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Agronomic evaluation of interspecific derivatives of okra in rainy season

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Abstract

An experiment was conducted to evaluate interspecific derivatives of okra for economic traits on forty nine genotypes during rainy season of 2014. The observations were recorded for ten quantitative traits and two quality parameters. Analysis of variance showed significant differences for the characters *viz.,* days to 50% flowering, marketable yield per plant, number of fruits per plant, number of fruits on main stem, number of nodes on main stem, fruit length, plant height, iodine content and YVMV incidence during rainy season. The genotype PAUIOL-265-43 was ranked at top for marketable yield per plant (283 g) and PAUIOL-265-229 (24) for number of fruits per plant. The maximum numbers of nodes on main stem were observed in genotype PAUIOL-264-339 (20.25). The highest iodine content was reported in the genotype PAUIOL-189-246 (14 ppm) its range was 1.85-14 ppm. The minimum mucilage content was observed in the genotype PAUIOL-267-503 (0.36 %) with a range of 0.36-2.68. Genotypes PAUIOL-265-43 (282.90 g), PAUIOL-211-168 (238.84 g), PAUIOL-213-213 (250.72 g), PAUIOL-242-22 (246.38 g), PAUIOL-235-95 (275 g) and PAUIOL-245-126 (270.14 g) yielded high and with low YVMV incidence.

Introduction

Okra [*Abelmoschus esculentus (L.)* Moench] is one of the important vegetable grown in the tropical and sub tropical parts of the world. It is quite suitable for the multiple cropping systems as it is a short duration crop. In India, okra is produced on an area of 532.7 thousand hectare with a production of 6346.4 thousand MT which contributes to 3.9 % of total vegetable production (NHB, 2015). The main limiting factor in the cultivation of this crop is yellow vein mosaic virus (YVMV) disease. The loss due to YVMV ranged from 50 to 95 per cent depending on the stage of the crop growth at which the infection occurs (Sastry and Singh, 1974). The wild relatives of okra reported to serve as an important source of resistance against YVMV disease. *Abelmoschus manihot* ssp. *manihot* and *Abelmoschus manihot* ssp *tetraphyllus* have been used for the development of YVMV resistant okra cultivars such as Punjab-7, Punjab Padmini, Parbhani Kranti, Arka Abhay and Arka Anamika. Presently, all these varieties have been compromised, thus, intervarietal transfer of YVMV resistance is unlikely and necessitating a constant research and transfer of newer sources/accessions of YVMV resistance. *A. tetraphyllus*, *A.manihot* subspecies *tetraphyllus, A. ficulneus, A.moschatus* and *Hibiscus huegelli* were observed to be resistant to YVMV disease under natural epiphytotic conditions by Rajamony *et al.* (1995). They also observed mild symptoms of virus especially in the young and terminal leaves of *A.manihot* which had a recognising tendency later on. *Abelmoschus manihot* ssp. *manihot,* identified to be resistant against YVMV disease was crossed with the YVMV susceptible plants of okra and the F_1 produced were again backcrossed to the recurrent parent (Pusa Sawani and Punjab Padmini) and then selfed to produce BC_3F_4 generation. The present study was planned to evaluate the available BC_3F_4 generation in comparison to the recurrent parents for agronomic and quality traits in rainy season.

Materials and Methods

The present study was carried out in the Department of Vegetable Science, Punjab Agricultural University, Ludhiana during rainy season of 2014. The experiment was laid out in simple lattice design with 2 replications. The experimental plant material comprised of 49 interspecific backcrosses (BC_3F_4) progenies along with their recurrent parents (Punjab Padmini and Pusa Sawani) and a standard check Punjab-8. Each genotype was sown as a single row of 3m length, with row to row distance of 60 cm and plant to plant distance of 30 cm. Observations were recorded for 10 agronomic and two quality traits. The statistical analysis was done according to Gomez and Gomez (1984).

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Results and Discussion

The analysis of variance was carried out for 12 characters *viz.* days to 50 % flowering, number of nodes on main stem, number of fruits on main stem, fruit length, fruit width, marketable yield per plant, number of fruits per plant, average fruit weight, plant height at final harvest, iodine estimation, mucilage content and field reaction to YVMV. For days to 50% flowering, marketable yield, number of fruits, fruits on main stem, nodes on main stem, fruit length, plant height, mucilage content, iodine content and YVMV incidence mean square due to genotypes were found to be significant (Table 1) and non significant for fruit weight, fruit width and mucilage content indicating thereby the presence of genetic variability in the experimental material.

The mean performance of the evaluated genotypes showed that PAUIOL-213-213 (39.50), PAUIOL-245-126 (41), PAUIOL-211-168 (42), PAUIOL-242-22 (42), PAUIOL-214-45 (42.50), PAUIOL-215-114 (42.50) flowered earlier (Table 2). The remaining 38 genotypes were at par with the standard check. The findings are in line with the results of Solankey *et al*. (2014), Chandra *et al.* (2014), Kaur *et al.* (2013), Das *et al.* (2012) and Garg (2009). Significant differences were observed among the genotypes for marketable yield per plant. Genotype PAUIOL-265-43 was ranked at top with 282.90 g per plant yield whereas, the standard check (Punjab 8) 189.84 g per plant. Other genotypes which significantly out yielded the standard check include PAUIOL-265-43 (282.90 g), PAUIOL-235-95 (275 g), PAUIOL-245-126 (270.37 g), PAUIOL-245-126 (270.14 g), PAUIOL-201-147 (267.63 g), PAUIOL-213-213 (250.72 g), PAUIOL-242-22(246.38 g), PAUIOL-211-205 (244.69 g) and PAUIOL-265-229 (241.22 g).

The highest number of fruits per plant was reported in PAUIOL-235-95 (27.91), PAUIOL-264-339 (25.33) PAUIOL-265-43 (24.49), PAUIOL-242-22 (23.87), PAUIOL-265-229 (23.72), PAUIOL-209-197 (15.78). In the present study a range of 11.35 to 27.91 and grand mean 16.98 for fruits per plants was observed. Significant differences were observed among the genotypes for number of fruits per plant. The data showed that the range for the average fruit weight was varied from 8.99 to12.29 cm with a mean of 11.01 cm. Out of total 49 genotypes none of the genotype had shown significant results for this character. Kaur *et al* (2013), Garg (2009) and Saifullah and Rabbani (2009) also reported similar results. The range for fruit width was 1.13-1.68 with general mean of 1.35 cm. None of the genotype was found significantly higher or lower as compared to standard check for this trait. However based on mean performance twenty three genotypes were observed with maximum fruit width while seven genotypes with lower fruit width and eighteen genotypes were at par with the standard check. Kaur *et al.* (2013) reported a range of 1.37 to 2.39 for this character.

Fruit length is one of the most important traits which contribute towards yield. In the present study the range for fruit length was 8.24-12.05 with general mean of 10 cm. Significant differences were observed for the trait fruit length. Longer pods were observed on the genotype PAUIOL-240-191 (10.97 cm), PAUIOL-240-193 (10.67 cm), PAUIOL-213-213 (10.55 cm), PAUIOL-265-216 (9.72 cm), PAUIOL-209-197 (9.66 cm), PAUIOL-211-205 (9.52 cm) and PAUIOL-264-423(9.08 cm) while PAUIOL-211-170 (4.96 cm) followed by Pusa sawani (5 cm) and PAUIOL-281-286 (5.18 cm) had shorter pods. Rest thirty genotypes were at par with the standard check. Solankey *et al.* (2014) reported a range of 3 to 11.3 with a mean of 9.59. Kaur *et al.* (2013) reported a range of 6.80 to 10.35 with a mean 8.82 for this character. Garg (2009) recorded a range of 5.59-9.88 with a mean value 7.90 for this character.

Nine genotypes namely PAUIOL-214-47 (8.50), PAUIOL-240-191 (8.20), PAUIOL-242-25 (8.05), PAUIOL-159-293 (7.70), PAUIOL-265-27 (7.45), PAUIOL-189-246 (7), PAUIOL-265-219 (6.95), PAUIOL-214-45 (6.83) and PAUIOL-1-258 (6) including Pusa Sawani (7.95) were found significantly lower for the trait number of fruits on main stem. Rest of the 31 genotypes including Punjab Padmini were at par with standard check. Garg (2009) reported a range

Table 1: Analysis of Variance for various horticultural characters in okra

Source of variation	df	Days to 50% flowering	Marketable yield/ plant (g)	Number of fruits/ plant	Fruit weight(g)	Number of fruits on main stem	Number of nodes on main stem	Fruit length (cm)	Fruit width (cm)	Plant height (cm)	Mucilage content (%)	Iodine content (ppm)	YVMV (%)
Replication	1	15.52	360.38	6.65	3.58	8.66	11.03	0.27	1.35	3.33	0.11	0.085	7.76
Block (rep)	12	2.47	846.37	6.78	1.20	3.58	2.88	0.60	0.05	63.67	0.08	0.520	12.35
Treatments	48	4.77**	3124.27**	30.16**	0.89	22.07**	19.68**	4.31**	0.037	61.30**	0.92	11.26**	195.56**
Error	36	2.15	630.91	10.53	0.52	2.30	3.2369	0.87	0.036	63.29	2.81	0.37	12.67
CD (p=0.05)		2.95	50.50	6.52	N.S.	3.05	3.61	1.88	N.S.	15.99	N.S.	1.23	7.15
CD (p=0.01)		3.94	67.37	8.70	N.S.	4.07	4.82	2.5117	N.S.	21.33	N.S.	1.6448	9.54

Table 2: Mean Performance of genotypes during Rainy Season

S. No.	Genotype	Days to 50% flowering	Marketable yield (g/pl.)	Number of fruits /plant	Number of fruits on main stem	Number of nodes on main stem	Average fruit weight (g)	Fruit Width (cm)	Fruit length (cm)	Plant height (cm)	Mucilage content (%)	Iodine content (ppm)	YVMV (%)
1.	PAUIOL-240-82	46.00^{c}	200.49^{c}	16.83^{c}	10.94^{c}	11.60^{c}	9.97	1.52	6.71^{c}	75.90^{c}	0.41	10.50^{c}	15.32^{a}
2.	PAUIOL-240-191	43.50^{c}	159.17^{c}	11.35^{c}	8.20^{b}	10.22^{c}	11.08	1.21	10.97^{a}	76.30^{c}	1.53	9.45^{c}	14.42^{a}
3.	PAUIOL-240-193	46.00^{c}	202.63^{c}	18.03^{c}	9.50^{c}	11.60^{c}	11.39	1.19	10.67^{a}	72.60^{c}	1.07	8.00^{b}	13.68^{a}
4.	PAUIOL-265-229	43.50^{c}	241.22^{a}	23.72^{a}	17.35^{a}	17.86^{a}	9.70	1.19	8.18^{c}	80.50^{c}	0.89	9.80^{c}	5.67^{a}
5.	PAUIOL-265-216	43.50^{c}	226.07^{c}	14.47^{c}	10.40^{c}	12.28^{c}	11.11	1.47	9.72^{a}	71.50^{c}	0.86	10.50^{c}	11.06^{a}
6.	PAUIOL-265-219	43.50^{c}	170.00^{c}	12.10^{c}	6.95^{b}	8.60^{b}	10.25	1.28	8.70^{c}	65.00^{c}	1.64	6.15^{b}	6.49^{a}
7.	PAUIOL-265-35	47.00^{c}	199.16^{c}	14.62^{c}	10.50^{c}	11.38^{c}	11.72	1.38	6.24^{c}	77.00^{c}	1.85	13.15^{a}	12.98^{a}
8.	PAUIOL-265-43	45.50^{c}	282.90^{a}	24.49^{a}	19.00^{a}	19.44^{a}	12.03	1.40	5.89^{c}	63.70^{c}	0.44	3.00^{b}	5.07^{a}
9.	PAUIOL-265-27	44.50^{c}	174.25^{c}	15.85^{c}	7.45^{b}	11.35^{c}	11.29	1.45	5.36^{c}	75.05^{c}	1.63	11.35^{a}	11.00^{a}
10.	PAUIOL-265-44	45.50^{c}	179.11^{c}	15.80^{c}	10.45^{c}	10.96^{c}	10.58	1.43	5.56^{c}	79.32^{c}	1.68	7.30^{b}	15.55^{a}
11.	PAUIOL-265-38	44.50^{c}	188.61^{c}	15.83^{c}	10.43^{c}	10.66^{c}	10.62	1.28	6.00^{c}	83.72^{c}	1.48	7.80^{b}	13.88^{a}
12	PAUIOL-265-40	44.00^{c}	198.89^{c}	14.94^{c}	10.00^{c}	10.22^{c}	10.69	1.15	5.65^{c}	85.78^{c}	1.02	6.60^{b}	11.38^{a}
13.	PAUIOL-211-205	44.50^{c}	244.69^{a}	22.43^{c}	16.50^{a}	17.06^{a}	10.89	1.18	9.52^{a}	72.00^{c}	2.46	9.25^{c}	5.92^{a}
14	PAUIOL-211-168	42.00^{a}	238.84^{c}	17.94^{c}	12.89^{c}	13.67^{c}	10.96	1.30	5.41^{c}	89.12^{c}	1.66	13.95^{a}	4.43^{a}
15.	PAUIOL-211-206	43.00^{a}	215.54^{c}	13.25^{c}	10.95^{c}	11.87^{c}	11.07	1.32	8.01^{c}	70.70^{c}	1.58	9.50^{c}	11.66^{a}
16.	PAUIOL-211-170	44.00^{c}	209.56^{c}	15.33^{c}	9.29^{c}	10.10^{c}	11.19	1.39	4.96^{b}	71.35^{c}	1.65	11.50^{a}	19.22^{a}
17.	PAUIOL-209-197	47.50^{c}	181.14^{c}	15.78^{a}	8.95^{c}	10.50^{c}	11.08	1.18	9.66^{a}	75.70^{c}	2.12	2.75^{b}	14.64^{a}
18.	PAUIOL-264-339	45.50^{c}	270.37^{a}	25.33^{a}	19.00^{a}	20.25^{a}	10.61	1.53	5.75^{c}	74.72^{c}	1.35	8.75^{c}	11.22^{a}
19.	PAUIOL-264-410	44.50^{c}	197.19^{c}	16.16^{c}	10.75^{c}	11.03^{c}	10.98	1.40	7.75^{c}	75.30^{c}	2.68	7.40^{b}	10.50^{a}
20.	PAUIOL-264-334	43.50^{c}	236.95^{c}	17.05^{c}	10.84^{c}	12.63^{c}	11.78	1.61	6.90^{c}	75.50^{c}	2.49	7.50^{b}	11.16^{a}
21.	PAUIOL-264-389	44.50^{c}	190.57^{c}	16.03^{c}	9.56^{c}	12.00^{c}	11.03	1.49	6.03^{c}	74.70^{c}	1.50	12.70^{a}	15.83^{a}
22.	PAUIOL-264-412	43.50^{c}	198.97^{c}	16.30^{c}	10.97^{c}	12.61^{c}	10.64	1.50	5.73^{c}	79.00^{c}	1.18	3.85^{b}	17.75^{a}
23.	PAUIOL-264-423	44.50^{c}	211.49^{c}	15.79^{c}	11.45^{c}	10.67^{c}	11.25	1.13	9.08^{a}	83.00^{c}	1.62	6.35^{b}	13.72^{a}
24.	PAUIOL-264-418	44.50^{c}	144.29^{c}	14.29^{c}	8.98^{c}	11.15^{c}	11.75	1.47	7.00^{c}	74.40^{c}	1.85	7.15^{b}	8.46^{a}
25.	PAUIOL-213-213	39.50^{a}	250.72^{a}	22.14^{c}	16.50^{a}	17.16^{a}	11.54	1.18	10.55^{a}	71.60^{c}	1.70	8.05^{b}	8.34^{a}
26.	PAUIOL-228-8	44.50^{c}	193.84^{c}	16.44^{c}	10.25^{c}	10.90^{c}	10.47	1.35	5.50^{c}	84.55^{c}	1.75	6.00^{b}	21.93^{a}
27.	PAUIOL-214-48	45.50^{c}	201.75^{c}	17.14^{c}	12.00^{c}	12.41^{c}	10.56	1.32	5.68^{c}	74.00^{c}	1.10	6.75^{b}	12.57^{a}
28.	PAUIOL-214-45	42.50^{a}	116.15^{b}	12.27^{c}	6.83^{b}	7.25^{b}	9.52	1.37	5.71^{c}	78.75^{c}	2.09	8.50^{c}	14.30^{a}
29.	PAUIOL-214-47	47.00^{c}	165.55^{c}	11.68^{c}	8.50^{b}	8.65^{b}	11.18	1.36	6.82^{c}	82.60^{c}	1.47	8.80^{c}	23.50^{a}
30.	PAUIOL-242-25	44.00^{c}	129.25^{b}	14.47^{c}	8.05^{b}	8.25^{b}	10.59	1.32	5.64^{c}	76.50^{c}	0.79	8.25^{c}	11.75^{a}
31.	PAUIOL-242-18	45.00^{c}	178.19^{c}	18.43^{c}	10.85^{c}	11.62^{c}	11.67	1.19	5.40^{c}	81.00^{c}	1.31	6.20^{b}	10.20^{a}
32.	PAUIOL-242-22	42.00^{a}	246.38^{a}	23.87^{a}	17.90^{a}	17.03^{a}	9.97	1.15	5.28^{c}	77.40^{c}	2.09	1.85^{b}	12.22^{a}
33.	PAUIOL-235-95	46.00^{c}	275.00^{a}	27.91^{a}	18.50^{a}	18.89^{a}	10.92	1.49	6.29^{c}	67.60^{c}	1.50	6.65^{b}	6.80^{a}
34.	PAUIOL-245-126	41.00^{a}	270.14^{a}	17.63^{c}	16.50^{a}	16.73^{a}	11.98	1.68	6.06^{c}	69.10^{c}	1.35	7.90^{b}	5.70^{a}
35.	PAUIOL-245-123	45.00^{c}	206.57^{c}	19.01^{c}	10.00^{c}	10.10^{c}	10.78	1.53	6.96^{c}	68.80^{c}	0.99	6.45^{b}	13.00^{a}
36.	PAUIOL-245-127	43.00^{a}	215.55^{c}	20.40^{c}	12.50^{c}	13.00^{c}	8.99	1.37	6.17^{c}	74.10^{c}	0.62	9.05^{c}	26.37^{a}
37.	PAUIOL-201-147	45.00^{c}	267.63^{a}	19.87^{c}	17.30^{a}	17.50^{a}	12.10	1.24	5.66^{c}	72.85^{c}	1.75	8.05^{b}	6.60^{a}
38.	PAUIOL-215-112	43.50^{c}	224.02^{c}	21.02^{c}	12.95^{c}	14.05^{c}	10.89	1.35	8.40^{c}	74.70^{c}	1.30	6.50^{b}	32.87^{c}
39.	PAUIOL-215-114	42.50^{a}	221.14^{c}	14.41^{c}	14.16^{c}	15.10^{c}	10.38	1.37	6.16^{c}	77.40^{c}	1.34	9.00^{c}	25.64^{a}
40.	PAUIOL-159-293	42.50^{a}	163.94^{c}	11.50^{c}	7.70^{b}	7.75^{b}	11.38	1.38	6.39^{c}	71.40^{c}	1.65	9.10^{c}	9.26^{a}
41.	PAUIOL-189-246	43.50^{c}	127.57^{b}	14.74^{c}	7.00^{b}	7.56^{b}	11.56	1.34	6.31^{c}	82.42^{c}	1.28	14.00^{a}	22.50^{a}
42.	PAUIOL-282-377	45.50^{c}	190.91^{c}	16.68^{c}	11.56^{c}	12.46^{c}	11.04	1.44	7.12^{c}	74.00^{c}	0.62	6.60^{b}	5.37^{a}
43.	PAUIOL-267-505	44.50^{c}	218.82^{c}	17.86^{c}	13.44^{c}	14.10^{c}	11.32	1.24	7.39^{c}	79.30^{c}	1.58	9.65^{c}	36.00^{c}
44.	PAUIOL-281-286	45.00^{c}	181.54^{c}	14.11^{c}	11.00^{c}	11.32^{c}	11.09	1.18	5.18^{b}	78.50^{c}	2.47	5.80^{b}	37.00^{c}
45.	PAUIOL-267-503	43.00^{a}	199.90^{c}	15.59^{c}	12.50^{c}	13.38^{c}	11.93	1.54	6.51^{c}	84.60^{c}	0.36	7.55^{b}	6.61^{a}
46.	PAUIOL-1-258	45.50^{c}	122.70^{b}	13.27^{c}	6.00^{c}	6.44^{b}	11.06	1.50	6.90^{c}	69.90^{c}	2.52	6.80^{b}	17.27^{a}
47.	Punjab Padmini	43.50^{c}	195.19^{c}	17.80^{c}	12.10^{c}	12.36^{c}	11.49	1.56	7.61^{c}	75.30^{c}	1.56	11.20^{a}	28.00^{a}
48.	Pusa Sawani	43.50^{c}	151.63^{c}	13.4875	7.95^{b}	8.23^{b}	11.55	1.37	5.03^{b}	82.10^{c}	1.51	7.15^{b}	66.00^{b}
49.	Punjab-8	46.00	189.84	16.78	11.60	12.29	12.29	1.33	7.08	77.50	0.97	9.45	35.97

Alphabet ‘a’ denotes significantly higher/ better genotypes at 5% level of significance
Alphabet ‘b’ denotes significantly lower/inferior genotypes at 5% level of significance
Alphabet ‘c’ denotes significantly at par genotypes at 5% level of significance

of 3.70 to 12.09 for this character.Out of total 49 genotypes, nine genotypes namely PAUIOL-264-339 (20.25), PAUIOL-265-43 (19), PAUIOL-235-95(18.89), PAUIOL-265-229(17.86), PAUIOL-201-147(17.50), PAUIOL-213-213(17.16), PAUIOL-211-205(17.06), PAUIOL-242-22(17.03) and PAUIOL-245-126(16.73) had significantly higher number of nodes on main stem.

In the present study the range for mucilage was 0.36-2.68 with general mean of 1.50. None of the genotype was found significant as compared to standard check for this trait. However based on the mean performance the minimum mucilage content was reported in the eight genotypes namely PAUIOL-267-503 (0.36 %), PAUIOL-240-82 (0.41 %), PAUIOL-265-43 (0.44 %), PAUIOL-245-127 (0.62 %), PAUIOL-282-377 (0.62 %), PAUIOL-242-25 (0.79 %), PAUIOL-265-216 (0.86 %) and PAUIOL-265-229 (0.89 %) whereas forty one genotypes were found with maximum mucilage content. Six genotypes were reported for significantly higher iodine content namely PAUIOL-189-246 (14 ppm), PAUIOL-211-168 (13.95 ppm), PAUIOL-265-35 (13.15 ppm), PAUIOL-264-389 (12.70 ppm), PAUIOL-209-

197 (11.50 ppm), PAUIOL-265-27 (11.35 ppm) including Punjab Padmini (11.20 ppm).

Out of the forty nine genotypes forty four were observed to be significantly better for the reaction to yellow vein mosaic virus disease. Out of these the top five genotypes which showed the minimum reaction for YVMV disease were PAUIOL-211-168(4.43%) followed by PAUIOL-265-43(5.07%), PAUIOL-282-377(5.37%), PAUIOL-265-229(5.67%), PAUIOL-245-126(5.70 %) as comparison to the standard check variety Punjab -8. Three genotypes namely PAUIOL-215-112 (32.87), PAUIOL-267-505 (36) and PAUIOL-281-286 (37) were at par with the standard check variety Punjab-8. Whereas, Pusa Sawani (66) had shown significantly higher infestation as compare to the check variety. The varying level of disease severity could be attributed to the climatic conditions especially temperature and humidity and which directly influenced on the vector (white fly) population (Samarjeewa and Rathnayaka, 2004).

The present investigation indicates that number of fruits/plant, fruit weight and marketable yield/plant were the most important characters to be given importance. It has provided a useful insight into the extent of variability and yield contributing characters. PAUIOL-265-43 (282.90 g), PAUIOL-282-377 (275 g), PAUIOL-189-246 (270.14 g), PAUIOL-265-27 (270.37 g) and PAUIOL-264-334 (267.63 g) yielded higher in rainy season. The disease incidence was very low in the genotypes and the marketable yield was higher PAUIOL-265-43 (283 g), PAUIOL-211-205 (244.69 g), PAUIOL-211-168 (238.84 g), PAUIOL-213-213 (250.72 g), PAUIOL-242-22 (246.38), PAUIOL-235-95 (275 g) and PAUIOL-245-126 (270.14 g).

सारांश

भिण्डी में अन्तः प्रजात व्यूत्पन्न के आर्थिक गुणों का मूल्यांकन वर्षाकाल में 49 जीनप्ररूपों को सम्मिलित कर वर्ष 2014 में किया गया। निरीक्षण हेतु 10 मात्रात्मक तथा 2 गुणात्मक घटकों को लिया गया। प्रसरण विशलेषण से सार्थक विविधता 50 प्रतिशत पुष्पन के दिन बाजार योग्य प्रति पौध उपज, फल/पौध, मुख्य तने पर फलों की संख्या, मुख्य तने पर पार्श्व गाँठ की संख्या, फल की लम्बाई, पौध लम्बाई, आयोडीन की मात्रा तथा पित्र शिरा मोजैक विषाणु का प्रकोप वर्षाकाल की फसल में पाया गया। जीनप्ररूप पी ए यू आई ओएल –265–43 कुल बाजार योग्य उपज/पौध (283 ग्राम) तथा पी ए यू आई ओएल –265–229 (24) फली/पौध के लिये सर्वोत्तम पाया गया। मुख्य तने पर पार्श्व गाँठ की संख्या जीन प्ररूप पी ए यू आई ओएल –265–339 (20.25) अधिकतम रहा। आयोडीन की उच्चतम मात्रा का औसत माध्य 1.85–14 पी पी एम जीनप्ररूप पी ए यू आई ओएल –189–246 (14 पी पी एम) की सूचना प्राप्त हुई। सबसे कम म्यूसीलेज की मात्रा जीन प्ररूप पी ए यू आई ओएल –267–503 (0.36 प्रतिशत) औसत मूल्य 0.36–2.68 के मध्य था। जीन प्ररूप पी ए यू आई ओएल –265–43 (282.90 ग्राम), पी ए यू आई ओएल –242–22 (246.38 ग्राम), पी ए यू आई ओएल –213–213 (250.72 ग्राम), पी ए यू आई ओएल –242–22 (246.38 ग्राम), पी ए यू आई ओएल –235–95 (275 ग्राम) तथा पी ए यू आई ओएल –245–126 (270.14 ग्राम) में अधिक उपज तथा पित्ताशीरा मोजैक विषाणु का प्रकोप कम पाया गया।

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