Vegetable Science (2018) 45 (1) : 118-120

Short Communication

Identification and possibility of monoecious inbred of muskmelon (*Cucumis melo* L.) for heterosis breeding

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Received: November 2017 / Accepted: May 2018

Muskmelon (*Cucumis melo* L.) is an economically important cucurbitaceous vegetable crop cultivated throughout the warmer parts of world and consumed as 'dessert'. It belongs to the family Cucurbitaceae and grown as a 'Dessert Crop'. Being a cross pollinated crop, it shows heterosis for earliness, fruit size, fruit weight, flesh thickness, total soluble solids, fruit flavour, transportability and fruit yield. Presently the main emphasis is given on the development of F_1 hybrids of muskmelon due to high yield, uniform fruit shape, size as well as consistently excellent quality. Muskmelon is predominantly andromonoecious in sex expression however, monoecious sex form is also found in natural populations (Foster 1968 and More et al. 1980). Pusa Rasraj F_1 has been developed by exploiting monoecy (Kesavan and More 1991) but not accepted commercially, due to its undesirable fruit shape and poor external appearance (Sandha and Lal 1999). The cost of hybrid seed production is high due to emasculation in the available andromonoecious cultivars of muskmelon. The use of genetic male sterile lines also involves difficulties in identification and rouging of 50% male fertile plants and maintenance of male sterile plants which makes the hybrid seed production costly. Therefore, the use of monoecious lines as female parent suppressing male flowers through ethrel minimizes the cost of hybrid production in muskmelon. Keeping in view, a monoecious line of muskmelon (AHMM/BR-8) has been identified at ICAR-Central Institute for Arid Horticulture, Bikaner, Rajasthan, India from the genetic stock collected from Sirohi district of Rajasthan. The identified line has been purified through inbreeding. Single plant selection was exercised based on earliness, fruit size, flesh colour and total soluble solids (TSS). Finally, the obtained population was tested for stability over the years and observed stable monoecious sex form (Choudhary et al. 2013). The biochemical analysis was also done for total sugar (336.9 mg/ g), tannin content (0.12 mg/ g), phenol content (34.7 mg/ g) and flavonoid content (1.05 mg/ g) on dry weight basis (Haldhar et al. 2013). It produced round fruits with salmon orange flesh and develops full slip at ripening. The seed of developed monoecious line has been multiplied and deposited to ICAR-National Bureau of Plant Genetic Resources, New Delhi, India with National Identity of IC-0599709 and registered for monoecious sex form as INGR 1403 (Choudhary et al. 2015). The presence of stable monoecious sex form in IC-0599709 could be economically utilized in heterosis breeding of muskmelon.

A wide range of genetic variability is available in muskmelon, however very little attention has been given to exploit heterosis (Choudhary et al. 2012). Therefore, the present experiment was conducted to evaluate the *per se* performance of muskmelon hybrids utilizing monoecious inbred line (IC-0599709) as a female parent.

Table 1: Salient characteristics of IC-0599709

S. No.	Character	Description
1	Sex form	Monoecious
2	Days taken to produce 50% female flower from sowing	43.80-46.13
3	Days taken to first fruit harvest from sowing	70.20-73.87
4	Fruit diameter	11.32-12.76 cm
5	Flesh thickness	3.43-4.00 cm
6	Width of seed cavity	4.37-5.12 cm
7	Total soluble solids (TSS)	10.8-11.3%
8	Fruit weight	0.8-1.10 kg
9	Number of fruits/ plant	3.47-4.27

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Table 2: *Per se* performance of muskmelon hybrids for flowering, yield and quality traits

F_1's	Days taken to produce 50% pistillate flowers	Days taken to first fruit harvest	Fruit weight (g)	Fruit diameter (cm)	Flesh thickness (cm)	Rind thickness (cm)	Width of seed cavity (cm)	Fruits/ plant	TSS (%)	Flesh colour	Sex form
IC-0599709 x Kashi Madhu	52.00	75.00	0.67	9.48	2.60	0.24	5.80	3.20	10.80	Salmon orange	Monoecious
IC-0599709 x Pusa Madhuras	55.00	76.00	0.84	9.26	2.82	0.22	5.86	2.80	11.32	Salmon orange	Monoecious
IC-0599709 x Punjab Sunehri	48.00	73.00	0.75	10.88	3.08	0.30	4.86	3.40	11.60	Salmon orange	Monoecious
IC-0599709 x Arka Rajhans	47.00	74.00	0.77	10.40	2.04	0.22	6.44	3.20	10.20	Creamy	Monoecious
IC-0599709 x MHY-3	45.00	74.00	0.90	11.46	2.58	0.24	6.46	2.80	11.14	Greenish white	Monoecious
IC-0599709 x Hara Madhu	50.00	89.00	0.80	11.43	2.60	0.21	5.90	3.00	11.32	Greenish white	monoecious

Figure 1: Monoecy in IC-0599709

The six diverse cultivars used as male parent (Kashi Madhu, Pusa Madhuras, Punjab Sunehri, Arka Rajhans, MHY-3 and Hara Madhu) were crossed with IC-0599709) during summer season of 2015. The resultant six crosses were evaluated during summer season of 2016 at Experimental Farm, ICAR-Central Institute for Arid Horticulture, Bikaner, Rajasthan.

Earliness is a critical consideration for maximizing economical return of muskmelon which is attributed to node number of first pistillate flower, time required for first pistillate flower appearance and time required for first fruit harvest. In the present findings it was observed that IC-0599709 x Punjab Sunehri took minimum days to first harvest (73 days) followed by IC-0599709 x Arka Rajhans (74 days) and IC-0599709 x MHY-3 (74 days). This might have resulted due to the transfer of earliness characters from the monoecious parent to hybrid. The fruit weight, fruit diameter and flesh thickness are the most important attributes to determine yield. The fruit weight (0.75 kg), fruit diameter (10.88 cm) and maximum flesh thickness (3.08 cm) with minimum width of seed cavity (4.86 cm) was recorded in IC-0599709 x Punjab Sunehri. Maximum number of fruits per plant (3.40) was also observed in IC-0599709 x Punjab Sunehri followed by IC-0599709 x Kashi Madhu and IC-0599709 x Arka Rajhans.


Figure 2: Fruits of IC-0599709

TSS is the most important fruit quality attribute of muskmelon and IC-0599709 x Punjab Sunehri registered maximum TSS (11.60%) among the evaluated hybrids followed by IC-0599709 x Pusa Madhuras (11.32%) and IC-0599709 x Hara Madhu (11.32%). The maximum rind thickness was also recorded in IC-0599709 x Punjab Sunehri (0.30 cm) which is desirable to improve shelf life and long distance transportability of muskmelon. Risser (1984) reported the undesirable linkage between genes controlling sex expression resulted in undesirable fruit shape and poor external appearance using monoecious lines of muskmelon in heterosis breeding. However, this problem was not noticed in the developed F_1 hybrids using IC-0599709 as female parent. Therefore, the monoecious inbred IC-0599709 taken in the present study could be utilized for heterosis breeding for earliness, high yield and better fruit quality. Among the evaluated cross combinations, IC-0599709 x Punjab Sunehri resulted as the best specific cross. Thus, from the above study it is evident that monoecious inbred incorporated as female parent

holds immense potential for utilization of heterosis breeding in muskmelon.

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