

# An effective alternative to test-cross for estimating the breeding value of parents for resistance to late blight in potato

J. Gopal<sup>1</sup>, Vinod Kumar<sup>2</sup> and S.K. Luthra<sup>3</sup>

<sup>1</sup>Division of Crop Improvement, Central Potato Research Institute, Shimla-171001 Himachal Pradesh, India; <sup>2</sup> Central Potato Research Station, Kufri, Shimla-171 012, Himachal Pradesh, India; <sup>3</sup> Central Potato Research Institute Campus, Modipuram-250 110, Uttar Pradesh, India

## Abstract

The GCA of 12 females estimated based on matings with specific single testers (top-cross) and three types of bulk pollen (poly-cross) were compared with those estimated by 72 (12 x 6) test-crosses, using common testers in three types of matings. Correlations coefficients among three types of matings showed that bulk pollen matings had poor effectiveness in predicting the GCA of the females, whereas matings with selected individual testers (Tobique was the best) resulted in GCA estimates similar to those based on six testers.

**Key word:** breeding value – combining ability – mating design

## Results

**Table 1:** Correlation coefficients for GCAs based on six-testers (test-cross) versus single testers (top-cross) (n = 12)

Generation	Correlation coefficient for tester					
	CFK69.1	Tollocan	F-6	Tobique	Montsama	MEX 759838
FCG	0.69*	0.44	0.76**	0.89**	0.71**	0.78**
SCG	0.33	0.69*	0.79**	0.83**	0.81**	0.44

\*, \*\* Significant at P ≤ 0.05, 0.01, respectively.

**Table 2:** Correlation coefficients for GCAs estimated using 3 different bulks of pollen (poly-cross) versus test-cross with bulked testers (n =12)

Generation	Correlation coefficient		
	Bulk pollen 1 versus six testers of bulk pollen 1	Bulk pollen 2 versus three testers of bulk pollen 2	Bulk pollen 3 versus three testers of bulk pollen 3
FCG	0.57*	0.59*	0.57*
SCG	n.s.	n.s.	0.69*

\* Significant at P ≤ 0.05; n.s. = not significant;

## Discussion

In test-crosses, the purpose of using a number of testers is to generate as diverse progeny as possible so that the breeding value of the female to which these are mated is judged reliably. The results of the present study showed that due to the heterozygous nature of potato, tester Tobique could probably contribute gametes as diverse as those produced by all testers in the test-crosses. The bulked pollen was not effective because it probably did not have equal representation of the testers bulked. The competition among the pollen grains of the testers bulked could be another possibility.

## Conclusion

Top-cross using identified tester can give as good estimates of breeding value of females as those of from matings with several testers in test-cross.

**Introduction:** Test-crosses for estimating combining ability in potato though useful are difficult to make being labour intensive and time consuming, and due to the problem of sterility. The objective of the present study was to test methods for estimating general combining ability (GCA) of parents for resistance to late blight based on fewer matings

**Materials and Methods:** 108 families were generated by 12 x 6 matings; and 36 families were generated by pollination of same 12 females with three types of bulked pollens. Bulk pollen 1 had approximately equal amount of pollen of testers Tollocan, F-6 and Montsama. Bulk pollen 2 was from remaining three testers and bulk pollen 3 had pollen from all six testers. Disease incidence was recorded at 10 days interval under natural epiphytotic conditions for tow years, and AUDPC was computed