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INDUCED VARIABILITY FOR HEADING DATE, PLANT HEIGHT AND TILLER NUMBER IN TRITICALE *

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Induced variability for heading date, plant height and tiller number in M_2 populations derived from γ-rays and EMS treated seeds of two triticale varieties namely DR-IRA (T_{33}) and Beagle (T_{937}) has been assessed.

For heading, the varieties responded differently. Earliness was induced in variety Beagle (T_{937}) while a mean response of lateness was induced in DR-IRA (T_{33}). Plant height was decreased in all treatments except EMS treatment of variety DR–IRA. In Beagle progeny of one plant in 25 kR dose produced all dwarf plants with stiff stem. The mutagenic treatments in general have depressive effect on tillers per plant.

Variability was substantially enlarged in all the treated populations of both the varieties.

INTRODUCTION

The most obvious use of amphiploidy has been the development of hexaploid and octaploid triticales Siddiqui [1[. Most attempts to improve the octaploid triticales have failed, and these triticales are mainly of interest as experimental material [2]. Hexaploid triticales (Primary triticales) have proved to be more promising and possess a number of advantages of practical interest to the breeders e.g. increased protein content, quality, resistance to certain fungal diseases and longer spikes with more spikelets per spike and florets per spikelet. However, the use of triticales in the form of commercial varieties is hampered by poor seedsetting, different degree of grain shrivelling, relatively tall plants and susceptibility to lodging, poor threshability and late maturity.

The triticales have a narrow genetic base, because they are derived from a limited number of primary triticales. This narrow spectrum of natural variability has been the major impediment to its improvement. Hence enlargement of genetic variability is obviously urgently needed, so that suitable plant types may be developed. In the present studies, physical (γ-rays) and chemical (EMS) mutagenic agents were employed to enlarge genetic variability and to isolate short culm, lodging resistant early maturing and high yielding mutants. Earlier mutation breeding experiments with triticales reported by Vettel [3] Ramanatha and Joshi [4], Rajpur [5] suggest that variability could be substantially enlarged through induced mutation breeding. Muntzing [2] has suggested that a combination of mutation breeding with conventionl breeding methods should accelerate the process of obtaining the desired plant type in triticales.

In the present paper induced variability for heading date, plant height and tiller number has been discussed.

METARILAS AND METHODS

Thirteen seeds from first spike of each M_1 plant derived from γ-rays and EMS treated populations of triticale varieties namely DR-IRA (T_{33}) and Beagle (T_{937}) were taken, and sown at a distance of 10 cm plant to plant and 30 cm between rows to grow M_2 generation. Desirable segregants such as short culm, lodging resistant, early maturing types were isolated. From rest of the population, twenty M_2 lines were selected at random from each treatment and 5 plants from each were pulled out alongwith roots. In this way 100 plants per treatment were available for observations on plant height, effective tillers per plant, spike length, spikelets per spike, fertility (%), grain yield per plant and 100 grain weight.

RESULTS AND DISCUSSIONS

Days to Heading. For earliness, variety Beagle (T_{937}) showed positive response to both the mutagenic agents, while in variety DR-IRA (T_{33}) on an average the heading was delayed. However, in the treated populations of both the varieties substantial increase in variability was observed

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Table 1: Range, mean, standard deviation and coefficient of variability for days to heading, plant height and tiller number in M_2 generation of Beagle and DR-IRA.

Characters	Variety	Mutagen and dose	Range	Mean	S.D.	C.V (%)
Days to heading	Beagle (T_{937})	Control	58.6 - 62.6	61.1	1.05	1.72
		Gamma-rays (25kR)	51.0 - 65.0	59.8	10.79	18.04
		E.M.S. (0.5%)	57.2 - 65.2	60.9	2.15	3.53
	DR-IRA (T_{33})	Control	60.2 - 64.6	62.3	1.33	2.14
		Gamma-rays (25kR)	62.0 - 69.0	64.35	2.13	3.31
		E.M.S (0.5%)	59.4 - 65.0	62.8	–1.5	2.39
Plant height (cm)	Beagle (T_{937})	Control	88.0 - 108.0	100.0	4.91	4.91
		Gamma-rays (25 kR)	87.0 - 107.0	96.0	5.83	6.07
		E.M.S. (0.5%)	81.0 - 101.0	95.6	5.41	5.38
	DR-IRA (T_{33})	Control	78.9 - 91.8	83.1	3.86	4.65
		Gamma-rays (25kR)	77.0 - 80.0	82.1	4.05	4.93
		E.M.S. (0.5%)	78.3 - 87.15	87.16	5.94	6.82
Tiller number	Beagle (T_{937})	Control	3.8 - 7.8	5.69	0.87	15.29
		Gamma-rays (25kR)	4.0 - 9.0	5.72	1.37	23.95
		E.M.S. (0.5%)	3.4 - 7.0	5.17	0.97	18.76
	DR-IRA (T_{33})	Control	4.6 - 8.2	6.17	0.96	16.56
		Gamma-rays (25kR)	3.0 - 10.0	–5.9	1.55	26.27
		E.M.S. (0.5%)	3.4 - 6.6	4.99	0.97	19.44

(Table 1). Similar results have been reported by Rajpur [5] in triticale and wheat. Increased variabilty in days to heading among treated populations which directly influences the maturity of the crop offers a great scope for the selection of desirable plant types. Earliness in heading and maturity is a desirable character provided the grain yield is not affected adversely.

Plant Height. The average plant height (Table 1) decreased in all the irradiation treatments except for treatment EMS in variety DR-IRA (T_{33}). Such growth reductions have also been reported earlier by Ghafoor *et al.* [6] in barley, Rajpur [5] in triticale and Arain [7] in bread wheat. This reduction in plant height is a desirable character for evolving lodging resistant varieties in cereal crops, especially in triticales which are characterised with weaker straw and are susceptible to lodging. Though the incorporation of dwarfing genes from both wheat and rye has produced strains of a more acceptable plant height but still weaker straw inherited from rye needs further shortening of culm to improve lodging resistance. Progeny of one M_1 plant (Beagle T_{937}, 25 kR γ-rays) produced all dwarf plants with stiff stem (Figs. 1 and 2), which suggests that

Fig. 1. Dwarf mutant in field alongwith control population.

Fig.2. Dwarf mutant (left) control (right).

mutations can be employed in the reduction of plant height.

Tiller Number. Tiller number per plant in cereals is an effective yield component, therefore, the plants with higher tillering capacity are preferred for achieving maximum yield potential. As for results of present investigation (Table 1) the mutagenic treatments have depressive effect for tiller number in both the varieties. The reduction in mean values for tiller number among irradiated populations, when no selection is applied has also been reported by Bhatia and Swaminathan [8] in bread wheat, and Rajpur [5] in triticale. Bhatia and Swaminathan [8] have fruther suggested that such decrease could be due to the deterimental effects occurring most frequently. However, the enlarged variability in treated populations could be instrucmental for selecting high tillering mutants.

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