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Estimation of heterosis for yield and its components in Dolichos bean (*Dolichos lablab* L.)

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Abstract

A Line x tester analysis was done with eight parents in view to obtain best heterotic crosses for yield and its attributing traits. Heterosis over mid-parents and standard check were estimated for yield and its contributing characters in 15 cross combinations. The hybrids viz., AK-WAL-18-25 X DOL-VARK-18-04, AK-WAL-18-15 X DOL-VARK-18-01, AK-WAL-18-16 X DOL-VARK-18-02, AK-WAL-18-16 X Phule gauri and AK-WAL-18-25 X DOL-VARK-18-02 were identified as promising crosses for green pod yield per plant thus, these crosses need further evaluation in preliminary or multilocation hybrid trials for further commercial exploitation. In some crosses primary branches per plant, average pod weight, seeds per pod and pod length also contributed towards green pod yield per plant. The crosses which are showing highest heterotic effects and *per se* performance, could be considered for exploitation of hybrid vigour.

Keywords: Heterosis, dolichos bean, pod yield

Introduction

Dolichos bean is an ancient legume crop widely grown throughout the world as vegetable or pulse crop for human consumption or animal forage or feed. It is highly self-pollinated crop and the possibility of exploiting hybrid vigour depends on the direction and gene action involved. Exploitation of heterosis on commercial scale in autogamous crops have resulted in the development of no. of high yielding hybrids and proved to be most important genetic tool in enhancing yield. The present study was designed to determine the relationship between performance of parents and their F_1 's combination showing heterosis.

Materials and Methods

Present investigation was conducted by using eight genotypes being maintained at Chilli and Vegetable Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. Fifteen F_1 's were developed through line x tester mating design and evaluated along with parents in randomized block design with three replications during *khariif*-2019. All the cultural practices were followed to raise the normal crop. Data were recorded on five randomly selected plants in each treatment for thirteen characters viz., days to 50% flowering, days to maturity, plant height, number of primary branches per plant, number of green pod per plant, pod length, pod width, pod weight, number of green seeds per pod, green pod yield per plant, number of picking per genotype, 100 green seed weight, green pod yield per hectare. Heterosis over mid-parents and standard check was estimated for pod yield and its contributing traits in dolichos bean.

Result and Discussion

The analysis of variance revealed that treatments were significant for all the characters under study in F_1 generation. In present study no. of crosses expressed considerable heterosis over mid-parents and standard check for 50% flowering, days to maturity, no. of primary branches per plant, no. of green pod per plant, pod length, pod weight, no. of green seed per pod, green pod yield per plant, 100 green seed weight. Among the fifteen hybrids, fourteen hybrids exhibited significant positive standard heterosis for green pod yield per plant. Cross AK-WAL-18-25 X DOL-VARK-18-04 exhibited highest standard heterosis (119.20%) over the check Kokan Bhusan for green pod yield per plant along with average heterosis (106.87%).

In addition to this, it showed significant standard heterosis in desirable direction for other traits like days to 50% flowering, number of primary branches per plant, number of green pods per plant, pod length, pod weight, number of green seeds per pod, 100 seed weight, number of picking per genotype, and green pod yield per hectare.

The hybrid AK-WAL-18-15 X DOL-VARK-18-01 ranked second and recorded significant useful heterosis (119.03%) over the check Kokan bhushan for green pod yield; it also showed significant average heterosis (48.40%). It showed significant standard heterosis in desirable direction for the characters number of primary branches per plant, number of green pods per plant, pod weight and green pod yield per plant.

Another cross AK-WAL-18-16 X DOL-VARK-18-02 ranked third and reported significant positive standard heterosis of 118.63% and significant positive average heterosis (45.18%). This cross combination exhibited significant positive heterosis for other characters like days to 50% flowering, number of green pod per plant, no. of picking per genotype, pod weight and 100 green seed weight and green pod yield/ha.

The cross AK-WAL-18-16 X Phule gauri ranked fourth and

exhibited significant and positive standard heterosis for green yield per plant (117.73%) and significant positive average heterosis (10.52%) for green pod yield per plant.

The hybrid AK-WAL-18-25 X DOL-VARK-18-02 ranked fifth and recorded significant positive useful heterosis (117.55%) over the check Kokan Bhushan. It also showed significant positive average heterosis (107.37%). This cross also exhibited desirable significant standard heterosis for the component characters like 50% flowering, primary branches per plant, number of green pods per plant, pod width, pod weight, number of green seeds per pod, green pod yield/plant, number of picking per genotype. 100 green seed weight. This cross was found to be best suitable for developing high green pod yield in dolichos hybrid as it has exhibited positive significant heterosis for green pod yield per plant along with other yield contributing traits.

Similar results were reported by Bagde *et al.* (2002) [2], Bhuvaneshwari and Muthiah (2005) [1], Valu *et al.* (2006) [8], Virja (2006) [9], patil *et al.* (2011) [7], Gawali (2011) [3], Patel *et al.* (2017) [6] and Nayak *et al.* (2018) [5] for green pod yield per plant in hybrids.

Table 1: Heterosis (%) over mid-parent (MP) and standard checks [KokanBhushan (H₃)] for different characters in dolichos bean

Sr. no.	Crosses	Days to 50% flowering		Days to maturity		Plant height(cm)		No. of Primary branches/plant		No. of green pod/plant		Pod length(cm)		Pod width(cm)	
		MP(H ₁)	SC(H ₃)	MP(H ₁)	SC(H ₃)	MP(H ₁)	SC(H ₃)	MP(H ₁)	SC(H ₃)	MP(H ₁)	SC(H ₃)	MP(H ₁)	SC(H ₃)	MP(H ₁)	SC(H ₃)
1	AK-WAL-18-15 X DOL-VARK-18-01	-7.45	-6.29	-9.36 **	-6.30 **	2.15	4.40	10.02	35.48**	68.78 **	56.06 **	9.41	27.76 **	110.76 **	52.30 **
2	AK-WAL-18-15 X DOL-VARK-18-02	14.86 **	6.92	-8.58 **	-3.91	-9.47 *	-3.77	17.60 *	28.23 *	61.38 **	10.98	-8.96	17.06 *	7.10	-24.03
3	AK-WAL-18-15 X DOL-VARK-18-03	4.16	18.24 **	1.90	4.78 *	-17.75 **	-12.58 *	25.08 **	26.69 *	76.10 **	15.92	2.08	14.08	0.81	9.72
4	AK-WAL-18-15 X DOL-VARK-18-04	-3.33	-8.81	2.87	1.30	7.69	5.66	15.77	29.03 **	60.86 **	8.23	15.61 **	27.83 **	34.19 **	47.70 **
5	AK-WAL-18-15 X Phule gauri	1.91	0.63	2.44	0.22	-20.63 **	-5.66	4.82	30.65 **	58.55 **	4.05	8.60	20.80 **	102.82 **	39.93 *
6	AK-WAL-18-16 X DOL-VARK-18-01	4.35	-1.89	-1.19	-0.43	15.75 **	6.29	5.69	35.48 **	32.16 *	26.09	13.84 *	26.12 **	13.43	-23.14
7	AK-WAL-18-16 X DOL-VARK-18-02	1.83	-12.58 *	-4.77 *	-2.39	12.13 *	7.55	10.99	26.61 *	77.28 **	27.13	-5.69	15.62 *	117.29 **	44.35 **
8	AK-WAL-18-16 X DOL-VARK-18-03	-0.59	5.66	0.65	0.87	-1.64	-5.66	25.14 **	33.06 **	45.73 *	0.22	21.14 **	28.13 **	-36.49 **	-33.75 *
9	AK-WAL-18-16 X DOL-VARK-18-04	12.64 *	-1.89	6.58 **	2.17	20.43 **	5.66	15.61	34.68 **	36.80 *	-3.93	12.09 *	17.22 *	-31.72 *	-27.92
10	AK-WAL-18-16 X Phule gauri	-6.53	-14.47 **	6.62 **	1.52	-7.25	0.63	4.35	35.32 **	86.86 **	28.13	9.66	15.42 *	122.74 **	43.64 **
11	AK-WAL-18-25 X DOL-VARK-18-01	-1.31	6.45	-8.35 **	-4.35 *	-15.01 **	-5.66	4.13	32.26 **	-12.67	5.55	2.54	7.42	-38.80 **	-32.69 *
12	AK-WAL-18-25 X DOL-VARK-18-02	-13.56 **	-13.84 **	-3.09	2.83	-22.40 **	-10.69	12.14	26.61 *	55.32 **	50.92 **	-1.99	14.25	34.31 **	45.94 **
13	AK-WAL-18-25 X DOL-VARK-18-03	-10.47 **	7.55	-1.80	1.96	-9.84 *	3.77	27.30 **	33.87 **	12.87	6.36	10.24	9.97	-24.17 **	11.13
14	AK-WAL-18-25 X DOL-VARK-18-04	-13.40 **	-12.58 *	4.90 *	4.35 *	-5.88	0.63	10.07	26.94 *	60.17 **	53.25 **	29.52 **	27.66 **	-5.32	39.93 *
15	AK-WAL-18-25 X Phule Gauri	0.90	6.29	-4.31 *	-5.43 *	-24.14 **	-3.14	-2.10	25.81 *	-10.23	-15.60	12.77 *	11.91	7.78	15.02
	SE±	2.11	2.44	2.75	3.18	2.54	2.93	0.37	0.43	49.68	57.37	0.61	0.70	0.24	0.27
	CD at 5%	4.33	5.00	5.65	6.52	5.20	6.01	0.76	0.88	101.77	117.52	1.25	1.45	0.49	0.57

Note:* Significant at 5% level of significance, ** Significant at 1% level of significance

Table 1: Cont.....

Sr. no.	Crosses	Pod weight (g)		No. of green seed/pod		Green pod yield/plant (kg)		No. of picking/genotype		100 green seed weight(g)		Green pod yield/ha(q)	
		MP(H ₁)	SC(H ₃)	MP(H ₁)	SC(H ₃)	MP(H ₁)	SC(H ₃)	MP(H ₁)	SC(H ₃)	MP(H ₁)	SC(H ₃)	MP(H ₁)	SC(H ₃)
1	AK-WAL-18-15 X DOL-VARK-18-01	44.93 **	69.17 **	25.08 *	73.22 **	48.40 **	119.03 **	0.46	84.48 **	26.83 **	33.54 **	49.04 **	128.25 **
2	AK-WAL-18-15 X DOL-VARK-18-02	0.26	32.83 **	-28.30 **	25.00	89.71 **	74.84 **	16.39	69.57 **	0.17	2.71	14.96	74.84 **
3	AK-WAL-18-15 X DOL-	19.42 *	35.67 **	6.37	54.12 **	56.57 **	45.59 *	-0.03	82.08 **	-0.44	-10.23	68.96 **	57.11 *

	VARK-18-03												
4	AK-WAL-18-15 X DOL-VARK-18-04	44.71 **	66.12 **	-19.60 *	21.54	118.02 **	103.24 **	0.17	82.18 **	35.26 **	28.84 **	151.40 **	134.35 **
5	AK-WAL-18-15 X Phule gauri	-1.93	32.93 **	24.62 *	76.31 **	17.28	62.53 **	5.60	80.18 **	-16.50 *	-14.73	58.78 **	62.53 *
6	AK-WAL-18-16 X DOL-VARK-18-01	21.43 *	38.88 **	7.12	17.70	-13.44	78.32 **	5.43	81.68 **	-6.60	4.71	26.85 *	96.76 **
7	AK-WAL-18-16 X DOL-VARK-18-02	28.23 **	66.88 **	21.43 *	76.97 **	45.18 **	118.63 **	34.08 *	80.18 **	17.37 *	28.34 **	59.85 **	146.23 **
8	AK-WAL-18-16 X DOL-VARK-18-03	50.54 **	67.47 **	11.92	30.15	8.83	64.78 **	5.95	80.98 **	-9.61	-12.35	85.69 **	76.30 **
9	AK-WAL-18-16 X DOL-VARK-18-04	23.90 *	39.32 **	5.58	29.40	-4.55	44.74 *	-2.41	66.47 **	1.05	3.14	64.18 **	56.26 *
10	AK-WAL-18-16 X Phule gauri	25.55 **	67.23 **	56.45 **	76.59 **	10.52	117.73 **	6.44	69.57 **	18.54 **	29.13 **	114.24 **	123.49 **
11	AK-WAL-18-25 X DOL-VARK-18-01	0.37	34.86 **	3.49	16.67	3.70	66.26 **	-1.79	81.18 **	-11.66	2.72	-28.30 **	47.83 *
12	AK-WAL-18-25 X DOL-VARK-18-02	17.63 *	76.61 **	17.27	74.25 **	107.37 **	117.55 **	23.29	80.68 **	13.14 *	28.45 **	13.93	133.68 **
13	AK-WAL-18-25 X DOL-VARK-18-03	-2.75	27.64 *	3.10	22.85	52.30 **	61.03 **	-7.60	69.07 **	-9.50	-8.45	0.81	47.20 *
14	AK-WAL-18-25 X DOL-VARK-18-04	35.97 **	80.08 **	24.75 *	56.46 **	106.87 **	119.20 **	-6.44	70.97 **	21.76 **	29.36 **	65.64 **	142.24 **
15	AK-WAL-18-25 X Phule Gauri	-14.59 *	30.84 *	52.67 **	76.69 **	-14.49	29.40	4.79	79.68 **	14.99 *	30.07 **	-9.31	40.92
	SE±	4.16	4.80	0.48	0.55	0.51	0.59	0.58	0.66	5.98	6.90	32.05	36.62
	CD at 5%	8.52	9.84	0.98	1.13	1.04	1.21	1.18	1.37	12.25	14.14	70.84	81.26

Note: * Significant at 5% level of significance, ** Significant at 1% level of significance

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