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Field Test Evaluation of Salinity Effects on Quantitative and Qualitative Parameters of Three Iranian Muskmelon Cultivars

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Abstract: Salt tolerance of three Iranian muskmelon cultivars (Samsoury, Tilsabz and Magasi) were assessed during growth in feild.The influence of salinity on the yield of cultivars was studied at irrigation water salinity level of (Ec 1and 10 dsm^{-1}) in the field. The influence of salinity on the yield, mean of fruit weigth, number of fruits per plant and Total Soluble Solids (TSS) were significant. Data showed that these parameters in semsury cultivar were highest significantly in compare to other cultivars. The salinity had positive significant effects on total soluble solids and had negative effects on number of fruits in plant and average weight of fruit. Data showed that sodium and clorin concentration in leaves and sodium to potassium ratio were raised by salinity and potassium and magnesium concentration in leaves were significantly decreased. On the whole, Samsouri cultivar was determined as a salt tolerant cultivar in compare to others.

Key words: Salinity · muskmelon · field test

INTRODUCTION

Soil salinity is one of the most important factors that limit crop production in arid and semi arid regions [1]. The plant growth is ultimately reduced by salinity stress but plant species differ in their salinity tolerance [2]. Salinity stress is an important characteristic when selecting a variety for salinity tolerance [3]. Muskmelon is one of the major crops of soils affected salts in Iran. These soils have indigenous salinity problems, which are increased as new areas are developed for irrigation.On the other hands,reduction of water quality as well as quantity, create a need for salt tolerance crops.

Although muskmelon has been described by various authors as moderately salt tolerant [4-7], but its growing is not without its problems and yield losses often occur when certain salinity thresholds are reached. These thresholds can vary according to the cultivar and plant growth stages [8, 9].

Shannon and Francois [10] reported that by increasing salinity, yield and fruit weight decreased and total soluble salt increased. Nokaya and Ishidi [11] also reported that with increasing salinity,fruit diameter decreased and total soluble solids increased. Results of Mendlinger and Pasternak [12] showed that yield decreased by salinity and salinity increased total soluble solids in fruit. Their results showed that mean of fruit weigth is the best criteria for salt tolerance in muskmelon. El-Dony *et al.* [13] investigated that yield, number of fruit per plant and mean of fruit weight were affected by salinity and decreased,but total soluble solids increased. Results of Mendlinger and Pasternak [12] showed yield decreased and total soluble solids increased by salinity. Information of the salt tolerance of Iranian muskmelon cultivars especially in field is lacking. The purpose of this study was to evaluate the salt tolerance of 3 Iranian muskmelon cultivars to measure the effects of salinity on several growth parameters in field.

MATERIALS AND METHODS

This study was conducted in Knave research station in 30 kms south of Varamin.The experiment was laid out in split plot design with three replications. Main plots included of two irrigation salinity (1 and 10 dS m^{-1}) and sub plots included of three muskmelon cultivars.

Each experiment plot was involved 20 plants. Before experiment, soil was sampled and analyzed (Table 1). Irrigation water was supplied of mixing two different water with different electrical conductivity (Table 2).

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Table 1: Results of soil analysis

Cu mg kg^{-1}	Zn mg kg^{-1}	Mn mg kg^{-1}	Fe mg kg^{-1}	K mg kg^{-1}	P mg kg^{-1}	Texture	OC	T.N.V%	EC dS m^{-1}	pH	Depth
0.51	0.9	12.2	1.8	228	27.5	CL	0.7	19.1	1.2	7.2	0-30

Table 2: Results of water analysis

			meq l^{-1}									
Class	SAR	SSP (%)	Na^+	Mg^{2+}	Ca^{2+}	So_4^{2-}	Cl^-	HCo_3^-	pH	EC dS m^{-1}	TDSmg l^{-1}	Scorsese
C4S1	3.0	29.3	11	12.6	13.9	14.2	17	6.5	7.1	1	1770	No 1
C5S1	7.8	44.0	38	26.0	22.0	36.0	41	8.1	7.0	10	3870	No 2

Each plot was fertilized with N, P and K based on soil test and aiming at high yield. The nitrogen application was split. One half was put down preplant with all of the phosphorous and potassium. The other half was applied as urea in two separate applications by topdressing at seedling and flowering stages. Fresh fruit weight, number of fruits per plant, mean of fruit weight and fruit sugar content soluble solids were measured. Finally, leaves were examined for total Nitrogen, Potassium, Calcium, Magnesium, Chlorine and sodium levels. Data were analyzed by MSTATC software and means were classified with Duncan multiple range test.

RESULTS

Yield, number of fruit per plant,fruit weight and total soluble solids (TSS) significantly affected by genotype and salinity. (Table 3). Base on the results, maximum yield (31.1 ton ha^{-1}), highest fruit per plant (2.9), maximum weight of fruit (1100 g) and highest TSS (9.5) produced by Samsouri cultivar. Data in Table 3 illustrated that Samsouri cultivar significantly differ in compare to other cultivars.

Data in Table 4 showed that yield, number of fruit per plant, fruit weight and TSS significantly affected by salinity. These results also indicated that by increasing salinity, yield, number of fruit per plant and fruit weight decreased 60, 17.3 and 49 percent respectively and TSS increased by salinity.Intractive effects of genotype and salinity illustrated in Table 5.

Yield: Data in Table 5 indicated that there was a significant difference among yield of cultivars. The highest yield in non saline condition and saline condition due to Samsouri coultivar.The lowest yield in non saline condition and saline condition due to Magasi coultivar. Tilsabz cultivar showed a 55% decrease in yield by salinity and Magasi showed a 75% decrease in yield in saline condition, but Samsouri only had 34% decrease in yield by salinity, so Magasi is more sensitive to salinity in compare to Samsouri and Tilsabz cultivars.

Table 3: Effects of genotypes on yield, TSS, mean of fruit weight and number of fruit per plant

Genotypes	TSS**	Mean of fruit weight**	Number of fruits per plant**	Yield** Kg ha^{-1}
Samsouri	9.5A	1100A	2.9A	31.1A
Tilsabz	8.3B	916AB	2.0B	22.1B
Magasi	8.5B	800B	1.5C	15.6B

Effects of salinity on some parameters summarized in Table 4

Table 4: Effects of salinity on yield, TSS, Mean of fruit weight and Number of fruits per plant

Irrigation salinity dS.m^{-1}	TSS*	Mean of fruit weight**	Number of fruits per plant**	Yield** Kg ha^{-1}
1	8.3	1244	2.3	32.8
10	9.9	633	1.9	13.1
Decreasing percentage	-19.2	49	17.3	60.0

**: Significant in 1% probability

*: Significant in 5% probability

Table 5: Intractive effects of genotype and salinity on yield, TSS, Mean of fruit weight and Number of fruits per plant

	Yield** Ton ha^{-1}		No. of fruit per plant**		Mean of fruit weight (g)**		TSS*	
Genotypes	EC=1	EC=10	EC=1	EC=10	EC=1	EC=10	EC=1	EC=10
Samsouri	38.0A	25.3C	2.9A	2.7B	1366A	833C	8.5C	10.5A
Tilsabz	30.6B	13.6D	2.2C	1.9D	1300A	523D	8.5C	10.1B
Magasi	25.0C	6.3E	1.8D	1.1E	1066B	530D	7.8C	9.2B

**: Significant in 1% probability

*: Significant in 5% probability

Data in each column with same letter haven't significant difference

Number of fruits per plant: The highest fruits per plant in non saline condition and saline condition due to Samsouri cultivar and the lowest fruits per plant in non saline condition and saline condition due to Magasi cultivar. Samsouri showed 7% decrease in number of fruits per plant by salinity and Magasi showed a 40% decrease in number of fruits per plant by salinity.Magasi cultivar had the highest decrease in number of fruits per plant among

other cultivars and decrease of yield in this cultivar by salinity refers to this subject.

Mean of fruit weight: The highest fruit weight in non saline condition and saline condition due to Samsouri and Tilsabz cultivars and the lowest fruit weight in non saline condition and saline condition due to Magasi coultivar. Fruit weight of Samsouri cultivar that affected by salinity and decreased 39% and Tilsabz showed 59% decrease in fruit weight by salinity.

Total soluble solid: There was not a significant difference among total soluble solids of cultivars in nonsalin condition. Data indicated that total soluble solids affected by salinity and rised.Increasing of total soluble solid in Samsouri cultivar by salinity was the highest. (24%) in compare to other cultivars. Some elements concentration in leaf summarized in Table 6.

Data showed that sodium and clorin concentration and sodium to potassium ratio were raised by salinity and potassium and magnesium concentration were significantly decreased. Data also showed that sodium, potassium, colorin and sodium to potassium ratio were affected by muskmelon cultivars.Samsouri cultivars had lowest sodium concentration and sodium to potassium ratio and highest potassium concentration in leaves in compare to other cultivars.Tilsabz had the highest sodium and sodium to potassium ratio and the lowest potassium concentration in leaves.

Table 6: Effects of salinity and genotypes on some elements concentration in leaves

Treatments	Na:K**	Cl^{-**}	Mg^{2+ns}	Ca^{2+ns}	K^{+**}	Na^{+**}
Genotype						
Magasi	0.71B	0.5B	1.2	4.4	2.8B	2A
Tilsabz	0.84A	0.8A	0.9	4.1	2.5C	2.1A
Samsouri	0.48C	0.6B	1.1	4.2	3.1A	1.5B
	Na:K*	Cl^{-*}	Mg^{2+**}	Ca^{2+**}	K^{+*}	Na^{+**}
Irrigation salinity						
EC=1 dSm^{-1}	0.28	0.2	1.2	4	3.5	1
EC=10 dSm^{-1}	0.82	4.2	0.4	3.4	2.9	2.4

**: Significant in 1% probability

*: Significant in 5% probability

Data in each column with same letter haven't significant difference

Data in Table 6 showed that Samsouri cultivar have lowest Na and most K concentration in leaves in compare to other cultivars. So Na to K ratio in Samsouri (0.48) cultivar is the lowest in compare to other cultivars. Samsouri had slightly lower Na levels in conjunction with its high K concentration. These trends support previous finding [10].

DISCUSSION

The decline in fruit fresh weight and yield is consistent with results reported in similar experiments by various authors [5, 7, 9-12]. Mean of fruit weight was affected by salinity and decreased significantly.Previus studies found a linear reduction in fruit weight with increasing salinity [9] and [10]. Data indicated that total soluble solid affected by salinity and raised. Increasing of TSS by salinity is consistent with results reported in similar experiments by various authors. [17] and [18]. Cl, Na, K, Mg and Ca contents in leaves for the various salinity had similar patterns to those reported by other researchers. [10] and [5].The aggregate content of Na and K dose not remain constant and with increasing salinity, Na rising markedly and K falling slightly. This phenomena also reported by Slama [15]. Accumulation of minerals in leaf may indicate how well the plant adapts to salinity stress. Plants growing under saline condition must adjust to the osmotic potential of the soil water [16].

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