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## Per se performance of parents and hybrids in bottle gourd (*Lagenaria siceraria* (Mol.) Standl.) for growth, yield and quality attributing characters

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### Abstract

The goal of the current study was to determine the average performance of parents and hybrids for growth, yield, and quality-attributing traits in bottle gourd at College of Horticulture, Venkataramannagudem, during 2019-20. Among the ten parents used for study Local Round (11.26 kg), Kashi Ganga (9.80 kg) and Arka Bahar (9.57) were high yielding of 11.26, 9.80 and 9.57 kg per vine, respectively. The hybrids Pusa Samridhi × Local Round, Pusa Samridhi × Pant Lauki-3 and Pant Lauki-3 × Local Long recorded highest yield of 14.90, 12.07 and 12.02 kg per vine, respectively in bottle gourd. The usage of parents in subsequent breeding programmes and the potential for hybrids to be employed for cultivation can both be based on their mean performance.

**Keywords:** Bottle gourd, yield, quality, per se performance

### Introduction

Bottle gourd (*Lagenaria siceraria* (Mol.) Standl.) is both tropical as well as subtropical vine, belongs to the family cucurbitaceae with chromosome number  $2n = 22$ . Bottle gourd is one of the cultivated annual monoecious species. It is commonly known as white flowered gourd, ghia, lauki, calabash gourd etc. Bottle gourd is widely grown for edible fruit. The tender green fruits contain considerable amount of water (96.1 g), carbohydrates (2.5 g), protein (0.2 g), fat (0.1 g), minerals (0.5 g), fiber (0.6 g) and energy (12 k cal) per 100 g of edible fruit. It has cooling effect and has both properties of diuretic and cardiogenic. (Barot *et al.*, 2015) [1].

The monoecious character of the bottle gourd reduces emasculation and the increased amount of hybrid seeds per cross makes it more cost-effective to use for the production of F<sub>1</sub> hybrid seeds at lower rates. The hybrid seed rate per hectare for commercial vegetable crops would also be low and economical because the crop is being grown at a larger spacing. Because of this, bottle gourd provides more opportunity for commercial exploitation of hybrid vigour to boost output. The genotypes that are doing well may be made available as a variety or may be employed further in a program of heterosis breeding.

### Materials and Methods

In this study, 10 genotypes of bottle gourd were selected, including Pusa Naveen, Pusa Samridhi, Pusa Santhusti, Pusa Sandesh, Arka Bahar, Kashi Ganga, Punjab Bahar, Pant Lauki-3, Local Round, and Local Long. For a variety of quantitative variables, these genotypes were chosen to reflect a sizable degree of genetic variability. Throughout 2019-20, they underwent crossing maintenance. The 45 F<sub>1</sub> hybrids were developed by crossing these ten genotypes in a 10 × 10 half-diallel combination during Summer, 2019. Subsequently, all the parents along with 45 F<sub>1</sub> hybrids were evaluated in Randomized Block Design with two replications during kharif, 2019. The plants were grown with a spacing of 3.0 m x 0.9 m. Throughout the cultivation process, all recommended package of practices were diligently followed to ensure a successful crop and to observe the mean performance of parents and hybrids.

### Results and Discussions

For all of the characteristics analyzed, the changes resulting from the treatments were significant for all. In addition, the treatment options were separated into parents, hybrids, and parents versus hybrids. For all the characteristics analyzed, the parents and hybrids showed a noticeable difference.

For majority of the characters, there were noticeable changes between parents vs hybrids, except for nine traits (Table-1)

The findings of the parents and hybrids *per se* performances (Table- 2) showed that, for vine length, number of nodes per vine and internodal length, the mean performance of parents ranged from 285.50 cm (Kashi Ganga) to 1535.36 cm (Local Round), 41.59 (Pusa Naveen, Kashi Ganga) to 111.23 (Local Round) and 9.16 cm (Pusa Sandesh) to 14.32 cm (Arka Bahar) respectively. The mean performance of cross combinations ranged from 258.31 cm (Arka Bahar × Local Long) to 1585.30 cm (Punjab Bahar × Local Round), 32.07 (Arka Bahar × Punjab Bahar) to 116.74 (Punjab Bahar × Pant Lauki-3) and 8.78 cm (Pusa Santhusti × Kashi Ganga) to 16.94 cm (Pusa Samridhi × Kashi Ganga) respectively. For number of secondary branches (lateral branches) per plant, node number at which first male flower appear and node number at which first female flower appear, the mean performance of parents ranged from 3.00 (Arka Bahar) to 7.70 (Local Round), 7.70 (Arka Bahar) to 17.70 (Local Round) and 9.10 (Arka Bahar) to 24.20 (Local Round) respectively. The mean performance of cross combinations ranged from 2.10 (Pusa Sandesh × Kashi Ganga) to 6.35 (Punjab Bahar × Local Round), 7.60 (Arka Bahar × Pant Lauki-3) to 12.70 (Kashi Ganga × Local Round) and 13.70 (Pusa Naveen × Pusa Sandesh) to 28.20 (Kashi Ganga × Local Round) respectively. These research results are consistent with prior findings in bottle gourd by Jain *et al.* (2016)<sup>[3]</sup> and Dubey *et al.* (2022)<sup>[2]</sup>.

For days to first appearance of male flower, days to first appearance of female flower and sex ratio (Table- 2), the mean performance of parents ranged from 31.95 (Pusa Sandesh) to 44.70 (Local Round), 37.10 (Pusa Samridhi) to 48.30 (Local Round) and 7.72 (Pusa Naveen) to 18.01 (Pant Lauki-3) respectively. The mean performance of cross combinations ranged from 30.30 (Pusa Sandesh × Kashi Ganga) to 40.95 (Kashi Ganga × Local Round), 32.30 (Pusa Sandesh × Kashi Ganga) to 47.10 (Punjab Bahar × Local Round) and 6.85 (Pusa Samridhi × Local Round) to 25.94 (Kashi Ganga × Pant Lauki-3) respectively. For days to first fruit harvest, number of fruits per vine and fruit length, the mean performance of parents ranged from 51.30 (Pusa Sandesh) to 63.30 (Local Round), 5.61 (Pusa Samridhi) to 9.96 (Local Round) and 13.15 cm (Punjab Bahar) to 65.05 cm (Pant Lauki-3) respectively. The mean performance of cross combinations ranged from 49.30 (Pusa Sandesh × Kashi Ganga) to 61.10 (Punjab Bahar × Local Round), 3.33 (Arka Bahar × Punjab Bahar) to 7.63 (Pusa Naveen × Pusa Santhusti) and 24.38 cm (Pusa Sandesh × Local Round) to 71.76 cm (Pusa Sandesh × Local Long) respectively. These research results are consistent with prior findings in bottle gourd by Kalpana *et al.* (2019)<sup>[4]</sup> and Rajendra *et al.* (2022)<sup>[5]</sup>.

For fruit diameter, fruit volume and average fruit weight

(Table- 3), the mean performance of parents ranged from 7.15 cm (Pusa Naveen) to 19.00 cm (Punjab Bahar), 1750 cc (Pusa Sandesh) to 2925 cc (Arka Bahar) and 821.15 g (Pusa Sandesh) to 1475.37 g (Kashi Ganga) respectively. The mean performance of cross combinations ranged from 7.48 cm (Kashi Ganga × Pant Lauki-3, Pant Lauki-3 × Local Round) to 20.71 cm (Punjab Bahar × Local Round), 1525 cc (Pusa Samridhi × Punjab Bahar) to 3450 cc (Pusa Samridhi × Local Long) and 815.08 g (Pusa Naveen × Pusa Santhusti) to 2568.27 g (Pant Lauki-3 × Local Long) respectively. For number of seeds per fruit, fruit yield per vine and fruit yield per plot, the mean performance of parents ranged from 310.47 (Pusa Naveen) to 460.41 (Arka Bahar), 6.30 kg (Pusa Samridhi) to 11.26 kg (Local Round) and 37.79 kg (Pusa Samridhi) to 67.56 kg (Local Round) respectively. The mean performance of cross combinations ranged from 222.83 (Pusa Naveen × Pusa Santhusti) to 632.95 (Pusa Naveen × Punjab Bahar), 3.39 kg (Punjab Bahar × Pant Lauki-3) to 14.90 kg (Pusa Samridhi × Local Round) and 20.33 kg (Punjab Bahar × Pant Lauki-3) to 89.39 kg (Pusa Samridhi × Local Round) respectively. These research results are consistent with prior findings in bottle gourd by Sharma *et al.* (2021)<sup>[6]</sup> and Sohi *et al.* (2021)<sup>[7]</sup>.

For estimated yield per hectare, total soluble solids and vitamin-C (Table- 4), the mean performance of parents ranged from 233.25 q (Pusa Samridhi) to 416.96 q (Local Round), 2.81 (Pusa Naveen) to 5.10 (Local Round) and 6.44 (Pusa Naveen) to 10.48 (Arka Bahar) respectively. The mean performance of cross combinations ranged from 125.48 q (Punjab Bahar × Pant Lauki-3) to 551.71 q (Pusa Samridhi × Local Round), 2.89 (Pusa Naveen × Local Long) to 4.60 (Pusa Samridhi × Local Round) and 6.64 (Pusa Naveen × Pusa Sandesh) to 9.60 (Pusa Samridhi × Arka Bahar) respectively. These research results are consistent with prior findings in bottle gourd by Thakur *et al.* (2013)<sup>[9]</sup>, Uddin *et al.* (2014)<sup>[10]</sup>, Sushil *et al.* (2018)<sup>[8]</sup>.

Among the 45 hybrids studied, 33 hybrids out yielded over both the checks, Arya F1 and Warad in terms of fruit yield per vine, fruit yield per plot, estimated yield per hectare. Similarly, all the hybrids for average fruit weight, 9 hybrids for fruit length, 4 hybrids for fruit diameter, 16 hybrids for fruit volume, 1 hybrid for vitamin-C has recorded greater values than both the checks. Among the 45 hybrids, none of them observed to have greater values for number of fruits per vine, total soluble solids compared to the both checks.

However, for the negative traits studied in the investigation, 5 hybrids recorded lower value compared to both the checks for vine length, 16 hybrids recorded minimum value compared to both the checks for internodal length, 1 hybrid recorded lower value compared to both the checks for sex ratio, 5 hybrids recorded minimum value compared to both the checks for days to first female flower appearance and 1 hybrid for days to first fruit harvest over both the checks.

**Table 1:** Analysis of variance for growth, yield and yield attributing characters in 10x10 half diallel of bottle gourd

Source	D.F.	Vine length (cm)	Number of nodes per vine	Internodal length (cm)	Number of secondary branches (lateral branches) per plant	Node number at which first male flower appear	Node number at which first female flower appear	Days to first appearance of male flower
Mean Sum of Squares								
Treatments	54.00	138602.80**	821.69**	6.24**	1.69**	5.25**	30.33**	15.66**
Parents	9.00	14510.40**	1319.55**	9.60**	3.94**	17.64**	42.09**	26.67**
Hybrids	44.00	105580.20**	738.53**	5.18**	1.26**	2.83**	22.20**	12.95**
Parent Vs. Hybrid	1.00	8428.88**	0.02	22.53**	0.11	0.00	282.12**	35.95**
Error	54.00	887.11	7.73	1.27	0.26	0.21	1.21	0.62

\* and \*\* Significance at 5% and 1% level respectively

Source	D.F.	Days to first appearance of female flower	Sex ratio (M: F)	Days to first fruit harvest	Number of fruits per vine	Fruit length (cm)	Fruit diameter (cm)	Fruit volume (cc)
Mean Sum of Squares								
Treatments	54.00	16.41**	56.29**	14.47**	3.86**	366.76**	26.53**	357262.30**
Parents	9.00	20.82**	16.33**	20.87**	2.75**	540.31**	42.77**	255569.40**
Hybrids	44.00	13.73**	58.48**	12.19**	2.11**	293.97**	23.81**	377145.00**
Parent Vs. Hybrid	1.00	94.72**	319.26**	57.38**	90.90**	2007.53**	0.06	397658.40**
Error	54.00	0.36	1.26	0.90	0.24	5.88	0.70	12056.51

\* and \*\* Significance at 5% and 1% level respectively.

Source	D.F.	Average fruit weight (g)	Number of seeds per fruit	Fruit yield per vine (kg)	Fruit yield per plot (kg)	Estimated yield per hectare (q)	Total soluble solids (° B)	Vitamin-C (mg 100g <sup>-1</sup> )
Mean Sum of Squares								
Treatments	54.00	382129.50**	12408.39**	9.27**	333.89**	12717.69**	0.47**	1.20**
Parents	9.00	83605.44**	3569.02**	4.87**	175.36**	6680.30**	0.94**	2.92**
Hybrids	44.00	336818.30**	14481.55**	10.37**	373.84**	14239.10**	0.38**	0.88**
Parents Vs. Hybrid	1.00	5062538.00**	743.63**	0.08	2.93	112.00	0.00	0.00
Error	54.00	1163.39	99.04	0.57	20.86	508.67	0.00	0.01

\* and \*\* Significance at 5% and 1% level respectively.

**Table 2:** Perse performance of parents and hybrids for growth attributing characters in 10x10 half diallel of bottle gourd

Sl. No.	Parents	Vine length (cm)	Number of nodes per vine	Internodal length (cm)	Number of secondary branches (lateral branches) per plant	Node number at which first male flower appear	Node number at which first female flower appear	Days to first appearance of male flower
1	Pusa Naveen	542.91	41.59	10.79	3.30	9.50	11.20	34.95
2	Pusa Samridhi	385.51	45.60	13.44	3.45	9.60	12.40	33.00
3	Pusa Santhusti	424.96	44.59	9.21	4.20	8.70	12.30	34.15
4	Pusa Sandesh	525.06	47.60	9.16	3.10	7.75	11.40	31.95
5	Arka Bahar	437.83	43.59	14.32	3.00	7.70	9.10	33.70
6	Kashi Ganga	285.50	41.59	9.66	3.45	9.50	12.40	35.95
7	Punjab Bahar	860.31	77.16	13.56	3.40	9.30	20.10	32.50
8	Pant Lauki-3	1118.21	97.20	12.69	3.50	9.70	13.00	33.70
9	Local Round	1535.36	111.23	15.15	7.70	17.70	24.20	44.70
10	Local Long	443.18	50.61	11.56	3.10	12.70	14.80	33.70
	Mean	655.88	60.08	11.95	3.82	10.22	14.09	34.83
Hybrids								
1	Pusa Naveen x Pusa Samridhi	656.62	62.13	13.20	4.60	11.95	15.90	31.10
2	Pusa Naveen x Pusa Santhusti	565.43	64.64	12.07	4.80	11.30	13.90	31.10
3	Pusa Naveen x Pusa Sandesh	835.91	67.64	11.88	4.60	9.70	13.70	34.40
4	Pusa Naveen x Arka Bahar	504.58	52.61	13.84	4.50	9.60	14.30	33.30
5	Pusa Naveen x Kashi Ganga	806.30	85.18	11.99	3.40	11.50	18.30	32.30
6	Pusa Naveen x Punjab Bahar	376.91	74.66	14.32	3.90	11.60	16.40	30.95
7	Pusa Naveen x Pant Lauki-3	445.12	42.09	14.96	3.50	9.70	13.90	31.35
8	Pusa Naveen x Local Round	735.15	66.64	15.83	5.40	10.70	17.00	32.40
9	Pusa Naveen x Local Long	589.17	55.62	16.12	5.50	10.70	18.40	31.45
10	Pusa Samridhi x Pusa Santhusti	631.45	73.15	12.62	3.90	11.50	20.10	32.40
11	Pusa Samridhi x Pusa Sandesh	358.41	41.59	13.43	4.25	10.50	20.00	31.50
12	Pusa Samridhi x Arka Bahar	915.66	79.67	13.24	3.60	12.30	21.80	32.50
13	Pusa Samridhi x Kashi Ganga	435.67	57.62	16.94	4.20	11.50	20.10	33.95
14	Pusa Samridhi x Punjab Bahar	780.23	81.67	14.28	4.30	11.70	16.50	31.50
15	Pusa Samridhi x Pant Lauki-3	573.89	55.12	12.65	3.10	10.30	18.30	32.60
16	Pusa Samridhi x Local Round	593.87	34.57	13.55	3.70	9.50	16.60	33.00

17	Pusa Samridhi x Local Long	400.34	36.08	13.90	2.80	8.50	15.00	31.90
18	Pusa Santhusti x Pusa Sandesh	524.86	55.12	13.45	2.80	10.70	14.80	31.70
19	Pusa Santhusti x Arka Bahar	545.93	55.12	11.76	3.10	10.70	15.30	33.50
20	Pusa Santhusti x Kashi Ganga	425.34	58.62	8.78	3.00	10.90	14.70	32.15
21	Pusa Santhusti x Punjab Bahar	565.33	41.59	13.13	3.70	9.30	17.70	31.20
22	Pusa Santhusti x Pant Lauki-3	543.42	36.58	14.93	3.15	10.30	17.80	33.70
23	Pusa Santhusti x Local Round	686.17	36.08	13.34	3.80	8.90	17.60	33.10
24	Pusa Santhusti x Local Long	826.33	92.69	13.43	3.10	10.50	18.70	32.80
25	Pusa Sandesh x Arka Bahar	518.64	68.64	11.78	3.60	9.50	16.30	32.20
26	Pusa Sandesh x Kashi Ganga	786.35	62.13	13.31	2.10	8.50	15.80	30.30
27	Pusa Sandesh x Punjab Bahar	494.66	45.09	13.28	3.80	8.10	16.10	31.20
28	Pusa Sandesh x Pant Lauki-3	473.50	61.63	12.85	3.10	9.60	16.90	31.15
29	Pusa Sandesh x Local Round	635.86	52.61	10.97	3.20	9.30	15.60	35.70
30	Pusa Sandesh x Local Long	467.48	51.11	10.51	4.00	8.70	21.90	33.30
31	Arka Bahar x Kashi Ganga	495.36	66.14	12.33	2.80	8.60	18.70	33.30
32	Arka Bahar x Punjab Bahar	545.50	32.07	11.65	3.60	10.50	17.30	33.30
33	Arka Bahar x Pant Lauki-3	637.71	85.68	12.23	3.60	7.60	15.50	34.30
34	Arka Bahar x Local Round	553.08	38.08	13.57	3.80	9.20	17.10	33.30
35	Arka Bahar x Local Long	258.31	25.05	10.47	3.05	9.70	20.50	40.35
36	Kashi Ganga x Punjab Bahar	720.22	57.62	14.39	3.40	10.30	19.90	33.50
37	Kashi Ganga x Pant Lauki-3	973.02	93.20	12.25	3.50	12.10	23.80	33.70
38	Kashi Ganga x Local Round	745.81	62.63	12.40	4.80	12.70	28.20	40.95
39	Kashi Ganga x Local Long	809.98	57.62	12.23	3.30	10.60	27.50	37.00
40	Punjab Bahar x Pant Lauki-3	1585.30	116.74	13.20	3.70	10.40	17.30	32.50
41	Punjab Bahar x Local Round	1198.83	97.20	14.44	6.35	9.50	21.60	39.90
42	Punjab Bahar x Local Long	577.78	66.64	12.33	3.10	9.30	17.50	31.50
43	Pant Lauki-3 x Local Round	420.61	53.61	11.73	3.95	10.40	22.40	33.20
44	Pant Lauki-3 x Local Long	605.28	44.09	14.44	3.40	9.50	22.90	34.25
45	Local Round x Local Long	668.02	61.13	16.72	3.30	11.70	21.30	39.90
	Mean	633.18	60.11	13.13	3.74	10.21	18.24	33.35
	Checks							
	Arya F1	875.46	45.09	12.01	5.60	10.50	13.40	31.20
	Warad	425.31	74.16	17.82	5.10	9.50	10.50	31.95
	Mean	650.38	59.62	14.92	5.35	10.00	11.95	31.58
	Grand mean	637.77	60.09	12.98	3.81	10.21	17.29	33.55
	S. Em	20.96	1.95	0.78	0.37	0.31	0.79	0.55
	C.D @5%	59.37	5.53	2.22	1.04	0.90	2.24	1.57
	C.D @1%	79.04	7.36	2.96	1.39	1.20	2.99	2.09

**Table 3:** Perse performance of parents and hybrids for growth and yield attributing characters in 10x10 half diallel of bottle gourd

Sl. No.	Parents	Days to first appearance of female flower	Sex ratio (m:f)	Days to first fruit harvest	Number of fruits per vine	Fruit length (cm)	Fruit diameter (cm)	Fruit volume (cc)
1	Pusa Naveen	37.20	7.72	54.20	7.81	42.80	7.15	2800.00
2	Pusa Samridhi	37.10	10.36	55.10	5.61	41.75	9.11	2850.00
3	Pusa Santhusti	39.10	10.50	54.10	6.29	30.35	12.22	2700.00
4	Pusa Sandesh	37.30	10.96	51.30	7.67	15.05	16.50	1750.00
5	Arka Bahar	39.30	8.38	56.30	6.79	34.40	8.15	2925.00
6	Kashi Ganga	39.50	9.77	57.50	6.64	52.30	7.77	2625.00
7	Punjab Bahar	39.10	12.10	53.10	7.44	13.15	19.00	2300.00
8	Pant Lauki-3	39.30	18.01	56.30	6.66	65.05	7.31	2275.00
9	Local Round	48.30	12.80	63.30	9.96	21.05	17.68	2575.00
10	Local Long	39.70	11.82	56.70	7.20	40.95	9.24	2775.00
	Mean	39.59	11.24	55.79	7.21	35.69	11.41	2557.50
	<b>Hybrids</b>							
1	Pusa Naveen x Pusa Samridhi	33.50	14.07	51.50	5.32	43.94	11.12	2505.00
2	Pusa Naveen x Pusa Santhusti	34.50	11.01	52.50	7.63	49.02	9.25	2700.00
3	Pusa Naveen x Pusa Sandesh	36.10	15.41	52.10	5.22	46.48	8.70	1795.00
4	Pusa Naveen x Arka Bahar	37.70	15.48	56.70	4.22	63.25	9.14	2975.00
5	Pusa Naveen x Kashi Ganga	36.50	23.80	53.50	4.17	60.71	10.48	3275.00
6	Pusa Naveen x Punjab Bahar	36.60	20.51	51.60	4.27	40.64	12.42	2950.00
7	Pusa Naveen x Pant Lauki-3	36.70	15.55	53.70	3.51	45.47	9.75	2660.00
8	Pusa Naveen x Local Round	38.70	18.27	53.70	4.35	32.64	11.73	2050.00
9	Pusa Naveen x Local Long	33.70	18.95	50.70	3.60	47.88	9.91	2800.00
10	Pusa Samridhi x Pusa Santhusti	39.10	15.19	54.10	5.66	42.93	10.84	2375.00
11	Pusa Samridhi x Pusa Sandesh	40.70	10.82	55.70	5.00	50.17	8.78	2100.00



5	Pusa Naveen x Kashi Ganga	2493.12	577.36	10.39	62.32	384.63	3.41	7.26
6	Pusa Naveen x Punjab Bahar	2383.09	632.95	10.17	61.01	376.54	3.15	7.71
7	Pusa Naveen x Pant Lauki-3	1803.54	379.01	6.34	38.02	234.67	3.37	7.42
8	Pusa Naveen x Local Round	1507.45	387.58	6.55	39.32	242.65	3.95	7.77
9	Pusa Naveen x Local Long	2016.90	355.53	7.27	43.62	269.19	2.89	7.15
10	Pusa Samridhi x Pusa Santhusti	1594.40	330.94	9.03	54.17	334.31	3.80	7.91
11	Pusa Samridhi x Pusa Sandesh	1588.49	340.51	8.19	49.15	303.34	3.60	7.78
12	Pusa Samridhi x Arka Bahar	1285.32	419.62	8.23	49.40	304.86	3.65	9.60
13	Pusa Samridhi x Kashi Ganga	1595.48	360.54	9.40	56.41	348.17	4.06	8.40
14	Pusa Samridhi x Punjab Bahar	2360.59	430.65	10.57	63.42	391.41	3.80	8.84
15	Pusa Samridhi x Pant Lauki-3	1843.55	430.14	12.07	72.41	446.86	4.02	8.56
16	Pusa Samridhi x Local Round	2169.54	500.77	14.90	89.39	551.71	4.60	8.91
17	Pusa Samridhi x Local Long	2215.55	344.05	9.52	57.12	352.54	3.54	8.28
18	Pusa Santhusti x Pusa Sandesh	1704.92	327.99	10.97	65.83	406.29	3.30	6.97
19	Pusa Santhusti x Arka Bahar	1583.47	387.34	7.17	43.02	265.50	3.35	8.79
20	Pusa Santhusti x Kashi Ganga	1901.07	294.92	9.01	54.05	333.58	3.76	7.59
21	Pusa Santhusti x Punjab Bahar	1837.05	261.89	6.25	37.51	231.52	3.50	8.04
22	Pusa Santhusti x Pant Lauki-3	1341.90	245.37	5.05	30.31	187.08	3.71	7.75
23	Pusa Santhusti x Local Round	1908.07	416.12	10.42	62.53	385.90	4.30	8.10
24	Pusa Santhusti x Local Long	1195.30	355.53	5.50	32.98	203.52	3.24	7.48
25	Pusa Sandesh x Arka Bahar	1884.57	403.10	8.10	48.59	299.87	3.15	8.66
26	Pusa Sandesh x Kashi Ganga	1414.92	374.03	6.28	37.67	232.50	3.56	7.47
27	Pusa Sandesh x Punjab Bahar	2014.40	286.43	9.22	55.33	341.50	3.29	7.91
28	Pusa Sandesh x Pant Lauki-3	1889.57	394.09	10.45	62.72	387.08	3.51	7.63
29	Pusa Sandesh x Local Round	1059.32	280.42	4.86	29.16	179.97	4.10	7.98
30	Pusa Sandesh x Local Long	1194.36	396.08	6.97	41.80	257.97	3.04	7.35
31	Arka Bahar x Kashi Ganga	1443.93	384.95	5.35	32.09	198.08	3.61	8.78
32	Arka Bahar x Punjab Bahar	2432.23	429.65	8.11	48.64	300.21	3.35	9.22
33	Arka Bahar x Pant Lauki-3	1709.42	299.95	7.86	47.16	291.05	3.56	8.94
34	Arka Bahar x Local Round	1820.36	415.12	8.57	51.43	317.40	4.15	9.29
35	Arka Bahar x Local Long	2113.63	382.05	8.51	51.06	315.11	3.09	8.66
36	Kashi Ganga x Punjab Bahar	1510.95	478.72	6.40	38.41	237.05	3.75	8.53
37	Kashi Ganga x Pant Lauki-3	1621.99	305.45	6.64	39.86	246.02	3.97	8.25
38	Kashi Ganga x Local Round	1641.49	479.22	11.57	69.41	428.40	4.56	8.60
39	Kashi Ganga x Local Long	1772.43	426.64	6.71	40.29	248.65	3.50	7.97
40	Punjab Bahar x Pant Lauki-3	917.18	280.92	3.39	20.33	125.48	3.71	8.69
41	Punjab Bahar x Local Round	1496.37	275.41	7.32	43.90	270.91	4.30	9.04
42	Punjab Bahar x Local Long	1528.96	386.08	6.85	41.08	253.51	3.23	8.41
43	Pant Lauki-3 x Local Round	1902.97	358.03	11.18	67.06	413.87	4.51	8.76
44	Pant Lauki-3 x Local Long	2568.227	330.50	12.02	72.10	444.95	3.45	8.13
45	Local Round x Local Long	1179.30	346.58	6.17	37.01	228.42	4.04	8.48
	Mean	1718.83	381.46	8.23	49.38	304.74	3.62	8.19
Checks								
1	Arya F1	740.22	285.56	6.52	39.11	241.36	4.65	8.22
2	Warad	780.23	202.82	6.63	39.80	245.64	3.94	9.44
	Mean	760.23	244.19	6.58	39.45	243.50	4.30	8.83
	Grand mean	1587.62	375.46	8.18	49.10	303.05	3.64	8.21
	S. Em	23.89	6.91	0.53	3.20	15.82	0.04	0.07
	C.D @5%	67.70	19.60	1.51	9.08	44.83	0.14	0.22
	C.D @1%	90.12	26.09	2.01	12.08	59.68	0.18	0.29
1	Pusa Santhusti x Punjab Bahar	1837.05	261.89	6.25	37.51	231.52	3.50	8.04
22	Pusa Santhusti x Pant Lauki-3	1341.90	245.37	5.05	30.31	187.08	3.71	7.75
23	Pusa Santhusti x Local Round	1908.07	416.12	10.42	62.53	385.90	4.30	8.10
24	Pusa Santhusti x Local Long	1195.30	355.53	5.50	32.98	203.52	3.24	7.48
25	Pusa Sandesh x Arka Bahar	1884.57	403.10	8.10	48.59	299.87	3.15	8.66
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36	Kashi Ganga x Punjab Bahar	1510.95	478.72	6.40	38.41	237.05	3.75	8.53
37	Kashi Ganga x Pant Lauki-3	1621.99	305.45	6.64	39.86	246.02	3.97	8.25

