

Study of mitotic interphase and prophase on some economical important bari variants of *Allium L*

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Abstract

Bangladesh Agricultural Research Institute (BARI) released seven variants of *Allium L.* such as BARI piaz-1, BARI piaz-2, BARI piaz-3, BARI piaz-4, BARI piaz-5, BARI patapiaz-1 and BARI chive-1 were analyzed to know the mitotic nature of interphase nuclei and prophase chromosome by using aceto-orcein staining. All the *Allium* variants of the analysis showed homogeneous staining nature in both interphase and prophase that categorized as 'diffuse type' and 'Continuous Type', respectively but differ in presence of nucleoli number in interphase. The details of the current analysis indicate that mitotic behavior of interphase nuclei and prophase chromosome of BARI variants of *Allium* are mostly similar and stable in character.

Keywords: *Allium L.*, mitosis, interphase, prophase, aceto-orcein staining

Introduction

Allium L. is one of the most agronomical important genera of Alliaceae family with about 750 species that primarily originated to Central Asia then vigorously distributed in different geographical regions [15]. Nearly 50 species of *Allium* are utilized for human consumption *i.e.* vegetables, spices, medicinal and ornamental plants as wild or cultivars [5, 8]. Among the wide range of species, *A. cepa* (onion), *A. sativum* (garlic) and *A. porrum* (leek) are counted as major crops whereas *A. tuberosum* (chive) and *A. fistulosum* (bunching or welsh onion) considering as minor crop around the world [7]. Due to presence of divergent range of constituents in *Allium i.e.* flavonoids, saponins, organosulfur compounds and soluble fibers, including fructo-oligosaccharides plays beneficial role in human health diet [1, 2, 4, 14]. In *Allium*, various biological properties have been reported including antioxidant, antimicrobial, antiasthmatic, prebiotic activities and immunomodulatory [18].

A mentionable amount of earlier reports has been found on *Allium* genus in different sectors of crop identification and improvements as they are well accepted vegetables and spices along with medicinal and biological activities worldwide [6, 7, 9, 10, 13, 16]. In 2008, Bangladesh was ranked 1st for onion production but due to increasing domestic demands, recently an accountable amount of onion and its related species has to import from other countries to fulfil its needs [3]. Now-a-days it is important to increase the yield production of *Allium* in Bangladesh to cover its shortage as to demands. Recently, cytological information is as essential as data of molecular analysis to crop identify and improvement whereas nature of mitotic interphase and prophase can be counted as a cytological tool to identify species [11, 12]. Thus, the following analysis has been performed to find out the mitotic type of interphase nuclei and prophase chromosome by using aceto-orcein staining that might provide convenient information for BARI variants of *Allium L.* which further utilize as relevant details in the impending researches for producing high yielding more variants of *Allium*.

Materials and Method

Plant materials

The seven variants of *Allium cepa*, *A. fistulosum* and *A. tuberosum* were collected from the Regional Spices Research Center (RSRC) of Bangladesh Agricultural Research Institute (BARI) and further maintained in the Botanical garden, Department of Botany, Jagannath University, Dhaka (Table-1).

Table 1: List of studied seven BARI varieties of *Allium L.*

Serial No.	Species	Varieties
1.	<i>A. cepa</i>	BARI piaz-1
2.	<i>A. cepa</i>	BARI piaz-2
3.	<i>A. cepa</i>	BARI piaz-3
4.	<i>A. cepa</i>	BARI piaz-4
5.	<i>A. cepa</i>	BARI piaz-5
6.	<i>A. fistulosum</i>	BARI patapiaz-1
7.	<i>A. tuberosum</i>	BARI chive-1

Slide Preparation

Fresh root tips (RTs) were cut 1-1.5 cm away from the bulbs of five varieties of *Allium cepa* and seedlings of *A. fistulosum* and *A. tuberosum* by a fine forceps. Then, the collected RTs were washed gently with water and soaked by filter paper to remove the surface water.

PDB (Para dichloro benzene) was used as a pre-treating agent for 2h at 20-25 °C and those pretreated RTs were hydrolyzed for 10 s at 60 °C in a mixture of 1N HCl and 45% acetic acid (2:1). After that, the hydrolyzed RTs were soaked on a filter paper and taken on a clean slide in which meristematic region about 0.5 cm was cut with a fine blade. For staining, a drop of 1% aceto-orcein was added to the material and kept in an acetic acid chamber for 1 hour. At first the materials were tapped gently by a tooth pick after placed a clean cover glass on the material and then squashed by placing thumbs. Lastly, the prepared slides were observed under a binocular microscope named XSZ-107BN and the photographs were taken by Euromex CMEX-10 digital USB camera (Holland).

Analytic form

In the following analysis, about 40 to 50 interphase nuclei and prophase chromosome were considered to reveal the nature of interphase and prophase of analyzed seven *Allium* L. variants and then characterized by Tanaka's (1971) classification [17].

Results and Discussion

After orcein staining, all the analyzed seven BARI variants of *Allium* displayed darkly stained homogenous nucleus with some less stained bodies in interphase which regarded as 'Diffuse type' based on classification of Tanaka (1971) [17] (Figure 1). In case of number of nucleolus, two nucleoli were observed in the most analyzed cell of six variants of *Allium* whereas four nucleoli were exhibited by the highest analyzed cells of variant of *A. tuberosum* (Figure 1G). Considering the staining properties of prophase chromosome of seven *Allium* variants, each of them showed homogeneously stained prophase chromosomes along the length which mentioned as 'Continuous type' in Tanaka's classification [17] (1971) (Figure 2). The nucleolus found in the interphase of analyzed seven *Allium* variants were not distinguishing in the prophase of any analyzed variants (Figure 2). According to Tanaka's (1971) [17], the species which showed 'Diffuse type' nucleus in interphase generally had to possess 'Continuous type' of prophase chromosomes. In the following analysis, all the analyzed *Allium* variants had to possess non-localized heterochromatins which expressed by their uniformly distribution into interphase nuclei and that further homogeneously arranged throughout the length of prophase chromosomes; also indicates the appearance of constitutive heterochromatins. Thus, the present highly finding correlates to the Tanaka's (1971) [17] analysis.

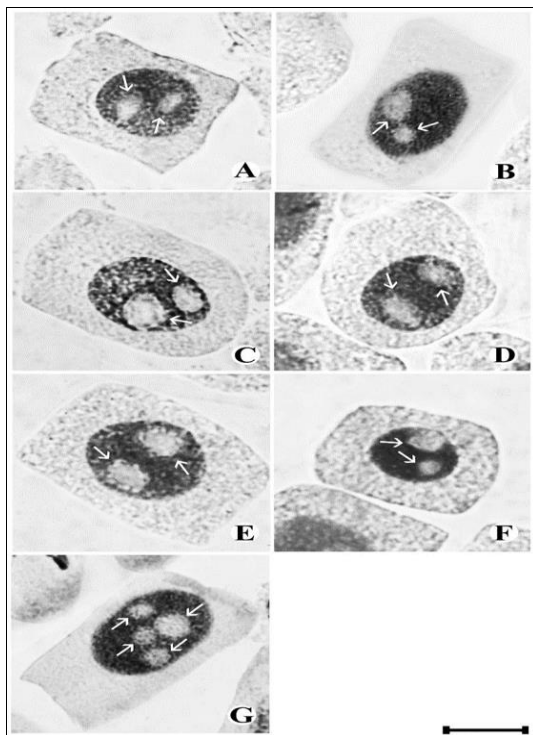


Fig 1: Orcein-stained mitotic interphase nuclei of seven varieties of *Allium* L.: A. BARI piaz-1; B. BARI piaz-2; C. BARI piaz-3; D. BARI piaz-4; E. BARI piaz-5; F. BARI piazpata-1; G. BARI chive-1; Arrows indicate the presence of nucleolus; Scale Bar= 5 μ m.

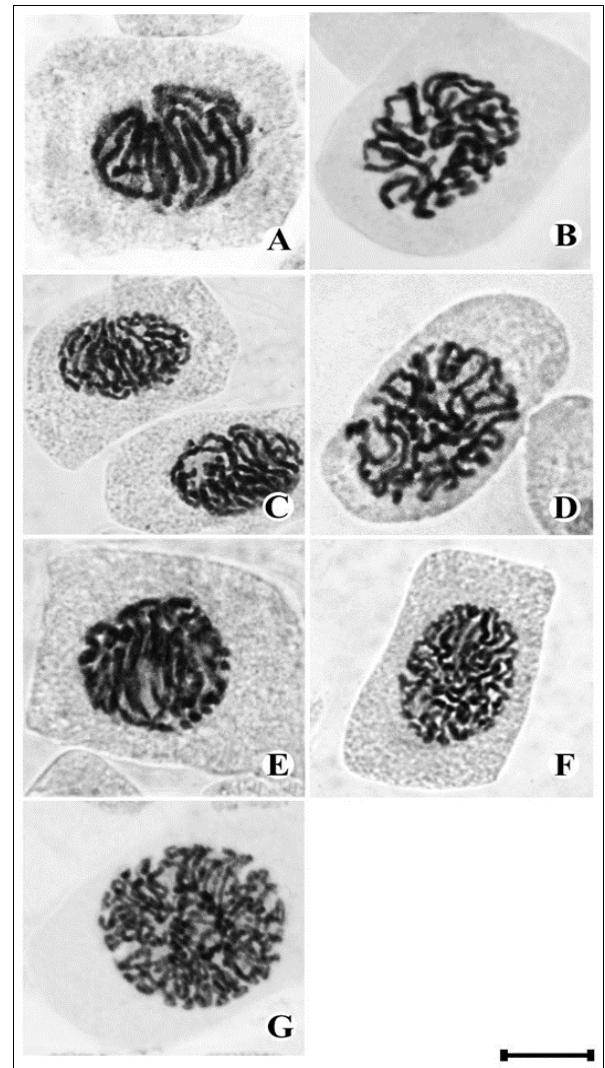


Fig 2: Orcein-stained mitotic prophase chromosome of seven varieties of *Allium* L.: A. BARI piaz-1; B. BARI piaz-2; C. BARI piaz-3; D. BARI piaz-4; E. BARI piaz-5; F. BARI patapiaz-1; G. BARI chive-1; Scale Bar= 5 μ m.

Conclusion

For the *Allium* genus, 'Diffuse type' of interphase nucleus and 'Continuous type' of prophase chromosome can be counted as a stable characteristic. Therefore, it can be concluded that type of mitotic interphase and prophase might be used as an essential means in the cytological analysis and act as informative outline for impending analysis of *Allium* L. from Bangladesh.

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