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EFFECT OF PHYSICAL AND CHEMICAL MUTAGENS ON DIFFERENT QUANTITATIVE CHARACTERS IN LENTIL (*LENS CULINARIS* MEDIK.)

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Induced variability was studied in lentil cultivar VL - 1 using gamma rays, EMS (0.5%), different concentrations of sodium azide, combined treatments of gamma rays + EMS and gamma rays + sodium azide. Nine quantitative characters were analysed in M_3 generation. Both positive and negative shift in the means were noticed.

Keywords: *Lens culinaris*; Induced variability.

Introduction

The present paper explains the mutational approach in enlightening the knowledge on various processes relevent for improvement and creation of variability in lentil.

Materials and Methods

Seeds of lentil cultivar VL- 1 were irradiated with three doses of gamma rays (20, 30, 40 kR); 0.5% aqueous solution of EMS for 10, 12 and 14h; 1, 1.5 and 2% sodium azide for 4 hours; combined treatments of GR + EMS for three treatments - 20 kR + 10h, 30 kR + 12 h and 40 kR + 14 h; combined treatments of GR + sodium azide for three treatments - 20 kR + 1%, 30 kR + 1.5% and 40 kR +2%. For each treatment, 100 seeds were used. Seeds were sown in the field maintaining space between the plants and lines.

A total of nine quantitative characters were recorded on twenty five randomly selected plants from each treatment. They are as follows. (i) plant height (cm.) (ii) no. of branches/ plant (iii) days to flowering iv) yield/plant (g) (v) flowers to pod (vi) pods/plant (vii) seeds/pod (viii) seeds/plant and (ix) 100-seeds weight (g). Estimates of mean, standard error, co-efficient of variability (c.v) were calculated for each character.

Results and Discussion

It is generally recognized that considerable genetic variation is released as a result of mutagenic treatments which

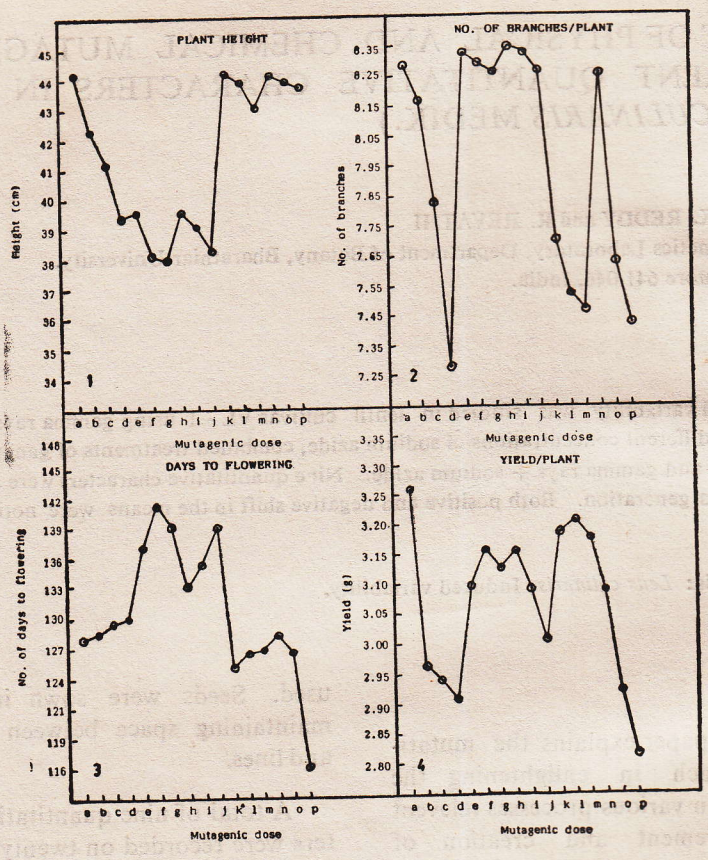

Fig 1

makes selection more effective. In the present study, nine quantitative characters were analysed in different mutagenic treatments in M_1 generation in lentil cultivar VL-1 (Figs. 1-11).

The mean values for plant height, number of branches per plant, yield per plant, pods per plant, seeds per plant, number of seeds per pod were shifted in negative direction, while the mean values for days to flowering, flowers to pods, and 100-seed weight were increased. Decline in the mean values for quantitative characters has been attributed to the result of frequent occurrence of mutations with harmful effects and other cytological disturbances (Mujeeb and Greig, 1973). Reduction in the mean values in several mutagenic treated populations were earlier reported in pulse crops like lentil (Kumar *et al*, 1988; Sinha and Singh, 1987) and mung bean (Khan, 1989).

Chemical mutagens cause more reduction of plant height and their effect was reduced in combined treatments by gamma rays. This is in

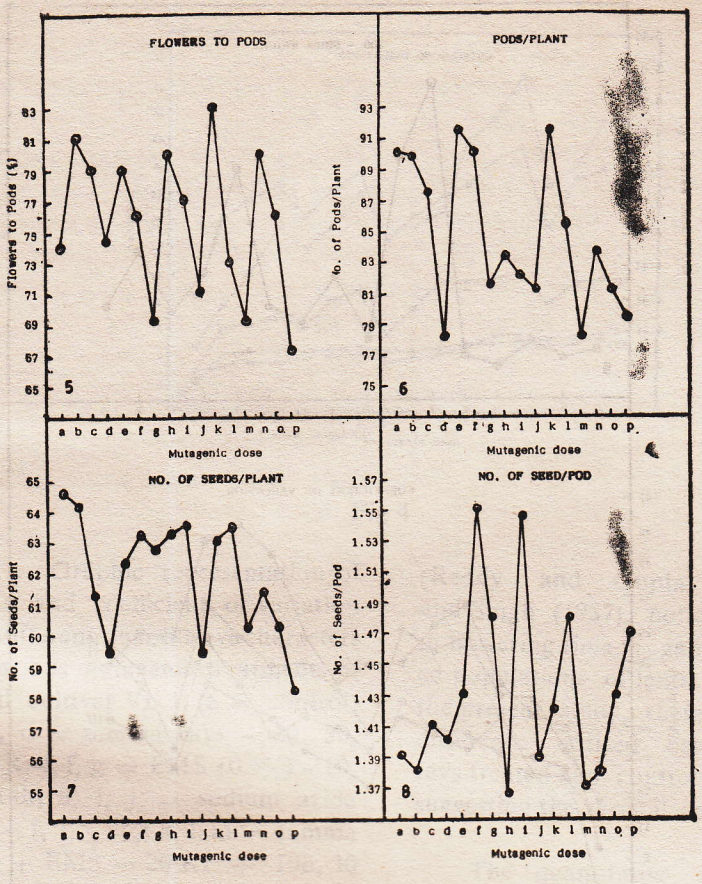

Fig 2

confirmity with earlier report of Sharma and Sharma (1979) in lentil. Plant height was decreased more in individual treatment of chemical mutagens. Similar observations were made in crops like *Vigna* (Krishnaswami and Rathinam, 1982), pigeon pea (Chary and Bhalla, 1988) and lentil (Sinha and Singh, 1987).

The other quantitative characters, number of branches per plant, yield per plant, pods per plant, seeds per plant, seeds per pod, were decreased significantly suggesting that reduction in plant yield is dependent on the reduction of above quantitative characters. Reduction in the plant yield was recorded in mutagenic treatments of lentil (Kumar *et al.*, 1988) and *Vigna* (Kundu and Singh, 1981). Muehlbauer and Miller (1971) recorded reduction in pod number in lentil which was due to a reduction of pods/peduncle. Nandan and Pandya (1980), observed that in lentil the yield was mainly governed by number of pods/plant and number of branches/plant, while Singh

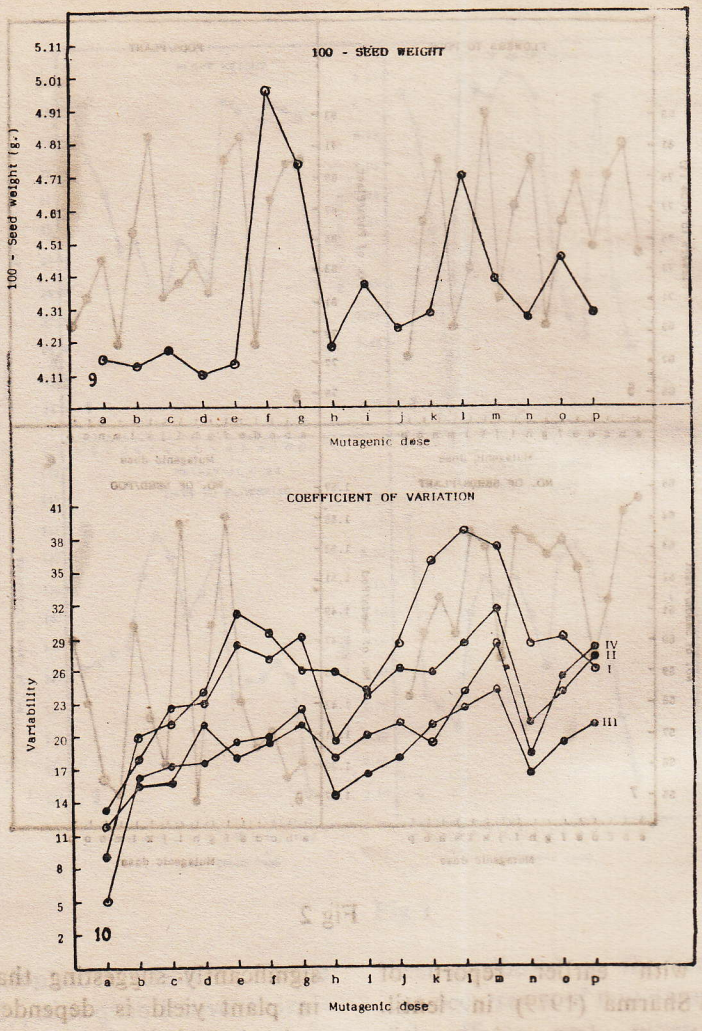

Fig 3

(1977), observed a positive correlation between plant height and pod number with plant yield. The present results, therefore, confirming that reduction in the yield in mutagenic populations of lentil is due to reduction in the plant height, number of branches per plant, pods per plant and seeds per pod. The character, flowers to pod increased either significantly or non-significantly in all mutagenic treatments. The number of pods per plant was decreased in the mutagenic population, suggesting that, increase in the number of flowers contributing for pod formation has no effects in increase in pod number and, therefore, flowers to pod may not be a primary yield contribut-

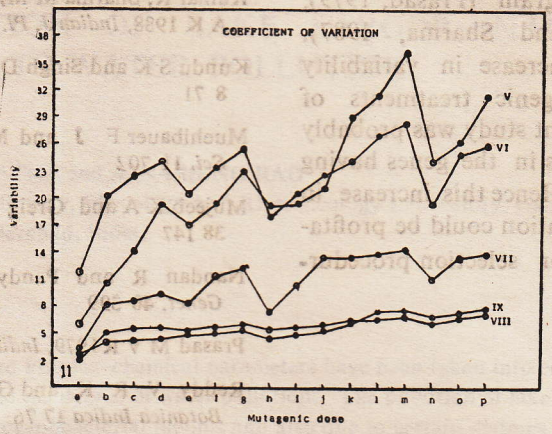

Fig 4

Figs. 1-11. Graphic representation of mean and coefficient of variation for different quantitative characters in various mutagenic treatments of lentil cultivar VL 1. (a = control; b, c, d = gamma rays - 20, 30, 40 kR; e, f, g = EMS (0.5%) - 10, 12, 14h; h, i, j = sodium azide (4h) - 1, 1.5, 2%; k, l, m = gamma rays + EMS = 20 Kr + 10h, 30 kR + 12h, 40 kR +14h; n, o, p= gamma rays + sodium azide = 20 kR +1%, 30 kR + 1.5%, 40 kR + 2%; I= Plant height, II = No. of branches/plant; III = days to flowering; IV = yield/plant; V = flowers to pods; VI = pods/plant; VII = no. of seeds per plant; VIII = no. of seeds/pod; IX = 100 seed weight).

ing character in lentil. The mean values for days to flowering were increased in mutagenic treatments. Similar observations were reported in black gram (Kundu and Singh, 1981), triticale (Reddy and Gupta, 1989). Sinha and Singh (1987), noticed a reduction in flowering time in gamma rays treated populations of lentil. However, in the present study, there was not much difference noticed between gamma rays treated and controlled population suggesting the varietal variation.

The quantitative character 100-grain weight did not change much and the decrease and increase recorded in various mutagenic treatments were insignificant. No significant differences in grain weight were noticed in mutagenic populations of mung bean (Khan, 1989). However, this result was not in confirmity with Singh (1977), who recorded a positive correlation between plant yield and 100-grain weight. In the present study the, coefficient of variation was considerably increased mutagenic treatments. Increase in coefficient of variability due to various mutagens were earlier reported in several crops such as *Cicer* (Kale *et*

al., 1980), greengram (Prasad, 1979), lentil (Sarkar and Sharma, 1987). Therefore, the increase in variability in all the mutagenic treatments of lentil in the present study was probably due to mutations in the genes having additive effect. Hence this increase in coefficient of variation could be profitably exploited for selection procedures.

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