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Full Length Research Article

EFFECT OF INDUCED MUTATION ON LEAF MORPHOLOGICAL CHANGES IN OKRA (*ABELMOSCHUS ESCULENTUS* L. MOENCH)

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ABSTRACT

The seeds of Okra varities Parbhani Kranti and Arka Anamika were treated with physical and chemical mutagen to observe the leaf morphology. The pertinent variations comprised reduction in size of leaves and suppression of leaf lamina. The frequency of leaf morphological changes carrying plants showed correlation with increasing concentration of mutagen. The frequency of leaf morphological changes carrying plants increased in gamma ray treatment in both the varieties of okra. The 20kR gamma ray treatment showed maximum frequency of leaf changes in Parbhani Kranti and Arka Anamika okra varieties.

INTRODUCTION

Okra is a good source of carbohydrates, minerals, vitamin-A and vitamin-C. It is stuffed with meat or cooked into soup. It is also canned and dehydrated for off-season consumption by army at high altitudes and for exports. Seedlings emerge from soil and cotyledons unfold and the first pair of leaves becomes visible at the tip of the shoot axis. Leaves are produced in alternate phyllotaxy. Leaves are broad with five lobes or are reduced into 3 to 5 lobes (Basha and Rao, 1988). Leaves are green, large, deeply lobed having sparse hairs and vary in intensity of green colour. Cultivars having light green, dark green leaves are on record. The angle of petiole on the main stem could be semi erect, horizontal or having down. Petiole is sparsely haired. Okra leaves are large, broad, heart shaped with lobes. They are used in preparation of medicines to reduce inflammation in Turky (Mehta 1959). In commercial cultivars of okra the leaves are simple with shallow incision having 16.2 cm length and 15.3 cm width (Singh et.al, 1974). Leaves are deeply lobed with narrow leaflets in the top 1/3 portion of the plant.

MATERIALS AND METHODS

Healthy and dry seeds of the varieties Parbhani Kranti and Arka Anamika of okra having uniform size and equilibrated to the moisture level of 12% were packed in small polythene covers and sealed for physical mutagen administration. The seed samples were exposed to doses of 5kR, 10kR and 20kR of gamma rays at the dose rate mentioned previously. The different concentrations used for chemical mutagenic treatments were 0.05%, 0.10% and 0.15% for EMS and 0.01%, 0.02% and 0.03% for SA, respectively. Immediately after the completion of treatment, the seeds were washed thoroughly under running tap water. Later on they were subjected to post-soaking in distilled water for one hour. For each treatment, a batch of 300 seeds was sown in field following randomised block design (RBD) with three replications along with controls for raising the M_1-generation. The seeds were sown at a distance of 30cm between plants and 45cm between rows. Individual plant was bagged to avoid cross-pollination. The various leaf abnormalities were noted mutagen wise and variety wise, separately.

RESULTS

In all treatments it was observed that the leaves of the plants exhibited various shapes and sizes. The leaf variations comprised (i) suppression of leaf lamina, and (ii) reduction in size of leaves. The frequency of plants carrying the leaf morphological changes varied from dose/concentration in different mutagens used. Of the three mutagens the gamma rays, especially its 20kR dose succeeded in inducing the highest frequency (16.21% and 15.42%) of the plants with leaf abnormalities in Arka Anamika and Parbhani Kranti. The

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lowest frequency of leaf changes carrying plants (5.43% and 1.28%) could be noted at 0.05% EMS in variety Parbhani Kranti and at 0.10% EMS in variety Arka Anamika.

Table 1. The effect of mutagens on the frequency of plant carrying leaf morphological changes in *Abelmoschus esculentus* (L.) Moench

Variety : Parbhani Kranti

Mutagen	Dose	Frequency of plant carrying leaf morphological changes (%)
Control	-	00
Gamma rays	5kR	7.58
	10kR	12.03
	20kR	15.42
EMS%	0.05	5.43
	0.10	11.14
	0.15	10.38
SA%	0.01	7.02
	0.02	11.36
	0.03	10.00

⬅ SE = 1.03

Table 2. The effect of mutagens on the frequency of plants carrying leaf morphological changes in *Abelmoschus esculentus* (L.) Moench

Variety : Arka Anamica

Mutagen	Dose	Frequency of plants carrying leaf morphological changes (%)
Control	-	-
Gamma rays	5kR	6.34
	10kR	11.12
	20kR	16.21
EMS%	0.05	3.97
	0.10	1.28
	0.15	5.03
SA%	0.01	6.42
	0.02	5.51
	0.03	7.78

⬅ SE = 1.45

DISCUSSION

Leaf morphological changes could be seen in the M1 population of both Parbhani Kranti and Arka Anamika okra varieties. The pertinent variations comprised reduction in size of leaves and suppression of leaf lamina. The frequency of leaf morphological changes carrying plants showed correlation with increasing concentration of mutagen. The frequency of leaf morphological changes carrying plants increased in gamma ray treatment in both the varieties of okra. The 20kR gamma ray treatment showed maximum frequency of leaf changes in Parbhani Kranti and Arka Anamika okra varieties. Bhasha et.al (1988) reported the morphological changes causing notching of leaf tip by gamma ray and sodium azide treatment. Jambhale and Nerkar (1980) reported compound leaves with 3-5 leaflets by gamma irradiation, having leaflets which are narrow and serrated. Venkatramani (1962) reported inheritance of leaf lobation. The changes in leaf shape and size have been reported by a number of investigators e.g., in beans (Genter and Brown, 1942), Pea (Gelin 1954), Soybean (Zacharias, 1956), black gram (Jana, 1962 and Appa Rao and Jana 1976), winged bean (Hakande 1992) leucern (More 1992), Kothekar (1978) in *Solanum nigrum*, Deshpande (1980) in *Momordica charantia* and Satpute (1994) in safflower. The changes in morphology of leaflets induced by mutagens could be due to changes in physiological and metabolic activities of the developing primordia and the consequent alterations in leaf morphology. Joshua et.al (1972) has correlated development of leaf abnormalities to the pleiotropic action of mutated genes. Chaturvedi and Singh (1978) found bifoliate, tetrafoliate, pentafoliate and wrinkled leaves in *Phaseolus aureus* after EMS and DES treatments. In the present study the leaf morphological changes may have developed due to physiological disturbances and developmental alterations produced in both the varieties of okra.

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