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SCREENING OF MUSKMELON (*Cucumis melo* L.) GERMPLASM AGAINST SALINITY

M. A. MALEK, M. OBAIDUL ISLAM,
M. MAMTAZUL HAQUE AND M. K. SULTAN

Abstract

Out of 78 germplasm of muskmelon (*Cucumis melo* L.), 67 germplasm (86%) survived against high salinity (13.82 ds/m) when screened at Benarpota, Satkhira, Khulna. These germplasm showed morphological variations in growth habit, leaf lobes, leaf pubescence, fruit shape, fruit ribs, fruit skin texture, flesh colour, flesh flavor, flesh texture, fruit splitting, fruit aroma, fruit size, seed coat colour, fruit skin colour at fully formed fruit and fruit skin colour at seed harvest maturity. The other qualitative characters, such as tendrils and flowering habit did not show morphological variations. Quantitative variations were observed in leaf length, leaf width, days to staminate flowering, days to pistillate flowering, fruit length, fruit width, fruit weight, number of fruits per plant, flesh thickness, number of seeds per fruit, days to fruit harvest and 1000-seed weight. Among the germplasm, BD-2255 and BD-9159 had no splitting of fruits. Therefore, these two germplasm can be selected for this trait. The characters, such as number fruits per plant and fruit weight exhibited highest number of fruits per plant (21) and maximum fruit weight (6.25 kg). These two characters should also be considered for improvement of muskmelon. Highest CV (%) was found in number of fruits per plants (36.35) followed by fruit weight (33.86).

Keywords: Muskmelon, germplasm, screening, salinity.

Introduction

Salinity is a serious environmental constraint to crop production in many parts of the world (Maranville *et al.*, 1993). Estimates for the extent of salinity damage vary from 25 to 50 percent of the worlds irrigated land (Postel, 1989; Adams and Hughes, 1990). In Bangladesh, about 2.83 million ha of land is affected by various degrees of salinity, and efforts are being made to bring the saline areas under cultivation (Begum *et al.*, 2000). Crop culture on such land thus becomes an important step by screening the salt tolerant cultivar (Begum *et al.*, 2000). Soil salinity has become a major factor limiting crop productivity worldwide, especially in arid and semi-arid regions. High salt concentration in the soil solution is bound to create high osmotic pressure in the root zone and reduce availability of water and nutrients to plants. Such conditions are known to affect plant physiological activities, which determine crop yield (Hebbara *et*

al., 2003). Muskmelon is a minor but the most common fruit crop of cucurbitaceae family in Bangladesh. It is grown almost every districts of Bangladesh. Immature melons are used fresh in salads, cooked (soup, stew, curry, stir-fry) or pickled. Mature fruits are eaten fresh as a desert fruit, canned or used for syrup or jam, dehydrated slices (lightly processed) for short-term or moderate storage can be reconstituted, and the pressed juice can be canned. Fruit flesh is usually orange but sometimes green. Its flavour is aromatic. Monoecious and andro-monoecious are most common in muskmelon. Two major genes A and G control sex expression in muskmelon (Vijay, 1987). It grows well in optimum soil pH 6.3 to 6.8. Muskmelon is best stored at 3 to 5°C with a high relative humidity of 95%. It may be direct seeded or transplanted. Wide variations are present in muskmelon so special attention should be given to its improvement. In these circumstances, the present study was undertaken to evaluate the germplasm of muskmelon against salinity in natural crop management system at saline zones in Benarpota, Satkhira, Khulna to identify the tolerant ones.

Materials and Method

Seventy eight germplasm of muskmelon were planted on 28 February 2008 at Benarpota, Satkhira, Khulna for screening of germplasm against salinity. These germplasm were collected from different districts of Bangladesh (Table 1). The seedling of each germplasm was raised in poly bags. The 25 days old seedlings of each germplasm were planted in the field maintaining plot size 2.0m spacing between the plants. Two plants of each germplasm were maintained in single pit. Recommended fertilizer dose was applied. Urea 50 g, Muriate of Potash (MP) 105 g and Triple Super Phosphate (TSP) 80 g were applied in each pit as basal dose during final land preparation. The second dose of urea 50 g was applied after 35 days of planting. Five irrigations were given at different dates (5.03.2008, 19.03.2008, 26.03.2008, 5.04.2008, and 20.04.2008) during cropping period. Necessary intercultural operations were followed.

May 5 was the last date of fruit harvest. Within this time highest salinity level was recorded as 13.82 ds/m and the plants of each germplasm was in good condition. Crop duration of each germplasm was 88 days.

Both qualitative and quantitative observations were recorded according to IBPGR (International Board for Plant Genetic Resources) descriptors. Pertinent data on temperature (°C), rainfall (mm) and humidity (%) and salinity level (ds/m), soil moisture (%) and soil pH of Benarpota station is presented in Table 4 and 5, respectively.

Table 1. Sources or places of collection of 78 muskmelon germplasm.

Sl. No.	Germplasm	District	Sl. No.	Germplasm	District
1	BD-2255	Kusthia	40	BD-2298	Comilla
2	BD-2256	Kusthia	41	BD-2299	Comilla
3	BD-2257	Kusthia	42	BD-2300	Comilla
4	BD-2258	Kusthia	43	BD-2301	Comilla
5	BD-2259	Kusthia	44	BD-2302	Sirajganj
6	BD-2260	Kusthia	45	BD-2303	Sirajganj
7	BD-2261	Kusthia	46	BD-2304	Sirajganj
8	BD-2262	Kusthia	47	BD-2305	Sirajganj
9	BD-2263	Kusthia	48	BD-2306	Sirajganj
10	BD-2264	Kusthia	49	BD-2307	Sirajganj
11	BD-2265	Kusthia	50	BD-2308	Sirajganj
12	BD-2266	Kusthia	51	BD-2309	Sirajganj
13	BD-2267	Kusthia	52	BD-2310	Sirajganj
14	BD-2268	Kusthia	53	BD-2311	Sirajganj
15	BD-2270	Chuadanga	54	BD-2312	Chittagong
16	BD-2271	Chuadanga	55	BD-2313	Chittagong
17	BD-2272	Chuadanga	56	BD-2314	Pabna
18	BD-2273	Chuadanga	57	BD-2315	Pabna
19	BD-2275	Chuadanga	58	BD-2316	Pabna
20	BD-2276	Faridpur	59	BD-2317	Pabna
21	BD-2277	Faridpur	60	BD-2318	Naogaon
22	BD-2280	Faridpur	61	BD-2319	Naogaon
23	BD-2281	Faridpur	62	BD-2320	Naogaon
24	BD-2282	Rajshahi	63	BD-2321	Naogaon
25	BD-2283	Chittagong	64	BD-2322	Kusthia
26	BD-2284	Chittagong	65	BD-2323	Kusthia
27	BD-2285	Jamalpur	66	BD-7442	Jessore
28	BD-2286	Jamalpur	67	BD-8888	IPK-Germany
29	BD-2287	Mymensingh	68	BD-8889	Barishal
30	BD-2288	Mymensingh	69	BD-9149	Kusthia
31	BD-2289	Mymensingh	70	BD-9151	Jamalpur
32	BD-2290	Tangail	71	BD-9154	Pabna
33	BD-2291	Tangail	72	BD-9155	Pabna
34	BD-2292	Tangail	73	BD-9156	Sreepur
35	BD-2293	Tangail	74	BD-9157	Gazipur
36	BD-2294	Tangail	75	BD-9158	Natore
37	BD-2295	Tangail	76	BD-9159	Chapainwabganj
38	BD-2296	Tangail	77	BD-9160	Rajshahi
39	BD-2297	Tangail	78	T-307	Kusthia

Results and Discussion

Seventy eight germplasm of muskmelon (*Cucumis melo* L.) were planted in Benarpota, Satkhira, Khulna. Among them, 67 germplasm (86%) survived against high salinity (13.82 ds/m). The 8 germplasm viz. BD-2280, BD-2283, BD-2294, BD-2300, BD-2302, BD-2303, BD-2308, and BD-2319 died after 18 days at 8.43 ds/m salinity and 3 germplasm, such as BD-2286, BD-2311, and BD-2316 died after 32 days of planting at 12.85 ds/m.

Morphological characterization

Morphological variations of 67 musk melon germplasm for different characters are presented in Table 2. All the germplasm of muskmelon showed morphological variations for all the characters except tendrils and flowering habit. These two characters showed no morphological variations. All the germplasm had tendrils and monoecious flower in nature.

The highest variability was observed in fruit skin colour (at fully formed fruit) viz. green-19, light green-1, cream-3, orange-1, pink-4, grey-3, and black-35. In case of growth habit, bushy-18, intermediate-31, and prostrate-18 were found in the germplasm followed by fruit skin texture viz. smooth-37, grainy-8, finely wrinkled-1, shallowly wavy-5, netted-3 and with spines-13. For leaf lobes, no leaf lobes-10, shallow-12, intermediate-29 and deep leaf lobes-16 were observed. Among the germplasm, three types of intensity of leaf pubescences, such as glabrous-17, sparse-31, and dense-19 were found. Ellipsoid-2, oblong ellipsoid-48, globular-9, and stem-end tapered-5 for fruit shape were observed among the germplasm. In case of fruit ribs, no fruit ribs-4, superficial ribs-27 and deep fruit ribs-36 were recorded. Three types of flesh colour, such as white-25, yellow-3, and orange-39 were observed among the germplasm. Insipid-50, intermediate-11 and sweet-6 were found for flesh flavour. In case of flesh texture, smooth fruit-34 and grainy firm-33 were exhibited in the germplasm. For fruit splitting, no splitting-2, superficial-5 and deep splitting-60 was observed. Among the germplasm, no fruit aroma-48, external only-2, internal only-15 and both external and internal fruit aroma-2 were observed. In case of fruit skin colour (at seed harvest), cream-2, yellow-27, orange-3, grey-2 and black-33 were found among the germplasm. Different types of fruit size viz. small-6, medium-20 and large fruit-41 were observed in the germplasm. Some germplasm showed white-58 and orange-9 was recorded for seed coat colour.

Splitting of the muskmelon fruit is an important character for marketing. Due to splitting of fruit, it is difficult to transport from one place to another. In this study, two germplasm such as BD-2255 and BD-9159 were found of no splitting type. Therefore, these germplasm can be selected for improvement of muskmelon.

Table 2. Number of muskmelon germplasm under different classes in salinity condition.

Growth habit	Leaf lobes	Leaf pubescence	Tendrils	Flowering habit	Fruit shape
Bushy : 18	Absent : 10	Glabrous : 17	Present: 67	Monoecious: 67	Ellipsoid : 2
Intermediate : 31	Shallow : 12	Sparse : 31			Oblong ellipsoid : 48
Prostrate : 18	Intermediate : 29	Dense : 19			Globular : 9
	Deep : 16				Stem-end tapered : 5
Fruit ribs	Fruit skin texture	Flesh colour	Flesh flavour	Flesh texture	Fruit splitting
Absent: 4	Smooth: 37	White : 25	Insipid : 50	Smooth fruit : 34	Not splitting : 2
Superficial: 27	Grainy: 8	Yellow : 3	Intermediate : 11	Grainy firm : 33	Superficial : 5
Deep: 36	Finely wrinkled: 1	Orange : 39	Sweet : 6		Deep : 60
	Shallowly wavy: 5				
	Netted : 3				
	With spines : 13				
Fruit aroma	Fruit skin colour (at fully formed fruit)	Fruit skin colour (at seed harvest)	Fruit size variability	Seed coat colour	
Absent : 48	Green : 19	Cream : 2	Small : 6	White : 58	
External only : 2	Light green : 1	Yellow : 27	Medium : 20	Orange : 9	
Internal only : 15	Cream : 3	Orange : 3	Large : 41		
Both external & internal : 2	Orange : 1	Grey : 2			
	Pink : 4	Black : 33			
	Grey : 3				
	Black : 35				

Quantitative characterization

The quantitative variations were observed in days to staminate flower, days to pistillate flower, fruit length (cm), fruit width (cm), fruit weight (kg), number of fruits per plant, flesh thickness (cm), number of seeds per fruit, 1000-seed weight (g), days to 1st harvest and days to final harvest (Table 3). Days to staminate flower ranged from 21 (BD-2268 and BD-2281) to 57 (BD-2263, BD-2310 and BD-9151) days. In case of days to pistillate flower ranged from 26 (BD-2260) to 62 (BD-2263, BD-2264, BD-2287, BD-2310 and BD-9151) days. The germplasm BD-2268 (52 days) and BD-2255 (55 days) were found as early variety on the basis of harvesting time of the fruit. These two germplasm required only 52 and 55 days to harvest, respectively. While the germplasm BD-2263 and BD-2287 (85 days), and BD-8889 (83 days) were observed as late variety on the basis of days to pistillate flowering and harvesting time of the fruit.

Mean, range, standard deviation and co-efficient of variation

Range, mean, standard deviation and co-efficient of variation are shown in Table 3. Wide variations were observed for all the characters except flesh thickness, days to 1st harvest, days to final harvest and 1000-seed weight (Table 3). These four characters exhibited the minimum range of estimates with a general mean indicating narrow range of variability.

Maximum range of variation were found in days to staminate flower (21-57 days), days to pistillate flower (26-62 days), fruit length (12.60-50.32 cm), fruit width (23.20-52.00 cm), fruit weight (1.40-6.25 kg), number fruits per plant (4-21), number of seeds per fruit (345-815), 1000-seed weight (g), and days to 1st harvest (52-85 days) indicating remarkable variations were present among the germplasm. Highest number of fruits per plant (21) was recorded in BD-2268 and second highest (20) in BD-2291. Highest CV% was observed in number of fruits per plant (36.35) followed by fruit weight (33.86).

The number of fruits per plant and fruit weight exhibited the maximum range of variation (4-21 and 1.40-6.25) with a mean of 10.46 and 2.75, respectively. Characters, which showed high range of variation, should be given priority in the selection (Vijay, 1987). While the range of variation was low for the characters indicated narrow range of variability among the germplasm and suggested that selection would not be effective for these traits. Among the germplasm, BD-2255 and BD-9159 were found as non-splitting type. Therefore, these two germplasm can be selected for this trait. In addition, the characters such as number fruits per plant and fruit weight should also be considered for improvement of muskmelon. All the 67 germplasm were rated as tolerant against the salinity level of 13.82 ds/m.

Table 3. Range, mean, standard deviation and CV% of muskmelon in salinity condition (13.82 ds/m).

Character	No. of observation	Range	Mean	Sd.	CV%
Days to staminate flower	67	21-57	41.34	12.07	29.19
Days to pistillate flower	67	26-62	46.37	11.69	25.22
Fruit length (cm)	67	12.60-50.32	29.57	6.36	21.49
Fruit width (cm)	67	23.20-52.00	36.08	6.17	17.09
Fruit wt (kg)	67	1.40-6.25	2.75	0.93	33.86
No. of fruits/plant	67	4-21	10.46	3.80	36.35
Flesh thickness	67	1.80-3.20	2.56	0.30	11.82
No. of seeds/fruit	67	345-815	518.73	108.47	20.91
1000-seed wt (g)	67	35.00-63.00	48.51	5.39	11.13
Days to 1 st harvest	67	52-85	68.64	7.75	11.29
Days to final harvest	67	70-88	77.75	5.77	7.42

Table 4. Monthly temperature (°C), rainfall (mm) and humidity (%) during cropping period.

Month	Temperature (°C)		Rainfall (mm)	Humidity (%)
	Maximum	Minimum		
January	25.26	11.83	0	304.27
February	27.10	16.86	112	313.12
March	30.67	18.70	18	275.39
April	34.29	24.83	121	298.02
May	35.50	26.27	30	289.82

Table 5. Date wise salinity (ds/m), soil moisture (%) and soil pH during cropping period.

Date	Salinity (ds/m)	Soil moisture (%)	Soil pH
28.02.2008	4.50	10.00	7.30
10.03.2008	8.24	9.75	6.70
25.03.2008	8.90	21.85	6.50
10.04.2008	8.52	19.35	7.30
24.04.2008	5.10	7.00	7.20
10.05.2008	13.82	7.50	7.00
25.05.2008	12.67	16.00	6.80

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