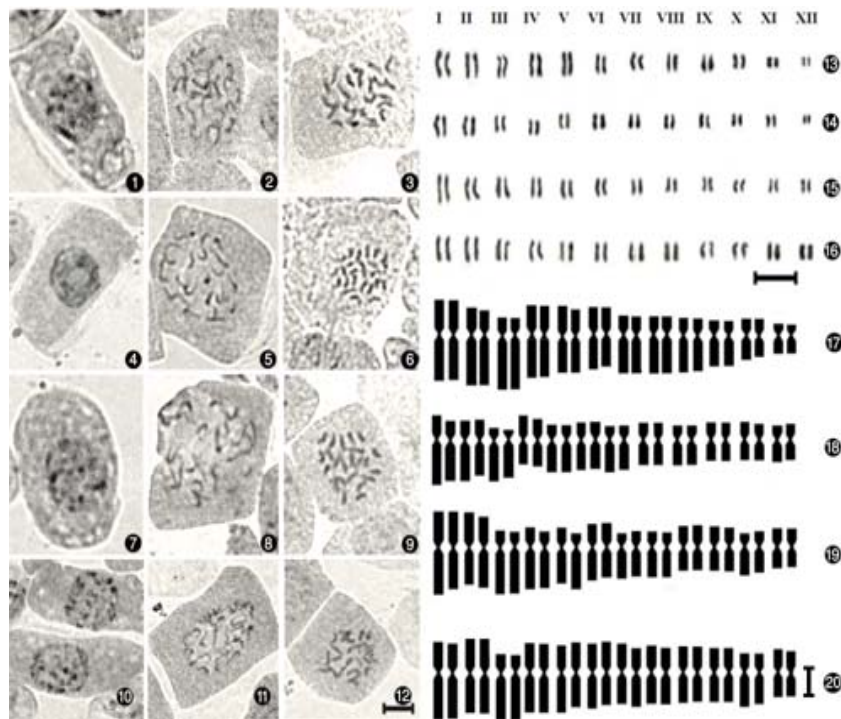
Seeds of four varieties of *Solanum melongena* L. (BARI Begun-5, BARI Begun-6, BARI Begun-7 and BARI Begun-8) were collected from BARI and sowed in the Botanic garden of Jahangirnagar University. The young healthy roots of these four varieties were collected at 9:30 a.m. in the winter season and at 9:00 a.m. in the summer. These were washed by tap water and cut 0.5 cm below the tips. The tips pretreated with cold water for 30 min at room temperature (25 - 30°C) followed by 15 min fixation in 45% acetic acid at 4°C. The pretreated root tips were hydrolyzed in a mixture of 1N HCl and 45% acetic acid (2 : 1) at 60°C for 28 sec and stained with

*Author for correspondence: <aawarasy@yahoo.com>.

1% aceto-orcein for 2:30 hrs and then squashed. The slides were observed under advanced Trinocular microscope (Olympus-D.P. 72, Japan) under 100X magnification at Wazed Meah Science Research Institute, Jahangirnagar University.

Results and Discussion

Orcein stained interphase nuclei of BARI Begun- 5, 7 and 8 showed a few small darkly stained heterochromatic regions (Figs 1, 7 and 10). Distinct nucleolar boundary without nucleolus was observed in these three varieties. The nature of interphase nuclei of BARI Begun-5, 7 and 8 was simple chromocenter type (Tanaka 1971). On the other hand, no heterochromatic body was found in the nucleus of BARI Begun-6. Instead, the chromatin fiber was more or less homogenously distributed in the interphase nuclei revealing diffuse type (Tanaka 1971). A distinct nucleolar boundary with a big prominent nucleolus was found of this variety (Fig. 4). Moreover, Fawzia and Alam 2011 reported the complex chromocentric type for BARI Begun-5. The presence of prominent nucleolus in interphase nuclei indicates the active transcription of rDNA. Thus the presence nucleolus in interphase nucleoli of BARI Begun-6 made it different from the other varieties.



Figs 1 - 20. Different mitotic phases after orcein staining in four varieties of *Solanum melongena* L. BARI Begun-5, BARI Begun-6, BARI Begun-7 and BARI Begun-8. 1. Interphase nuclei of BARI Begun-5, 2. Prophase chromosomes of BARI Begun-5, 3. Metaphase chromosomes of BARI Begun-5, 4. Interphase nuclei of BARI Begun-6, 5. Prophase chromosomes of BARI Begun-6, 6. Metaphase chromosomes of BARI Begun-6, 7. Interphase nuclei of BARI Begun-7, 8. Prophase chromosomes of BARI Begun-7, 9. Metaphase chromosomes of BARI Begun-7, 10. Interphase nuclei of BARI Begun-8, 11. Prophase chromosomes of BARI Begun-8, 12. Metaphase chromosomes of BARI Begun-8, 13. Karyotype of BARI Begun-5, 14. Karyotype of BARI Begun-6, 15. Karyotype of BARI Begun-7, 16. Karyotype of BARI Begun-8, 17. idiogram of BARI Begun-5, 18. idiogram of BARI Begun-6, 19. Idiogram of BARI Begun-7, 20. Idiogram of BARI Begun-8. Bar = 5 μ m for Figs 1-16 and Bar = 1 μ m for Figs 17-20.

The prophase chromosomes of these four varieties showed gradual staining from one end to another with orcein (Figs. 2, 5, 8, and 11). The one end of the chromosomes was darker than the other. Their nature would be recognized as gradient type as per Tanaka (1971). Although the staining properties in the interphase nuclei of these four varieties were quite different, they showed same type of prophase chromosomes. A specimen has the diffuse type of interphase nuclei generally shows continuous type of prophase chromosomes (Sultana and Alam 2016). A specimen has the simple or complex chromocenter type of interphase nuclei generally shows gradient or interstitial type of prophase chromosomes. On the other hand, there is a correlation between diffuse type of interphase nuclei with continuous type of prophase chromosomes and simple or complex chromocenter type of interphase with gradient or interstitial type of prophase chromosomes (Begum and Alam 2016). The result indicated that, BARI Begun-5, 7 and 8 followed the usual rules for staining nature of interphase nuclei and prophase chromosomes. On the other hand, BARI Begun-6 did not follow this usual rule. The probable reason for this unusual result was due to either- (i) facultative heterochromatin accumulation. Or (ii) dissociation of heterochromatic blocks.

These four varieties possessed $2n = 24$ chromosomes (Figs 3, 6, 9 and 12). The centromeric formulae of BARI Begun-5, 6, 7 and 8 were found $8m + 10sm + 6ac$, $10m + 12sm + 2ac$, $12m + 12sm$ and $20m + 4sm$, respectively (Figs 13 - 20 and Table 1). The total length of $2n$ chromosome complements of BARI Begun- 5, 6, 7 and 8 were 50.46, 40.46, 47.01 and 55.19 μm , respectively. Individual chromosome length ranged from 1.05 μm to 2.88 μm in BARI Begun-5, 1.34 to 2.50 μm in BARI Begun-6, 1.4 to 2.98 μm in BARI Begun-7 and 1.64 to 2.88 μm in BARI Begun-8 (Table 1). Fawzia and Alam 2011 reported the same chromosome number in case of BARI Begun-5. The total length of $2n$ chromosome complements of BARI Begun-5 was 38.29 μm , individual chromosome length ranged from 1.11 to 2.13 μm and the centromeric formulae was found $15m + 9sm$. Present study found acrocentric chromosome also in case of BARI Begun-5.

Table 1. Comparative karyotype analysis of four varieties of *Solanum melongena*.

Varieties	2n	Range of chromosomal length (μm)	Total length of 2n chromosome complements (μm)	Centromeric formulae*
BARI Begun-5	24	1.05-2.88	50.46	$8m + 10sm + 6ac$
BARI Begun-6	24	1.34-2.50	40.46	$10m + 12sm + 2ac$
BARI Begun-7	24	1.41-2.98	47.01	$12m + 12sm$
BARI Begun-8	24	1.64-2.88	55.19	$20m + 4sm$

*m = Metacentric, sm = Sub-metacentric, ac = Acrocentric.

Thus the present finding did not support the earlier report. The probable reason for this disagreement was either- (i) deletion of chromosomal part from the short arm of metacentric or sub-metacentric chromosome resulting the formation of acrocentric chromosome or (ii) the specimen (BARI Begun-5) was different cytotype.

The BARI Begun-5 and BARI Begun-6 possessed most heterogenous consisting of metacentric, submetacentric and acrocentric chromosomes (Table 1). The other two varieties had metacentric and submetacentric chromosomes. The karyotype formulae indicated that the former two varieties are more asymmetric and advanced in nature (Stebbin1971). Therefore, the four varieties of *Solanum melongena* (BARI Begun-5, 6, 7 and 8) could be characterized with certain karyotypic parameters.

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