Agriculture Update
Volume **12** | TECHSEAR-8 | 2017 | 2262-2267
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RESEARCH ARTICLE :

Morphological variation as influenced by colchicine treatment in African marigold

■ **SHANTI R. PATIL,VANDANA S. MADKE, ARATI D. RATHOD, BHAVANA R. WANKHADE AND MAYA M. RAUT**

ARTICLE CHRONICLE :
Received :
20.07.2017;
Accepted :
16.08.2017

SUMMARY : An experiment on effect of colchicine on polyploidy induction in white marigold was conducted in CRD with six treatments and five replications. The seeds of white marigold were treated with 0.0, 0.5, 1.0, 1.5, 2.0 and 2.5 % colchicine at room temperature for 12 hrs. and germinated in protray. Thirty days old seedlings were transplanted in the field with spacing of 45 cm × 30 cm in ridges and furrow. Observations on morphological variations were recorded on each and every plant in each treatment. Reduced stem elongation, slow growth, slower node development as compared to control seedlings, abnormal first 1-2 true leaves were major morphological and growth characteristics observed due to colchicine treatments. These effects on seedling growth were most evident at the higher colchicine concentrations (1.5 to 2.5 %). Maximum number of 12 variant types were observed in 0.5 % colchicine followed by 1 % colchicine which recorded 8 variant types. This study lead to the conclusion that seeds treated with 0.5 % colchicine for 2 hrs. was optimum for inducing variation in marigold. The colchiploid treated marigold plants identified on the basis of morpholoigical variation requires to be confirmed from further cytological studies.

KEY WORDS :
Marigold, Colchicines, Variation

How to cite this article : Patil, Shanti R., Madke, Vandana S., Rathod, Arati D., Wankhade, Bhavana R. and Raut, Maya M. (2017). Morphological variation as influenced by colchicine treatment in African marigold. *Agric. Update,* **12** (TECHSEAR-8) : 2262-2267.

Author for correspondence :
SHANTI R. PATIL
Department of Botany, College of Agriculture, NAGPUR (M.S.) INDIA

See end of the article for authors' affiliations

BACKGROUND AND OBJECTIVES

Marigold is grown for loose flowers, making garlands, decoration during puja and several religious functions, besides its use in landscape gardening. Apart from its significance in ornamental horticulture, it has been valued for other purposes too. The aromatic oil extracted from marigold, is called as "Tagetes oil". It is used in preparation of high grade perfumes and also as an insect fly repellent. Recently dried flower petals of marigold are used as poultry feed in order to improve the colour of egg yolk as well as broiler's skin. Flowers of African marigold can be used for extraction of L-limonene, ocimene, L-linalylacetate, L-linalool. Marigold petals are used for extraction of xanthophylls. Lutein which is the major constituent of xanthophylls is used for colouring food stuffs. Purified extract of marigold petals containing lutein dipalmitate is marketed as an ophthalmologic agent under the name

adaptinol.

Marigold is widely cultivated as bedding plant in landscape design. Beside the pristine uses as loose flower and the bedding plants, marigold occupies anthelmintic, analgesic, anti-inflammatory, aromatic, bronchodilatory, digestive, diuretic, emmenagogue, sedative and stomachic properties. It is also widely used as perfumes, herbal, gulal, organic manure, anticarcinogenic agent, antioxidant in retinotherapy and for oil extraction. The floral extract of marigold is used for treating eye diseases and ulcers. Flowers are important for their economic use as well as aesthetic value. Among the flowers grown by farmers, marigold has its own importance. It has gained popularity among flower growers because of its easy cultivation and wide adaptability. The growers are attracted towards marigold flower as it has a habit of free flowering, short duration to produce marketable flowers of attractive colours having good keeping quality.

Total area under marigold crop in India during the year 2014-2015 was 56.04 thousand ha. with the production of 497.59 thousand metric tonnes of loose flowers and 4.28 lakhs number of cut flowers (Anonnymous, 2015). Flower characters of marigold are generally one of the important aspects that acquire a tremendous attention from morphological breeders and growers. Those of undesired flower characters could possibly be improved by polyploidization. According to Azmi *et al*. (2016) perfection of flower in the floriculture plants have probably been achieved by polyploidy. In recent times, polyploidy program had been used to bring about variation in chromosome number, in order to fill up the needs of the industry. Polyploidy can increase genetic variability and improve flower characteristics, therefore, floriculture is probably the most benefited from this techniques. Those of several previous studies have been showed valuable role of polyploidy in marigold and various crops improvement.

Keeping in mind the above views, this study was planned in white marigold (*Tagetu serecta*, 2n = 2x = 24) using colchicines with the objective of creating more genetic variability, high yield and novel flower characters.

RESOURCES AND METHODS

The seeds of diploid white marigold were collected from Horticulture section of College of Agriculture, Nagpur. Before sowing the seeds were soaked in water for 12 hr and after that water soaked seeds were treated with different concentration of colchicine for 12 hr. The seeds at the rate of 50 per treatment were soaked in aqueous solution of colchicine with a concentration of 0.00 (control), 0.5, 1.0, 1.5, 2.0 and 2.5 per cent w/v at room temperature (25º C) for 12 hrs. Five replication of 10 seeds for each treatment were planted in the holes of protray filled with potting mixture of coco pit and vermicompost which was then gently covered with the soil. Trays were watered lightly with the help of hands. After about 3 to 4 days the seeds started germinating and potential germination was completed within ten days. Thirty days old uniform well developed and healthy seedlings of 10-15 cm length were transplanted in the field with 45 × 30 cm^2 spacing in ridges and furrow. The experiment was conducted in CRD design with five replication. Observation on morphological variation were recorded in each treatment in each replication and isolated.

OBSERVATIONS AND ANALYSIS

The treated plants were regularly observed from germination to harvesting for recording morphological variations. Major morphological and growth habit characteristics observed in seedlings or plants treated with colchicine showed reduced stem elongation, slow growth and slower node development relative to control seedlings, and in some cases, the first 1-2 true leaves were morphologically abnormal eg. wrinkled, subsequent leaves appeared normal. These effects on seedling growth were most evident at the higher colchicine concentrations (1.5 to 2.5%). In consistent with this results Liu *et al*. (2007) also reported morphological differences of the colchiploid plants which included a more compact growth habit, broader and thicker leaves in marigold.

The data recorded on the type of variants along with their frequency are depicted in table 1 and plate 2, 3. Maximum number of variants were observed in the treatment of 0.5 % colchicine followed by 1 % colchicine. Least number of variants were recorded in 2.0 % colchicine followed by 2.5 % colchicine. All the variants identified were labelled and harvested separately. The results on morphological observations revealed that 0.5 % colchicine for 12hrs. is more effective in inducing variation followed by 1 % colchicine for 12 hrs.

In consistent to this result Hanzelka and Kobza (2001) reported 1- 1.5 % colchicine for 5 days to be the

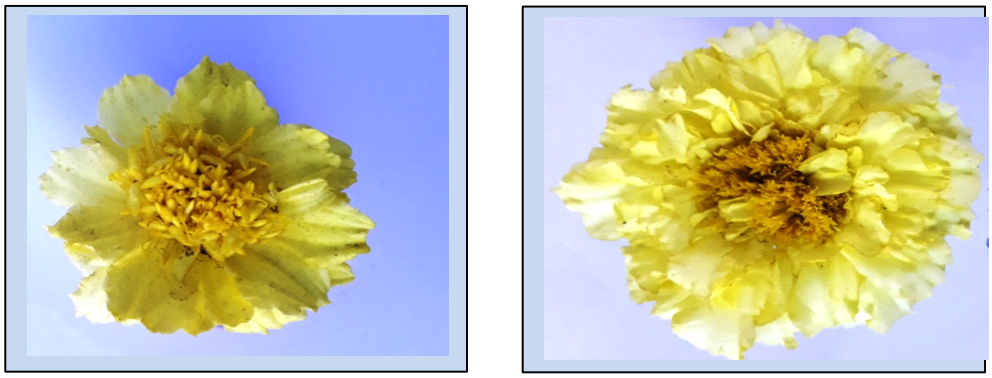
best treatment for variant induction in Aster. Kazi (2013) observed maximum variation with 0.2 % and 0.3 % colchicine for 12 hrs in Marigold. In *Torenia fournieri*, the most effective treatments were 5 ppm colchicine for 1 day and 15 ppm for 3 days which yielded maximum variants as reported by Jiranapapan *et al*. (2011).

The inferences drawn from the data related to morphological revealed that seeds treated with 0.5 % colchicine for 12 hrs. was more effective as this treatment gave maximum number of variants. This treatment also showed favourable influence for the characters studied. Increase in the concentration of colchicine was observed to adversely affect the plants At higher concentration of any chemical/nutrients outside the cell more than that of cytoplasmic concentration the exo-osmosis takes place and cell losses its turgidity and electron also losses out. This might be the reason for adverse effect due to higher concentration of colchicine in the present study. Hence, 0.5 % colchicine was considered as an optimum concentration in marigold. The

Table 1 : Morphological variations induced by various colchicine concentrations

Treatment	Total no. of variants	Type of variant characters	No. of plants showing variant characters
T_0	-	-	-
T_1	12	Tall	11
(0.5 %)		Compact growth	9
		Drooping	2
		Large leaf	19
		Small leaf	3
		Dark green leaf color	19
		Thick leaved plant	3
		Small compact flower	5
		Large flower	17
		Thick and hard stem plant	15
		Thin stem	7
		Profuse branching	10
T_2	8	Plant with single stem	2
(1.0 %)		Dense growth	13
		Large leaf	11
		Small leaf	4
		Dark green leaf	9
		Flower with few petals	2
		Medium size flower	13
		Thick stem plant	9
T_3	7	Plant with single branch	3
(1.5 %)		Dwarf and stunted	6
		Larger leaf	2
		Small leaf	7
		Compact small flower	3
		Medium size flower	6
		Thick stem	4
T_4	2	Tall erect with thick and rigid growth habitat	2
(2.0 %)		Dwarf plant habitat	2
T_5	4	Medium height with dense growth	All plants
(2.5 %)		Small flower	2
		Large flower	1
		Flower with few petals	1

Tall | Compact growth | Droop | Large leaf



Small & compact flower | Large flower

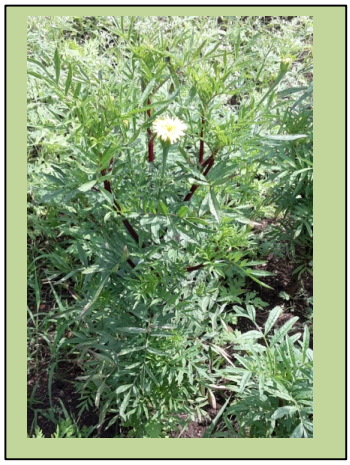
Small leaf | Thick leaved plant Thick & hard stem plant | Thin stem | Profuse branching

Plate 1: Morphological variations induced by 0.5 % colchicine treatment

Plant with single stem

Flower with few petals

Large leaf



Dense growth

Small leaf

Medium size flower

Thick stem plant

Plate 1: Morphological variations induced by 1.0 % colchicine treatment

colchiploid treated marigold plants identified on the basis of morpholoigical variation requires to be confirmed from further cytological studies.

Authors' affiliations :

VANDANA S. MADKE AND ARATI D. RATHOD, Department of Botany, College of Agriculture, NAGPUR (M.S.) INDIA

BHAVANA R. WANKHADE, Department of Dairy Science, College of Agriculture, NAGPUR (M.S.) INDIA

MAYA M. RAUT, Department of Agricultural Chemistry, College of Agriculture, NAGPUR (M.S.) INDIA

REFERENCES

Azmi, T.K.K., Sukma, D., Aziz, S.A. and Syukur, M. (2016). Polyploidy induction of Moth Orchid (*Phalaenopsis amabilis* (L.) Blume) by colchicine treatment on pollinated flowers. *J. Agri. Sci.*, **11**(2) : 62-73.

Hanzelka, P. and Kobza, F. (2001). Genome induced mutation in *Callistephus chinensis* and effect of colchicine application on the early plant development. *Zahardnictvi Hort. Sci.*, **28**(1): 15-20.

Jiranapapan, J., Kikuchi, S., Manochai, B., Taychasinpitak, T., Tanaka, H. and Tsujimoto, H. (2011). A simple method of chromosome doubling using colchicine in Torenia (*Linderni aceae*), and the behavior of meiotic chromosome in amphidiploids. *Chromosome Sci.*, **14**: 29-32.

Kazi, N.A. (2013). Effect of colchicine on growth and flowering of China aster (*Callistephus chinensis* Nees.). *Eco. Env. & Cons.*, **19**(1): 83-86.

Liu, G. (2007). Colchicine-induced chromosome doubling in *Platanus acerifolia* and its effect on plant morphology. *Euphytica*, **157**: 145-154.

WEBLIOGRAPHY

Anonnymous (2015). Area, production and productivity of flowers. Ministry of Agriculture and farmers welfare, Gov. of India. *http://www.mafw.gov.in.*