Journal of Crop and Weed, 12(3):175-177(2016)

Performance of watermelon (*Citrullus lanatus*) in red and laterite zone of West Bengal

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Received : 25.11.2016; Revised :24.12.2016; Accepted : 30.12.2016

ABSTRACT

A field study was conducted taking thirteen genotypes of watermelon in Horticulture Farm, Sriniketan during summer 2015 to judge their suitability of cultivation in this region. Data on vine length, branch number, node number and days to first male and female flower opening, total number of male and female flowers per plant, sex ratio, equatorial and polar diameter of fruit, rind thickness, number of fruits per plant, average fruit weight, fruit yield per plant and TSS were taken and compared. Maximum vine length was recorded in KSP-1127 while Black Wonder recorded maximum branch number. Lowest node to first male and female flower opening, maximum female flowers per plant, lowest sex ratio, maximum polar and equatorial diameter of fruit, maximum fruit weight and yield per plant was recorded in KSP-1127. Highest TSS content was noted in Sugar Baby and KSP-1127.

Keywords : Flowering TSS, watermelon, yield

Watermelon (*Citrullus lanatus* (Thunb.) Matsum. & Nakai) is a warm-season crop belongs to the family Cucurbitaceae. The fresh fruit of water melon is low in calories but highly nutritious, sweet and thirst-quenching (Mangila *et al*., 2007). Watermelon is grown over 3.5 million ha worldwide with production of 104million tons (FAO, 2012). Varietal differences affect the growth and yield of crops. Genetic factors influence the growth characters of water melon such as plant height, vine length, leaf area, number of leaves or branches, and fruit production. The soil and climatic condition of this sub-humid, sub-tropical and lateritic belt of West Bengal highly matches with the basic requirements to grow melons and many other cucurbits. Watermelon is being sporadically but successfully grown in this region. However, locally grown water melon often upset the producers due to poor productivity and consumers due to lack of desirable fruit traits particularly sweetness. Keeping the above constraints in viewthe present work was performed with the objective to identify suitable water melon genotype(s) of this region.

MATERIALS AND METHODS

The experiment was planned in randomized block design with three replications at Horticulture Farm of Institute of Agriculture, Sriniketan (West Bengal) in spring-summer 2015. The planting was done in channel and bed system (2 x 0.5m). Thirteen genotypes (Icebox, BS-504, WN-786, NBH-Mastana-70, BSS-2000, Black Magic, Agri Sweet Honey, Arka Manik, Sugar Baby, TMWH-702, Black Wonder, KSP-1127 and TMWH-701) were chosen for this experiment. Observations were recorded from ten tagged plants on vine length, branch number, first male and female flowering node, days taken to first male and female flowers, total number of male and female flowers plant^{-1}, sex ratio, equatorial and polar diameter, rind thickness, number of fruits plant^{-1}, average fruit weight, fruit yield plant^{-1} and TSS. The total variation for different genotypes was tested for significance by F test using analysis of variance technique (Panse and Sukhatme, 1985).

RESULTS AND DISCUSSION

Growth parameters

The data revealed that significant genotypic variation in vine length exists. The maximum vine length was recorded in KSP-1127 (296.3cm) and minimum vine length was observed in TMWH-701 (188.5cm). Maynard and Scott (1998) distinguished types of melon growth based on the vine length. Significantly higher branch number was recorded in Black Wonder (6.1). KSP-1127 (5.1), TMWH-702 (4.6), Arka Manik (4.5), NBH-Mastana-70 (4.5) and BS-504 (4.5) also produced fairly large number of branches plant^{-1}. It was recorded that crop produced average 4.4 branches plant^{-1}. Increased branch number also increases probable fruiting sites and thereby helps to increase the fruit yield plant^{-1}.

Flowering traits

First flowering node is an important parameter of earliness in cucurbits. KSP-1127 showed first appearance of male flowers at the lowest number node (5.2). It was followed by Sugar Baby (5.8), WN-786 and Arka Manik (6.2), which were statistically *at par*

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with each other. KSP-1127 (13.0) also recorded lowest node of appearance of female flowers. The result revealed that Sugar Baby started flowering 46.2 days after sowing of plant which was statistically *at par* with Black Magic (46.8). Early appearance of female flowers gave early market opportunity. The genotype BS-504 gave early female flowering (58.5days) followed by KSP-1127 (59.6 days). Minimum total number of male flower plant^{-1} was registered in Sugar Baby (54.4) followed by TMWH-701 (64.0) and Arka Manik (64.5). The maximum number of male flowers plant^{-1} was produced by genotype Icebox (87.5). Number of female flowers plant^{-1} is an important parameter that is related to number of fruits plant^{-1}. Maximum female flowers plant^{-1} were recorded in KSP-1127 (10.5). is known as sex ratio. The implication in monoecious genotypes is to reduce the male flowers and increase the number of female flowers and produce them in lower nodes. Lower the value of sex ratio, thus always advantageous to achieve higher production. Among the 13 genotypes, lowest sex ratio was obtained in KSP-1127 (6.9) followed by Sugar Baby (7.8).

Table 1: Vine length and branch number in different genotypes of watermelon

Treatment	Vine length (cm)	Branch number
Icebox	230.2^{de}	4.1^{cdef}
BS-504	262.3^{b}	4.5^{bc}
WN-786	261.5^{b}	4.2^{cde}
NBH-Mastana-70	241.6^{c}	4.5^{bc}
BSS-2000	201.2^{g}	3.4^{fg}
Black Magic	210.3^{fg}	3.5^{efg}
Agri Sweet Honey	235.5^{cd}	4.3^{cd}
Arka Manik	221.3^{ef}	4.5^{bc}
Sugar Baby	222.4^{e}	3.7^{defg}
TMWH-702	206.6^{g}	4.6^{bc}
Black Wonder	260.6^{b}	6.1^{a}
KSP-1127	296.3^{a}	5.1^{b}
TMWH-701	188.5^{h}	4.3^{cd}
Mean	**233.7**	**4.4**
LSD (P=0.05)	**11.0**	**0.7**
CV (%)	**3.4**	**11.0**

Table 2 : Flowering traits in different genotypes of watermelon

Treatment	1st male flowering node	1st female flowering node	Days to first male flowers	Days to first female flowers	Total no of male flowers plant^{-1}	Total no of female flowers plant^{-1}	Sex ratio
Icebox6.8^{efg}	16.1^{c}	51.3^{fgh}	64.3^{cd}	87.5^{h}	7.5b^{cde}	11.9^{defghi}	
BS-504	7.1^{fghi}	18.4^{e}	48.3^{bc}	58.5^{a}	75.3^{e}	7.2^{cdefg}	10.8^{defg}
WN-786	6.0^{bc}	27.4^{j}	49.1^{cd}	70.4^{j}	76.3^{e}	5.6^{ij}	13.8^{ijk}
NBH-Mastana-70	6.5^{cde}	17.5^{de}	51.0^{defgh}	64.0^{b}	71.4^{cd}	7.3^{bcde}	9.9^{bcde}
BSS-2000	6.7^{def}	21.6^{g}	49.9^{cdefg}	67.1^{fgh}	95.3^{i}	6.4^{efghi}	15.0^{kl}
Black Magic	7.2^{fghi}	23.6^{i}	46.8^{ab}	66.8^{efg}	78.2^{f}	4.6^{jk}	17.1^{l}
Agri Sweet Honey	6.9^{efgh}	20.4^{f}	52.4^{h}	69.2^{ij}	71.2^{c}	8.5^{b}	8.4^{abc}
Arka Manik	6.2^{bcd}	14.6^{b}	48.3^{bc}	68.2^{ghi}	64.5^{b}	5.2^{ijk}	12.5^{fghij}
Sugar Baby	5.8^{b}	16.4^{c}	46.2^{a}	65.2^{cde}	54.4^{a}	7.1^{cdefgh}	7.8^{ab}
TMWH-702	7.2^{fghi}	17.4^{d}	52.5^{h}	66.4^{ef}	82.4^{g}	7.9^{bcd}	10.5^{cdef}
Black Wonder	6.5^{cde}	22.3^{gh}	49.2^{cde}	65.2^{cde}	79.2^{f}	8.2^{bc}	9.8^{bcd}
KSP-1127	5.2^{a}	13.0^{a}	49.3^{cdef}	59.6^{a}	72.6^{cd}	10.5^{a}	6.9^{a}
TMWH-701	8.2^{j}	21.8^{gh}	51.2^{efgh}	69.6^{ij}	64.0^{b}	5.6^{ij}	11.5^{defgh}
Mean	**6.6**	**19.3**	**49.6**	**65.7**	**74.8**	**7.0**	**11.2**
LSD (P=0.05)	**0.5**	**0.9**	**2.0**	**1.7**	**1.8**	**1.2**	**2.1**
CV (%)	**5.3**	**3.5**	**2.9**	**1.9**	**1.7**	**11.9**	**13.2**

Yield attributes, yield and TSS

Equatorial and polar diameters of watermelon together determine the shape and size of fruit. Significant differences of equatorial and polar diameter among the genotypes were noticed. The maximum equatorial and polar diameter (66.3 and 69.2cm) was observed in KSP-1127. Mean equatorial and polar diameter was 50.4 and 52.3 cm respectively. Similar to fruit diameter maximum rind thickness was registered in KSP-1127 (1.6cm), which was noted statisticallyat par with Arka Manik (1.6cm), Agri Sweet Honey (1.6cm), BSS-2000 (1.5cm), TMWH-701 (1.4) and TMWH-702 (1.4). Rind thickness of water melon can affect a variety's suitability for shipping and its overall marketability. Varieties with thicker rinds may be more suitable for shipping, but a thinner rind may be more appealing to consumers. Number of fruits plant^{-1} was an important yield attribute contributed directly to production. Black Wonder genotype produced maximum number of fruits plant^{-1} (4.4). Higher fruits

Table 3: Yield and yield attributing characters in different genotypes of watermelon

Treatment	Equatorial diameter (cm)	Polar diameter (cm)	Rind thickness (cm)	Number of fruits plant^{-1}	Average fruit weight (kg)	Fruit yield plant^{-1} (kg)	TSS (^{0}brix)
Icebox	49.8^{defg}	58.7^{c}	1.1^{cdef}	2.3^{gh}	2.6^{cde}	6.2^{fg}	9.2^{ghij}
BS-504	61.5^{b}	61.8^{b}	0.8^{fg}	3.4^{bc}	3.6^{b}	12.3^{ab}	11.6^{cd}
WN-786	46.2^{hi}	50.0^{ij}	1.3^{abcd}	2.2^{gh}	1.5j	3.3^{hij}	11.9^{bc}
NBH-Mastana-70	47.3^{gh}	54.5^{de}	1.1^{cde}	3.1^{bcde}	2.5^{cdef}	7.7^{def}	10.2^{defg}
BSS-2000	44.7^{hi}	53.4^{def}	1.5^{ab}	2.2^{gh}	2.2^{cdefghi}	4.9^{gh}	9.4^{fghi}
Black Magic	47.4^{fgh}	49.0^{j}	1.2^{bcde}	3.0^{cdef}	2.8^{c}	8.3^{d}	11.0^{cdef}
Agri Sweet Honey	60.1^{bc}	63.3^{b}	1.6^{a}	3.3^{bcd}	3.5^{b}	11.5^{abc}	8.4^{ijk}
Arka Manik	52.2^{cd}	55.1^{d}	1.6^{a}	1.5^{i}	2.5^{cdef}	4.0^{hi}	12.3^{b}
Sugar Baby	54.0^{c}	54.5^{de}	1.0^{defg}	3.6^{b}	2.3^{cdefgh}	8.2^{de}	13.4^{a}
TMWH-702	52.4^{c}	52.7^{efg}	1.4^{abc}	1.4^{i}	2.1^{defghij}	3.0^{ij}	10.1^{defgh}
Black Wonder	51.2^{cde}	51.8^{fghi}	1.1^{cdef}	4.4^{a}	2.4^{cdefg}	10.5^{c}	7.4^{k}
KSP-1127	66.3^{a}	69.2^{a}	1.6^{a}	2.5^{fg}	5.1^{a}	12.5^{a}	13.2^{a}
TMWH-701	50.4^{def}	52.3^{efgh}	1.4^{abc}	2.3^{gh}	2.7^{cd}	6.2^{fg}	11.2^{cde}
Mean	**52.6**	**55.9**	**1.3**	**2.7**	**2.8**	**7.6**	**10.7**
LSD (P=0.05)	**3.0**	**1.9**	**0.3**	**0.5**	**0.6**	**1.6**	**0.6**
CV (%)	**4.0**	**2.4**	**15.3**	**13.2**	**16.4**	**15.3**	**4.2**

plant^{-1} was also produced by Sugar Baby (3.6), BS-504 (3.4), Agri Sweet Honey (3.3) and NBH-Mastana-70 (3.1). The lowest number of fruits plant^{-1} was registered in TMWH-702 (1.4). In recent years, preference of consumers has shifted toward fruit of smaller sizes than the large sizes traditionally used for parties and picnics (Gusmini and Wehner, 2007). Maximum average fruit weight was registered in KSP-1127 (5.1 kg). On the other hand, the minimum fruit weight was resulted in WN-786 (1.5kg) and TMWH-702 (2.1kg). Nanu and Vasile, 1998, also studied quantitative and qualitative characters of watermelon. Genotype KSP-1127 produced maximum fruit yield of 12.5kg Plant^{-1}, closely followed by BS-504 (12.3kg plant^{-1}) and Agri Sweet Honey (11.5kg plant^{-1}). The maximum direct effect on fruit yield per plant was exerted by fruit weight at phenotypic level followed by number of fruits per plant (Choudhary, 2012). Maynard (2001) reported that sweetness, one of the prime quality factors in watermelon fruit is related to total soluble solids. The total soluble solids content in unit amount of watermelon flesh is dependent on cultivar and environmental factors (Porter, 1940). The maximum TSS was noted in Sugar baby (13.4^0 brix) followed by KSP-1127 (13.2^{0}brix). Maynard and Elimstrom (1989) also studied total soluble solid content in various triploid cultivars.

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