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Short Communication

An Assessment of Induced Variability in M_2 Progenies of Coriander

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Coriander (*Coriandrum sativum* L.) is one of the important seed spice crops of India (Purthi, 1976) with large domestic consumption and a bright export potential. Rajasthan state has 1,37,670 ha area under the crop, with the production of 1,44,951 t (Anonymous, 1995-96), thus constituting 40-50% of the total area, as well as production of the country. The dry climate of the state, particularly during crop maturity, promotes the quality of produce. However, the crop suffers from low productivity (5-6 q ha^{-1}) on account of the lack of high yielding varieties, high incidence of diseases and pests, and poor adoption of improved package of practices (Sharma, 1994). Studies on the germplasm collection revealed that a genetic variability in respect of yield and yield attributes is limited, restricting the progress of crop improvement. Controlled hybridization to exploit limited variability is difficult due to small flower size. Keeping these in view, an attempt was made to use physical (gamma rays) and chemical (Azide + hydroxyl amine) mutagens to create variability in respect of yield and yield traits in M_2 progenies of coriander variety RCr-20.

The experimental material consisted of 192 M_2 progenies, 83 arising from 15 kR gamma rays (Source ^{60}Co, IARI), 2 from 20 kR, 19 from Azide (1 mM), 45 from Azide + 15 kR, 10 from Azide + 20 kR, 20 from hydroxyl amine (1%), 12 from hydroxyl amine + 15 kR and 1 from hydroxyl amine + 20 kR treatments. Each M_2 progeny was corresponded to single M_1 plant of the coriander variety RCr-20, which was selfed to obtain M_2. The M_2 progenies were sown in a plot consisting of 3 m long single row. The plots were spaced 30 cm apart, with 10 cm distance between the plants.

The data recorded on yield and various yield attributes were subjected to analysis of variance. The source of variation, their

Table 1. Analysis of variance in M_2 generation

Sources of variation	D.F.	S.S.	Expected M.S.	F-Value
Inter-progeny	(p-1)	V_{BP}	$\sigma_{WP} + n\sigma_{BP}$	V_{BP}/V_{wp}
Intra-progeny	p (n-1)	V_{WF}	σ_{WP}	V_{wp}/V_c
Control	nc-1	V_c	σ_c	

p = number of progenies; n = number of plants in each progeny; σ_{WP} = intra-progeny variance (within); σ_{BP} = inter-progeny variance (between); Vc = within control variance; nc = number of plants in control.

degrees of freedom with expectations of mean squares are given in Table 1.

From the components of variance, magnitude of coefficient of variation for each progeny was calculated. The mean c.v. values were used to identify desirable progenies.

The results revealed that inter-progeny mean squares were highly significant for all the traits, suggesting induction of variation in respect of all the characters studied. This finding also indicates that different loci/genes are mutated in the seed lot subjected to treatment. The intra-progeny variance in respect of all the traits was, however, non-significant. Singh *et al.* (1992) also reported non-significant intra-progeny variance for yield and yield attributes in coriander except umbels per plant. Since coriander is a cross pollinated crop, induction of forward mutation at heterozygous loci may be partly responsible for decreasing the variation within the progenies.

Of the 192 M_2 progenies studied, a majority (140) originated from 15 kR gamma ray treatment applied either singly or in combination with chemical mutagen treatments (The dose of 15 kR is also LD_{50} which was determined earlier on the basis of germination and survival of M_1 plants, Anonymous, 1996-97). The test of significance of progeny mean revealed that considerable number of progenies had significantly higher mean than the respective control, e.g., 71 progenies for plant height, 95 progenies for primary branches/plant, 116 progenies for umbels/plant, 74 for umbellets/umbel, 27 for grains/umbel, 31 for seed setting/umbel, 99 for yield/plant and 89 for 100-grain weight. Umbels per plant recorded maximum increase of 372%, followed by yield (289%), primary branches (84%), grains per umbel (66%), plant height (38%), 100-grain weight (28%) and 22% for seed setting per umbel.

A number of progenies with higher yield/plant were identified with low or high

Table 2. Magnitudes of different quantitative characters of M_2 progenies with high yield and high or low coefficient of variation

M_2 progenies	Yield/plant (g)		Plant height (cm)		Umbels/ plant		Grain/ umbel		Seed setting/ umbel (%)		100-grain weight (g)	
	mean	c.v.	mean	c.v.	mean	c.v.	mean	c.v.	mean	c.v.	mean	c.v.
41	7.31	19.95	70.00	4.16	19.60	12.50	34.80	31.70	50.40	14.45	1.63	12.85
93	8.31	25.41	57.40	7.65	23.00	19.44	35.60	26.32	54.00	22.90	1.67	11.30
140	6.83	50.00	64.60	7.55	21.40	39.10	37.40	21.60	65.20	14.92	1.70	14.83
182	7.91	36.74	53.80	7.24	30.20	35.23	28.60	27.15	52.40	27.83	1.72	13.00
203	9.14	45.77	70.40	10.12	35.40	59.94	26.00	22.72	52.80	9.87	1.76	10.13
229	7.44	49.22	65.50	14.56	31.20	20.20	29.40	37.46	52.80	19.50	1.84	4.72
244	7.51	39.32	66.60	11.90	24.20	36.77	38.40	22.90	58.00	14.13	1.91	6.98
278	12.57	59.00	73.00	17.86	57.20	54.21	37.80	38.26	55.60	11.71	1.92	12.82
314	12.50	83.40	73.40	13.12	65.00	41.32	30.40	34.15	53.80	21.00	1.67	3.65
324	7.61	40.74	68.00	4.53	42.80	59.20	23.80	21.91	42.00	29.90	1.74	17.36
Control	3.71	42.40	57.50	14.24	13.78	42.00	33.50	30.18	56.30	11.72	1.55	12.48

co-efficient of variation as compared to the control (Table 2). It may be seen that, in general, high yielding progenies have significantly higher magnitudes for other characters also. However, the magnitudes of seed setting/umbel and umbellets/umbel among these progenies were mostly comparable to their controls viz., 56% and 4.9%, respectively. Two progenies, namely 278 and 314, were identified with high mean and high c.v., which permit the further improvement through selection in M_3.

The results of this study demonstrate the potential of gamma ray treatment in inducing variability for various polygenic traits, particularly for yield.

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