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YIELD COMPARISON OF DIFFERENT GREEN FODDER CROPS MIXTURES

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ABSTRACT

In Hungary there is a new opportunity to use mixtures of green fodder crops for ruminant nutrition. Joining the EU there is a subsidy for cattle breeders who prefer the extensive way of breeding. The objective of this paper is to determine which plant species and varieties could be used in the green fodder feeding system. The small plot trials with spring barley, oat, pea and vetch were performed in four repetitions. We used the following mixtures of temporary certified seeds: oat & pea, oat & vetch, barley & pea, barley & vetch, sunflower & pea. Immediately after the harvest yields of fodder from plots were weighted and the samples were analysed for dry matter, crude protein and crude fibre. The yields of green fodder, dry matter and crude protein were calculated in tons per hectare. In 2002 the green fodder yield was highest with Bakonyalja (oat) and Eszter (vetch) mixtures (45.95 t ha^{-1}), but the highest crude protein yield was given by Annabell (barley) mixed with Rubin (pea) (1040 kg ha^{-1}). In 2003 yield of Annabell and Rubin mixtures was higher than yield of Bakonyalja mixed with Rubin (e.g. crude protein yield 513; 403).

Keywords: animal nutrition / ruminants / green forage / forage mixtures / dry matter yield / crude protein yield

PRIMERJAVA PRIDELKOV RAZLIČNIH KRMNIH MEŠANIC ZA ZELENO KRMLJENJE

IZVLEČEK

Na Madžarskem se odpirajo nove možnosti pridelave krmnih mešanic za zeleno krmljenje za prežvekovalce. S pridružitvijo EU lahko rejci govedi uveljavljajo premije za ekstenzivno rejo. Namen prispevka je ugotoviti, katere vrste in sorte rastlin bi lahko uporabljali pri zelenem krmljenju. Naredili so poljski poskus z jarim ječmenom, ovsom, grahom in grašico v štirih ponovitvah. Uporabili so naslednje mešanice trenutno priznanih semen: oves in grah, oves in grašica, ječmen in grah, ječmen in grašica ter sončnice in grašica. Takoj po košnji so stehtali pridelek s parcel in vzeli vzorce za določitev suhe snovi, surovih beljakovin in surove vlaknine. Pridelek zelene krme, suhe snovi in surovih beljakovin so preračunali v t ha^{-1}.V letu 2002 je največji pridelek zelene mase dala mešanica bakonyalja (oves) in eszter (grašica) (45,95 t ha^{-1}), največji pridelek surovih beljakovin pa je dala mešanica annabell (ječmen) in rubin (grah) (1040 kg ha^{-1}). V letu 2003 je bil pridelek mešanice annabell in rubin večji od pridelka bakonyalja in rubin (pridelek surovih beljakovin je znašal 513 oziroma 403).

Ključne besede: prehrana živali / prežvekovalci / zelena krma / krmne mešanice / suha snov / surove beljakovine

INTRODUCTION

The green fodder and the green fodder mixtures had a great role in the nutrition of ruminants in Hungary in 1960's (Tóth, 1964, Csomós, 1965). In the 1970's concentrated and specialized

cattle farms were established using total mixed ration (Horn, 1972, Babinszky, 1972). From 1990 the dramatically change of the cow population caused a 50% fall in the number of the population till 1997. During the last ten years the system of cattle farming was changed too. After the changing of the system of ownership several small farms could have been established, which preferred to use the green forage feeding system instead of monodietical feeding from spring till autumn (Rank, 1991).

New species and varieties got into the cultivation. The nutritional value of these varieties hasn't been exactly determined yet.

The actuality of this topic is showed by some different articles (such as: e.g. Csizi, 1998, Antal, 2001).

Aims

- Which species and varieties grow able successfully at the Southern-Trans-Danube local soil an climatic condition
- Which varieties can be perspective in green fodder feeding system
- Which species and varieties can be use for the feeding of cattle on medium level of milk producer farms

MATERIALS AND METHODS

Soil conditions:

The experimental area was situated on the Experimental farm of the Faculty of Animal Science.

The type of the soil is brown forest soil with clay illuvitation. The properties of the level A (0–30 cm) are the following: pH(H_2O): 6.28; K_A:37 Humus%: 1.5.

Climatic conditions

The climate of region is arid continental. The precipitation and the average temperature data of the experimental periods are showed in the Table 1.

Table 1. Climatic conditions

Month	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.
Average of 50 years Rainfall, mm	42.0	41.0	44.0	59.0	77.0	76.0	66.0	63.0	61.0
Average of 50 years Temperature, °C	–1.0	0.7	5.7	10.5	15.4	18.6	20.7	19.5	15.8
2002. Rainfall, mm	5.3	46.4	7.5	102.3	53.6	55.1	76.6	57.2	52.3
2002. Temperature average, °C	0.3	5.4	7.6	10.4	18.8	21.3	23.1	21.2	14.7
2003. Rainfall, mm	73.6	28.9	13.9	22.5	38.5	20.7	85.0	31.5	56.6
2003. Temperature average, °C	–2.4	–3.9	5.9	10.4	19.5	24.3	22.9	24.4	15.9

Materials and methods of small plot trials.

The small plot trials were carried out in four repetitions, in complete random design. The plot sizes were: 1.4 m × 9.2 m = 12.9 m^2.

The sowing was made by Wintersteiger plot sowing machine, the harvesting was made by hand. The small plot trials were carried out in four repetitions using conventional random adjustment of National Institute of Agricultural Quality Control (NIAQC) standard. After the harvesting we weighted the plots yield. The dry matter content, crude protein, crude fibber was determined by Wendeei analysis in two repetitions in the Chemical Institute of University of Kaposvár. Afterwards we calculated the green yield, dry matter yield and crude protein yield in tons per hectare. The influence of the factor was evaluated by analysis of variance with the statistical software SPSS for Windows 10.0. The significance level was $P<0.05$.

Materials for species and subspecies comparison

We used for the small plot trial the following species varieties (barley-Annabell; oat-Bakonyalja; pea- IP5, Rubin; sunflower-Iregi csíkos; vetch-Eszter, Gabi, Kisvárdai) and seed density (Table 2.). The data of sowing and harvesting are showed in the same schedule.

Table 2. Species varieties, seed density, sowing and harvesting data

Species and varieties	Seed density (piece/ha)		Sowing date	Harvesting date
	1st component	2nd component	day/month/year	day/month/year
Annabell-IP5	3 500 000	500 000	8th march 2002	6th june 2002
Annabell-Rubin	3 500 000	500 000	8th march 2002	6th june 2002
Bakonyalja-IP5	3 000 000	500 000	8th march 2002	6th june 2002
Bakonyalja-Rubin	3 000 000	500 000	8th march 2002	6th june 2002
Annabell-Beta	2 500 000	2 000 000	8th march 2002	6th june 2002
Annabell-Gabi	2 500 000	2 000 000	8th march 2002	6th june 2002
Bakonyalja-Kisvárdai	2 500 000	2 000 000	8th march 2002	6th june 2002
Bakonyalja-Beta11	2 500 000	2 000 000	8th march 2002	6th june 2002
Bakonyalja-Eszter	2 500 000	2 000 000	8th march 2002	6th june 2002
Bakonyalja-Rubin	1 000 000	500 000	15th april 2003	17th june 2003
Annabell-Rubin	1 000 000	500 000	15th april 2003	17th june 2003
Rubin Iregi csíkos st	500 000	500 000	15th april 2003	17th june 2003
Bakonyalja Rubin st.	2 500 000	500 000	15th april 2003	17th june 2003
Annabell Rubin st.	2 500 000	500 000	15th april 2003	17th june 2003
Rubin Iregi csíkos 8:2	800 000	200 000	15th april 2003	17th june 2003

st. = standard seed density

RESULTS

Green yield

The yields of the mixtures are showed in the Table 3. In 2002 there was a significant difference between the oat mixtures and the barley mixtures. Variety Bakonyalja mixed with Eszter gave the highest green yield (45.95 t ha^{-1}). In 2003 the climate was more arid than 2002. There was a huge decrease in the yield. The different seed density could not affect significantly to the green yield. The standard seed density of sunflower mixed with pea gave higher green yield (5 t ha^{-1}) than the others.

Dry matter yield

In 2002 there is no considerable difference among the vetch mixtures, but the difference between pea mixtures and vetch mixtures are significant except the mixture of Bakonyalja Rubin. There is no significant difference among the mixtures in 2003 as well.

Table 3. Yield of different green forage crops in 2002 and 2003

Species and varieties of mixture	green yield	dry matter yield	crude protein yield
	t ha^{-1}	t ha^{-1}	kg ha^{-1}
2002			
Barley & Pea -Annabell; IP5	32.85[a]	7.15[a]	953[a]
Barley & Pea -Annabell; Rubin	33.92[a]	7.20[a]	1040[b]
Oat & Pea -Bakonyalja; IP5	39.15[b]	7.39[a]	1008[ab]
Oat & Pea -Bakonyalja; Rubin	44.18[c]	8.89[b]	1141[c]
Barley & Vetch -Annabell; Beta	32.24[a]	8.25[c]	853[d]
Barley & Vetch-Annabell; Gabi	32.96[a]	8.63b[c]	860[d]
Oat & Vetch -Bakonyalja; Kisvárdai	40.35[b]	8.28[c]	739[e]
Oat & Vetch -Bakonyalja; Beta11	44.47[c]	8.77[b]	900[d]
Oat & Vetch -Bakonyalja; Eszter	45.94[c]	8.57b[c]	901[d]
2003			
Barley & Pea -Annabell; Rubin	12.21[a]	2.90[a]	513[a]
Barley & Pea -Annabell; Rubin st.	10.34[a]	2.56[a]	403[b]
Pea & Sunflower -Rubin; Iregi csíkos	17.24[b]	3.02[a]	491[ab]
Pea & Sunflower. -Rubin; Iregi csíkos	16.85[b]	2.66[a]	387[b]
Oat & Pea -Bakonyalja; Rubin	10.86[a]	2.44[a]	407[b]
Oat & Pea -Bakonyalja; Rubin st.	10.52[a]	2.48[a]	405[b]

st.=standard seed density

Crude protein yield

In 2002 there is significant difference between pea mixtures and vetch mixtures. The highest crude protein yield was given by Bakonyalja Rubin. Between the two Barley mixed with pea and

the two oat mixed with pea are significant difference for the Rubin instead of IP5. In 2003 we could find significant difference between the mixture of Annabell Rubin instead of the others except the mixture Rubin Iregi csíkos in standard seed density.

CONCLUSIONS

- Because of the extreme weather conditions we could not compare the results of the two years, so we have to carry on researching
- The yield results of 2002 suggested that better to use the pea mixtures instead of vetch mixtures especially the variety Rubin of pea into the green fodder feeding system
- The yield results of 2003 we were able to determine that the drought resistance of mixture of barley with pea is better than the mixture of oat with pea
- In 2003 among the mixture of oat and pea or vetch was given fewer yields than barley mixed with pea or vetch. The reason of this amount of evapotranspiration of oat is higher than barley. Accordingly barley gave higher yield than oat
- In 2003 pea mixed with sunflower is perspective because it has high green and crude protein yield
- The determination of the optimal seed density of the mixtures, which can give the highest yield by the extreme weather conditions, have to be important part of the research
- We must continue our research because we need determine some further total mixed ration of the mixtures

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