

## Heterosis for Yield and Yield Component in Vegetable Indian Bean (*Dolichos lablab* L.)

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Received: 14.05.2017 | Revised: 20.06.2017 | Accepted: 25.06.2017

### ABSTRACT

A set of 44 genotypes including 8 females, 4 males and their 32 single hybrids were sown during rabi - 2011 at Vegetable Research Scheme, Regional Horticulture Research Station, NAU, Navsari to study the magnitude of heterosis, using line x testers analysis for thirteen characters. Significant differences were observed among parents and hybrids indicating considerable genetic variation among these genotypes. Significant standard heterosis and high per se performance with regard to green pod yield per plant were recorded by the crosses viz., GNI-14 x Gujarat Papdi, GNI-14 x Manchhi Papdi, GNI-9 x Katargam, GNI-14 x NPS-1, GNI-9 x NPS-1, GNI-9 x Gujarat Papdi, GNI-9 x Manchhi Papdi, GNI-45 x Katargam, GNI-14 x Katargam and GNI-45 x Gujarat Papdi.

**Key words:** Heterosis and Indian bean.

### INTRODUCTION

*Lablab purpureus* (L.) sweet (Syn. *Dolichos lablab* L., 2n=22) is an important legume as well as vegetable crop cultivated in the tropical region of Asia, Africa and America. It is commonly called hyacinth bean, bonavist bean, Indian bean, field bean Egyptian bean, “wal papdi or valor” in Gujarat state. It belongs to the family Fabaceae. They are *Dolichos lablab*

var. *typicus* prain, is a garden type and cultivated for its soft and edible pods as an annual in nature and *Dolichos lablab* var. *lignosus* (L.) prain, is known as field bean, mainly cultivated for dry seed as a pulse, is bushy perennial<sup>13</sup>.

In view of the importance of the crop, there is need for breeding for faster growth, uniform maturity with higher yields, photo-insensitivity and disease and pest resistance.

**Cite this article:** Patel, J.M., Patel, A.I. and Pandya, M.M., Heterosis for Yield and Yield Component in Vegetable Indian Bean (*Dolichos lablab* L.), *Int. J. Pure App. Biosci.* 5(6): 1645-1649 (2017). doi: <http://dx.doi.org/10.18782/2320-7051.2978>

As hybridization has its own advantages it has been frequently used in any breeding programme aimed at to improve the yield. In development of high yielding hybrids, choice of suitable parents is the crucial stage. For this purpose, knowledge of genetic architecture of different yield and yield component traits as well as the exploration of heterosis in various cross combinations appears to be necessary in order to formulate a fruitful breeding programme.

#### MATERIALS AND METHODS

The present investigation was taken up to elicit information on Heterosis with A set of 44 genotypes including 8 females, 4 males and their 32 single hybrids were sown during *rabi* - 2011 at Vegetable Research Scheme, Regional Horticulture Research Station, NAU, Navsari to study the magnitude of heterosis, using line x testers analysis for thirteen characters in vegetable Indian bean. The magnitude of heterosis was estimated in relation to better parent and standard check values. They were thus, calculated as percentage increase or decrease of  $F_1$ s over the better parent (BP) and standard check (SC) using the method of Turner<sup>19</sup> and Hayes *et al*<sup>8</sup>.

#### RESULTS AND DISCUSSION

In the present investigation, standard heterosis ranged from -13.93 to 119.02 for green pod yield per plant. The maximum standard heterosis recorded by cross GNI-14 x Gujarat Papdi was 119.02 % followed by GNI-14 x Manchhi Papdi (104.52%), GNI-9 x Katargam (86.21%), GNI-14 x NPS-1 (85.83%), GNI-9 x NPS-1 (84.40%), GNI-9 x Gujarat Papdi (80.98%), GNI-9 x Manchhi Papdi (73.68%), GNI-45 x Katargam (69.86%), GNI-14 x Katargam (65.52%), GNI-9 x Gujarat Papdi (80.98%), (Table I). Almost identical results have been reported by Patel *et al*<sup>11</sup>, Ponmariam and Das<sup>12</sup>, Shashibhushan and Chaudhari<sup>16</sup>. It is interesting to note that top ranking crosses based on *per se* performance and standard heterosis was same.

The best crosses showing high standard heterosis and their performance for green pod yield and related parameters have been summarized in (Table II). The crosses *viz.*, GNI-9 x Katargam, GNI-45 x Katargam and GNI-14 x Katargam recorded high heterosis with high *per se* performance for green pod yield (Table II) but it contains one poor parent also. Out of ten ranking crosses, nine crosses *viz.*, GNI-14 x Katargam (53.93), GNI-14 x Manchhi Papdi (43.37), 14 x NPS-1 (40.07), GNI-14 x Gujarat Papdi (33.25), GNI-9 x Katargam (31.38), GNI-9 x Manchhi Papdi (29.59), GNI-11 x Gujarat Papdi (28.85), GNI-9 x Gujarat Papdi (16.14) and GNI-11 x Katargam (14.03) showed high order standard heterosis for number of pods per plant, a major yield component.

All the crosses showing significant and positive standard heterosis for average pod weight and seed index (Table II). The average pod weight might be resulted into higher seed index and it might be resulted into higher green pod yield. Out of ten yielding crosses, seven crosses, *viz.*, GNI-9 x Gujarat Papdi (6.41), GNI-9 x NPS-1 (5.74), GNI-45 x Katargam (4.56), GNI-14 x Katargam (3.01), GNI-9 x Manchhi Papdi (2.95), GNI-14 x NPS-1 (2.06) and GNI-9 x Katargam (2.01) showed significant heterosis for shelling percentage. Hence, this character was also important for getting higher green pod yield. Out of ten top yielding crosses none of the crosses showed significant standard heterosis for plant height. Hence, this character was not an important for green pod yield per plant.

The comparison of standard heterosis ascertained the superiority of a cross combination over the best commercial variety/hybrid released for general cultivation. Therefore, heterosis over standard hybrids Gujarat Papdi was also estimated for thirteen characters. Component wise examination of the crosses revealed

that out of thirty two crosses tested heterotic effects in desired direction were observed for number of hybrids in different traits, such as 11 crosses depicted desirable heterosis for days to 50 per cent flowering, one crosses for plant height, 23 crosses for number of primary branches per plant, 10 for days to first picking, 7 for days to first picking, 12 for pod length (cm), 14 crosses for number of pods per plant, 10 for number of seeds per pod, 30 for average pod weight (g), 13 green pod yield per plant, 32 shelling per cent and 19 crosses for protein content over the standard checks, Gujarat Papdi.

As observed in the preset investigation, several workers have also reported the present of considerable amount of heterosis for number of pods per plant in *Dolichos* bean<sup>6</sup>, and in Indian bean<sup>15,16,21</sup>, moderate to high heterosis observed in present study has also been reported by several workers for pod length in Pea<sup>18</sup>; in French bean<sup>14</sup>; in Indian bean<sup>22</sup>, in cowpea<sup>16,21</sup>, number of pods per plant and number of branches per plant<sup>6,20,22</sup> in Indian bean, in Pea<sup>18</sup>, in cowpea<sup>16</sup>, Days to first picking in French bean<sup>14</sup> and in

pigeon pea<sup>9</sup>, Average pod weight in pea<sup>17</sup>, seeds per pod in Pea<sup>18</sup>, in pigeon pea<sup>9</sup>, in cowpea<sup>16,21</sup>, plant height in pea<sup>17</sup>, in Indian bean<sup>5,23</sup>, in cowpea<sup>3,16</sup>. Relatively low heterosis for days to 50 per cent flowering observed in present investigation was also reported by Singh and Mishra<sup>17</sup> in pea, Patel<sup>11</sup>, Desai et al<sup>7</sup>., Vashi et al<sup>23</sup>. and Bagade et al<sup>2</sup>., in Indian bean and Ram and Rajput<sup>14</sup> in French bean, days to first picking in French bean<sup>14</sup>, in pigeon pea<sup>9</sup>. A considerable more positive heterosis in the present study for pod yield per plant was observed by Pandey<sup>10</sup> in pigeon pea and seed per pod<sup>1,4,16,21</sup>.

The promising hybrids exhibited significant and desired economic heterosis twelve component traits. The best five hybrids on the basis of heterotic performance had also significant positive standard heterosis for some common characters such as number of pod per plant, average pod weight, seed index. This emphasized that high degree of heterosis for grain yield might be due to the heterosis for these component traits. All the ten hybrids recorded significant standard heterosis for average pod weight, seed index (%).

**Table I: Estimates of heterosis for over better parent (BP) and standard check (SC) for green pod yield per plant in vegetable Indian bean**

Sr. No.	Crosses	Green pod yield per plant (g)		Sr. No.	Crosses	Green pod yield per plant (g)	
		BP	SC			BP	SC
1	GNI-3 x NPS-1	8.16	10.38	17	GNI-32 x NPS-1	-13.42	-1.04
2	GNI-3 x Manchhi Papdi	-2.11	-0.11	18	GNI-32x Manchhi Papdi	-18.93*	-7.33
3	GNI-3 x Katargam	-15.66	-13.93	19	GNI-32 x Katargam	-9.76	3.16
4	GNI-3 x Gujarat Papdi	17.19	19.60	20	GNI-32 x Gujarat Papdi	10.02	25.77
5	GNI-8 x NPS-1	-9.80	1.12	21	GNI-38 x NPS-1	-7.13	-2.52
6	GNI-8 x Manchhi Papdi	-7.32	3.91	22	GNI-38x Manchhi Papdi	-15.34	-11.14
7	GNI-8 x Katargam	-2.45	9.36	23	GNI-38 x Katargam	-8.30	-3.75
8	GNI-8 x Gujarat Papdi	2.98	15.45	24	GNI-38 x Gujarat Papdi	-12.40	-8.05
9	GNI-11 x NPS-1	27.57**	23.49	25	GNI-9 x NPS-1	-10.45*	84.40**
10	GNI-11x Manchhi Papdi	26.92**	24.95	26	GNI-9 x Manchhi Papdi	-15.58**	73.83**
11	GNI-11 x Katargam	21.64*	19.76	27	GNI-9 x Katargam	-9.57*	86.21**
12	GNI-11 x Gujarat Papdi	44.99**	44.95**	28	GNI-9 x Gujarat Papdi	-12.11**	80.98**
13	GNI-14 x NPS-1	-7.39	85.83**	29	GNI-45 x NPS-1	-4.27	61.11**
14	GNI-14x Manchhi Papdi	1.92	104.52**	30	GNI-45x Manchhi Papdi	-4.25	61.16**
15	GNI-14 x Katargam	-15.63**	69.52**	31	GNI-45x Katargam	0.93	69.86**
16	GNI-14 x Gujarat Papdi	9.14*	119.02**	32	GNI-45 x Gujarat Papdi	-0.03	68.25**

**Table II: Promising hybrids for green pod yield per plant with standard checks, their sca effects and component characters showing significant desired heterosis in vegetable Indian bean**

Most heterotic crosses	Pod yield per plant	Heterosis (%)	sca effects	Significant standard heterosis for other traits in desirable direction
		over Gujarat Papdi		
GNI-14 x Gujarat Papdi	345.4	119.02**	21.49*	NBP,PL,NPP,APW ,SI
GNI-14 x Manchhi Papdi	322.5	104.52**	21.52*	DF,NBP,DFH,DLH,PL,NPP,NSP,APW ,SI,
GNI-9 x Katargam	293.7	86.21**	15.58	NPP,APW ,SI,SP,
GNI-14 x NPS-1	293.1	85.83**	-10.93	DF,DFH,PL,NPP,APW ,SI,SP
GNI-9 x NPS-1	290.8	84.40**	7.81	NBP,NPP,NSP,APW ,SI,SP,
GNI-9 x Gujarat Papdi	285.4	80.98**	-17.51	NPP,APW ,SI,SP,PC
GNI-9 x Manchhi Papdi	274.1	73.83**	-5.88	NBP,NPP,APW ,SI,SP
GNI-45 x Katargam	267.9	69.86**	15.43	PL,NPP,APW ,SI,SP,
GNI-14 x Katargam	267.3	69.52**	-32.08**	DF,DFH,DLH,PL,NPP,APW ,SI,SP
GNI-45 x Gujarat Papdi	265.3	68.25**	-11.93	NBP,PL,NSP,APW,PYP,SI,PC

DF - Days to 50 % flowering

PH - Plant height (cm)

NBP - Number of primary branches per plant

DFH - Days to first picking

DLH - Days to last picking

PL - Pod length (cm)

NPP - Number of pods per plant

NSP - Number of seeds per pod

APW - Average pod weight

PYP - Pod yield per plant

SI - Seed index (%)

SP - Shelling per cent

PC - Protein content (%)

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