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ORIGINAL ARTICLES

Evaluation of morphological and phonological traits of 25 Lentil cultivars under Rain fed and Irrigated Conditions

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ABSTRACT

To evaluate the morphological and phonological traits in 25 various lentil genotypes, including 23Ardabil local genotypes and two control genotypes, a study was conducted in Ardabil IAU Agricultural Research Station (Hasanbaruq) in two rain fed and irrigated conditions in randomized complete block design in 2010. Results suggested that there was a significant difference between studied genotypes on days to 50% flowering, days to maturity, plant height, grain yield and number of leaflets. The interaction between genotype × cultivation conditions was significant on plant height trait. Genotype No. 7 has the highest seed yield.

Key words: *lentil, morphological and phonological traits*

Introduction

Lentil (Lens culinaris Medikus) is a legume like the cold, probably originated from the Near East's Fertile Crescent (parsa and Bagheri, 2008). it is obvious that lentil plant can do Protein supply and nitrogen fixation of by its roots, Which can be an important crop in the rotation cycle of the plants, especially in leguminous family. Lentil crop acreage is 220,000 ha in Iran which 92% is grown in dry land conditions (Sabagh Poor, 2006). Grains are among plants which have different yields during years. Water shortages are among the main factors, in this regard (Ferguson *et al*., 1996) .Water shortages are among the main natural limiting factors which result in planting limitation and food reduction in arid and semiarid regions in different ways. According to FAO reports, 90percent of the area in Iran with an average rainfall of 240mm is located in arid and semiarid regions (Anonymous, 2008). One third of the world's arable lands suffer from water shortages. Climate change and also population growth could worsen the problem in future (Houerou, 1996). Hence, identifying plants which could survive such environmental conditions with higher yield and also studying the survival mechanisms seem to be of the most significance in defeating drought (Rebetzke *et al*., 2006). Preventing late season droughts as an ecologic strategy is proposed for pasture and crop plants. by accelerating phonology, plant completes its life cycle before confronting drought stress and skips the drought (Turner *et al*., 2001). Drought tolerance is a quantitative trait and there is no direct method to measure it. This problem has hardened identifying drought resistive genotypes (Takeda and Matsuoka, 2008). However, seed yield in without stress and drought stress conditions seem to be a good starting point for choosing genotypes which are compatible by planting in drought condition (Farshadfar *et al*., 2001; Ludlow and Muchow, 1990).

The following research tries to evaluate the morphological and phonological traits in various lentil genotypes under two rain fed and irrigated conditions.

Materials And Methods

This experiment was conducted on research farm of Islamic Azad University of Ardabil in 2010 (Ardabil West 5 km). The climate is semi-arid and cold, winter temperatures were often below zero degrees. Altitude was 1350 meters and latitude and longitude were 38.15 north and 48.2 east, respectively. Average annual minimum and maximum temperature and maximum absolute temperature were -1.98, 15.18 and 21.8 ° C, respectively, and mean annual precipitation have been reported 310.9 mm. The experiment soil was clay *alluvial* soils; its acidity varies between 8.2-7.8.

A study was conducted in Ardabil IAU Agricultural Research Station (Hasanbaruq) in two rain fed and irrigated conditions in randomized complete block design in 2010. Each variety consists of 4 lines 5/2 meters, the distance 25 cm from each other, so planting was in the first half of May. The lateral two lines were as the margin and middle two line was considered as a resource for each treatment. The main problem was in the weeds. Because most weeds are dominant over the lentils. Thus carried hand-weeding out mostly in 2 to 4 leaf

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stage of weeds. The weeding was about 3 to 4 times, the irrigated operation was carried out regularly without stress. When the lentils reach to ripening stages, crops harvested by considering both sides and 20 cm from the beginning and end of the line as the border between the middle lines as calculating performance.

The traits that were evaluated during testing are following:

Number of days to 50% flowering (According to field observations, the date when 50% plants were scored for each experimental unit, as recorded on 50% flowering and number of days from planting to the date stated as the number of days to 50% flowering)., Time of harvest maturity (when the lower one-third of the plants begins to yellow and greenish yellow color of the scabbard, as was the harvest time. The number of days from planting to harvest was recorded as days to maturity)., Plant height at harvest time was measured by a ruler., the number of leaflets (leaflets from 10 plants per experimental unit were counted and then calculated the average number of leaflets per plant)., Grain yield in each experimental unit (Removing the margins, The entire remaining part of the test material and seed weight was calculated).

In any of the methods according to need and was used MSTATC & spss software.

Results and Discussion

Combined analysis of variance (Table 1) suggested that there was a significant difference between studied genotypes on days to 50% flowering, days to maturity, plant height, grain yield and number of leaflets. However, there was no significant difference found between other studied traits. Hence, it could be claimed that there is a proper diversity between genotypes for selection of most traits. There are various factors which lead to low lentil yield. Among the main factors which result in low yield are low yield potential and local genotypes' incompatibilities with rain fed conditions (Sabaghpour *et al*., 2004). Seed yield and its sustainability in regions with environmental stresses have always been considered as an important criterion in selecting and introducing cultivars (Trituan and Reynolds, 2007). Alcale and Summerfield (1994) and Danver and Palival (1975) indicated that one time irrigation during seed filling period could increase lentil yield. In another report, it was claimed that three times irrigation during seed filling period could increase lentil yield (EskIne and Ashkar, 1993). Water shortages stress in soy results in decrease in number of flowers, number of pods, pods size, number of seeds in pod and seeds weight (Desklas *et al*, 2000; Woforud *et al*, 1993).

Table 2 indicates that genotype No. 7 at Hasanbaruq station had the highest seed yield. The genotype had the highest values in days to 50% flowering, days to maturity. The interaction between genotype × cultivation conditions was significant on plant height trait (Table 1). However, plant height, in all genotypes, were higher in irrigated conditions comparing o the rain fed conditions. Due to the interaction between genotype and environment, evaluating new cultivars in various environments by modifiers seems to be essential. Since, popular analysis methods such as combined analysis of variance could only provide information on interaction between genotype and environment; researchers have applied various criteria for to determine the cultivars sustainability and introduction (Rustai *et al*., 2003). The interaction between genotype × environment is among the main issues in breeding which has a great role in developing modified cultivars. Genotype interaction in the environment indicates the various reactions to various environments; that is, the best genotype in an environment is not necessarily the best genotype in other environments (Farshadfar, 1998).Drought stress during growth season leads to decrease in plant height and leaf area index (LAI) (Castel *et al*., 1985). The total yield and final number of seeds during seed filling period was decreased under drought stress (Ricci *et al*., 1993). Hence, it seems that one method to defeat drought stress is to modify early tolerant plants. Also, studying the mechanisms which each plant or genotype uses to defeat stress seems to be of importance (Koocheki *et al*., 2006). Selecting plants which have skipped drought stress has had a great success (Siddique *et al*., 1999; Subarao *et al*., 1995).

Table 1: Combined Analysis Of Variance on 25 Lentil Genotypes in Two Conditions of Irrigated and Rain fed in Hasanbaruq Station

S.O.V	df	MS				
		Days to 50% Flowering	Days to Maturity	Plant Height	Grain Yield(in plot)	Number of Leaflets
Conditions	1	166.427**	188.16*	2430.577**	0.63*	113.01**
Error 1	4	1.413	4.4	13.504	0.299	4.33
Genotype	24	10.431*	8.332	12.642**	0.094**	1.350**
C*G	24	0.218ns	3.174ns	8.032**	0.005ns	0.520ns
Error 2	96	3.42	4.094	3.572	0.028	0.718
CV %		3.23	2.29	8.16	4.1	6.99

* and **: Significant at $p < 0.05$ and < 0.01, respectively

Table 2: Comparison of Means of the traits on 25 Lentil Genotypes

Genotype	Traits				
	Number of Leaflets	Plant Height(cm)	Days to 50% Flowering	Days to Maturity	Grain Yield(gr in plot)
1	9.933	22.74	57.00	88.83	74.47
2	9.367	21.69	56.00	88.67	79.61
3	10.00	22.29	56.00	88.00	84.53
4	9.000	21.89	57.67	90.17	83.56
5	9.267	23.45	57.33	86.83	76.03
6	10.20	23.43	55.50	87.67	12.08
7	10.00	23.89	60.00	89.83	144.2
8	10.00	20.76	58.00	89.33	84.33
9	10.00	22.81	59.33	89.67	99.08
10	9.330	24.23	56.00	84.33	50.58
11	9.667	24.26	59.33	88.83	97.05
12	9.733	24.92	58.00	89.00	117.5
13	9.133	23.64	56.67	87.83	65.92
14	9.867	24.89	56.00	88.33	88.71
15	9.400	21.46	55.50	88.67	79.06
16	9.933	22.22	57.67	87.67	105.44
17	9.333	21.33	57.00	87.67	56.75
18	9.333	26.62	56.00	87.67	87.71
19	9.533	21.93	57.67	87.67	110.66
20	9.800	22.31	55.67	88.50	38.19
21	10.00	24.68	56.00	88.17	69.18
22	11.07	23.54	58.00	89.17	116.7
23	9.533	21.26	59.33	88.50	94.84
24	10.87	23.58	56.67	88.67	100.0
25	10.20	24.94	57.67	89.33	94.62
LSD	1.01	2.252	2.204	2.411	0.199

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