EFFECT OF RADIATION ON BROAD BEANS, VICIA FABA L.

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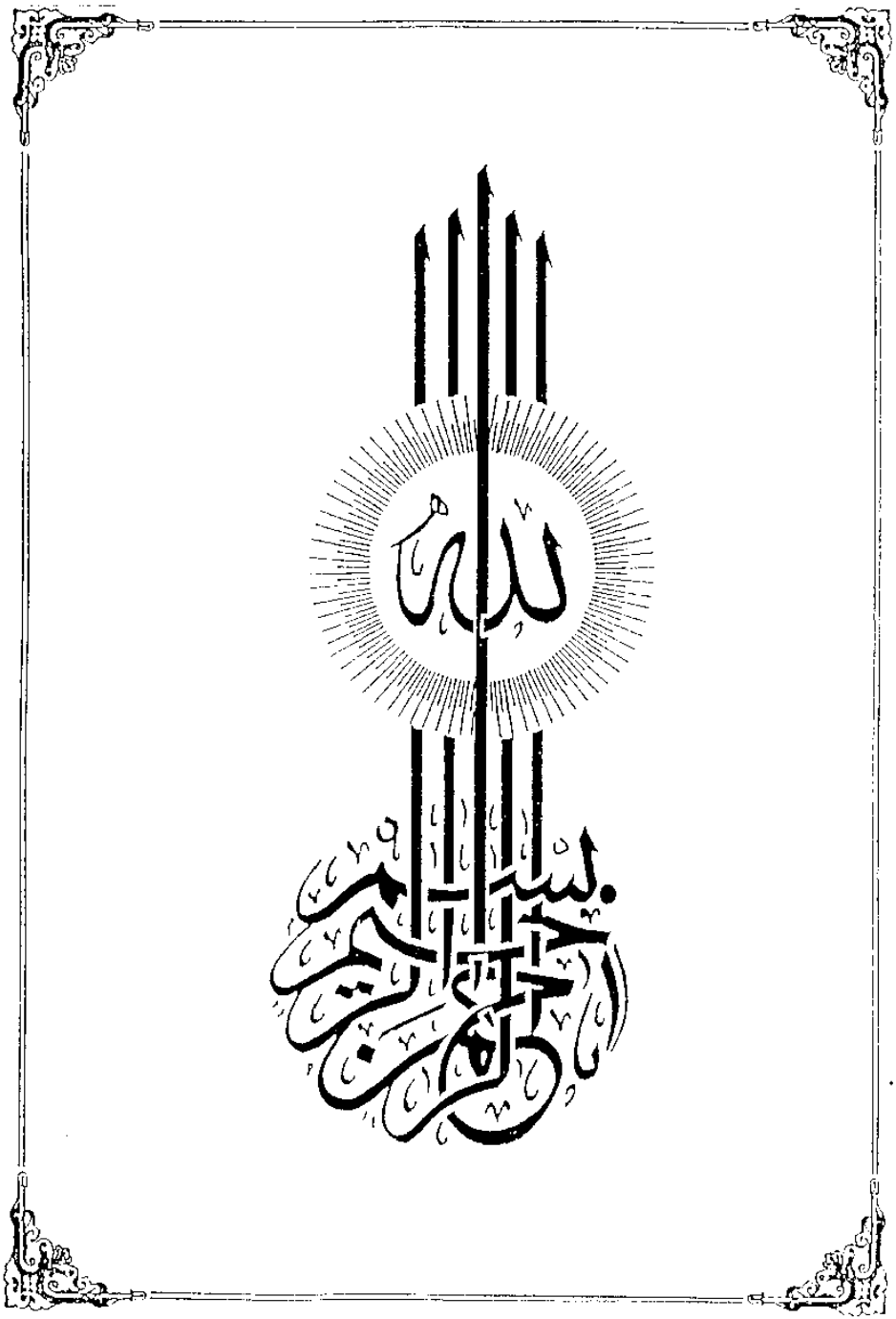

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CONTENT

I- INTRODUCTION

Producing field beans varieties, Vicia faba L.of high quality and good agronomic characters have been one of the main objectives of plant breeders and agronomists. They have devoted much of their efforts to produce new varieties fulfilling these objectives. There has been an increasing interest in the utilization of mutagenic agents as a tool to induce genetic variation in crops that lack natural variation or when the hybridization technique is tedious or expensive. It should be pointed out also that induced mutations are thought to complement and may help to extend the range of natural variation.

Dry seeds of two field beans varieties were exposed to various doses of gamma radiation. The irradiated seeds were sown at three planting dates during the first generation following radiation (R_1). Seeds produced from the R_1 selected plants of all treatments at the three planting dates were sown at one planting date during the second generation following radiation (R_2).

The main objectives of the present work are:

a) To provide estimates with respect to some growth and yield components characters under various planting dates during the first generation.

b) To obtain informations concerning some growth and yield components during the second generation.

c) To persuade the variability of cytological aberrations in the first meiosis division during the first generation.

d) To determine the rate of morphological abnormalities during first and second generations.

These estimates and informations would be necessary for breeders and agronomists to improve field beans.

II. REVIEW OF LITERATURE

In general, the literature presented here will be mostly dealing with field bean plant except in few noted cases it will be on other crops. This presentation will be under the following main headings:

A- Planting dates

Zahran and Zaghloul (1948) found that the number of days from planting to the appearance of first inflorescence varied from 29 to 50 days for planting dates 1/10 and 1/12/1947, respectively. Hamid (1953) illustrated that number of days from planting to the appearance of first inflorescence varied from 54 to 56 days for planting dates 18th November and 18th December, respectively. Mohamed (1972) working on field bean variety Giza 2, found that the mean numbers of days from planting to first inflorescence appearance were lesser in case of early plantings. Deremne (1966) found that all sowings up to mid March reached maturity together 3 weeks ahead of the control.

Zahran and Zaghlould (1948) found that plant height at harvest varied from 168.5 to 89.6 cm for planting dates 1/10 and 1/12/1947, respectively. Listowski et al. (1966), working on horse bean, revealed that plant

height decreased from 157.6 to 107.7 cm for planting dates 24/10 and 3/12/1966, respectively and from 153.4 to 115.7 cm for planting dates 14/10 and 3/12/1967, respectively. Mohamed (1972) revealed that the mean plant daily growth tended to decrease by delaying planting date. These means were 0.98, 0.87 and 0.69 cm for 8/11 23/11 and 8/12/1967 plantings, respectively and they were 1.22, 1.21, 0.88 and 0.68 cm for 23/10, 8/11, 23/11 and 8/12/1968 plantings, respectively.

Slomnická and Nothmann (1962) proved that delay in planting date from 17 September to 17 November decreased greatly the number of branches per plant. Maher (1969) found that the number of branches per plant decreased from 3.0 to 2.1 for planting dates 29/10 and 3/12/1966, respectively and from 2.6 to 1.9 for planting dates 14/10 and 3/12/1967, respectively. Salem (1969) found that the number of seeds per pod were 2.98, 3.09, 3.10 and 3.02 for planting dates 28/10, 13/11, 28/11 and 12/12/1966, respectively and they were 2.95, 2.97, 3.09 and 3.03 for planting dates 26/10, 6/11, 27/11 and 17/12/1967, respectively. Mohamed (1972) indicated that the mean number of seeds per pod at harvest decreased significantly as planting date was delayed till early December.

Zahran and Zaghloul (1948) found that the weight of 100 seeds varied from 72 to 63 g for 1/10 and 1/12/1967 plantings, respectively. Maher(1969) reported that the weight of 100 seeds was 80.0 and 77.7 g for 24/10 and 3/12/1966 planting dates, respectively and it was 77.8 and 60.5 g for 14/10 and 3/12/1967 planting dates, respectively. Salem (1969) found that the weight of 100 seeds decreased from 77.33 to 53.58 g for 28/10 and 12/12/1966 planting dates, respectively and from 74.63 to 57.08 g for 16/10 and 17/12/1967 planting dates, respectively. Mohamed (1972) showed that the weight of 100 seeds decreased significantly by delaying planting date.

B- Varieties

Kooistra (1972) showed, in a germination trial of 280 Phaseolus vulgaris varieties at 9-9.5°C , that good germination results were obtained with varieties of Phaseolus coccineus and a sample of Phaseolus trilobus.

Ibraheem (1954) indicated that the mean number of days from sowing to the date of first flower appearance varied from 60.42 to 63.52 days after sowing according to the varieties. Abdalla (1964) found that the number of days from planting to the appearance of first inflorescence varied from 44 to 47 days according to the variety

Akhundova (1972) showed, in different varieties of broad beans, that in small-seeded late varieties, more flowers were fertilized than in large seeded early varieties.

Bailey(1949) stated that plant height varied from 30-180 cm according to the variety. Block (1958) showed, in five German varieties of bean, that plant height depends on the number and growth of side shoots. Rolands (1958) found, in ten spring varieties of field beans, that these varieties varied significantly from each other in plant growth. Abdalla (1964) found that the mean plant height varied, in different collections of beans, from 77-95 cm in the first season and from 55-75 cm in the second season with highly significant differences between collections in both seasons.

Ibraheem (1954), found that the number of branches per plant varied from 2-7 to 3-4 branches according to the tested Egyptian varieties of beans. Rowlands (1958) showed that the ten spring varieties studied differed significantly from each other in plant height and number of branches.

Rowlands (1958) revealed that the varieties of beans differed from each other in the number of seeds per pod.

Ibraheem (1954) showed that the weight of 100 seeds varied from 69 to 77 g according to the variety. Rowlands (1958) found that the weight of 100 seeds varied from 41.2 to 15.9 g according to the variety.

Abdalla (1964) illustrated that the mean weight of 100 seeds varied from 38-76 to 31-65 g in the first and second seasons, respectively, with highly significant differences between collections of beans. El-saied (1967) found that within the varieties Baladi and Rebaya 34, large seeds emerged earlier and produced larger plants than small seeds, Kambal (1970) showed, in the study of the agronomic characters of some varieties of Vicia faba L., that the comparative studies conducted in the Sudan showed no significant differences in the yielding capacity of Egyptian and local Vicia faba varieties. The local varieties had small seeds and produced more pods per plant, whilest the reverese was true for the Egyptian varieties. Grigoreva et al. (1971) found, in forage broad bean varieties, that the seeds of most varieties studied were cylindrical. Those of the varieties Russian Black and White Russian Garden were flat. Voronova (1972) showed, in 60 varieties of fodder broad bean, that the species fodder vulgaris and the sub-species enfaba contained a large-seeded and a small-seeded variety.

C- Radiation doses

Heringa (1965) found that the percentages of germination in pea at R_1 generation was only slightly reduced when dry seeds of the variety pouli were subjected to irradiation with X-ray, gamma-ray and neutrons. Abo-Hegazi (1968) showed, in Vicia faba variety minor variety Giza 2 treated with acute gamma radiation, that the percentage of seed germination was 98.6% for the dose 0.5 kr and it was 53.4% at the dose 5.0 kr in M_1 generation.

Abo-Hegazi (1968) showed, in vicia faba minor variety Giza 2 by using gamma-Rays, that the earliness of the number of days from sowing to the first flower appearance ranged from 2-5 days by using the doses from 2 to 4 kr. He also showed that the lateness of the number of days from sowing to the first flower appearance ranged from 3 to 9 days by using the doses from 2 to 5 kr. Casarett (1968) reported that high doses of ionizing radiation inhibited growth in plants and small exposure usually less than 5 kr stimulated growth in plants and increased earlier flowering.

Gladston (1958) found, in Blue Lupinus, that a dose of 50 to 60 kr of X-rays was necessary to produce

any reduction at all percentages of survival plants at maturity. Koo (1962) found, in diploid and hexaploid species of Avena treated by X-rays and thermal neutrons, that the survival of the diploid Saia and hexaploid Minhafer differed in both X-ray and thermal neutron treatment. At the 5 kr level, there was little or no reduction in survival in the varieties as compared with the control. However, Saia showed a sharp decrease in survival with increase of X-ray dosage, while Minhafer showed only a small decrease. Tereschenko (1966) reported, that the 5 kr treatment of gamma-rays gave the greatest number of plants with promising agronomic features in the pea variety konkursnyj. He isolated six families from the R_2 that exceeded the control by 26%. Rasmelg (1967) showed, in Vicia faba L. treated with gamma radiation, that plant survival was very sensetive. Casarett (1968) reported that although high doses of ionizing radiation inhibit growth in plants, there are many reports of an apparent growth stimulation by small exposures (usually less than 5000 r). It has been suggested that high doses of radiation may disturb the activity of certain enzymes involved in the synthesis of growth.

Johnson (1938), working on growth of wheat plants taken from dry and soaked irradiated grains, indicated