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Assessment of Parental Lines and F1 Hybrid for Earliness and Growth in Cucumber (*Cucumis sativus* L.)

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ABSTRACT

The present investigation was conducted during *Zaid* season in year 2023-24 (Y_1) and 2024-25 (Y_2) to evaluate mean performance using Line x Tester mating design with thirteen diverse parents of cucumber. They were crossed in a Line x Tester mating design for generating experimental material. All thirteen parents and their thirty hybrids were grown in randomized block design with three replications. Observations were recorded for the seven traits. The evaluation of parents and hybrids for seven traits over two years and pooled data revealed significant variations. Based on the per se performance findings of the experiment conducted it may be suggested that crosses NDCU-23-3 × Arka Veera, NDCU-23-8 × Pusa Uday, VRCU- 2203× Arka Veera, NDCU-23-5 × Punjab Naveen are the top most hybrids in order of merit for Growth and Earliness. It is suggested to test the superior hybrids in multilocation trial to confirm their potentiality and stability over different agro climatic conditions. Selected parents with desirable per se and combining ability effect can be used in multiple crossing schemes to recombine different productive components.

INTRODUCTION

Cucumber (*Cucumis sativus* L.) is an economically significant member of the Cucurbitaceae family, widely cultivated as a summer vegetable across the globe. Its immature, tender fruits are primarily consumed as salads. The crop is believed to have originated in India and has been cultivated for over 3,000 years. It is considered one of the oldest domesticated vegetable crops. Cucumber is a thermophilic and frost-sensitive plant that thrives in temperatures above 20°C. It is a valuable source of essential nutrients, including carbohydrates, vitamin B, and vitamin P. Nutritional analysis of 100 grams of edible cucumber fruit indicates it contains approximately 96 grams of water, 2.2 grams of carbohydrates, 0.1 grams of fat, and 0.6 grams of protein. Additionally, it provides essential minerals such as calcium (12 mg), iron (0.3 mg), magnesium (15 mg), and phosphorus (24 mg). The fruit also contains 45 IU of vitamin A, 0.3 mg of niacin, 0.03 mg of vitamin B1, 0.02 mg of vitamin B2, and 12 mg of vitamin C. Beyond its nutritional benefits, cucumber holds significance in Ayurvedic medicine due to its astringent and antipyretic properties. The oil extracted from its seeds is believed to contribute to brain health. Furthermore,

cucumber plays a crucial role in the cosmetic industry due to its hydrating, soothing, and healing properties. In India, cucumber cultivation extends from the plains to high-altitude regions. In northern India, it is grown twice a year-during the *Zaid* and *Kharif* seasons-while in hilly areas, it is cultivated in the autumn-summer period.

Materials and Methods

The present investigation conducted during *Zaid* season in year 2023-24 (Y_1) and 2024-25 (Y_2) to per se performance by using Line x Tester mating design at the Main Experiment Station (MES), Department of Vegetable Science, Acharya Narendra Deva University of Agriculture and Technology, Narendra Nagar, Kumarganj, Ayodhya (U.P.) India. The experimental site is geographically, falls under humid, sub-tropical climate and is located in between 24.470 and
26.560 N latitude and 82.120 and 83.980 E longitude at an altitude of 113 m above the mean sea stratum in the Gangetic alluvial plains of Eastern Uttar Pradesh. The soil of experimental site was sandy loam with average fertility level with pH in the range of 7.5-8.5. The selected parental lines for the present investigation comprised of 13 parents NDCU-23-1 (L_1), NDCU-23-3 (L_2), NDCU-23-4 (L_3), NDCU-23-5 (L_4), NDCU-23-7 (L_5), NDCU-23-8 (L_6), NDCU-23-9 (L_7), NDCU-23-10 (L_8) , NDCU-23-11 (L_9), VRCU-2203 (L_{10}) and testers Pusa Uday (T_1), Punjab
Naveen (T_2), Arka Veera (T_3) were crossed in Line x Tester cross combinations to get 30 F_1 that were evaluated in randomized block design in three replications having each experimental unit of single row with spacing of 2.5 m x 0.5 m. The mean of five plants was calculated and used for statistical analysis. The field experiment was laid out in a randomized block design with three replications.

Result

Days to first staminate flower anthesis

In pooled, days to first staminate flower anthesis ranged from 36.67 to 44.21 days for parents and 28.98 to 40.68 days for hybrids. Parent NDCU-23-3 (36.67 days) found earliest for days to first staminate flower anthesis among the parents which was followed by NDCU-23-10 (37.66 days), NDCU-23-8 (38.05 days), Arka Veera (38.63 days) and NDCU-23-7 (38.78 days). The best F_1 hybrid for days to first staminate flower anthesis was NDCU-23-3 × Arka Veera (28.98 days) followed by NDCU-23-11 x Punjab Naveen (29.11), NDCU-23-7 x Arka Veera (29.91), NDCU-23-11 x Pusa Uday (30.14) and NDCU-23-3 x Pusa Uday (30.47). Averages over the parental mean (39.67 days) and averages over the F_1 hybrid mean (33.36 days) were more or less of the same order.

Days to first pistillate flower anthesis

In pooled, days to first pistillate flower anthesis ranged from 41.71 to 48.62 days for parents and 32.51 to 45.63 days for hybrids. Parent NDCU-23-3 (41.71 days) found earliest for days to first pistillate flower anthesis among the parents which was followed by NDCU-23-8 (42.59 days), NDCU-23-7 (42.62 days), NDCU-23-10 (42.71 days) and NDCU-23-4 (42.92
days). The best F_1 hybrid for days to first pistillate flower anthesis was NDCU-23-3 × Arka Veera (32.51 days) followed by NDCU-23-11 x Punjab Naveen (33.84), VRCU-2203 x Arka Veera (34.15), NDCU-23-7 x Arka Veera (34.41) and NDCU-23-11 x Pusa Uday (34.49).
Averages over the parental mean (44.29 days) and averages over the F_1 hybrid mean (37.38 days) were more or less of the same order.

Node number to first staminate flower appearance

In pooled, node number to first staminate flower appearance ranged from 4.18 to 6.63 nodes for parents and 3.96 to 6.55 nodes for hybrids. Parent NDCU-23-7 (4.18 nodes) found earliest for node number to first staminate flower appearance among the parents which was followed by NDCU-23-11 (4.72), NDCU-23-3 (4.73), NDCU-23-1 (4.77) and Pusa Uday (4.84).

The best F1 hybrid for node number to first staminate flower appearance was NDCU-23-7 x Pusa Uday (3.96 days) followed by NDCU-23-9 × ArkaVeera (4.06), NDCU-23-8 x Pusa Uday (4.49), NDCU-23-11 x Pusa Uday (4.50) and NDCU-23-9 x Punjab Naveen (4.51). Averages over the parental mean (5.20 nodes) and averages over the F_1 hybrid mean (5.02 nodes) were more or less of the same order.

Node number to first pistillate flower appearance

In pooled, node number to first pistillate flower appearance ranged from 8.83 to 12.67 nodes for parents and 8.30 to 12.38 nodes for hybrids. Parent NDCU-23-11 (8.83 nodes) found earliest for node number to first pistillate flower appearance among the parents which was followed by NDCU-23-8 (8.86), NDCU-23-1 (8.93), NDCU-23-4 (9.17) and Pusa Uday (9.66).
The best F_1 hybrid for node number to first pistillate flower appearance was NDCU-23-8 × Pusa Uday (8.30 days) followed by NDCU-23-10x Arka Veera (8.33), NDCU-23-11 × Pusa Uday (8.40), NDCU-23-3 x Arka Veera (8.46) and NDCU-23-7 x Pusa Uday (8.48). Averages over the parental mean (10.04 nodes) and averages over the F_1 hybrid mean (9.53 nodes) were more or less of the same order.

Days to first fruit harvest

In pooled, days to first fruit harvest ranged from 47.06 to 54.12 days for parents and
36.77 to 49.91 days for hybrids. Parent NDCU-23-3 (47.06 days) found earliest for days to first fruit harvest among the parents which was followed by NDCU-23-10 (47.20 days), NDCU-23-7 (48.22 days), NDCU-23-8 (48.24 days) and NDCU-23-9 (48.34 days). The best F_1 hybrid for days to first fruit harvest was NDCU-23-3 × Arka Veera (36.77 days) followed by NDCU-23-11x Punjab Naveen (38.31), VRCU-2203 x Arka Veera (38.41), NDCU-23-7 x Arka Veera (38.76) and NDCU-23-9 x Punjab Naveen (38.82). Averages over the parental mean (49.46 days) and averages over the F_1 hybrid mean (41.88 days) were more or less of the same order.

Vine length (m)

In pooled, vine length (m) ranged from 2.16 to 2.80 (m) for parents and 2.28 to 3.42 (m) for hybrids. NDCU-23-5 (2.80 m) found maximum for vine length among the parents which was followed by Arka Veera (2.66 m), NDCU-23-9 (2.61 m), VRCU-2203 (2.59) & NDCU-23-3
(2.54 m).The best F_1 hybrid for vine length was VRCU-2203× Arka Veera (3.42 m) followed by NDCU-23-7 x Arka Veera (3.35 m), NDCU-23-3 x Pusa Uday(3.31 m), VRCU-2203 × Pusa
Uday (3.23 m) and NDCU-23-3 x Arka Veera (3.21 m). Averages over the parental mean (2.47 m) and averages over the F_1 hybrid mean (2.78 m) were more or less of the same order.

Number of primary branches per vine

In pooled, number of primary branches per vine ranged from 2.20 to 3.04 for parents and
3.01 to 4.55 for hybrids. Parent Arka Veera (3.04 branches) found maximum number of primary branches per vine among the parents which was followed by NDCU-23-9 (3.01 branches), NDCU-23-7 (2.99 branches), NDCU-23-8 (2.97 branches)and Punjab Naveen (2.95 branches). The best F_1 hybrid for days to first fruit harvest was NDCU-23-5 × Punjab Naveen (4.55 branches) followed by NDCU-23-5 x Arka Veera (4.53 branches), NDCU-23-7 x Arka Veera (4.44 branches), NDCU-23-1 x Arka Veera (4.10 branches) and NDCU-23-1 x Punjab Naveen (4.05 branches). Averages over the parental mean (2.69 branches) and averages over the F_1 hybrid mean (3.75 branches) were more or less of the same order.

CONCLUSION

In conclusion, the comprehensive analysis of parental and hybrid performance across seven traits over two years reveals significant insights into the genetic potential and variability within the studied genotypes. Notable variations

were observed both within and between parent varieties and their hybrids. The values for these traits were consistently recorded by specific genotypes, highlighting their potential for selection and breeding purposes. The findings underscore the importance of genetic diversity in enhancing crop quality attributes, thus contributing to future breeding strategies aimed at developing superior varieties. Further research in this direction could facilitate the development of crops that meet diverse consumer preferences and nutritional needs.

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Table- Mean performance for parents and their hybrids

sn	Parent/Hybrids	Days to first staminate flower anthesis			Days to first pistillate flower anthesis			Node No. to first staminate flower appearance			Node No. to first pistillate flower apperance			Days to first fruit harvest		
		Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P	Y1	Y2	P
	Parents															
1	NDCU-23-1	44.85	43.56	44.21	49.23	48.00	48.62	5.29	4.26	4.77	9.54	8.31	8.93	54.90	53.34	54.12
2	NDCU-23-3	37.22	36.12	36.67	42.32	41.09	41.71	5.16	5.10	5.13	10.86	9.60	10.23	47.84	46.28	47.06
3	NDCU-23-4	39.44	38.32	38.88	43.54	42.31	42.92	5.58	4.19	4.89	9.78	8.56	9.17	49.32	47.76	48.54
4	NDCU-23-5	41.77	40.58	41.17	46.78	45.55	46.16	5.91	5.62	5.76	11.52	10.29	10.90	51.90	50.34	51.12
5	NDCU-23-7	39.36	38.21	38.78	43.23	42.00	42.62	4.13	4.23	4.18	10.36	9.45	9.90	49.00	47.44	48.22
6	NDCU-23-8	38.64	37.46	38.05	43.21	41.98	42.59	5.28	4.18	4.73	9.46	8.26	8.86	49.02	47.46	48.24
7	NDCU-23-9	39.96	38.81	39.38	44.43	43.20	43.82	6.30	5.07	5.68	11.36	10.13	10.75	49.12	47.56	48.34
8	NDCU-23-10	38.24	37.08	37.66	43.32	42.09	42.71	6.30	3.96	5.13	10.26	9.10	9.68	47.98	46.42	47.20
9	NDCU-23-11	40.60	39.36	39.98	45.78	44.55	45.17	4.92	4.53	4.72	9.45	8.22	8.83	50.43	48.87	49.65
10	VRCU-2203	40.58	39.42	40.00	45.79	44.56	45.18	7.84	5.43	6.63	13.26	12.07	12.67	51.02	49.46	50.24
11	Pusa Uday	41.51	39.87	40.69	45.21	43.86	44.53	5.12	4.56	4.84	10.37	8.94	9.66	50.88	49.12	50.00
12	Punjab Naveen	42.41	40.90	41.66	46.21	44.86	45.54	6.98	4.99	5.98	11.97	10.60	11.28	51.78	50.02	50.90
13	Arka Veera	39.49	37.77	38.63	44.89	43.54	44.22	5.90	4.48	5.19	10.37	8.94	9.66	50.23	48.47	49.35
	Mean	**40.31**	**39.04**	39.67	**44.92**	**43.66**	44.29	**5.74**	**4.66**	5.20	**10.66**	**9.42**	10.04	**50.26**	**48.66**	49.46
	Min	37.22	36.12	36.67	42.32	41.09	41.71	4.13	3.96	4.18	9.45	8.22	8.83	47.84	46.28	47.06
	Max	44.85	43.56	44.21	49.23	48.00	48.62	7.84	5.62	6.63	13.26	12.07	12.67	54.90	53.34	54.12
	Hybrids															
14	NDCU-23-1 x Pusa Uday	39.04	38.21	38.63	43.32	41.89	42.61	5.91	4.11	5.01	10.03	8.60	9.31	47.89	46.55	47.22
15	NDCU-23-1 x Punjab Naveen	36.69	35.42	36.05	41.01	39.58	40.30	6.90	5.03	5.97	11.94	10.56	11.25	45.12	43.78	44.45
16	NDCU-23-1 x Arka Veera	37.89	36.71	37.30	41.21	39.78	40.50	4.93	4.35	4.64	9.28	7.85	8.57	45.03	43.69	44.36
17	NDCU-23-3 x Pusa Uday	31.08	29.86	30.47	35.32	33.89	34.61	5.84	4.19	5.01	10.15	8.76	9.46	40.21	38.87	39.54
18	NDCU-23-3 x Punjab Naveen	34.73	33.51	34.12	40.03	38.60	39.31	5.14	4.32	4.73	9.32	7.89	8.61	44.78	43.44	44.11
19	NDCU-23-3 x Arka Veera	29.54	28.42	28.98	33.23	31.80	32.51	5.08	4.08	4.58	9.17	7.76	8.46	37.44	36.10	36.77
20	NDCU-23-4 x Pusa Uday	37.11	35.78	36.45	41.51	40.08	40.80	5.68	3.91	4.79	9.59	8.16	8.88	45.78	44.44	45.11
21	NDCU-23-4 x Punjab Naveen	31.89	30.67	31.28	36.32	34.89	35.61	6.26	4.02	5.14	10.28	8.90	9.59	40.43	39.09	39.76
22	NDCU-23-4 x Arka Veera	34.50	33.38	33.94	39.94	38.51	39.23	5.85	4.40	5.13	10.25	8.85	9.55	44.12	42.78	43.45
23	NDCU-23-5 x Pusa Uday	39.24	38.03	38.64	43.62	42.19	42.90	6.61	4.29	5.45	10.89	9.50	10.20	47.67	46.33	47.00
24	NDCU-23-5x Punjab Naveen	35.53	34.41	34.97	39.94	38.51	39.23	5.79	4.12	4.96	9.91	8.51	9.21	44.19	42.85	43.52
25	NDCU-23-5 x Arka Veera	34.52	33.23	33.87	38.23	36.80	37.51	6.53	4.25	5.39	10.77	9.37	10.07	43.00	41.66	42.33

26	NDCU-23-7 x Pusa Uday	32.36	31.20	31.78	37.20	35.77	36.49	3.61	4.31	3.96	9.20	7.77	8.48	41.54	40.20	40.87
27	NDCU-23- 7x Punjab Naveen	31.59	30.36	30.97	35.34	33.91	34.62	5.48	4.59	5.04	10.08	8.70	9.39	40.00	38.66	39.33
28	NDCU-23-7 x Arka Veera	30.52	29.31	29.91	35.12	33.69	34.41	6.97	4.22	5.59	11.18	9.75	10.47	39.43	38.09	38.76
29	NDCU-23-8 x Pusa Uday	41.35	40.00	40.68	46.34	44.91	45.63	4.94	4.05	4.49	8.99	7.61	8.30	50.58	49.24	49.91
30	NDCU-23- 8 x Punjab Naveen	37.50	36.34	36.92	41.20	39.77	40.49	5.55	4.49	5.02	10.04	8.61	9.33	45.51	44.17	44.84
31	NDCU-23-8 x Arka Veera	31.33	30.21	30.77	36.43	35.00	35.72	6.63	5.15	5.89	11.78	10.42	11.10	40.64	39.30	39.97
32	NDCU-23-9 x Pusa Uday	31.50	30.31	30.91	35.34	33.91	34.62	5.07	4.15	4.61	9.23	7.82	8.52	39.60	38.26	38.93
33	NDCU-23- 9 x Punjab Naveen	32.07	30.84	31.45	35.34	33.91	34.62	4.89	4.12	4.51	9.24	7.80	8.52	39.49	38.15	38.82
34	NDCU-23-9 x Arka Veera	31.37	30.25	30.81	36.12	34.69	35.41	3.54	4.59	4.06	12.04	10.63	11.34	40.33	38.99	39.66
35	NDCU-23-10 x Pusa Uday	37.21	36.00	36.61	41.23	39.80	40.52	4.99	4.58	4.79	9.57	8.14	8.86	46.00	44.66	45.33
36	NDCU-23- 10 x Punjab Naveen	37.34	36.04	36.69	40.00	38.57	39.28	6.77	4.91	5.85	11.69	10.26	10.97	45.12	43.78	44.45
37	NDCU-23-10 x Arka Veera	33.50	32.38	32.94	37.92	36.49	37.21	5.03	4.08	4.55	9.11	7.56	8.33	42.78	41.44	42.11
38	NDCU-23-11 x Pusa Uday	30.73	29.56	30.14	35.21	33.78	34.49	4.92	4.09	4.50	9.11	7.68	8.40	39.52	38.18	38.85
39	NDCU-23- 11 x Punjab Naveen	29.67	28.56	29.11	34.55	33.12	33.84	7.77	5.32	6.55	13.09	11.67	12.38	38.98	37.64	38.31
40	NDCU-23-11 x Arka Veera	32.50	30.67	31.59	37.00	35.57	36.29	5.54	4.28	4.91	9.82	8.39	9.11	40.89	39.55	40.22
41	VRCU-2203 x Pusa Uday	33.04	31.92	32.48	36.45	35.02	35.74	5.73	5.02	5.37	10.74	9.34	10.04	40.67	39.33	40.00
42	VRCU-2203 x Punjab Naveen	32.08	30.86	31.47	36.48	35.05	35.76	6.08	5.12	5.60	11.20	9.76	10.48	40.72	39.38	40.05
43	VRCU-2203 x Arka Veera	31.60	30.41	31.01	34.87	33.44	34.15	5.22	4.03	4.63	9.47	8.08	8.78	39.08	37.74	38.41
	Mean	**33.97**	**32.76**	33.36	**38.19**	**36.76**	37.48	**5.64**	**4.41**	5.02	**10.24**	**8.82**	9.53	**42.55**	**41.21**	41.88
	Min	29.54	28.42	28.98	33.23	31.80	32.51	3.54	3.91	3.96	8.99	7.56	8.30	37.44	36.10	36.77
	Max	41.35	40.00	40.68	46.34	44.91	45.63	7.77	5.32	6.55	13.09	11.67	12.38	50.58	49.24	49.91
44	Zoya	38.59	36.89	37.74	42.42	41.56	41.99	5.87	5.35	5.61	11.23	9.80	10.51	47.54	45.78	46.66
	Mean	**35.95**	**34.71**	35.33	**40.28**	**38.91**	39.59	**5.68**	**4.50**	5.09	**10.39**	**9.02**	9.70	**44.94**	**43.51**	44.23
	Min	29.54	28.42	28.98	33.23	31.80	32.51	3.54	3.91	3.96	8.99	7.56	8.30	37.44	36.10	36.77
	Max	44.85	43.56	44.21	49.23	48.00	48.62	7.84	5.62	6.63	13.26	12.07	12.67	54.90	53.34	54.12
	SE(d) ±	1.37	1.43	1.36	1.68	1.61	1.64	0.26	0.18	0.20	0.42	0.38	0.39	2.00	1.73	1.86
	C.D.at 5%	2.74	2.84	2.70	3.34	3.21	3.26	0.51	0.35	0.40	0.84	0.75	0.78	3.98	3.45	3.71
	C.V. (%)	4.68	5.04	4.71	5.10	5.08	5.07	5.56	4.77	4.77	4.95	5.14	4.95	5.44	4.88	5.16

Contd.

sn	Parent/Hybrids	Vine length (m)			Number of primary branches per vine		
		Y1	Y2	P	Y1	Y2	P
	Parents						
1	NDCU-23-1	1.81	2.52	2.16	2.36	2.68	2.52
2	NDCU-23-3	2.21	2.87	2.54	2.25	3.00	2.62
3	NDCU-23-4	1.95	2.64	2.29	2.14	2.53	2.33
4	NDCU-23-5	2.44	3.15	2.80	2.03	2.37	2.20
5	NDCU-23-7	2.16	2.81	2.49	2.82	3.15	2.99
6	NDCU-23-8	2.12	2.73	2.42	2.80	3.14	2.97
7	NDCU-23-9	2.27	2.95	2.61	2.81	3.20	3.01
8	NDCU-23-10	1.88	2.55	2.22	2.16	2.50	2.33
9	NDCU-23-11	1.93	2.70	2.31	2.38	2.74	2.56
10	VRCU-2203	2.25	2.94	2.59	2.62	3.00	2.81
11	Pusa Uday	2.17	2.83	2.50	2.47	2.81	2.64
12	Punjab Naveen	2.13	2.78	2.45	2.76	3.15	2.95
13	Arka Veera	2.37	2.95	2.66	2.86	3.22	3.04
	Mean	**2.13**	**2.80**	2.47	**2.50**	**2.89**	2.69
	Min	1.81	2.52	2.16	2.03	2.37	2.20
	Max	2.44	3.15	2.80	2.86	3.22	3.04
	Hybrids						
14	NDCU-23-1 x Pusa Uday	2.18	2.74	2.46	3.66	4.34	3.99
15	NDCU-23-1 x Punjab Naveen	2.12	2.73	2.42	3.69	4.40	4.05
16	NDCU-23-1 x Arka Veera	2.30	2.90	2.60	3.76	4.45	4.10
17	NDCU-23-3 x Pusa Uday	3.01	3.61	3.31	3.67	4.30	3.98
18	NDCU-23-3 x Punjab Naveen	2.34	2.96	2.65	2.85	3.52	3.18
19	NDCU-23-3 x Arka Veera	3.09	3.34	3.21	3.45	4.15	3.80
20	NDCU-23-4 x Pusa Uday	2.38	2.67	2.52	3.02	3.70	3.36
21	NDCU-23-4 x Punjab Naveen	2.31	2.84	2.58	3.39	3.98	3.68
22	NDCU-23-4 x Arka Veera	2.53	3.10	2.81	3.67	4.34	4.01
23	NDCU-23-5 x Pusa Uday	2.35	2.96	2.66	2.68	3.40	3.04
24	NDCU-23-5x Punjab Naveen	2.52	3.00	2.76	4.20	4.90	4.55
25	NDCU-23-5 x Arka Veera	2.74	3.30	3.02	4.20	4.87	4.53
26	NDCU-23-7 x Pusa Uday	2.03	3.00	2.51	2.68	3.38	3.03
27	NDCU-23- 7x Punjab Naveen	2.07	2.63	2.35	3.47	4.20	3.83
28	NDCU-23-7 x Arka Veera	3.07	3.64	3.35	4.08	4.80	4.44
29	NDCU-23-8 x Pusa Uday	2.56	3.12	2.84	3.27	3.94	3.60
30	NDCU-23- 8 x Punjab Naveen	2.39	3.00	2.70	3.48	4.03	3.76
31	NDCU-23-8 x Arka Veera	2.89	3.44	3.17	3.45	4.14	3.80
32	NDCU-23-9 x Pusa Uday	2.23	2.83	2.53	2.68	3.34	3.01
33	NDCU-23- 9 x Punjab Naveen	2.38	2.95	2.66	2.68	3.36	3.02
34	NDCU-23-9 x Arka Veera	2.45	2.12	2.28	2.67	3.34	3.01
35	NDCU-23-10 x Pusa Uday	2.59	3.17	2.88	3.34	4.12	3.73
36	NDCU-23- 10 x Punjab Naveen	2.56	3.12	2.84	2.67	3.36	3.01
37	NDCU-23-10 x Arka Veera	2.17	2.75	2.46	3.67	4.34	4.01

38	NDCU-23-11 x Pusa Uday	2.41	3.00	2.71	3.68	4.40	4.04
39	NDCU-23- 11 x Punjab Naveen	2.72	3.27	2.99	3.70	4.37	4.04
40	NDCU-23-11 x Arka Veera	2.52	3.08	2.80	3.64	4.36	4.00
41	VRCU-2203 x Pusa Uday	2.91	3.54	3.23	3.67	4.34	4.01
42	VRCU-2203 x Punjab Naveen	2.52	3.08	2.80	3.65	4.32	3.98
43	VRCU-2203 x Arka Veera	3.11	3.72	3.42	3.59	4.30	3.95
	Mean	**2.51**	**3.05**	2.78	**3.41**	**4.09**	3.75
	Min	2.03	2.12	2.28	2.67	3.34	3.01
	Max	3.11	3.72	3.42	4.20	4.90	4.55
44	Zoya	2.51	3.05	2.78	2.99	3.33	3.16
	Mean	**2.40**	**2.98**	2.69	**3.13**	**3.72**	3.42
	Min	1.81	2.12	2.16	2.03	2.37	2.20
	Max	3.11	3.72	3.42	4.20	4.90	4.55
	SE(d) ±	0.13	0.16	0.14	0.18	0.20	0.19
	C.D.at 5%	0.26	0.31	0.29	0.35	0.40	0.37