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COMPARATIVE STUDY ON EFFECT OF EMS, SA AND GAMMA RAYS ON CREATION OF APPRESSED POD IN *BRASSICA JUNCEA* (L.) COSS. & CZERN. CV VARUNA

K.N. Sathawane
S.N.Mor College of Arts, Commerce & Smt..G.D.Saraf Science College, Tumsar

ABSTRACT:
Induced mutagenesis is a useful tool and being used widely to create variability in plants. In the present study, three mutagens, ethyl methane sulphonate (EMS), sodium azide (SA) and gamma rays were used to create morphological variability in *Brassica juncea cv Varuna*. Dry and water pre-soaked seeds were used. EMS and SA treatment with dry seeds were of 12h duration whereas for 12 and 18h water pre-soaked, the treatment duration was 6h. The seeds were also exposed to 10, 20, 30 and 40kR gamma rays. In M1 generation, on maturity, M1 plants were harvested on plant wise basis. M2 generation was raised on M1 plant seeds. In M2 generation, EMS, SA and Gamma rays induced Appressed Pod mutation in variable frequency. Gamma rays induced higher frequency of compared to EMS and SA and breed true for M3 and M4 generations. Appressed pod mutants were characterised for their morphological and yields characters and screened out for crude fibre, crude protein, glucosinolate and Appressed Pod mutation erucic acid contents.

Keywords: mutagenesis, morphological variability and appressed Pod mutation.

INTRODUCTION :

Induced mutagenesis is a useful tool. It is frequently being utilised for creation of new variability in plants of interest. These objectives have been achieved by many workers (Muller, 1927;Goodspeed,1929;Swaminathan,1969).Induced mutagenesis techniques have been used widely in the plant improvement programme in many agriculturally important crops (Gopal-Ayengar et. al.,1971; Robbelen and Nitsch,1975; Bechyne,1976; Ashri 1982;Bhargava and Khalatkar,1983 and Bhatia et.al.,1990). Recent past, report indicated considerable qualitative and quantitative improvement of durum wheat by physical and chemical mutagens. In oleiferous Brassicas also, induced mutagenesis have improved many characteristics of economically importance (Kumar,1972; Robbelen, 1975;Abidi and Hag,1972 Ahmad and Ahmad, 1979; Abraham and Bhatia,1986; and Indurkar and Khalatkar,1995). Keeping in mind, these contributions and success, investigation was planned to create new variabilities in term of morphology, quantitative and qualitative improvements in Varuna cultivar of Brassica *juncea* through induced mutagenesis technique. In the present study, comparative effect of EMS, SA and Gamma rays was investigated on induced appressed pod mutant plant with respect to quantitative parameters like flowering days, height of plant, branches, pod numbers, pod length, seed per pod, seed weight and qualitative characteristics like crude fibre, crude protein, glucosinolate and erucic acid contents.

MATERIAL AND METHOD:

Genetically pure and physiologically uniform seeds of *Brassica juncea* cv Varuna were obtained from Central Institute for Cotton Research, Nagpur. Dry and water pre-soaked seeds were used in mutagenic treatments. Dry seeds were treated with EMS and SA for 12h and 12h and 18h, water pre-soaked seeds were treated with EMS and SA for 6h. Dry seeds (6% moisture) were also irradiated with 10,20,30 and 40kR gamma radiations in Co^{60}, gamma cell installed at Regional Sophisticated Instrumentation Centre, RTM Nagpur University. Immediately after the chemical mutagenic treatments, the seeds were thoroughly washed in distilled water. Mutagenized seeds with control seeds were sown in experimental field in separate lines. The M1 plants were harvested individually and seeds were used to raise M2 generation. Appressed pod mutations were scored in M2. The selected mutants were tested up to M4 generations. Morphological mutants - the Appressed pod type plants were screened for quantitative parameters like days to flower, height of plant, branches, pod numbers, pod length, seed per pod, seed weight and also for qualitative parameters like Glucosinolate level tested by Tes- tape method(Mc Gregor and Downey, 1975), erucic acid by paper

chromatography (Thies, 1971). The crude protein estimated by Semi Microkjeldahl method and crude fibre content was also known.

RESULTS AND DISCUSSION

In the present study, appressed pod mutant (APM) at different frequencies was induced by EMS,SA and gamma rays in M2 generation. Of these mutagens, the gamma rays induced relatively higher frequency of APM than EMS and SA(Table 01). In dry 18h seed treatment both EMS and SA induced APM in higher doses. In water pre-soaked treatments of 12h and 18 h, EMS induced 0.02% frequency of APM. These were also recorded in both 12h and 18 h pre-soaked SA treatment. However, the lower dose of SA in 12h pre-soaked induced more mutations than that of 18h pre-soaked of SA. Moreover, 12h pre-soaked SA treatment induced higher frequency of APM compared to 12h pre-soaked of EMS. Gamma rays induced 0.11% APM in 30 kR dose. M2 induced APM were sown to raise M3 and M4 generations. EMS and SA induced APM did not bred true in M3 and M4 generations except for gamma rays (Table 02). Qualitatively and quantitatively APM is comparable with control Varuna (Table 03).

Results obtained in the present investigation show that radiations are more effective than EMS and SA in inducing APM in *Brassica juncea* as reported by earlier worker (Rai,1958; Nayar and George, 1969) . The APM resembles the pod arrangement in *Brassica nigra* . *Brassica juncea* is believed to be an amphidiploids of *B. nigra* with appressed pod and *B. campestris* with open pod arrangement . Thus the appressed pod arrangement in APM shows a pod arrangement of one of the putative parent. APM reduced the unit area requirement for raising the plants due to its close pod arrangement and branches. This can increase the seed rate per unit area ultimately increasing the production in a limited area with better agronomical practices. APM is comparable to control Varuna in number of pod ,pod length, branches per plant and 1000 seed weight (Table 03).The pods of the mutant are, relatively non-shattering, consequently yields more seeds per plant. However, with increase in yield per plant the protein and fibre content decreased while glucosinolate level was ++ as compared to +++ of control Varuna. The Erucic acid level was same as control. The reduction in crude fibre would help towards enhanced digestive energy value of animal feed besides lower glucosinolate than control and high yield are attractive features of appressed pod mutant.

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Table No.1 : M2 Frequencies of A P M in EMS, SA and Gamma Rays

S. No.	Treatment	Total No. of plants screened/harvested	Appressed pod mutant in M2
1	Dry control	4500	Nil
	Dry 18h EMS		
2	0.008%	4350	2(0.04)
3	0.01%	4290	1(0.02)
1	12h PSW control	4500	Nil
	12h PSW+ 6h EMS		
2	0.01%	4455	1(0.02)
1	18 PSW control	4500	Nil
	18h PSW+ 6H EMS		
2	0.01%	4425	1(0.02)
1	Dry control	4500	Nil
	Dry 18h SA		
2	0.008%	4380	2(0.04)
1	12h PSW control	4500	Nil
	12h PSW+ 6h SA		
2	0.01%	4425	2(0.04)
1	18h PSW control	4500	Nil
	18h PSW+ 6h SA		
	0.01%	4500	1(0.02)
1	Gamma Rays control	6000	Nil
2	30 kR	4410	5(0.11)

Table NO. 2: Inheritance pattern of M2 APM in M3 and M4 generations

S. No.	Generation	Type of Mutagens		
		EMS	SA	Gamma Rays
1	Non Segregating M3 progeny (%)	0	0	20
2	Segregating M3 progeny (%)	100	100	80
3	Non Segregating M4 progeny (%)	0	0	100
4	Segregating M4 progeny (%)	0	0	0