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X-RAY IRRADIATION OF BHENDI (*HIBISCUS ESCULENTUS*) SEEDS

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MUTANTS that influence leaf morphology with little or no apparent influence on other tissues which form a class and which includes changes in the overall size reflecting differences in cell number or size or shape are common[1]. Since leaves obviously participate in the source-sink relationships of plants, the distribution of assimilates between the vegetative and the reproductive portions of the plant is of great practical concern. The aim frequently is to tip the balance in favour of reproductive growth. No definite relationship is evident between the magnitude or severity of change in leaf morphology and the impact that the change may have on the plant's physiological wellbeing[2]. The present study is concerned with studies on X-ray induced radio-stimulation/mutation of leaf area and associated changes in some physiological parameters.

Seeds of *Abelmoschus esculentus* (Bhendi) var. Pusa Savani were soaked for 6 hr in Petri dishes with distilled water and subjected to X-ray treatment with doses of 25, 50 and 75 kW. They were then sown in well-ploughed garden soil.

The protein and the chlorophyll contents were stimated according to the methods of Lowry *et al*[3] and Arnon[4] respectively. The protein content was estimated both in the leaves and fruits in 38–day–old plants. Leaf area was measured using Licor INC portable leaf area meter (model LI 3000). Carbon fixation was measured using the method of Berry *et al*[5] with a slight modification.

The lowest dose (25 kW) caused a maximum increase in leaf area viz. an almost three-fold increase over that of control plants (table 1). There was a slight increase at 50 kW i.e. nearly double the value of control values. There was a decrease with a high dose (75 kW). Mutants that influence leaf morphology form a class which includes changes in overall size (reflecting differences in cell number and/or size) or shape of leaves[6]. In the present study X-ray irradiation caused change in the leaf size.

According to Yoshida[7], the dry matter must theoretically correlate with the product of leaf area and photosynthetic rate. Carbon dioxide fixation, protein content in the leaf and fruit as an index of source-sink relationship, total chlorophyll content, chl a, chl b, chl a/b ratio showed corresponding increase with leaf area (table 1) with 25 kW radiation. Although the ratio is nearly equal to that of control leaves, contents of chl a and chl b are relatively higher.

It was noticed that the plant height, the number of fruits, the length and weight of the fruits and the number and weight of the seeds per fruit showed a significant increase indicating a rise in the yield with 25 kW X-ray irradiation (table 2). The effect of X-ray irradiation on fruit and seed growth thus invokes the larger question of source-sink rela-

Table 1 *Effect of physical mutagen (X-rays) on leaf area, carbon fixation, protein content, total chlorophyll, chl a, chl b, and chl a/b ratio*

Treatments	Leaf area (cm^2)	CO_2 fixation ($dm^{-2}hr^{-1}$)	Protein (mg/g f.wt) Leaf	Protein (mg/g f.wt) Fruit	Total chlorophyll	Chl a (mg/g fresh weight)	Chl b (mg/g fresh weight)	Chl a/b (mg/g fresh weight)
Control (no irradiation)	33.9 ±1.8	3.0 ±0.1	2.3 ±0.5	5.2 ±0.3	1.3 ±0.3	1.0 ±0.0	0.3 ±0.4	3.3 ±0.0
25 kW	102.5 ±0.7	8.2 ±0.0	3.9 ±0.3	12.0 ±0.5	2.4 ±0.1	1 8 ±0.0	0.6 ±0.1	3.0 ±0.1
50 kW	58 9 ±0.1	5.1 ±0 1	2.2 ±0.1	5.6 ±0.7	1.3 ±0.0	0.9 ±0 0	0.4 ±0.0	2.2 ±0.1
75 kW	22.5 ±1.6	1.4 ±0.1	1.9 ±0.2	4.0 ±0.1	1.2 ±0.1	0.9 ±0 2	0.3 ±0.0	3.0 ±0.7

Values are the mean of 10 replications; Age of the plant is 38 days.

Table 2 *Effect of physical mutagen (X-ray) on growth and yield in Hibiscus esculentus (L)*

Parameters	Control	25 kW	50 kW	75 kW
Height of the plant (cm)	30±1.0	46±1.0	38±0.6	20±0.2
Number of fruits	12±0.0	16±0.0	12±0.1	8±0.3
Length of fruit (cm)	11±0.4	15±0.3	9±0.8	7±0.9
Weight of the fruit (g)	11±0.4	15.2±1.1	12±0.0	3.8±1.4
Total number of seeds in a fruit	38±0.4	61±1.0	40±1.0	30±0.2
Weight of the seeds (g)	1.5±0.1	1.9±0.1	1.7±0.2	1.6±0.3

The values are the mean of 10 replication ± S.E.

tionship. The doses that suppress the growth of the main shoot (height) may not have a noticeable effect on processes such as photosynthesis, respiration and absorption of mineral substances[8]. In the present study, at higher dose (75 kW) there is a general reduction in plant height which affected the leaf area, the carbon fixation and the protein content thus contradicting the statement made by Vasiliev[8]. Since there is a growing belief that certain developmental processes are regulated through hormonal balances, individual genes in a group that mediate the same plant process may participate by controlling either the promotory or inhibitory effects[9].

Sinnot[1] found that X-ray irradiation can stimulate genes for leaf size. He considers some of the abundant evidence for the existence of genes for size, form and shape. Thus in contrast, Linde-Laursen[10] observed that the number of roots in a mutant barley was reduced, which shows the inhibitory effect of mutations.

A significant increase in the number of roots in the present study (control = 12, 25 kW X-rays = 28) can be regarded as a mutation.

Thus as the genetic information accumulates, it may be possible to select mutants for desirable characters.

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ON THE OCCURRENCE OF *LYCOPERDON PERLATUM* IN *PINUS PATULA* PLANTATIONS IN TAMIL NADU

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During our studies on the ectomycorrhizal fungi associated with *Pinus patula* in Kodaikanal and Nilgiris in Tamil Nadu *Lycoperdon perlatum* was found as one of the predominant fungal species in the plantations. The rhizomorphs from the sporocarps were traced up to the mycorrhizal roots. *L. perlatum* has so far not been reported to be associated with *P. patula*[1] and a good description of this species occurring in India is lacking. Hence the fungus is described below. The colour terminology used is that of Kornerup and Wanscher[2].

Lycoperdon perlatum Pers., Syn. Meth. Fung., 148, (1801), figure 1a–e.