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EFFECT OF MUTAGENS ON THE ASSOCIATION BETWEEN VARIOUS TRAITS IN SIRATRO [*MACROPTILIUM ATROPURPUREUM* (DC.) URB.]

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The correlation between characters in an ordinary population is the composite of the effect of selection, gene linkage and pleiotropy. Under similar selection criteria the differences in the correlation coefficients between the control and the mutagen treated population will be due to the effect of the mutagens on gene linkage and altered pleiotropic effects of the newly mutated genes. The present investigation was carried out to study the effect of different mutagens on the relationship between some plant traits in siratro, an important subtropical pasture legume.

The materials for the study comprised six treatments of gamma-rays (5, 10, 15, 20, 25 and 30 kR) and five treatments of NaN_3 (0.5, 1.0, 2.0, 2.5 and 3.0 mM) with appropriate control. Individually harvested M_1 plants were sown during June 1991 at the Regional Research Station, HPKV, Dhaulakuan (Sirmaur), H.P. in the compact family block design with three replications. Spacing was maintained as 60 cm between lines and 30 cm between plants. Data on 3 normal looking random plants in each progeny from each replication were recorded for days to first flowering and first pod maturity, plant height (cm), number of primary and secondary branches, internode length (cm), leaf area (cm^2), leaf to stem ratio on fresh and dry matter basis, fresh and dry matter yield (g), pods/plant, pod length (cm), seeds/pod, leaves/plant and 100-seed weight (g). Simple correlations of these attributes were computed. The significance of differences in the correlation coefficients between the control and the treated populations were tested using the Z transformation as suggested by Panse and Sukhatme [1]. Test of significance for correlations and Z transformation was applied on 3 digits and then rounded off upto two decimal points.

The correlations among all possible pairs of the control and treated populations (M_2) were computed but only the significant correlation coefficients in the control as well as in the treated populations are presented in Table 1. The results indicated that in a few instances

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Table 1. Comparison of phenotypic correlations in the control with the mutagenized populations of siratro

Character pair	Control	Gamma rays (kR)						Sodium azide (mM)				
		5	10	15	20	25	30	0.5	1.0	2.0	2.5	3.0
Days to maturity–primary branches	0.62**	0.54*	−0.01[a]	0.08[a]	0.32	−0.29[b]	−0.46*[b]	0.23	−0.06[a]	0.34	0.59**[b]	−0.18[b]
Plant height–green leaf to stem ratio	−0.62**	−0.20	−0.15	−0.50*	−0.29	−0.52*	0.47*[b]	−0.27	−0.51*	0.14[a]	−0.31	0.07[a]
Plant height–primary branches	−0.56*	−0.24	−0.11	−0.21	−0.20	0.05	0.28[b]	0.29[b]	0.17[a]	0.49*[b]	0.33[b]	0.18[a]
Leaves per plant–green leaf to stem ratio	−0.58**	0.45*[b]	0.25[b]	0.36[b]	−0.02	−0.12	−0.38	0.26[b]	0.04	0.31[b]	−0.21	−0.19
Dry leaf to stem ratio–leaf area	−0.48*	−0.05	0.11	−0.20	−0.02	0.07	0.31	0.09	0.32[b]	0.08	0.12	0.42[b]
Fresh forage yield–dry matter yield	0.99**	0.93**[b]	0.88**[b]	0.85**[b]	0.97**	0.86**[b]	0.95**[a]	0.20[b]	0.96**	0.98**	0.95**[a]	0.93**[b]
Fresh forage yield–secondary branches	0.70**	0.85**	−0.14[b]	0.61**	0.30	0.72**	0.93**[a]	0.37	0.84**	0.84**	0.26	0.23
Dry matter yield–internode length	0.46*	0.08	0.33	0.05	0.08	−0.37[b]	−0.02	−0.14	−0.02	0.66**	0.45*	−0.14
Seeds per pod–seed weight	−0.58**	0.19[a]	−0.04	0.05[a]	0.03[a]	0.32[b]	0.14[a]	0.26[b]	0.31[b]	0.30[b]	0.06[a]	0.18[a]
Seeds per pod–pod length	−0.57**	−0.01	0.32[b]	0.31[b]	−0.06	0.34[b]	−0.07	−0.10	0.33[b]	0.20[a]	0.17[a]	−0.12
Pod length–seed weight	0.99**	0.78**[b]	0.30[b]	0.18[b]	0.61**[b]	0.09[b]	−0.18[b]	−0.13[b]	−0.04[b]	0.11[b]	0.40[b]	−0.08[b]

*,**Correlation coefficient significant at $P \leq 0.05$ and $P \leq 0.01$, respectively.

[a,b]Correlation coefficient in mutagenized population significantly different from that of control at 5% and 1%, respectively.

the relationship between the traits under study changed from control to treated populations. The positive association of days to first pod maturity with primary branches in the control reversed its direction in the 30 kR gamma-ray treatment but it was same in the 5 kR and 2.5 mM and showed no relationship in the rest of the treatments. Likewise, the change in correlations was observed for some other pairs of characters in comparison with the control. The desired positive association of fresh forage yield with dry matter yield and pod length with seed weight decreased significantly in some of the treated populations. By contrast, the desirable positive association of fresh forage yield with secondary branches improved substantially in the 30 kR gamma-ray treatment which may be exploited for improvement of forage yield. In general, it has been observed that the significant changes in correlations due to gamma-rays increased from 5 kR to 10 kR but remained almost same from 10 kR to 30 kR except in case of 20 kR. This suggested a lower dose upto 10 kR should be sufficient for creating variability in this crop. Similar trend of results was also obtained in case of chemical treatments suggesting that a lower dose from 0.5 to 1.0 mM was equally efficient.

Thus, in the present material the lower doses of both the mutagens were effective. Such cases of alterations in the relationships appear to be owing to the effect of mutagens in breaking or strengthening the linkage of genes or altering the pleiotropic effects of the newly mutated genes. Such alterations in the correlations among traits may be utilized to enhance the rate of selection response in a primary trait [2]. The usefulness of mutations in weakening, strengthening or altering character association has been demonstrated by Tanaka and Takagi [3] and Vilwan and Siddiq [4] in rice (*Oryza sativa* L.), Shroff and Srinivasachar [5] in cotton (*Gossypium hirsutum* L.), Ibrahim and Sharaan [6] and Morsi et al. [7] in barley (*Hordeum vulgare* L. em. Bowden), Sharma and Sharma [8] in lentil.

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