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THE YIELD AND QUALITY OF DIFFERENT *ELYMUS HISPIDUS* ACCESSIONS IN DRYLAND REGIONS

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Abstract

Planting suitable species of forages can be a proper way to overcome feed shortages. For measuring the forage yield and quality traits of ***Elymus hispidus,*** 19 accessions of this plant were sown using randomized complete block design (RCBD) under dry land farming system. The 19 genotypes were grouped into 4 clusters based on Ward cluster analysis method. Collected data were analyzed for DM, plant height, stem number, leaf to stem ratio (LSR), dry matter digestibility (DMD), water soluble carbohydrate (WSC), crude protein (CP), acid detergent fibre (ADF) and ash. The results showed significant differences between genotypes for all of traits except LSR, CP and ash. Four genotypes (Khosh Yeelagh, Patava, Sabzkoh and Mimand) with average values of 4034, 3068, 2942 and 2450 kg ha^{-1} had higher yield, respectively. Two genotypes (Khosh Yeelagh and Mimand) had higher quality and in terms of both yield and quality recognized as the best genotypes. There was positive correlation between DM with plant height and stem number. DMD showed positive and negative correlation with WSC and ADF, respectively. The relationship between CP and total ash was positively significant. The principal component analysis used to show variation between five quality traits (DMD, WSC, CP, ADF and ash). In the first component, four quality traits (DMD, WSC, CP, and ADF) determined about 76% of the total variations. Whereas DM yield and stem number were the important traits in the second components. The results showed that some genotypes of ***Elymus hispidus*** can adapt well to local climate conditions in dry regions.

Key words: Elymus hispidus, yield, quality, dry land, farming system

Introduction

Elymus hispidus species constitutes a varied group of perennial forage millet that has been extended in temperate areas of the world (Lawrence and Heinrichs, 1968). These plants, which are regarded as the most important rangeland millet of Iran, grow in cold steppe and temperate areas. This plant species with turf vegetative form has a considerable rangeland value (Mozaffarian, 2007). The native habitats of this species expand from steppes and mountain skirts of southern areas of Europe towards the Middle East, Central Asia and West Pakistan. It is regarded as a high yield plant in the areas with a maximum elevation of 3000 m from the sea level and an annual rainfall of 350 to 370 mm. Since Iran is one of the most important countries of forage plant variety, and has a very good potential for development of these product, therefore, for a better exploitation, a careful and appropriate planning is required so as to be able to preserve this scarce variety and exploit it (Mohammadi, 2006). The objective of this study was to introduce superior genotypes of the *Elymus hispidus*

species (forage quantitative and qualitative) to be use as suitable animal feed resoures, and is adaptable to local climatic conditions in order to determine the pattern of genetic variation and grouping the genotypes, using multivariate statistical methods.

Materials and methods

In this study, the seeds of 19 genotypes of *Elymus hispidus* species, which were prepared from the gene bank of Natural Resources of Forest and Rangelands Research Institute, were grown at the rangeland plants station of Hossein Abad, 25 km to the west of Shiraz, in a completely random block design with 3 replicates in dryland conditions (totally 57 plots). After emergence of genotypes in the field, noting the traits in question before and after flowering was made. Weed weeding was made in mechanical form. At the end, the harvest of samples was made in two cuts, with a time interval of 30 days. For determination of the dry forage yield, the samples were weighed immediately after harvesting. After transferring to the lab, the samples were dried, re-weighed and the dry weight of the leaf, stem and leaf to stem ratio were determined. A sample of each genotype was grinded separately, and prepared for measuring the forage qualitative traits. The traits being investigated included the plant height, number of stems in each plant, leaf to stem ratio, and target yield, while the measurement of qualitative traits included the dry matter digestibility (DMD), crude protein (CP), water soluble carbohydrate (WSC), acid detergent fiber (ADF) and total Ash percentages, which were measured using the NIR system (Jafari and Naseri, 2007).

Results and discussion

Analysis of variance and comparison between the means of genotypes for all quantitative and qualitative traits by Duncan method showed that there is variations among genotypes for the traits under study and one could utilize that variation in production of improved cultivars (Table 1).

Table 1- The sources and the means of the traits under study genotypes belonging to *E. hispidus* species in dry land conditions

No.	Genotype	Plant height	Number of stems	Leaf to stem ratio	Forage yield	Digestibility	Crude protein	Soluble sugars	ADF (%)	Total ash
1	Chahar Mahal	32.56 bcd	30.00 cd	3.00 a bc	2241 ed	43.73 abcde	17.90 a	11.86 cdef	44.20 b c	7.83 a b
2	Kohgilouyeh	34.89 b cd	41.89 abc	2.59 abc	3068 bc d	41.84 efg	18.09 a	10.52 g	46.22 a b	7.93 b
3	Esfahan	31.08 bcd	27.56 cd	2.44 abc	2489 ed	43.48 bcdef	17.67 a	12.61 abcdef	43.94 bcd	7.62 ab
4	Chahar Mahal	28.00 d c	42.89 ab c	2.57 abc	2450 ed	45.88 a	16.93 a	13.57 a	41.22 e	7.17 ab
5	Chahar Mahal	37.22 a bc	38.89 abc	2.91 abc	3615 ab	42.69 cdefg	17.19 a	12.17 bcdef	44.87 a bc	7.43 ab
6	Fars	33.89 bcd	43.44 abc	2.69 abc	2485 ed	41.17 g	18.27 a	11.91 cdef	46.78 a	7.78 ab
7	Esfahan	26.89 d	37.00 abc	3.51 a b	2619 cd e	43.26 cdefg	18.20 a	12.48 abcdef	44.01 bc	7.48 ab

8	Kordestan	38.89[a] b	18.11[d]	2.38[b] c	2772[bc] de	41.38[fg]	17.82 a	12.78 abcde	46.84[a]	7.87 ab
9	Esfahan	35.00 bcd	34.56[bc]	3.28 abc	2914 bcd	42.03[defg]	17.21 a	11.59 efg	44.08 bc	7.33 ab
10	Kohgilouyeh	38.22[a] b	38.22 abc	2.09[c]	2942 bcd	45.66[ab]	17.34 a	13.33[a] b	41.46 de	7.32 ab
11	Kohgilouyeh	26.56[d]	37.11 abc	3.13 abc	1918[e]	43.91[abcde]	17.13 a	11.43 fg	43.82 bcd	7.83 ab
12	Fars	36.67[a] bc	39.22 abc	2.94 abc	2259[ed]	43.86 [abcde]	17.68 a	11.63 defg	43.86 bcd	7.78 ab
13	Fars	29.78 bcd	31.56[cd]	2.60 abc	1889 [e]	42.12 [defg]	17.47 a	12.89 abcd	44.67 abc	7.66 ab
14	Azarbaijan Gharbi	32.11 bcd	34.33[bc]	3.26 abc	2219 [ed]	44.60[abc]	17.10 a	12.73 abcde	42.76 cde	7.77 ab
15	Tehran	35.57 bcd	40.00 abc	3.27 abc	2366 [ed]	44.73[abc]	17.60 a	12.97[a] bc	42.73 cde	7.72 ab
16	Hamedan	30.33 bcd	42.33 abc	3.34 abc	2978 bcd	44.19[abcd]	17.63 a	12.70 abcdef	44.71 abc	7.41 ab
17	Ardebil	45.33a	33.00 bcd	3.81[a]	2711 cde	43.76 [abcde]	17.21 a	12.37 abcdef	43.23 cde	7.67 ab
18	Mazandaran	34.22 bcd	52.73[a]	3.33 abc	3484[ab] c	42.77 [cdefg]	17.78 a	12.32 abcdef	44.93 abc	7.97[a]
19	Golestan	37.11[a] bc	47.56[ab]	3.06 abc	4034[a]	43.90 [abcde]	17.59 a	13.11 abc	43.73 bcd	7.23 ab

Non- similar letters in each column mean a significant difference between genotypes at 5% level by multi- range Duncan test. The findings of comparison between the means of traits showed that the genotypes of Khosh Yeylagh (Gorgan), Pataveh (Yassouj), Sabz Kooh (Chahar Mahal) and Meymand (Yassouj), with yields of 4034, 3068, 2942 and 2450 kg were the best genotypes, in that order, among which the genotypes of Khosh Yeylagh (Gorgan) and Meymand (Yassouj) had a better forage quality as well, which were proposed as appropriate genotypes for forage culture in the rangelands of the region. Generally, the findings showed that the genotypes of Gorgan (Khosh Yeylagh), with highest forage yield, plant height and stem concentration, had the highest content of soluble sugars as well. The genotypes of Noor-Baladeh, with higher yield, had a higher leaf to stem ratio, and, consequently, was more palatable. Perhaps the reason for being palatable and highly leafed of the latter species was the humid climate of north Iran. Next to these, the genotypes of Assad Abad (Hamedan) and Meymand (Yassouj), in addition to high forage yield, had a higher quality regarding the digestibility (Table 1).

The findings of the correlation coefficient showed that the forage yield, the plant height and the number of stems had a positive, significant correlation at 5%level. The results reported by Jafari and Naseri (2007), and Jafari and Rezaeifard (2010) are in line with the results of this study. The correlation coefficient between digestibility and soluble sugars was positive at 3% level, while it was negatively significant with ADF content. In other words, digestibility decreases with increasing ADF content.

Conclusion

Some genotypes of ***Elymus hispidus*** can adapt well to local climate conditions and use as suitable livestock feed resources in dry regions. Planting and increasing the production of these spices can reduce overgrazing pressure on the ranges, the output per each unit of feed intake will increase, and the conversion of feed to live weight gain can decrease.

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