

Evaluation of Six Sunflower Cultivar for Forage Productivity Under Salinity Condition

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Abstract

Sunflower cultivars were introduced and evaluated under saline conditions in Jordan. Objective of this study were to determine the tolerance of sunflower cultivars for soil and water salinity and to select superior cultivars for local production using the available resources. Seeds from six cultivars were introduced from Russia and it was cultivated in saline soil (15.7 dS m⁻¹) using saline water (5.6 dS m⁻¹) for irrigation during the spring season of 2011. In our experiments the following traits were recorded: yield and yield components and some morphological traits. Our results indicated that the sun flower cultivars varied significantly in their productivities. For example "Carslien" cultivar gave the highest dry weight (630.8 g plant⁻¹), and seed yield (92.5 g head⁻¹) and also gave the largest head and seed size. Also Carslien" cultivar gave the highest dry biomass and seed yield 18.02 and 2.64 t ha⁻¹, respectively under saline soil and saline water conditions.

Key words: forage, Helianthus annuus, introduced cultivars, salinity, yield.

INTRODUCTION

Sunflowers are annual or perennial plants that are cultivated in temperate regions and has many uses such as raw material for silage, oil production and to its potential as a new source of energy from the biological fuel production. The spreading of the sunflower promising crop as the second summer crop in Jordan depends on a continuous evaluation of new cultivars obtained by the documentation of greater materials able to express high yield and acceptable quality in the different regions especially under saline conditions. The growth and productivity of crop is influenced by several biotic and abiotic stresses [1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18]. Tanji [19] reported that salinity is one of the main factors limiting crop productivity by inhibiting plant growth as a result of many stress factor such as drought and mineral toxicity [20] which reflected adversely by the inhibition of plant leaf expansion and biomass production [21]. Jordan is considered as one of the ten most water-poor countries in the world and we use saline water for increasing agricultural production. The present study was designed to evaluate six promising sunflower cultivar grown under salinity conditions.

MATERIAL AND METHODS

The study was carried out in Al-Kahledeyah (Marfaq), Jordan in an area measuring approximately 350 m². The soil at the site is calcareous, pH 7.5, clay loam textured and salinity of 15.7 dS m⁻¹. The climate is Mediterranean of mild rainy winters and dry hot summers. The longer term rain average is 120 ml per year.

Six sunflower cultivars were introduced from Russia: Carslien, Vezate, Bostiyalske, Darae, Tshass and Kharfksky. The cultivars were evaluated for the yield and yield components. Seeds were grown in mid-April and harvested at maturity in July. Sowing was by hand in a wide spaced (70 x 50 cm) plots of 16.8 m² area in three replications and arranged in a one factor randomized complete block design. The trial lands were irrigated by adding 400 mm distributed as three days interval after sowing. Irrigation water was from underground well with salinity of 5.6 dS m⁻¹. Random plant samples within each plot were used to record the morphological data. At harvest random single plants from each plot were harvested to determine the yield and yield components on single plant bases. Estimations were calculated for the dry biological yield, seed yield and the harvest index (HI). Data for each trait were analyzed for a randomized complete block design (RCBD). Comparisons between means were made using least significant differences (LSD) at 0.05 probability level.

RESULTS AND DISCUSSION

Morphological characters:

Crop productivity under saline condition is considered very important issue in the world. For this reason many strategies have been proposed, one of which is the use of salt tolerant species [22].

Our results indicated that Sunflower cultivars differed significantly in their plant height (Table 1), where Bostiyalske and Carslien gave the highest plant height compared with other cultivars.

Regarding number of leaves per plant our results indicated that no significant differences were recored among cultivars. On the other hand, Carslien cultivar gave significantly the highest head diameter compared with other cultivars. The variation was attributed to the differences in genetic potential among sunflower cultivars.

Table 1: Morphological characterization of sunflower cultivars grown under saline condition.

Cultivar	Plant Height	Leaf plant ⁻¹	Head Diameter	Head Dry Weight	Seed head ⁻¹
	Cm	no.	cm	gm	no
Carslien	67.67	21.50	19.67	276.7	1028.0
Vezate	55.00	21.17	18.17	268.5	889.3
Bostiyalnske	74.83	20.83	17.33	193.8	884.0
Darae	61.83	21.83	17.67	244.7	1013.0
Tshass	61.67	21.00	17.33	228.3	841.3
Kharfksky	58.67	21.5	18.17	244.2	1182.0
LSD (0.05%)**	11.42	NS	1.571	73.58	213.9
CV %*	20.77	10.43	9.68	34.26	25.2

*Least significant difference

**Coefficient of variability; NS =not significant

Yield and yield components:

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Table 2: Yield and yield components of sunflower cultivars grown under saline condition.

Cultivar	Plant Dry Weight	Seed Dry Weight head ⁻¹ plant ⁻¹	1000 Seed Weight	Estimated Biological Dry Weight	Estimated Seed Dry Weight	Harvest index
	gm	Gm	gm	t ha ⁻¹	t ha ⁻¹	HI
Carslien	630.8	92.5	83.7	18.02	2.64	0.15
Vezate	578.3	73.0	81.7	16.52	2.09	0.13
Bostiyalnske	382.7	72.3	73.0	10.93	2.07	0.19
Darae	427.5	79.0	76.5	12.21	2.26	0.18
Tshass	393.3	71.5	83.7	11.24	2.04	0.18
Kharfksky	404.2	81.3	71.0	11.55	2.32	0.20
LSD (0.05%)*	173.1	15.79	10.34	-	-	
CV %**	41.99	22.93	14.29	-	-	

*Least significant difference

**Coefficient of variability; NS =not significant

Our results indicated that plant productivity is very important issue under stresses conditions and the selection of good cultivars that able to adapted to stress condition is a key issue in the agriculture productivity [23,24,25]. Also our results indicated that breeding and the use of salt-tolerant cultivars of triticale might be the most favorable approaches for harvesting higher grain yield of best quality under saline conditions.

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