Plant Archives Vol. 14 No. 1, 2014 pp. 221-223 *ISSN 0972-5210*

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

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Abstract

Generation mean analysis was undertaken using three crosses to ascertain the inheritance of earliness characters *viz.*, days to first flowering, days to first female flowering, number of nodes up to first female flowering and days to first harvest. The results indicated that the lines with early fruit maturity can be achieved by adopting selection in segregating generation or recurrent selection in cross Karnool-1 x Hara Madhu due to presence of both additive and dominance gene action in governing the earliness trait. In crosses Haryana Local × Hara Madhu and IC 203079 × Punjab Sunheri, it is appropriate to follow heterosis breeding or recurrent selection due to predominance of dominant genes.

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, it is commonly grown 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. Earliness is a desirable trait of a cultivar, days to first flowering, days to first female flowering, number of nodes up to first female flowering and days to first harvest are the important components for earliness. The limited genetic studies on earliness have been made in this crop. Hence, the present study was envisaged to ascertain the inheritance of these characters, which is essential in formulating a suitable breeding programme.

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 randomised 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. Data on days taken to first flowering, days taken to first female flowering, number of nodes up to first female flowering and days to first harvest were recorded on individual plant basis.

The generation means were partitioned into additive (d), dominance (h), additive × additive (i), additive × dominance (j) and dominance × dominance (l) as suggested by Hayman (1958).

Results and Discussion

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

Days to first flowering

Additive gene effect along with additive × dominance type of non-allelic interactions was significant and complementary type of epistasis was found to be operating in cross Karnool-1 × Hara Madhu. Earlier, Zalapa *et al.* (2006) reported additive, dominance and additive ×

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Table 1: Estimation of gene effects for different earliness 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.	Days to first flowering	C-I	34.81**	0.55	4.51**	0.97	6.38^{NS}	3.37	2.43^{NS}	2.94	4.29**	1.21	3.56^{NS}	5.56	C
		C-II	33.48**	0.45	4.95**	0.94	5.06^{NS}	3.03	4.96^{NS}	2.60	2.75**	1.02	-12.06*	5.17	D
		C-III	33.15**	0.42	2.69**	1.04	2.74^{NS}	3.16	-2.60^{NS}	2.69	3.84**	1.28	14.30*	5.60	C
2.	Days to first female flowering	C-I	42.88**	0.38	4.20**	0.84	2.11^{NS}	2.34	3.06^{NS}	2.28	4.05*	0.89	0.63^{NS}	3.88	C
		C-II	43.20**	0.32	-0.54^{NS}	0.81	4.39^{NS}	2.86	4.49**	2.09	-4.44*	2.02	-13.59**	5.25	D
		C-III	42.61**	0.29	-0.90^{NS}	0.78	7.08**	2.11	5.33**	1.96	-0.95^{NS}	0.89	-11.43**	3.70	D
3.	Number of nodes up to first female flower	C-I	5.73**	0.11	-0.09^{NS}	0.24	0.31^{NS}	0.76	0.26^{NS}	0.67	-0.65*	0.31	-0.36^{NS}	1.28	D
		C-II	5.46**	0.12	-0.35^{NS}	0.24	-0.71^{NS}	0.76	-0.36^{NS}	0.68	-1.20**	0.27	-0.03^{NS}	1.29	C
		C-III	4.83**	0.10	0.44^{NS}	0.24	1.61*	0.70	1.56*	0.63	0.09^{NS}	0.27	-3.76**	1.21	D
4.	Days to first harvest	C-I	84.71**	0.49	-3.59**	0.92	-1.56^{NS}	2.83	1.33^{NS}	2.71	-5.39**	1.03	-6.53^{NS}	4.51	C
		C-II	82.90**	0.43	-2.20**	0.30	-7.25**	1.86	-2.80^{NS}	1.83	-5.65**	0.45	5.69*	2.23	D
		C-III	83.86**	0.46	-0.19^{NS}	0.53	-11.16**	2.30	-7.86**	2.15	-4.69**	0.81	19.66**	3.28	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 × additive, *j* = additive × dominance, *l* = dominance × dominance type of epistasis, C = Complementary type of epistasis, D = duplicate type of epistasis.

dominance gene actions for days to first flowering in muskmelon. Therefore, for the improvement of this trait selection in segregating generation or recurrent selection may be advantageous. Cross Haryana Local x Hara Madhu exhibited the significance of additive gene effect and among all the interaction gene effects (*i*, *j* and *l*), additive × dominance and dominance x dominance type of non-allelic interactions were significant, type of epistasis was duplicate. Hence, recurrent selection is appropriate breeding method to improve the trait. In Cross IC 203079 × Punjab Sunheri additive type of gene effect and among non-allelic interactions additive × dominance and dominance × dominance types were significant and complementary epistasis was operating. Zalapa *et al.* (2006) reported additive, dominance and additive × dominance gene actions for days to first flowering in muskmelon. These results suggested that substantial gain for this character can be made through selection in segregating generation or by recurrent selection.

Days to first female flowering

Additive gene effect and among interactions additive × dominance type of non-allelic interaction was significant along with complementary type of epistasis in cross Karnool-1 × Hara Madhu. Therefore, for the improvement of this trait selection in segregating generation or recurrent selection may be advantageous. In Cross Haryana Local × Hara Madhu both additive and dominance type of gene actions were non-significant and among non-allelic interactions additive x additive, additive × dominance and dominance × dominance were found significant and duplicate type of epistasis was operating. Therefore, recurrent selection is advantageous to get lines with early female flowers. In Cross IC 203079 × Punjab Sunheri, dominance effect and dominance × dominance type of epistasis were found significant. Similar results were also reported by Arvindkumar (2004) in muskmelon and Sirohi and Ghoruri (1993) in bitter gourd. Hence, heterosis breeding is most appropriate method for the improvement of the character.

Number of nodes up to first female flower

Both additive and dominance gene effects were non-significant and among non-allelic gene interactions only additive × dominance interaction was significant along with duplicate type of epistasis in cross Karnool-1 × Hara Madhu and in cross Haryana Local × Hara Madhu additive × dominance type of non-allelic gene interaction was significant along with complementary type of epistasis. Hence, recurrent selection is advantageous in improving this trait. Dominance gene effect, additive × additive and dominance × dominance epistasis were found significant and duplicate type of epistasis was operating in cross IC 203079 × Punjab Sunheri. Singh *et al*. (1989) and Tomar *et al.* (2008) reported dominance gene action for the trait in muskmelon. Due to predominance of dominant genes, heterosis breeding and recurrent selection can be useful to get lines with female flowers in early nodes.

Days to first harvest

Additive gene effect was significant for this character along with additive × dominance type of non-allelic interaction and complementary type of non-allelic interaction is operating in cross Karnool-1 × Hara Madhu. Whereas, Singh *et al*. (1976) and Munshi and Verma (1998) reported additive and dominance gene action for the trait in muskmelon. Therefore, for the improvement of this trait selection in segregating generation or recurrent selection may be advantageous. In cross Haryana Local × Hara Madhu, both additive and dominance gene effects were significant. Among non-allelic interactions additive × dominance and dominance × dominance were found significant. In cross IC 203079 × Punjab Sunheri, dominance gene effect was significant while additive gene effect was non-significant. For non-allelic interactions all the three types (*i, j* and *l*) were found significant. The opposite signs of *h* and *l* represented the presence of duplicate type of epistasis in both the crosses. Singh *et al*. (1976) and Munshi and Verma (1998) reported additive and dominance gene action for the trait in muskmelon. Because of the higher magnitude of dominance genes, it is appropriate to follow heterosis breeding or recurrent selection to improve this trait in crosses Haryana Local × Hara Madhu and IC 203079 × Punjab Sunheri.

Acknowledgement

The authors would like to thank the Department of Vegetable Sciences, Kittur Rani Chennamma College of Horticulture, Arabhavi for facilitating the project work.

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