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Combining Ability Studies in Intraspecific Derivatives of Wal (*Lablab purpureus* (L.) Sweet)

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Eight genotypes of Wal (*Lablab purpureus* (L) Sweet) viz., DPLW-46, DPLW-61, DPLW-10, DPLW-31, DPLW-15, DPLW-48, DPLW-51, DPLW-29 and their crosses made in half diallel fashion were evaluated for the combining ability effects. The analysis of variance for g.c.a. was highly significant for all the characters except number of seeds per pod while the s.c.a. variance was highly significant for days to flowering, plant height, number of primary branches per plant, pod length, number of seeds per pod, 100 grain weight and seed yield per plant. The s.c.a. was non-significant for number of peduncles per plant, number of pods per plant and days to maturity. The proportion of δ^2g/δ^2s revealed preponderance of non additive gene action for inheritance of all the characters except for number of peduncles per plant. All the parents exhibit significant estimates for g.c.a. for one or more characters. The parent DPLW-29, DPLW-15 and DPLW-51 were good combiner for most of the characters. Among the crosses DPLW-46 x DPLW-29, DPLW-51 x DPLW-29, DPLW-46 x DPLW-61, DPLW-15 x DPLW-51 and DPLW-46 x DPLW-10 were identified as promising cross combinations.

(***Key words:*** *Wal, Gca, Sca, Crosses and Gene action)*

Wal (*Lablab purpureus* (L.) Sweet) is one of the important pulse crops cultivated in Konkan region of Maharashtra. It is predominantly grown on residual moisture after rice crop during Rabi season. It is popularly recognized as 'Wal' in Maharashtra. Though the crop is having a considerable diversity and the improvement through selection is possible, the productivity of this crop is very low. Hence, an attempt was made to identify promising parents and hybrids in wal on the basis of their combining ability.

MATERIALS AND METHODS

The experimental material consisted of eight genetically diverse genotypes of wal viz., DPLW-46, DPLW-61, DPLW-10, DPLW-31, DPLW-15, DPLW-48, DPLW-51 and DPLW-29. These genotypes were crossed in half diallel fashion (excluding reciprocals) as suggested by Griffing (1956) in Method–I, Model–II. The resulting 28 F1's and 8 parents were grown in randomized block design with three replications during Rabi 2012. The experiment was conducted at research farm of the Department of Agricultural

Table 1. *Analysis of variance for combining ability for ten characters in 8 × 8 half diallel of Wal (Lablab purpureus L. Sweet)*

Characters	Mean sum of squares			σ^2g	σ^2s	σ^2g/σ^2s
	g.c.a (d.f.= 7)	s.c.a (d.f.= 27)	error (d.f.=70)			
Days to first flowering	5.775**	1.147**	0.115	0.566	1.030	0.553
Days to maturity	1.860*	0.523	0.669	0.119	-0.146	-0.815
Plant height (cm)	50.451**	9.935**	1.737	4.871	8.197	0.594
Number of primary branches per plant	0.720**	0.186*	0.087	0.063	0.099	0.636
Number of peduncles per plant	3.610**	0.861	0.772	0.284	0.089	3.191
Number of pods per plant	168.824**	47.915	32.697	13.613	15.218	0.895
Pod length (cm)	0.099**	0.082**	0.0093	0.009	0.072	0.125
Number of seeds per pod	0.0074	0.0521**	0.0062	0.0001	0.046	0.00261
100 grain weight (g)	18.661**	6.039**	0.0054	1.866	6.034	0.309
Seed yield per plant (g)	26.861*	15.823*	9.378	1.748	6.445	0.2712

*Significant at 5% level; **Significant at 1% level

Table 2. *Estimates of general combining ability effects of parents for ten characters in Wal (Lablab purpureus L. Sweet)*

Parents	Days to first flowering	Days to maturity	Plant height (cm)	Number of primary branches per plant	Number of peduncles per plant	Number of pods per plant	Pod length (cm)	Number of seeds per pod	100 grain weight (g)	Seed yield per plant (g)
DPLW-46	1.28**	0.55*	-2.18**	-0.45**	0.32	1.68	-0.13**	0.00	-1.93**	-0.47
DPLW-61	0.28**	-0.22	-0.78	-0.21*	0.19	-1.88	0.00	-0.03	0.99**	-0.94
DPLW-10	0.32**	0.08	1.88**	-0.08	-0.68*	0.26	0.08**	0.04	0.75**	1.07
DPLW-31	0.52**	-0.05	2.52**	-0.08	-0.24	0.52	0.12**	0.02	0.04	0.64
DPLW-15	-0.32**	-0.22	0.20	0.21*	-0.51	1.89	0.13**	0.02	1.16**	1.32
DPLW-48	-0.88**	0.628	0.38	0.31**	-0.36	-7.57**	-0.06	-0.04	0.85**	-3.15**
DPLW-51	-1.02**	-0.72**	1.98**	-0.01	0.06	-1.80	-0.05	-0.02	0.49**	-0.53
DPLW-29	-0.18	-0.05	-4.00**	0.31**	1.22**	6.89**	-0.10**	-0.01	-2.34**	2.05*
SE (gi)	0.101	0.242	0.390	0.087	0.260	1.691	0.028	0.023	0.022	0.906
SE (gi-gj)	0.153	0.366	0.589	0.132	0.393	2.557	0.043	0.035	0.033	1.370
CD @ 5%	0.24	0.57	0.92	0.21	0.61	4.00	0.07	0.05	0.05	2.14
CD @ 1%	0.35	0.85	1.36	0.31	0.91	5.92	0.10	0.08	0.08	3.17

*Significant at 5% level; **Significant at 1% level

Table 3. *Estimation of specific combing ability effects of crosses for 10 characters in Wal (Lablab purpureus L. Sweet)*

Hybrids	Days to first flowering	Days to maturity	Plant height (cm)	Number of primary branches per plant	Number of peduncles per plant	Number of pods per plant	Pod length (cm)	Number of seeds per pod	100 grain weight	Seed yield per plant (g)
DPLW-46 X DPLW-61	-1.40**	0.50	-4.90	0.18	0.47	11.45*	-0.03	0.22**	-2.91**	4.69
DPLW-46 X DPLW-10	-1.10**	0.20	3.65**	0.57*	1.60	5.02	0.22*	0.09	4.54**	4.01
DPLW-46 X DPLW-31	0.37	-0.33	-3.59**	-0.63*	-0.44	0.69	-0.01	0.06	-0.99**	2.24
DPLW-46 X DPLW-15	0.87****	0.50	2.06	-0.45	0.77	-8.42	0.44**	0.18*	2.23**	-3.04
DPLW-46 X DPLW-48	0.43	-1.33	-0.18	-0.35	-0.25	-4.29	0.13	0.13	-3.20**	-1.11
DPLW-46 X DPLW-51	0.23	-0.33	2.08	0.05	-0.74	-8.86	0.02	0.17*	4.16**	-2.39
DPLW-46 X DPLW-29	-0.60	-0.67	1.06	-0.88**	2.44**	21.06	0.02	0.06	-0.80**	9.96**
DPLW -61X DPLW-10	-0.77**	-0.37	-2.69*	0.47	0.53	3.57	0.20*	0.19*	0.82**	1.52
DPLW-61 X DPLW-31	0.03	-0.57	-2.06	0.07	-0.98	-5.16	0.21*	0.21**	0.95**	-2.49
DPLW -61X DPLW-15	0.53	-0.07	1.18	0.05	-0.51	1.54	0.18	0.12	0.31**	1.34
DPLW -61X DPLW-48	0.10	0.77	3.34**	0.48	0.28	-1.27	-0.10	0.08	1.61**	0.47
DPLW -61X DPLW-51	0.23	-0.23	-4.73	-0.13	0.52	4.30	0.12	0.11	-5.29**	0.69
DPLW -61X DPLW-29	2.07**	0.10	1.12	0.08	0.23	-3.06	0.26**	-0.03	2.91**	3.24
DPLW-10 X DPLW-31	-1.00**	-0.53	-0.52	0.19	-0.51	-0.96	0.03	0.09	0.70**	2.60
DPLW-10 X DPLW-15	-0.17	-0.37	-0.40	-0.29	0.76	3.40	0.26**	0.10	-0.51**	2.42
DPLW-10 X PLW-48	-0.60	0.13	0.76	-0.06	-1.12	-2.94	0.46**	0.16*	-0.11	-2.58
DPLW-10 X PLW-51	1.53**	0.47	-4.58	0.27	0.45	-3.11	0.18	0.09	-4.25*8	-1.76
DPLW-10 X PLW-29	0.37	1.13	-1.14	0.21	-0.37	-0.79	-0.27**	0.20**	-3.38**	-2.11
DPLW-31 X PLW-15	-0.37	0.77	5.42	0.37	0.12	1.14	-0.30**	-0.29**	-1.31**	-0.08
DPLW-31 X PLW-48	-0.80*	0.27	-2.62*	-0.13	0.64	-0.73	0.37**	0.13	0.60**	-0.68
DPLW-31 X PLW-51	0.33	0.27	-2.22	0.47	-0.65	3.10	0.06	0.18*	-1.18**	1.44
DPLW-31 X PLW-29	-2.17	-1.07	1.22	0.21	-0.67	-3.12	0.35**	0.12	0.69**	-0.41
DPLW-15 X DPLW-48	-1.30	1.10	0.30	0.59*	0.45	6.29	-0.05	0.01	0.65**	2.87
DPLW-15 X DPLW-51	-0.50	-0.23	-2.84*	0.05	0.29	10.99*	-0.01	0.01	-0.66**	4.59
DPLW-15 X DPLW-29	-0.67*	-0.23	0.54	0.32	-0.13	-3.29	0.15	0.18*	1.21**	0.14
DPLW-48 X DPLW-51	-1.27	-0.40	-1.68	-0.39	0.54	1.45	-0.10	-0.08	1.18**	0.73
DPLW-48 X DPLW-29	0.90**	-1.07	1.03	0.09	-1.01	-0.43	-0.11	-0.03	-3.18**	-0.59
DPLW-51 X DPLW-29	-0.97***	-0.73	3.36**	-0.19	0.03	5.13	0.04	0.08	2.81**	5.26
S.E. (ij)	0.311	0.742	1.195	0.267	0.797	5.185	0.087	0.071	0.067	2.777
S.E. (ij-ik)	0.460	1.097	1.768	0.395	1.179	7.672	0.129	0.105	0.099	4.109
S.E. (ij-kl)	0.434	1.034	1.667	0.373	1.112	7.233	0.122	0.099	0.093	3.874
C.D. @ 5%	0.64	1.52	2.45	0.55	1.64	10.64	0.18	0.15	0.14	5.70
C.D. @ 1%	0.86	2.05	3.31	0.74	2.21	14.37	0.24	0.20	0.19	7.69

*Significant at 5% level; **Significant at 1% level

Botany, College of Agriculture, Dapoli, Maharastra. The seeds were sown on 60 x 45 cm distance between rows and plants. Observations were recorded on five randomly selected plants of each genotype per replication for 10 quantitative characters viz., days to first flowering, days to maturity, plant height (cm), number of primary branches per plant, number of penduncles per plant, number of pods per plant, pod length (cm), seeds per pod, 100 seed weight and seed yield per plant (g). The analysis of variance was computed as suggested by Panse and Sukhatme (1976). The combining ability analysis was carried out as per Kempthorne (1969).

RESULTS AND DISCUSSION

The analysis of variance for gca was highly significant for all the characters except for number of seeds per pod while the variance for s.c.a. was highly significant for days to first flowering, plant height, number of primary branches per plant, pod length, number of seeds per pod, 100 grain weight and seed yield per plant. However, it was non-significant for days to maturity, number of peduncles per plant, number of pods per plant (Table 1). The ratio of d2g/d2s revealed preponderance of non additive gene action for inheritance of all the characters except for number of penducles per plant. Gawali *et al.*, (2011) has also reported similar non additive gene action of high magnitude for various characters.

The general combining ability (gca) effects of the parents are presented in Table 2. The results revealed that none of the parent was good general combiner for all the characters. The parent DPLW-51 was found to be the good general combiner with gca effect (-1.02) and (-0.72) for days to first flowering and days to maturity respectively. The parent DPLW-29 showed desirable general combining ability effect for the characters viz., plant height, number of primary branches per plant, number of peduncles per plant, number of pods per plant and yield per plant. The parent DPLW-15 was the good general combiner for pod length and 100 grain weight. All the parents showed non-signficant g.c.a effect for number of seeds per pod in both directions. Sawant *et al.*, (2006), Viraj *et al.*, (2006) and Ushakumari *et al.*, (2010) have also reported such negative as well as positive g.c.a. effects exhibited by parents for one or more yield contributing characters.

The specific combining ability (sca) effects of hybrids are presented in Table 3. The results indicated that none of the cross combination was consistently good for all the characters. The highest yielding cross DPLW-46 x DPLW-29 recorded significantly highest positive sca effect for seed yield per plant (9.96) and number of peduncles per plant (2.44). The second high yielding cross DPLW-51 x DPLW-29 exhibited significant sca effect for days to first flowering (-0.97) and 100 grain weight (2.81). While the cross DPLW-46 x DPLW-61 showed significant sca for days to first flowering, number of pods per plant, number of seeds per pod, but the character plant height (-4.90) showed negative non significant high sca effect. The cross DPLW-15 x DPLW-51 showed significant sca effect for plant height (-2.84) and number of pods per plant (10.99). The cross DPLW-46 x DPLW-10 showed highest significant sca effect for 100 grain weight, days to first flowering and number of primary branches per plant. The cross DPLW-46 x DPLW-48 found to be the best combiner for days to maturity (-1.33) and the cross DPLW-31 x DPLW-29 for days to first flowering (-2.17). The cross DPLW-15 x DPLW-48 exhibited high sca effect for number of primary branches per plant (0.59) and the cross DPLW-10 x DPLW-48 found to be the best combiner for pod length (0.46). Such varying specific combining ability effects exhibited by different crosses have already been reported by Jayarani and Manju (1996) and Jyothula and Guttala (2001).

The gca estimates revealed that none of the parent was good combiner for all the characters. The parents DPLW-29, DPLW-15 and DPLW-51 were good general combiner for most of the characters in wal. The sca estimates revealed that no cross combination was good for all the characters. However, the crosses DPLW-49 x DPLW-29, DPLW-51 x DPLW-29, DPLW-46 x DPLW-61 and DPLW-15 x DPLW-51 exhibiting high sca effects were identified as good specific combiners for yield contributing characters.

REFERENCES

Gawali S. T., Khandelwal V., Chauhan D. A., and Lodam V. A. (2011). Heterosis and combining ability in Indian bean. *Journal of Food Legumes* **24**(2): 145-147.

Griffing, B. (1956). Concepts of general and specific combining ability in relation to diallel hybridizing system. *Australian Journal of Biological Science* **9**: 463-493

Jayarani, L. S. and Manju, P. (1966). Combining ability in grain cowpea. *Journal of Tropical Agriculture* **34**: 93-95.

Jyothula, D. P. B. and Guttala, S. B. (2009). Combining ability analysis for seed yield and some quantitative characters in field pea. *Crop Research* **37**(1, 2 & 3): 174-180.

Kempthorne, O. (1969). *An introduction to genetic statistics*, Second edition. John Wiley and Sons, Inc, New York, Chapman and Hall, London. pp 468-470.

Panse, V. G. and Sukhatme, P. V. (1976). Statistical Methods for Agricultural Workers, I.C. A.R. New Delhi.

Sawant, S. S., Bendale, V. W., Bhave, S. G. and Jadhav, B. B. (2006). Studies on combining ability for yield components and yield realization index in lablab bean. *Journal of Maharashtra Agricultural University* **31**(1): 77-78.

Ushakumari, R., Vairam, N., Ahandakumar, C. R. and Malini, N. (2010). Studies on hybrid vigour and combining ability for seed yield and contributing characters in cowpea (Vigna unguiculata). *Electronic Journal of Plant Breeding* **1**(4): 940-947.

Viraj, N. R., Bhatiya, V. J. and Poshiya, V. K. (2006). Heterosis and combining ability in Indian bean (Lablab purpureus (L.) Sweet). *Agricultural Science Digest* **26**(1): 6-10.