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Study of transgressive segregation of different progenies for different characters in F_2 and F_3 generations of watermelon

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Abstract
Desirable transgressive segregation was observed for ten characters in both crosses for F_2 and F_3 generations. The highest proportion of desirable transgressive segregation were observed for fruit length, node at which first female flower appeared (31.33%), followed by fruit length, yield per vine (29.33%), rind thickness (23.33%) in cross C_1 of F_2 generation whereas for fruit length (30.67%), node at which first female flower appeared (26.67%), fruit diameter (20.00%), yield per vine (17.00%) in cross C_1 of F_3 generation.
The highest transgressive segregation were found in vine length (39.00%), rind thickness (35.66%), yield per vine (22.33%), No. of seeds per fruit (18.00%), Fruit Weight (15.33%) in cross C_2 of F_2 generation whereas for vine length (32.33%), rind thickness (27.33%), No. of seeds per fruit (16.67%), yield per vine (13.00%), in C_2 of F_2 generation.
In most of the segregation of two crosses in both generation (F_2 and F_3) the yield per plant of better parent was found to be trans greed simultaneously with transgression of one or more other yield contributing character.
Thus all the characters were improved beyond capacity of their parental genotypes on the basis of high values of transgressive segregation. It was concluded that, when desired intensity (i.e. percent improvement) of a character is not available in the parent, transgressive breeding may be successfully used to extend the limit of expression of character in a particular cross combination

Keywords: Yucatec maya, traditional medicine, plant use, herbalist

Introduction

Watermelon (*Citrullus lanatus* (Thunb.) Mansf.) is one of the most popular vegetables of cucurbitaceae family. It is an important cash crops and yields good profit in short period. In India it is cultivated in different parts of the country round the year. It is consumed in different forms and have tremendous economic importance in human diet.

It is a cross pollinated vegetable, thus, its natural population has tremendous variability for fruit shape, colour, taste etc. Evaluation of genotypes to assess the existing variability is considered as preliminary step in any crop improvement programme. In order to pursue an effective breeding programme, the present investigation was carried out to gather information on genetic variability, heritability, genetic advance and correlation for different characteristics of watermelon.

Materials and Methods

The genotypes for present study comprised of seeds of two parents and their two promising F1 hybrids *viz*., Thar Manak x Thunba (C1) and Thunba x Thar Manak (C_2), and their F_2, BC_1 and BC_2 populations. The experiment was conducted in Randomized Block Design with three replications at All India Coordinated Research Project (Vegetable Crop), Department of Horticulture, MPKV, Rahuri, during *kharif* 2013 and summer 2014.

F_2 progenies from the two crosses were selected on the basis of resistant to WMV-1 virus, fruit weight, shape of fruit, fruit surface, yield per vine and T.S.S. content. Initially, F_2 progenies were evaluated along with two parents were sown during summer 2013. The superior 10 progenies were selected and selfed for F_3 generation. The F_2 and F_3 generations of both crosses were evaluated in randomized block design with three replications. For evaluation of F_2 and F_3 progenies, 200 vines of selected progenies and 10 vines of parents were planted in three replications for recording the observations.

Results and Discussion

Overall performances of different progenies in F_2 and F_3 generations

In the present study, the overall performance of progenies in F_2 and F_3 generation for different traits has been reported separately for each character and presented in Table 1.

Vine length (cm)

In F_2 generation, the significantly maximum vine length 363.22 cm was recorded in progeny-6 of C_2, which was followed by progenies-10, 7 and 8 of C_2 (344.12 cm, 343.26 cm and 342.67 cm). The progeny-2 of C_1 had recorded significantly minimum vine length 282.14 cm.

While in F_3 generation, the significantly maximum vine length 368.40 cm was recorded in progeny-6 of C_2, which was followed by progenies-8, 10 and 7 of C_2 (351.44 cm, 346.53 cm and 344.40 cm). The progeny-2 of C_1 was recorded significantly minimum vine length 302.32 cm.

Node at which first female flower appears

In F_2 generation, the significantly minimum node number at which first female flower appeared was recorded in progeny-2 (9.42) of C_1, which was followed by progenies-6 and 8 of C_2 (10.20 and 10.98). The progeny-9 of C_2 was recorded significantly maximum node number at which first female flower appeared (12.02).

While in F_3 generation, the significantly minimum node number at which first female flower appeared was recorded in progeny-8 (10.83) of C_2, which was followed by progenies-3 and 2 of C_1 (11.08 and 11.16). The progeny-10 of C_2 recorded significantly maximum node number at which first female flower appeared (12.38).

Number of fruits per vine

In F_2 generation, the significantly maximum number of fruits 3.45 was recorded in progeny-2 of C_1, which was followed by progenies-6 of C_2 (3.43). The progeny-1 of C_1 was recorded significantly minimum number of fruits 2.78.

While in F_3 generation, the significantly maximum number of fruits 3.63 was recorded in progeny-1 of C_1 which was followed by progeny-7 of C_2 (3.63). The progeny-1 of C_1 and progeny-10 of C_2 recorded significantly minimum number of fruits 2.78.

Fruit weight (kg)

In F_2 generation, the significantly maximum fruit weight 2.21 kg was recorded in progeny-4 of C_1, which was followed by progeny-2 and 3 of C_1 (2.20 kg and 2.18 kg). The progeny-8 of C_2 was recorded significantly minimum fruit weight 1.75 kg.

While in F_3 generation, the significantly maximum fruit weight 2.46 kg was recorded in progeny-2 of C_1, which was followed by progenies-9 of C_2 and progeny-1 of C_1 (2.41 kg and 2.36 kg). The progeny-8 of C_2 was recorded significantly low fruit weight 2.04 kg.

Yield per vine (kg)

In F_2 generation, the significantly maximum yield per vine 7.53 kg was recorded in progeny-2 of C_1, which was followed by progeny-4 and 3 of C_1 (7.00 kg and 6.85 kg). The progeny-8 of C_2 was recorded significantly minimum yield per vine 5.12 kg.

While in F_3 generation, the significantly maximum yield per vine 7.80 kg was recorded in progeny-2 of C_1, which was followed by progeny-6 of C_2 and progeny-3 of C_1 (7.58 kg and 7.50 kg). The progeny-8 of C_2 expressed significantly low yield per vine 6.25 kg.

Yield per ha (tonnes)

In F_2 generation, the significantly maximum yield per ha 30.11 tonnes was recorded in progeny-2 of C_1, which was followed by progeny-4 and 3 of C_1 (28.01 and 27.40 tonnes). The progeny-8 of C_2 was recorded significantly low yield per vine 20.48 tonnes.

While in F_3 generation, the significantly maximum yield per ha 31.19 tonnes was recorded in progeny-2 of C_1, which was followed by progeny-6 of C_2 and progeny-3 of C_1 (30.33 and 29.98 tonnes). The progeny-8 of C_2 was recorded significantly low yield per vine 25.02 tonnes.

Fruit length (cm)

In F_2 generation, the significantly maximum fruit length 21.90 cm was recorded in progeny-5 of C_1, which was followed by progeny-4 and 2 of C_1 (21.14 and 21.04 cm). The progeny-9 of C_2 was recorded significantly minimum fruit length 15.60 cm.

While in F_3 generation, the significantly maximum fruit length 23.64 cm was recorded in progeny-5 of C_1, which was followed by progeny-4 and 1 of C_1 (23.6 cm and 23.60 cm). The progeny-9 of C_2 had recorded significantly minimum fruit length 18.51 cm.

Fruit diameter (cm)

In F_2 generation, the significantly maximum fruit diameter 18.30 cm was recorded in progeny-5 of C_1, which was followed by progeny-3 and 1 of C_1 (17.20 cm and 16.75 cm). The progeny-7 of C_2 was recorded significantly minimum fruit diameter 14.40 cm.

While in F_3 generation, the significantly maximum fruit diameter 18.71 cm was recorded in progeny-3 of C_1, which was followed by progeny-4 and 1 of C_1 (18.35 cm and 18.16 cm). The progeny-10 of C_2 was recorded significantly minimum fruit diameter 15.58 cm.

Flesh diameter (cm)

In F_2 generation, the significantly maximum flesh diameter 16.64 cm was recorded in progeny-5 of C_1, which was followed by progeny-3 and 1 of C_1 (15.56 cm and 15.15 cm). The progeny-7 of C_2 was recorded significantly minimum fruit diameter 12.94 cm.

While in F_3 generation, the significantly maximum flesh diameter 18.71 cm was recorded in progeny-3 of C_1, which was followed by progeny-4 and 1 of C_1 (18.71 cm and 18.16 cm). The progeny-8 of C_2 was recorded significantly minimum flesh diameter 15.78 cm.

Rind thickness (cm)

In F_2 generation, the significantly minimum rind thickness 1.33 cm was recorded in progeny-6 of C_2, which was followed by progeny-8 and 7 of C_2 (1.42 cm and 147 cm). The progeny-2 of C_1 was recorded significantly maximum rind thickness 1.69 cm.

While in F_3 generation, the significantly minimum rind thickness 1.41 cm was recorded in progeny-1 of C_1, which was followed by progeny-8 and 9, 7 of C_2 (1.50 cm and 1.53 cm). The progeny-10 of C_2 was recorded significantly maximum rind thickness 1.69 cm.

Number of seeds per fruit

In F_2 generation, the significantly minimum number of seeds per fruit 200.92 was recorded in progeny-1 of C_1, which was followed by progeny-5 of C_1 and 3 of C_1 (202.27 and 205.53). The progeny-4 of C_1 was recorded significantly maximum number of seeds per fruit 219.98.

While in F_3 generation, the significantly minimum number of seeds per fruit 207.20 was recorded in progeny-3 of C_1, which was followed by progeny-1 of C_1 and progeny-6 of C_2 (209.18 and 210.35).

The progeny-4 of C_1 was recorded significantly maximum number of seeds per fruit 223.92.

100 seed weight (g)

In F_2 generation, the significantly minimum 100 seed weight 5.44 g was recorded in progeny-7 of C_2, which was followed by progeny-2 of C_1 and 10 of C_2 (5.77 and 5.82 g). The progeny-8 of C_2 was recorded significantly maximum 100 seed weight 6.85 g.

While in F_3 generation, 100 seed weight was recorded non-significant.

Total soluble solids (^{0}Brix)

In F_2 generation, the significantly maximum TSS, 6.36 was recorded in progeny-6 of C_2, which was followed by progenys-1 of C_1 and 10 of C_2 (5.98 and 5.97). The progeny-2 of C_1 was recorded significantly minimum TSS (5.26).

While in F_3 generation, significantly maximum TSS, 5.40 was recorded in progeny-3 of C_1, which was followed by progenies-1 of C_1 and 6 of C_2 (5.39 and 5.36). The progeny-9 of C_2 was recorded significantly minimum TSS (4.59).

Table 1: Mean performance of different progenies for different characters in F_2 and F_3 generations of watermelon.

Cross	Prog-eny	Vine length (cm)		NFFF		Number of fruits per vine		Fruit weight (kg)		Yield per vine (kg)		Yield per ha. (tonnes)	
		F_2	F_3	F_2	F_3	F_2	F_3	F_2	F_3	F_2	F_3	F_2	F_3
	P_1	276.85	292.72	9.47	9.00	3.00	3.23	2.07	2.27	6.49	6.88	24.51	27.71
	P_2	298.99	327.68	11.30	10.97	3.70	4.00	0.55	0.61	2.00	2.58	7.99	10.31
C_1 TM x T	1	319.57	325.49	10.20	11.28	2.78	2.78	2.06	2.36	5.76	6.56	23.05	26.25
	2	282.14	302.32	9.42	11.16	3.45	3.17	2.20	2.46	7.53	7.80	30.11	31.19
	3	311.77	307.37	11.08	11.08	3.12	3.22	2.18	2.34	6.85	7.50	27.40	29.98
	4	307.03	311.36	10.98	11.17	3.17	3.07	2.21	2.30	7.00	7.03	28.01	28.13
	5	296.30	315.98	11.08	11.35	2.82	2.92	2.08	2.23	5.80	6.47	23.21	25.89
C_2 T x TM	6	363.22	368.40	12.02	11.57	3.43	3.63	1.94	2.07	6.68	7.58	26.71	30.33
	7	343.26	344.4	11.90	12.13	2.93	3.40	1.87	2.07	5.56	7.05	22.23	28.20
	8	342.67	351.44	11.83	10.83	2.92	3.12	1.75	2.04	5.12	6.25	20.48	25.02
	9	329.55	341.02	11.98	11.32	2.67	3.08	2.13	2.41	5.69	7.45	22.75	29.81
	10	344.12	346.53	11.97	12.38	3.03	2.78	2.08	2.38	6.35	6.62	25.41	26.48
G.M.		317.95	327.86	11.07	11.19	3.08	3.20	1.92	2.13	6.13	6.65	23.49	26.61
S.E.+-		3.95	4.35	0.31	0.28	0.15	0.16	0.08	0.07	0.41	0.43	1.66	1.74
C. D. @ 5%		11.60	12.78	0.91	0.81	0.45	0.48	0.24	0.22	1.22	1.27	4.88	5.10

NFFF - Node at which first female flower appear

Table 1 contd….

Cross	Progeny	Fruit length (cm)		Fruit diameter (cm)		Flesh diameter (cm)		Rind Thick. (cm)		Number of seeds per fruit		100 seed weight (g)		TSS (^{0}Brix)	
		F_2	F_3	F_2	F_3	F_2	F_3	F_2	F_3	F_2	F_3	F_2	F_3	F_2	F_3
	P_1	20.45	21.22	16.58	17.57	15.44	16.16	1.49	1.35	212.87	207.33	11.05	11.13	7.41	7.49
	P_2	6.46	6.83	6.35	6.63	5.50	5.81	0.85	0.74	258.00	221.10	3.65	4.18	4.28	4.76
C_1 TM x T	1	20.81	23.60	16.75	18.16	15.15	18.16	1.60	1.41	200.92	209.18	6.42	6.84	5.98	5.39
	2	21.04	23.04	15.95	16.66	14.27	16.63	1.69	1.65	219.47	211.68	5.77	6.45	5.26	4.81
	3	19.12	21.66	17.20	18.71	15.56	18.71	1.63	1.58	209.20	207.20	5.91	6.82	5.51	5.40
	4	21.14	23.64	16.54	18.35	14.90	18.35	1.64	1.61	219.98	223.92	6.11	6.97	5.66	5.15
	5	21.90	24.04	18.30	17.75	16.64	17.75	1.66	1.68	205.53	213.05	6.19	6.79	5.62	5.18
C_2 T x TM	6	17.47	20.21	15.30	15.91	13.97	15.91	1.33	1.65	213.88	210.35	6.36	6.74	6.36	5.36
	7	17.87	20.45	14.40	17.47	12.94	17.47	1.47	1.53	219.60	219.27	5.44	6.51	5.55	5.19
	8	17.03	19.98	14.41	15.57	12.98	15.57	1.42	1.50	212.33	215.07	6.85	6.43	5.94	5.15
	9	15.60	18.51	15.69	16.30	14.06	16.30	1.63	1.53	209.75	212.40	6.27	6.64	5.78	4.59
	10	15.61	17.72	14.87	15.58	13.32	15.58	1.55	1.69	202.27	212.18	5.82	7.12	5.97	5.01
G.M.		17.88	20.07	15.21	17.54	14.71	16.03	1.50	1.49	214.88	213.56	6.32	6.88	5.82	5.29
S.E.+-		0.54	0.51	0.24	0.23	0.24	0.25	0.06	0.06	5.35	4.73	0.23	0.15	0.12	0.10
C. D. @ 5%		1.58	1.50	0.71	0.68	0.72	0.73	0.18	0.84	15.69	N.S.	0.67	0.45	0.36	0.30

TSS- Total soluble solids

References

1. Capoor SP, Verma PM. White fly transmission of mosaic disease of *Lagenaria vulgaris* by special methods. Curr Sci. 1965;34:267-268.
2. Clark MF, Adams AN. Characteristics of the microplate method of enzyme-linked immunosorbent assay for the detection of plant viruses. J Gen Virol. 1977;34:475-483.
3. Díaz JA, Mallor C, Soria C, Camero R, Garzo E, Fereres A, Alvarez JM, Gómez-Guillamón ML, Luis-Arteaga M, Moriones E. Potential sources of resistance for melon to nonpersistently aphid-borne viruses. Plant Dis. 2003;87:960-964.
4. Jaylaxmi V. Transgressive segregation of physiological and yield attributes in groundnut (*Arachis hypogaea* L.). Crop Improv. 2000;27(1):67-72.
5. Kadam KG. Genetic studies in watermelon (*Citrullus lanatus* (Thunb.) Mansf.). PhD thesis. Rahuri: Mahatma Phule Krishi Vidyapeeth; 1997.
6. Konstantinos A, Jahn M, Perl-Treves R. Inheritance and

linkage analysis of resistance to zucchini yellow mosaic virus, watermelon mosaic virus, papaya ringspot virus and powdery mildew in melon. Euphytica. 2000;116:265-270.

7. Kshirsagar DB. Studies on transgressive segregation of F3 and F4 generation in tomato (*Lycopersicon esculentum* Mill.) with special reference to resistance against leaf curl virus. PhD thesis. Rahuri: MPKV; 2009.
8. Kumar S, Sankarlingam A, Rabindran R. Characterization and confirmation of papaya ringspot virus-W strain infecting *Trichosanthes cucumerina* in Tamil Nadu, India. J Plant Pathol Microb. 2014;5(2):1-5.
9. Radkov P. Transgression for quantitative characters in intervarietal hybrids of French bean. Rasteniev dni Nauki. 1980;17(1):3-12.
10. Rajput LV. Assessment of variability studies in F2 and F3 generations of bitter gourd (*Momordica charantia* L.). PhD thesis. Rahuri: Mahatma Phule Krishi Vidyapeeth; 2012.
11. Shirkole. Studies on transgressive segregation and variability in orange-fruited tomato (*Lycopersicon esculentum* Mill.). MSc thesis. Rahuri: MPKV; 2006.
12. Vicente MC de, Tanksley SD, De-Vicente MC. QTL analysis of transgressive segregation in an interspecific tomato cross. Genetics. 1993;134(2):585-596.