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GENERATION MEAN ANALYSIS OF DIFFERENT YIELD TRAITS IN MUSKMELON (*CUCUMIS MELO* L.)

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Abstract

Six generation mean analysis was carried out to investigate the inheritance of yield traits (number of fruiting braches per vine, number of fruits per vine, average fruit weight, yield per vine, fruit length and fruit girth) using three crosses of muskmelon *viz.*, Karnool-1 × Hara Madhu, Haryana Local × Hara Madhu and IC 203079 × Punjab Sunheri, parents, F_1, F_2, BC_1 and BC_2 generation in *kharif* season of 2009 at Kittur Rani Chennamma College of Horticulture, Arabhavi, Belagavi district (Karnataka), India. Results indicated that dominance gene effect was predominant in cross Karnool-1 × Hara Madhu and additive and additive x dominance interactions were predominant in crosses Haryana Local × Hara Madhu and IC 203079 × Punjab Sunheri for average fruit weight. For yield per vine dominance gene effect in the cross Karnool-1 × Hara Madhu and additive gene effect in crosses Haryana Local × Hara Madhu and IC 203079 × Punjab Sunheri were predominant.

Key words : *Cucumis melo,* gene effects, epistasis, muskmelon, generation mean analysis.

Introduction

Muskmelon (*Cucumis melo* L.) is an economically important, cross-pollinated, vegetable species of the tropics and sub tropics grown all over the world. In India is commonly grown during summer in river beds and tank beds and also cultivated in fields. Though, there is a wide range of genetic variability available in India, not much attention has been given to the genetical studies and crop improvement. Estimation of genetic parameters is needed to understand the genetic architecture of yield and yield contributing components. Information about type of gene action of yield and yield contributing components would be of immense help for a plant breeder to decide about the proper breeding procedure to be adopted.

Materials and Methods

The experiment comprising of three crosses *viz*., Karnool-1 × Hara Madhu, Haryana Local × Hara Madhu and IC 203079 × Punjab Sunheri of muskmelon each having two parents, F_1, F_2 and two backcrosses were laid out in a randomized block design with two replications during *kharif* season of 2009 at Kittur Rani Chennamma College of Horticulture, Arabhavi, Belagavi district (Karnataka), India. The different parents used were Karnool-1, Hara Madhu, Haryana Local, IC203079 and Punjab Sunheri. Seeds were sown in rows spaced 2m with spacing of 1m between plants. In each replication five plants in each parent and F_1 hybrid, 10 plants in each back cross and 30 plants in each F_2 were taken for study. The normal recommended cultural practices were adopted during experimentation. The characters studied were number of fruiting braches per vine, number of fruits per vine, average fruit weight, yield per vine, fruit length and fruit girth.

The estimates of six genetic parameters namely mean (m), additive (d), dominance (h), additive × additive (i), additive × dominance (j) and dominance × dominance (l) were worked out by analysing and partitioning the means of all the six generations by adopting the methods proposed by Jinks and Jones (1958) as well as Hayman (1958).

Results and Discussion

The estimates of gene effects of different yield traits are presented in table 1.

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Number of fruiting branches per vine

In cross Karnool-1 × Hara Madhu, additive and dominance gene effects were non-significant for this trait, among non-allelic interactions additive × additive (i), additive × dominance (j) and dominance × dominance (l) were found significant. Duplicate type of epistasis was found to be operating. Hence, it is appropriate to follow recurrent selection. In cross Haryana Local × Hara Madhu all types of gene effects (allelic and non-allelic) were found significant with predominance of dominant gene action along with duplicate type of epistasis. Due to higher magnitude of dominant genes heterosis breeding or recurrent selection would be appropriate breeding methods in improving the trait using this cross. Both additive and dominance gene effects were significant along with additive × dominance type of interactions. The type of epistasis was complementary in cross IC 203079 × Punjab Sunheri. Hence, it is appropriate to follow recurrent selection for achieving more number of fruiting branches per vine.

Number of fruits per vine

Number of fruits per vine is the most important yield component, which ultimately determines the productivity of the crop. In cross Karnool-1 × Hara Madhu and IC 203079 × Punjab Sunheri, neither additive (*d*) nor dominance (*h*) effects were significant. All the interaction effects (*i*, *j* and *l*) were also non-significant. Hence, for improvement of the trait new genetic stock could be tried for hybridization and further selection can be done. In cross Haryana Local × Hara Madhu only additive and additive × dominance type of gene effects were significant. The opposite signs of *h* and *l* revealed the operation of duplicate type of epistasis. Therefore, simple selection or recurrent selection would be fruitful for the improvement of the trait.

Average fruit weight

Fruit weight is one of the key yield components, which is positively associated with yield. Hence, giving importance to the fruit weight would be useful for achieving useful results. Dominance gene effect, additive × dominance and dominance × dominance type of non-allelic gene interaction along with duplicate type of epistasis was significant in cross Karnool-1 × Hara Madhu. Whereas, Zalapa *et al*. (2006) reported significance of *d, h* and *l* in muskmelon. As dominant genes are predominant, heterosis breeding or recurrent selection would be a better option to improve fruit weight. Additive gene effect and additive x dominance interaction was significant in cross Haryana Local × Hara Madhu and IC 203079 × Punjab Sunheri. The type of epistasis was duplicate in cross Haryana Local × Hara Madhu and was complementary in IC 203079 × Punjab Sunheri. Hence, simple selection or recurrent selection would be useful in improving the character.

Yield per vine

Among all allelic and non-allelic gene effects only dominance (allelic) gene effect (Kalloo and Dixit, 1983) was significant in cross Karnool-1 × Hara Madhu with duplicate epistasis. Hence, heterosis breeding would be useful in achieving lines with higher yield per plant. In Haryana Local × Hara Madhu additive gene effect and additive × dominance type of non-allelic interactions were found significant along with duplicate type of epistasis. Therefore, simple selection or recurrent selection would be fruitful for the improvement of the trait. In cross IC 203079 × Punjab Sunheri additive gene effect was significant and none of the non-allelic gene interactions were significant and same signs of *h* and *l* indicated the complementary type of epistasis. Earlier Arvindkumar (2004) also reported additive gene action for the trait in muskmelon. Therefore, simple selection or selection among segregating generation is appropriate breeding method for improvement of yield.

Fruit length

Additive gene effect was found significant and none of the non-allelic interaction was significant along with the complementary type of epistasis in cross Karnool-1 × Hara Madhu. Earlier, Serquen *et al*. (1997) also reported additive gene action in cucumber. Selection would be useful in getting better results. In cross Haryana Local × Hara Madhu only additive gene effect and among non-allelic gene interactions only additive × dominance interaction was found significant. Complementary type of epistasis was found operating. Therefore, simple selection or recurrent selection would be fruitful for the improvement of the trait. In cross IC 203079 × Punjab Sunheri, both additive and dominance gene effects were significant along with dominance × dominance type of non-allelic interactions duplicate type of epistasis. Due to the predominance of dominance gene effects, heterosis breeding or recurrent selection would be useful in improving fruit length.

Fruit girth

In cross Karnool-1 × Hara Madhu additive gene effect and additive × dominance type of non-allelic gene interactions were significant along with complementary type of epistasis. Therefore, simple selection as well as recurrent selection may be beneficial in increasing the fruit diameter. In cross Haryana Local × Hara Madhu

Table 1 : Estimation of gene effects for different yield traits in three crosses of muskmelon.

S. no.	Character	Crosses	*m*	SE	*d*	SE	*H*	SE	*i*	SE	*j*	SE	*l*	SE	Type of epistasis
1.	Number of fruiting braches per vine	C-I	15.85**	0.20	0.05^{NS}	0.31	-1.35^{NS}	1.10	-2.30*	1.02	1.60**	0.39	4.90**	1.72	D
		C-II	17.56**	0.20	2.29**	0.30	-2.71*	1.35	-5.26**	1.26	5.34**	0.39	10.76**	1.90	D
		C-III	18.86**	0.30	2.09**	0.33	3.18*	1.44	-0.46^{NS}	1.38	5.54**	0.41	2.16^{NS}	1.98	C
2.	Number of fruits per vine	C-I	2.08**	0.09	0.15^{NS}	0.23	-0.23^{NS}	0.63	0.36^{NS}	0.60	-0.14^{NS}	0.26	-1.46^{NS}	1.10	C
		C-II	2.53**	0.13	0.75**	0.28	0.21^{NS}	0.84	0.16^{NS}	0.78	0.90**	0.26	-1.36^{NS}	1.41	D
		C-III	2.33**	0.09	-0.45^{NS}	0.24	0.51^{NS}	0.71	0.36^{NS}	0.61	0.09^{NS}	0.30	0.43^{NS}	1.26	C
3.	Average fruit weight (g)	C-I	654.66**	17.31	12.75^{NS}	35.56	-250.16*	103.74	-186.16^{NS}	99.28	97.25**	37.66	339.66*	169.27	D
		C-II	698.66**	21.89	175.25**	44.60	-32.41^{NS}	140.45	-61.16^{NS}	125.00	287.50**	52.62	250.16^{NS}	236.44	D
		C-III	642.16**	21.81	-144.75**	53.17	-105.41^{NS}	146.59	-31.16^{NS}	137.57	-132.50*	57.17	-103.83^{NS}	251.21	C
4.	Yield per vine (g)	C-I	1359.50**	66.01	160.5^{NS}	119.0	-791.00*	381.26	-289.00^{NS}	355.61	154.50^{NS}	140.76^{NS}	76.00^{NS}	610.13	D
		C-II	1732.41**	95.87	857.75**	148.33	33.08^{NS}	511.75	6.83^{NS}	484.84	1199.00**	184.97^{NS}	-525.83^{NS}	778.72	D
		C-III	1460.41**	60.80	-549.75**	138.20	11.83^{NS}	427.25	121.83^{NS}	368.18	-177.75^{NS}	178.38	146.66^{NS}	743.44	C
5.	Fruit length (cm)	C-I	10.59**	0.21	-1.11**	0.35	-0.43^{NS}	1.17	-0.11^{NS}	1.11	-0.69^{NS}	0.46	-0.84^{NS}	1.82	C
		C-II	10.00**	0.21	0.68*	0.33	1.51^{NS}	1.20	0.53^{NS}	1.08	2.54**	0.44	0.80^{NS}	1.89	C
		C-III	11.64**	0.35	-1.62*	0.81	3.66*	2.40	3.20^{NS}	2.15	-1.32^{NS}	0.92	-10.73**	4.13	D
6.	Fruit girth (cm)	C-I	9.69**	0.21	-1.74**	0.34	-0.26^{NS}	1.17	0.35^{NS}	1.09	-0.99*	0.46	-3.02^{NS}	1.82	C
		C-II	9.74**	0.22	1.12**	0.41	2.65*	1.33	1.36^{NS}	1.22	2.76**	0.47	-2.53^{NS}	2.17	D
		C-III	9.92**	0.26	-0.31^{NS}	0.60	3.64*	1.77	2.11^{NS}	1.59	0.24^{NS}	0.73	-6.43^{NS}	3.60	D

*Significant at 5% level, **Significant at 1% level, SE = Standard error, NS = Non-significant, C-I = Cross-I (Karnool-1 x Hara Madhu) C-II = Cross-II (Haryana Local × Hara Madhu), C-III = Cross-III (IC 203079 × Punjab Sunheri), *m* = mean, *d* = additive, *h* = dominance, *i* = additive x additive, *j* = additive x dominance, *l* = dominance x dominance C = Complementary type of epistasis, D = duplicate type of epistasis.

both additive and dominance gene effects were significant along with additive × dominance type of non-allelic interaction. Duplicate type of epistasis was found to be operating. Earlier report by Tomar *et al*. (2008) in muskmelon also indicated additive and dominant gene effects. Hence, heterosis breeding or recurrent selection can be adopted for the improvement of the trait. Only dominance gene effect was significant and duplicate type of epistasis was found to operating in cross IC 203079 × Punjab Sunheri. Kalloo and Dixit, (1983) also reported dominant gene action for the trait in muskmelon. Hence, heterosis breeding is useful in improving the fruit diameter.

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