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PRODUCTION CHARACTERISTICS OF DOMESTIC ALFALFA *(Medicago sativa L.)* CULTIVARS IN AGROECOLOGICAL CONDITIONS OF SREM DISTRICT[1]

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Content: Alfalfa is one of the most important perennial forage plants. High forage yields, share and quality of protein, longevity, yield of seed and other agronomically important traits make alfalfa irreplaceable in production of high quality voluminous livestock feed.

Major agronomical traits (yield of green forage and content of dry matter) of seven genetically divergent genotypes – three cultivars – of alfalfa were investigated on the experimental field of the Institute for Animal Husbandry, Belgrade-Zemun during period 2002 to 2004 and compared to alfalfa cultivar NS–Medijana used as standard.

Components of yield of alfalfa are in significant genetic correlation with yield of dry matter. Analysis of components of yield and content of dry matter showed no significant genetic variability between investigated cultivars. Obtained results show that none of the investigated cultivars demonstrated statistically significant differences in regard to investigated parameters and realized yield of green mass and dry matter were at the level of standard.

Key words: alfalfa, cultivars, yield of green mass and dry matter.

Introduction

Alfalfa is one of most important forage species and belongs to the group of plants used for livestock nutrition. Production of alfalfa is realized on plough land which in our country occupy 366.270.000 ha, livestock forage plants are produced on 502.441 ha, and alfalfa on 205 886 ha (*Janković, 2004*).

Importance of alfalfa in production of voluminous livestock feed is great since it ensures high yields of proteins (*Vučković, 1991*). Proteins as material compounds have very good amino acid composition and high biological value. Beside proteins alfalfa is rich on minerals and vitamins especially vitamins C, A, B_1, and B_{12}.

In livestock nutrition, this type of alfalfa is used in different forms – fresh (grazing) or conserved (hey, silage, heylage, alfalfa meal, pellets, etc.). In order to intensify livestock production and provide sufficient quantities of cheep and high quality voluminous food, selection and breeding of alfalfa are of paramount significance.

Breeding objectives in case of alfalfa are directed towards increase of forage productivity in different production and utilization conditions, in other words yield in different cuts, quality of forage, yield of seed, resistance to diseases and other stressful conditions (*Đukić and Erić, 1995*)

Materials and Methods

Alfalfa cultivars were investigated on experimental field of the Institute for Animal Husbandry, Belgrade-Zemun over period of three years. Trial was designed according to method of random block system in five repetitions. Seven alfalfa cultivars were investigated in relation to the standard cultivar - NS-Medijana.

Dry mass was determined was determined by taking of green mass samples of 1 kg which were subsequently dried on temperature of 60°C for three days. Samples were then weighed and based on obtained data total yield of dry matter from surface of 1 ha was calculated.

Data on obtained yields of dry matter were processed using single factor variance analysis, and differences between realized yields of investigated cultivars were tested using LSD test.

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Climate and soil

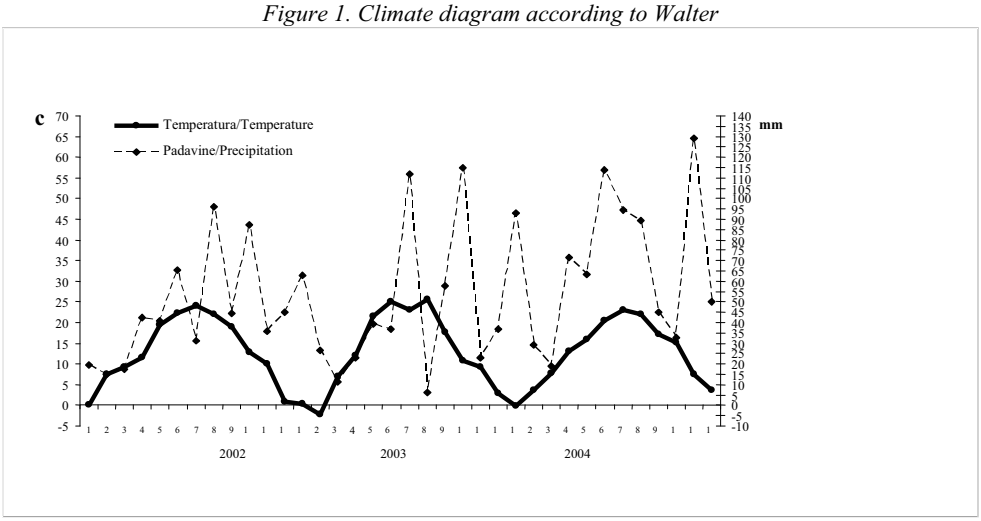
Experimental field of the Institute for Animal husbandry, Belgrade-Zemun is located in moderate-continental climate zone. According to data of the Republic Hydro meteorological Bureau of the Republic of Serbia, Meteorological Observatory Belgrade, for the region of GMS Surčin average precipitation sum for period 1992 to 2002 is 645,18 mm and average annual temperature 12,11 °C.

Table 1. Average monthly air temperatures and precipitation for period 2002-2004

Months	Air temperatures, °C			Precipitation, mm		
	2002	2003	2004	2002	2003	2004
January	0,2	0.4	-0.2	19,50	62,9	92,9
February	7,6	-2.1	3.6	15,10	26,5	29,4
March	9,4	7.1	7.7	17,30	11,4	18,9
April	11,7	12.0	13.1	42,40	23,1	71,7
May	19,5	21.5	16.0	40,80	39,5	63,3
June	22,4	25.0	20.5	65,70	37,0	113,8
July	24,1	23.1	23.1	31,30	111,8	94,6
August	22,1	25.6	22.0	96,00	6,4	89,3
September	17,0	17.8	17.2	44,80	58,0	45,0
October	12,9	10.8	15.1	87,50	115,2	32,9
November	10,0	9.2	7.6	35,70	23,4	129,5
December	0,9	2.8	3.7	44,90	36,7	50,3
Average; Sum	13,2	12,76	12,45	541,0	551,9	831,6

Average monthly temperature for three year investigation period from 2002 to 2004 was 12,8 °C. First investigation year was the hottest with average annual temperature of 13,2 °C, and the lowest annual temperature was recorded in the third investigation year 12,45°C. The warmest months were July in the first and in the third year with 24,1 and 23,1°C and august in the second year 25,5°C. Average sum of precipitation for three year period was 641,5 mm. During vegetation period in average 436,5 mm of precipitation was recorded or 68,04 % of total annual precipitation. Second investigation year exceeds other two years in amount of precipitation with 831,6 mm which is in relation to other two years in average more by 285,15 mm.

Figure 1. Climate diagram according to Walter



Soil on which trial was carried out is slightly carbonate chernozem of favourable mechanical composition, structure, water and air and temperature regime. According to mechanical composition soil is clay type and of crumbly-grainy structural composition. According to performed standard laboratory analysis of chemical composition – content of potassium was 16,2 mg/100g, of phosphorus 90,9 mg/100g which is very high concentration and quantity of total nitrogen in soil was 0,26 %. PH value in H_2O varied from 6,91 to 7,29.

Results and discussion

Data regarding the yield of dry matter obtained from seven investigated alfalfa cultivars in relation to standard cultivar Mediana is presented in table 2.

Table 2. Yield of dry matter of alfalfa cultivars during three year investigation, per cuts (tha^{-1})

	Year	2002				2003				2004			Total			
	Sp. Cv.	I	II	III	IV	I	II	III	IV	I	II	III	2002	2003	2004	Σ
Medicago sativa	**1**	1.30	1.19	1.63	0.96	4.53	3.58	3.28	2.31	6.47	6.34	4.84	5,08	13,70	17,65	12,14
	2	1.28	1.55	2.04	0.88	4.80	4.14	3.70	2.54	6.48	3.26	5.24	5,75	15,18	14,98	11,97
	3	1.47	1.09	1.77	0.72	4.43	3.75	3.05	2.07	6.75	5.02	4.06	5,05	13,30	15,83	11,39
	4	1.12	1.35	1.88	0.83	4.57	3.88	3.52	2.71	7.23	5.21	4.25	5,18	14,68	16,69	12,18
	5	0.85	1.11	1.76	0.87	5.26	3.62	2.86	2.15	4.96	4.10	3.65	4,59	13,89	12,71	10,40
	6	1.40	1.40	2.06	0.89	4.98	4.01	3.74	2.44	6.04	5.12	4.72	5,75	15,17	15,88	12,27
	7	1.28	1.31	1.92	0.88	5.04	3.59	3.10	2.10	6.68	6.96	4.05	5,39	13,83	17,69	12,30
	Stand	1.43	1.32	2.16	0.98	5.19	4.24	3.80	2.93	7.14	5.15	5.21	5,89	16,16	16,79	12,95
	X	1.27	1.29	1.90	0.88	4.85	3.85	3.38	2.40	6.47	5.15	4.50	5,33	14,50	16,03	11,95
	LSD 0.05	1.52	0.15	0.24	0.16	1.02	0.66	0.45	0.42	1.74	0.94	0.43	0,51	1,83	2,15	10,14
	LSD 0.01	2.04	0.20	0.33	0.21	1.38	0.90	0.61	0.57	2.41	1.30	0.60	0,68	2,46	2,96	13,97

Results relating to yield of dry matter of alfalfa cultivars obtained during three year investigation are different in investigation years, cuts and different cultivars and their standards. None of the differences in yield of dry matter established between cultivars were statistically significant.

In the first year of utilization, the highest yields were registered in first two cuts by cultivar No. 2 - 1,55 t/ha, which is not great deviation from the standard and cultivar No.3 - 1.47 t/ha. In the following two cuts as well as in 2003 none of the investigated cultivars realized yield higher than standard. In the third year the highest yields were realized by cultivar No. 4 - 7,23 t/ha, cultivar No. 7 - 6,96 t/ha and cultivar No. 2 - 5,24 t/ha.

Considering total yield of dry matter in all three investigation years no significant differences were established between yields realized in different years or in relation to standard. The highest total yield in 2002, compared to standard was realized by cultivar No. 2 - 5,75 t/ha. The highest total yield of dry matter in the second investigation year was realized by cultivar No. 2 - 15,18 t/ha and cultivar No. 6 - 15,17 t/ha. In the third investigation year cultivars realized higher yields of dry matter compared to previous two years. In regard to yield of alfalfa the best results were determined in cultivar No. 1 with 17,65 and cultivar No. 7 of 17,69 t/ha which is higher than standard cultivar where yield of 16,79 t/ha was recorded. Compared to results obtained in research of Radović et al. (2004.), who have investigated yields of green and dry matter of domestic cultivars such as K-22 – 19,50 t/ha and Novosađanka – 17,96 t/ha and foreign cultivars from Ukraine (Nadežda - 17,35 t/ha, VNIOZ -16,63 t/ha), Russia (Čišminskaja – 14,66 t/ha, Raduga – 15,66 t/ha, Bijska – 12,38 t/ha, Zarnica – 16,99 t/ha, Lada – 13,23 t/ha), Azerbaijan (Apšeron – 17,12 t/ha) Lithuania (Zydrune – 16,03 t/ha) in the second and third exploitation year, we can conclude that our investigated cultivars achieved average yields of dry matter similar or at the level of those recorded in case of cultivars from Russia, Azerbaijan and Lithuania. In investigation by Katić et al. (2004.) cultivar NS Banat ZMS II realized average yield of dry matter for three year period of utilization of 15,24 t/ha which is also the level

achieved in our research. Deprez et al. (2004) investigated 9 Belgium cultivars of alfalfa and determined that yield of dry matter in the second year of utilization varied from 16,1 - 14,7 t/ha which is similar to our results.

Data on average height of plants for three year period of investigation are presented in table 3. Height of plants is one of important factors in realization of high yields and parameter of morphological traits.

Table 3. Average height of plants per years and total (cm)

Species	Cultivar No.	Average height of plant			(cm)
		2002	**2003**	**2004**	**2002-2004**
Medicago sativa	**1**	42,2	67,2	65,0	58,1
	2	42,3	73,4	66,7	60,8
	3	41,6	68,8	62,3	57,5
	4	44,3	67,8	70,0	60,7
	5	43,7	67,1	61,3	57,4
	6	41,5	72,2	68,8	60,8
	7	43,8	64,8	70,8	59,8
	standard	41,1	71,6	70,8	61,2
	Prosek/Av.	42,6	69,1	67,0	59,5
	LSD 0,05	4,08	17,49	4,87	25,95
	LSD 0,01	5,94	25,45	7,09	35,75

Differences in plant height were statistically significant only in the third investigation year. Standard cultivar achieved the greatest average plant height in three year investigation period of 61,2 cm. Other cultivars realized plant height which was not significantly different from the standard. Beside the standard cultivar the greatest plant height was recorded also for cultivars No. 2 and No. 6 of 60,8 cm and the lowest were plants of cultivar No.5 - 57,4 cm.

According to investigation by *Milić et al. (2004*) of some foreign and domestic alfalfa cultivars in two year period plant height in average varied from 51,8 to 71,4 cm. Our investigated cultivars have realized over the three year investigation period average plant height which is between the average minimum and average maximum value determined by previously mentioned authors.

Conclusion

All investigated cultivars in all three investigation years have realized yield of dry matter, per cuts and in total, on the level of standard alfalfa cultivar. Determined differences weren't statistically significant. Newly selected cultivars are not significantly different in regard to quality from the standard cultivar.

Based on this research we can conclude that selection activities should be continued in order to obtain cultivars with higher yields of forage and in this way provide livestock production with high quantities of high quality food.

PRIZVODNE KARAKTERISTIKE DOMAĆIH SORTI LUCERKE *(* Medicago sativa *L.)* U AGROEKOLOŠKIM USLOVIMA SREMSKOG OKRUGA

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R e z i m e

Lucerka je jedna od najvažnijih i najznačajnijih višegodišnjih krmnih biljaka. Visoki prinosi krme, udeo i kvalitet proteina, dužina života, prinos semena i druga agronomski važna svojstva svrstavaju lucerku u red nezamenljivih biljaka u proizvodnji kvalitetne voluminozne stočne hrane.

Na oglednom poljimu Instituta za stočarstvo u periodu od 2002–2004. godine ispitivana su važnija agronomska svojstava (prinos zelene krme i sadržaj suve materije) sedam genetički divergentnih genotipova, odnosno sorti lucerke, u poređenju sa sortom NS–Medijana koja je korišćena kao standard.

Komponente prinosa lucerke su u značajnim genetičkim korelacijama sa prinosom suve materije. Analizom komponenti prinosa i sadržaja suve materije nije utvrđena značajna genetska varijabilnost između ispitivanih sorti. Dobijeni rezultati pokazuju da sve proučavane sorte nisu ispoljile statistički značajne razlike u pogledu ispitivanih parametara i ostvarile su prinos zelene mase i suve materije na nivou standarda.

Ključne reči: lucerka, sorte, prinos zelene i suve materije.

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