



Joint Seminar of the FAO-CIHEAM Sub-networks
“Mediterranean Pastures and Forage Crops” and “Mountain Pastures”

Agrosilvopastoral Futures: Bridging Tradition with Innovation in Mediterranean and Mountain Pastures

Kuşadası, Türkiye, 9-11 April 2025

BOOK OF ABSTRACTS



Session ID	Abstract ID	Presenting author	Title	Page
S3-P05	13	Hajer Ammar	Effect of chemical pretreatments on nutritional aspects of almond hulls as a feeding strategy for sheep raised under harsh Mediterranean conditions	117
S3-P06	18	Naziha Ayeb	Nutritional value of a promising forage species "Panicum maximum" cultivated in a Tunisian arid environment	119
S3-P07	22	Feyza Döndü Bilgin	Fenugreek (<i>Trigonella foenum-graecum</i> L.), A Potential New Forage Crop: A Review	122
S3-P08	25	Teresa Carita	Progress in breeding annual clovers for biodiverse permanent pastures of the Mediterranean-climate zones	125
S3-P09	49	Hadhamil Hajji	Agro-industrial by-products pellets': Sustainable pathway to feed rams in arid regions of southern Tunisia.	127
S3-P10	52	Hatem Hamdon	Utilization of date palm leaves in the diet of lambs under tropical conditions	129
S3-P11	57	Apostolos P. Kyriazopoulos	Shading effects on plant functional traits of <i>Poa bulbosa</i> in an open oak woodland	132
S3-P12	63	Rita A. M. Melis	Agronomic assessment of pasture mixtures based on complementary functional groups	134
S3-P13	75	Zoi Parissi	Mountainous rangelands in Central Greece: forage production and its chemical composition for grassfed cattle meat	136
S3-P14	77	Riccardo Primi	Comparative effects of teff and sorghum grazing on milk yield and composition in dairy sheep: implications for sustainable forage systems in the Mediterranean basin.	138
S3-P15	84	Elif Şahin	Determination of yield performance of some legumes, grasses, and herbs in both pure and mixture pasture	140
S3-P16	97	Ozgur Tongel	Determination of the effects of different mowing intervals on botanical composition, dry matter yield and nutrient values in a fertilized lowland pasture	142
S3-P17	101	Tamer Yavuz	The effects of seed mixture ratios and harvest time on yield and quality of annual ryegrass mixtures with Anatolian and berseem clover	144
S3-P18	103	Nacima Zirmi-Zembri	Fodder availability for dairy cattle farming in the mountainous region of Tizi Ouzou (Algeria)	146
S3-P19	105	Ruby Wiese	Evaluation of the agronomic performance of a novel method for sustainable subterranean clover (<i>Trifolium subterraneum</i> L.) seed harvesting	148
S3-P20	106	Soumaya Boukrouh	Impact of <i>Vicia ervilia</i> ecotypes, seedling date, dose, and cutting stage on the nutritive value of bitter vetch ecotypes	150

(No. 101 – Poster)

THE EFFECTS OF SEED MIXTURE RATIOS AND HARVEST TIME ON YIELD AND QUALITY OF ANNUAL RYEGRASS MIXTURES WITH ANATOLIAN AND BERSEEM CLOVER

S. Yüce¹, T. Yavuz^{2*}¹ Kırşehir Ahi Evran University, Institute of Science. Terme St., Cacabey Campus, No:45, 40100, Kırşehir, TURKIYE² Kırşehir Ahi Evran University, Faculty of Agriculture, Department of Field Crops. Şehit Necdet Yağız St., No:143/E, 40100, Kırşehir, TURKIYE

Summary: The most critical factors determining the quality of grass-legume mixtures in roughage production are the legume ratio in the mixture and the harvest time.

Keywords: Annual ryegrass, Anatolian clover, Berseem clover, Yield, Forage quality

Introduction

Straw is commonly used in livestock diets in Türkiye due to the limited production of high-quality forage crops (Yavuz et al., 2020). Therefore, the cultivation area for forage crops, currently 2.7 million hectares, needs to be expanded to address the roughage deficit effectively. Annual forages can play a crucial role in increasing forage crop production by incorporating them into crop rotations. Growing legumes and grasses in a mixture provides both high yields and a more balanced nutritive value for livestock, but achieving optimal yield and forage quality requires careful adjustment of species proportions in the mixture and harvesting at the appropriate time (Hatipoğlu et al., 2005; Yavuz, 2017). This present study aimed to determine the effects of different mixture rates and harvest times on yield and nutritive value of monocultures and binary mixtures of annual ryegrass (*Lolium multiflorum* Lam), Anatolian clover (*Trifolium resupinatum* L.), and Berseem clover (*Trifolium alexandrinum* L.).

Materials and methods

İlkadım cultivar of annual ryegrass (**AR**), Demet-82 cultivar of Anatolian clover (**AC**), and Efsane cultivar of berseem clover (**BC**) were used as materials in the study. The field experiment was conducted in a split-plot design in randomized blocks with three replications. Three different harvest times were applied in the research: the beginning of budding-flowering, 50% flowering, and third harvest time full flowering. Dry matter yield (**DMY**) was calculated based on the values obtained by weighing 500 g of sample taken from each parcel after drying at 60 °C until it reached a constant weight. Crude protein (**CP**), acid detergent fiber (**ADF**), and neutral detergent fiber (**NDF**) content of forages were determined using the C-0904FE-Hay and Fresh Forage calibration with the Foss XDS NIRS analyser.

Results and discussion

Averaged across harvest times, the highest DMY was obtained from 25% AR + 75% AC and 25% AR + 75% BC mixtures (1121 kg da⁻¹ and 1112 kg da⁻¹, respectively), and the lowest was obtained from berseem clover, annual ryegrass, and Anatolian clover (758 kg da⁻¹, 791.2 kg da⁻¹, 798.1 kg da⁻¹, respectively). The highest DMY was obtained with the harvest at the full flowering harvest stage (1069.5 kg da⁻¹), while the lowest was obtained at the beginning of flowering (808.2 kg da⁻¹) (Table 1). While the yield of the mixtures was higher than the pure sown species, the DMY increased as the harvest time progressed as also reported by Salawu et al. (2001) and Yavuz, (2017).

The highest CP content was obtained from AC (%19.2) and the lowest from AR (%14.3). The highest crude protein ratio was obtained from the full flowering period (%17.1) and the lowest from the beginning of flowering and 50% flowering periods (%16.8-16.9). Crude protein content of mixtures and pure

legumes were higher than annual ryegrass, and as the proportion of legumes increased in mixtures, so did the CP content of forages (Demirel et al., 2003).

The highest ADF content was obtained from the second and third cutting times (31.41-31.44%, respectively) and the lowest from the first cutting time (30.71%). The highest was obtained from annual ryegrass (33.37%), and the lowest was obtained from Anatolian clover (28.50%). Similar to the ADF ratios of species and mixtures, the highest NDF ratio was obtained from annual ryegrass (54.74%), and the lowest was obtained from Anatolian clover (44.47%). The difference between the NDF ratios of the cutting time averages is statistically insignificant. As the legume ratios in the mixtures increased, the crude protein ratios of all mixtures increased, while the ADF and NDF ratios decreased, and as a result, feed quality improved (Türk & Albayrak, 2012).

Table 1. Dry matter yield (DM), crude protein (CP), acid detergent fiber (ADF), and neutral detergent fiber (NDF) ratios of species and mixtures.

Species And Mixtures	DM (kg da ⁻¹)				CP content (%)			
	Budding-flowering	50% Flowering	Full flowering	Mean	Budding-flowering	50% Flowering	Full flowering	Mean
100% AR*	646.3 l**	927.3 f	800.0 hij	791.2 D**	14.89 n**	13.61 p	14.24 o	14.25 H**
100% AC	726.5 jk	805.9 hij	862.0 fgh	798.1 D	18.63 c	19.36 b	19.63 a	19.21 A
100% BC	700.2 kl	763.3 ijk	810.6 hi	758.0 D	17.35 gh	17.51 g	18.19 e	17.68 C
75% AR + 25% AC	768.5 ijk	1003.0 e	1125.0 cd	965.7 C	16.45 j	16.36 j	16.10 kl	16.31 F
50% AR + 50% AC	791.2 hij	1187.0 bc	1220.0 b	1066.0 B	17.19 h	17.47 g	17.35 gh	17.33 D
25% AR + 75% AC	869.4 fgh	1169.0 bcd	1326.0 a	1121.0 A	17.93 f	18.32 de	18.47 cd	18.24 B
75% AR + 25% BC	839.5 ghi	906.2 fg	1102.0 d	949.3 C	15.93 lm	15.71 m	15.75 m	15.80 G
50% AR + 50% BC	920.8 f	1015.0 e	1157.0 bcd	1031.0 B	16.40 j	16.25 jk	16.46 j	16.37 F
25% AR + 75% BC	1011.0 e	1101.0 d	1223.0 b	1112.0 A	16.90 i	16.88 i	17.36 gh	17.04 E
Mean	808.2 C**	986.5 B	1069.5 A	954.7	16.85 B*	16.83 B	17.06 A	16.91
	ADF content (%)				NDF content (%)			
	Budding-flowering	50% Flowering	Full flowering	Mean	Budding-flowering	50% Flowering	Full flowering	Mean
100% AR	32.24 f**	34.46 a	33.41 b	33.37 A**	53.39 c**	56.29 a	54.55 b	54.74 A**
100% AC	29.05 o	28.25 p	28.20 p	28.50 H	45.29 k	44.79 kl	44.22 l	44.77 G
100% BC	30.60 k	31.88 g	31.60 h	31.36 E	48.57 i	48.74 i	48.46 i	48.59 E
75% AR + 25% AC	30.90 j	31.27 i	31.87 g	31.35 E	50.00 gh	50.50 fgh	51.31 ef	50.60 C
50% AR + 50% AC	30.28 l	30.17 l	30.57 k	30.34 F	48.42 i	48.41 i	48.75 i	48.53 E
25% AR + 75% AC	29.64 m	29.30 n	29.41 n	29.45 G	46.79 j	46.77 j	46.53 j	46.70 F
75% AR + 25% BC	31.55 h	32.73 d	33.12 c	32.47 B	51.35 ef	51.96 de	52.63 cd	51.98 B
50% AR + 50% BC	31.23 i	32.47 e	32.68 d	32.13 C	50.42 fgh	50.98 efg	51.38 ef	50.93 C
25% AR + 75% BC	30.90 j	32.18 f	32.12 f	31.73 D	49.46 hi	49.87 gh	49.90 gh	49.74 D
Mean	30.71 B**	31.41 A	31.44 A	31.19	49.30	49.81	49.75	49.30

*AR: Annual ryegrass, AC: Anatolian clover, BC: Berseem clover. * Statistically significant at $P \leq 0.05$ level. ** Statistically significant at $P \leq 0.01$ level.

Conclusions

Our research has shown that the legume ratio in the mixture, or the crude protein content, is a significant factor in determining forage quality. We recommend the 25% RG + 75% AC mixture for high yield and quality roughage production, mainly when harvested during the full flowering period. This recommendation offers the potential for significant benefits in forage production, providing an advantage in feeding ruminants.

Acknowledgements

This study, which is a part of Sümeyye Yüce's master's thesis, was supported by the Pilot Agriculture and Geothermal Coordinatorship of Kırşehir Ahi Evran University with project number pilot kabayem.26.23.001.

References

- Demirel, M., Cengiz, F., Erdoğan, S., & Çelik, S. (2003). *Türk J. Vet. Anim. Sci*, 27(4), 853-859.
- Hatipoğlu, R., Kökten, K., Atış, İ., & Kutluay, B. (2005). Türkiye VI. Field Crops Congress, 5-9 September, Antalya, Salawu, M., Adesogan, A., Weston, C., & Williams, S. (2001). *Anim Feed Sci Technol*, 94(1-2), 77-87.
- Türk, M., & Albayrak, S. (2012). *Turkish Journal of Field Crops*, 17(2), 111-114.
- Yavuz, T. (2017). *Journal of Central Research Institute for Field Crops*, 26(1), 67-74.
- Yavuz, T., Kir, H., & Gül, V. (2020). *Türk J Agric Res*, 7(3), 345-352. <https://doi.org/doi:10.19159/tutad.728119>