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Genetics of Seed-Coat Colour in *Citrullus lanatus* (Thunb.) Mansf.

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Summary. Intervarietal crosses in watermelon, *Citrullus lanatus* (Thunb.) Mansf., involving six parents with black (J18-1 and J 75), brown (J56-1 and N.H. Midget), red (Bykovski-199) or light cream (Red Nectar) seed-coat colour were made. Parents, F_1, F_2 and backcross populations were evaluated for their phenotypic expressions with regard to the seed-coat colours involved. Black colour was monogenically dominant over brown light cream and red colour of seed-coat separately or independently. Red colour was dominant over light cream colour of seed-coat by a single pair of genes. The light cream colour was recessive to the brown seed-coat colour of watermelon where a single pair of genes was involved.

Key words: *Citrullus lanatus* – Seed-coat colour – Genetics

Introduction

Watermelon, *Citrullus lanatus* (Thunb.) Mansf., is primarily grown in many countries of the world for dessert purposes although in some countries the seeds are also consumed. A close relative of it, *Citrullus colocynthis* Schrad is grown in many countries of West Africa for seeds only. The genetics of the watermelon has been studied in different countries and a number of improved varieties have been bred. The genetics of seed-coat colour in watermelon has been studied earlier (Mckay 1936; Weetman 1937; Poole, Grimball and Porter 1941; Poole 1944; Nath and Dutta 1973; Sachan and Nath 1976) but the present investigation was designed to study the genetics of those seed-coat colours which had not been reported and in a few cases reconfirmed. Crosses were made among the true breeding lines and phenotypic observations in parents, F_1, F_2 and backcross generations recorded at the University of Udaipur, Jobner campus.

Observations

Observations on the seed-coat colour of parents and F_1 populations are recorded in Table 1 and of F_2 and backcross generations are recorded in Table 2.

(i) *Black vs. Brown.* The F_1 population of the cross between P-1 (black) and P-2 (brown) produced only plants with black seeds, indicating black was dominant over the brown coloured seed-coats. The F_2 population segregated into 3 black to 1 brown seed-coat colour types showing monogenic dominance of black over brown seed-coat colour, which was confirmed by the blackcross (F_1 × P-2) population which segregated into 1 black to 1 brown seed-coat colour types. The backcross population of F_1 with the dominant parent, however, produced plants with black seeds only.

(ii) *Black vs. Light Cream.* The F_1 hybrid population of parents P-1 (black seed-coat) and P-5 (light cream seed-

Table 1. Observations on seed-coat colour in parents and F_1 hybrids in watermelon

Population	Number of plants with seed-coat colour				
	Black	Light cream	Red	Brown	Total
Parents					
P-1 J 18-1	25	–	–	–	25
P-2 J 56-1	–	–	–	25	25
P-3 N.H. Midget	–	–	–	25	25
P-4 Bykovski-199	–	–	25	–	25
P-5 Red Nectar	–	25	–	–	25
P-6 J 75	25	–	–	–	25
F_1 hybrids					
P-1 × P-2	30	–	–	–	30
P-1 × P-5	30	–	–	–	30
P-6 × P-4	30	–	–	–	30
P-4 × P-5	–	–	30	–	30
P-3 × P-5	–	–	–	30	30

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Table 2. Observations on seed-coat colour in F_2 and backcross generations in watermelon

	No. of plants observed with seed-coat					Expected ratio	x^2 value		
	Black	Light cream	Red	Brown	Total		Calculated	Tabular 1%	Tabular 5%
F_2 generation									
(P-1 X P-2) X (P-1 X P-2)	92	–	–	28	120	3:1	0.17	11.341	7.815
(P-1 X P-5) X (P-1 X P-5)	88	32	–	–	120	3:1	0.17	11.341	7.815
(P-6 X P-4) X (P-6 X P-4)	91	–	29	–	120	3:1	0.04	11.341	7.815
(P-4 X P-5) X (P-4 X P-5)	–	29	91	–	120	3:1	0.04	11.341	7.815
(P-3 X P-5) X (P-3 X P-5)	–	28	–	92	120	3:1	0.04	11.341	7.815
Backcross generation									
(P-1 X P-2) X P-1	50	–	–	–	50	–	–	–	–
(P-1 X P-2) X P-2	26	–	–	24	50	1:1	0.08	6.635	3.841
(P-1 X P-5) X P-1	50	–	–	–	50	–	–	–	–
(P-1 X P-5) X P-5	26	24	–	–	50	1:1	0.08	6.635	3.841
(P-6 X P-4) X P-6	50	–	–	–	50	–	–	–	–
(P-6 X P-4) X P-4	27	–	23	–	50	1:1	0.32	6.635	3.841
(P-4 X P-5) X P-4	–	–	50	–	50	–	–	–	–
(P-4 X P-5) X P-5	–	26	24	–	50	1:1	0.08	6.635	3.841
(P-3 X P-5) X P-3	–	–	–	50	50	–	–	–	–
(P-3 X P-5) X P-5	–	23	–	27	50	1:1	0.32	6.635	3.841

coat) produced fruit with black seed-coat colour only. The F_2 population segregated in the ratio of 3 black to 1 light cream coloured seed types. The backcross population with the parent P-1 produced fruits with black seed only but the backcross population with the other parent P-5 produced fruit which segregated in the ratio of one black to 1 light cream colour of seeds. It was concluded from these results that black colour was monogenically dominant over the light cream colour.

(iii) *Black vs. Red.* When parent P-6 (black) was crossed with P-4 (red), the F_1 progenies produced plants with black seeded fruit only, showing dominance of black over the red colour of the seed-coat. The F_2 progenies segregated in the ratio of 3 black to 1 red seed-coat colour types involving a single pair of genes. The backcross population of F_1 with the dominant parent, P-6 produced black seeded progenies only, whereas the backcross population of F_1 with the recessive parent segregated into 1 black to 1 red confirming that black colour was dominant over red colour.

(iv) *Red vs. Light Cream.* The F_1 population of the cross between P-4 (red) and P-5 (light cream) produced fruit with red seeds only, showing dominance of the red over the light cream colour of the seed-coat. In the F_2 generation the plants segregated into 3 red to 1 light cream seed-coat types, inferring that the red colour was monogenically dominant over the light cream colour. The backcross population obtained from a cross between F_1 and the dominant parent P-4 produced fruit with red seeds only, but the backcross population, obtained through a cross between F_1 and the recessive parent P-5, segregated between 1 red to 1 light cream types confirming that one pair of genes was involved.

(v) *Brown vs. Light Cream.* When the parent P-3 with a brown seed-coat was crossed with the parent P-5 with a light cream seed-coat, the F_1 progenies produced fruit which contained brown seeds only. The F_2 progenies segregated into 3 brown to 1 light cream seed-coat types suggesting that the brown was monogenically dominant over the light cream colour of the seed-coat. The backcross population, obtained through a cross between F_1 and the dominant parent P-3, produced fruit with brown seeds only but the backcross population of a cross between F_1 and the recessive parent, P-5, produced fruit which segregated into one brown to 1 light cream types, indicating that a single pair of genes was involved.

Discussion

Evaluation of the phenotypic expression of the parents F_1, F_2 and backcross populations with regard to different seed-coat colours gave definite results on their inheritance. Data revealed that the black seed-coat colour was monogenically dominant over the brown seed-coat colour. This is in conformity with the results obtained by Sachan and Nath (1976) where the dark brown was recessive to the black seed-coat colour. It indicates that black is dominant over brown or dark-brown with respect to seed-coat colour in watermelon.

The crosses between black and light cream seed-coat parents indicated that the light cream was recessive to

black seed-coat and that a single pair of genes was involved. Weetman (1937), Pool (1944) and Grimball and Porter (1941) have reported that black was monogenically dominant over tan colour of seed-coat but information with respect to light cream was lacking.

Data revealed that the black colour was monogenically dominant over the red colour of seed-coat in watermelon. Similar results were reported by Sachan and Nath (1976) involving different parents.

Studies with the red and light cream colours revealed that the light cream colour was recessive to the red colour of seed-coat and that a single pair of genes was responsible. No other report involving these two characters is available.

Crosses between brown and light cream seed-coat colour parents indicated that the brown was monogenically dominant over the light cream colour of seed-coat in watermelon. Sachan and Nath (1976) reported dark-brown colour to be dominant over red colour of watermelon seed-coat, but no previous report is probably available involving parents with light cream seed-coat colour. The present study and the previous reports (Mckay 1936; Weetman 1937; Poole et al. 1941; Poole 1944; Nath and Dutta 1973; Sachan and Nath (1976) suggest that the seed-coat colour in watermelon is monogenically inherited in most of the cases.

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