RESEARCH ARTICLE **(Open Access)**

The mineral composition in grassland growing in Kosova

IMER RUSINOVCI[1*], SALI ALIU[1], SHUKRI FETAHU[1], KEMAJL BISLIMI[2], MENTOR THAQI[1], NIKOLLAQ BARDHI[3]

[1]University of Prishtina, Faculty of Agriculture, Department of Crop Science, Prishtina

[2]University of Prishtina, Faculty of Natural Science, Department of Biology, Prishtina.

[3]Agricultural University of Tirana, Department of Plant Production, Tirana

*Corresponding author, e-mail; imer. rusinovci@uni-pr. edu

Abstract

Grasslands represent a land-use which is effective and has great economical importance in the European agriculture. Grasslands represent an important and effective source of energy and proteins to ruminants, and combine high yield stability and draught resistance with low tillage operations and pesticide use and thus leading to good environmental conditions. Furthermore, good management practice in grasslands provides high potential of carbon sequestration in soils, resulting in climate change mitigation. The field experiment were carried out on a field study was conducted in the central part of Kosovo, respectively Lipjani location 15 km near the capitol city of Prishtina. The plot sizes were 81. 5x 8m per plot or 12 $m^{2.}$ The fertilization also was used in quantity 80 kg N ha $^{-1.}$ In experiment was including four treatments: C- Control (normal cutting without harrowing); Cutting regime include; A-One week early without harrowing, B- One week later without harrowing and H-With harrowing. The samples were decomposed with concentrated HNO3 at 250°C in Ultra-Clave from Milestone (Milestone microwave Ultra clave III). The samples were diluted to 10 % concentrated HNO3 before analysis. The results were obtained in our study demonstrated that substantial differences in mineral composition exist in grasslands. The four treatments had considerable variation in mineral composition. The Aluminum (Al) and Calcium (Ca) content ranged from 0. 36 to 0. 19 and 5. 07 to 7. 31 g kg^{-1} respectively.

Key words; Grassland, treatments, harrowing, mineral composition.

Introduction

Herbs had the greatest concentrations of most of the minerals investigated, followed by legumes and then grasses. [17] Grassland covers about 40% of the agricultural area in Europe [6] and it supplies most of the feed used by cattle and other ruminants. Among the various constituents of herbage quality that are important for ruminants is the need for sufficient amounts of minerals in the diet to ensure good health and performance[16]. However, it is a challenge to manage the mineral supply of ruminants fed on grassland, because mineral concentrations in the herbage are influenced by a number of factors including species composition of the sward [6], time of the year [7] and fertilization [14]. Livestock grazing represents a system of land management in non-agricultural marginal areas, whereas, on rangeland livestock grazing represents the most suitable land use [9]. Good pastures are being converted into cropland leaving increasingly poorer lands for livestock production [12], without thinking about the conservation of soil. Biodiversity plays an essential role to all levels of the ecosystem service hierarchy: as a regulator of supporting ecosystem processes, as a service and as a good that is subject to valuation [10]. The use of mineral supplementation is allowed in both conventional and organic livestock production systems to ensure that animal health requirements are met [5, 1]. In temporary grasslands, sown plant species comprise three broad functional groups: grasses forage legumes and forage herbs [17]. There are a number of dicotyledonous plant species (i. e. herbs) that occur naturally in pastures or which may be included in sown mixtures [2]. These species can be mineral rich [2, 18, 3, 19, 15], demonstrated that mineral concentrations in total herbage vary during the season. Kosovo has an area of 10. 887 km^2 or 1. 1 million ha, about 430. 00 ha forested or 39. 1% and 577. 000 ha are agriculture land or 52%. From the total agricultural surface, with Grasses are 166. 769 hectares or 28. 90%, meadow 86000 hectares or 14. 90% and with forage crops 38000 hectares or 6. 59% [11]. The objective of this study were to indentify productivity and mineral composition with different treatments in grassland of Kosova.

Material and methods

The field experiment was conducted in the central part of Kosovo, respectively Lipjani location 15 km near the capitol city of Prishtina. The botanical composition which is dominant in our experimental field was; *Medicago spp, Dactylis glomerata, Festuca pratensis, Vicia liaca,* and some others plants include ; *Convollvolus arevese, Mentha spp, Galium verum, Silena vulgaris.* The experiment was designed as a randomized complete with four replication. The plot size were 81. 5x 8m per plot or 12 $m^{2.}$ The fertilization also was used in quantity 80 kg N ha^{-1}. In experiment was including four treatments: C- Control (normal cutting) ; Cutting regime include; A-One week early without harrowing, B- One week later without harrowing and H-With harrowing. Cutting regime based on optimal phenological plant development increase the yield and improves the forage quality. Samples for the determination of dry matter (DM) content, botanical and chemical composition were taken from cut herbage mass in four replicates for each treatment. The fresh weight (FW) was determined by $1m^2$, while the Dry Weight (DW) was determined after because dried in the temperature in 65^0 C for 24 hours. The samples were decomposed with concentrated HNO3 at 250°C in Ultra-Clave from Milestone (Milestone microwave Ultra clave III). The samples were diluted to 10 % concentrated HNO_3 before analysis. The determination of elements were done on ICP_OES (inductively coupled plasma optical emission spectrometry) with an Perkin Elmer Optima 5300 DV instrument (Perkin Elmer, Inc 2004 Shelton, USA). This analysis was done in University of Life Science, Department of Plant Sciences, Norway. Duncan's multiple range test was used to compare means and significance was accepted at LSD*p*=0. 05 level of probability. Statistical analysis was performed using the statistical program of MINITAB-14, SPSS. version. 19 [10] and Excel program.

Results and Discussion

The treatment coded H (with harrowing) for different mineral elements include (Al, Ca Cu, K, Mg, etc) compare to other treatments are with higher significant differences for level of probability LLSD=0. 01. Results are presented in Table. 1.

Table 1. The average content with mineral composition in grasses

Treatment	*Al*	*Ca*	*Cu*	*Fe*	*K*	*Mg*	*Mn*	*Na*	*P*	*Zn*
	g kg^{-1}	*g kg^{-1}*	*g kg^{-1}*	*g kg^{-1}*	*g kg^{-1}*	*g kg^{-1}*	*g kg^{-1}*	*g kg^{-1}*	*g kg^{-1}*	*g kg^{-1}*
C	0. 19^{b}	5. 92^{a}	0. 050^{a}	0. 14^{b}	22. 74^{a}	1. 20^{b}	0. 04^{c}	0. 032^{a}	2. 53^{ab}	0. 019^{a}
A	0. 23^{b}	7. 31^{a}	0. 050^{a}	0. 21^{ab}	23. 08^{a}	1. 55^{a}	0. 05^{b}	0. 097^{a}	2. 62^{ab}	0. 021^{a}
B	0. 19^{b}	5. 07^{a}	0. 075^{a}	0. 15^{b}	21. 50^{a}	1. 20^{b}	0. 06^{a}	0. 023^{a}	2. 30^{b}	0. 025^{a}
H	0. 36^{a}	7. 07^{a}	0. 112^{a}	0. 27^{a}	25. 16^{a}	1. 38^{a}	0. 06^{a}	0. 030^{a}	2. 83^{a}	0. 024^{a}
Average	0. 242	6. 342	0. 071	0. 19	23. 12	1. 33	0. 20	0. 045	2. 57	0. 022

Notes: C-control without harrowing; A- one week early without harrowing; B-One week later without harrowing; H- With harrowing.

The Aluminum (Al) and Calcium (Ca) content ranged from 0. 36 to 0. 19 and 5. 07 to 7. 31 g kg^{-1} respectively**.** The differences for Copper (Cu), potassium (K), Nitrogen (N) between treatments was not significantly for level of probability. The results of Al^{++} and Ca^{++} compared with average values (0. 242 g kg^{-1}, and 6. 34 g kg^{-1}) the differences were +0. 118 and +0. 73 g kg^{-1} respectively. These differences can be attributed to differences in genetic makeup of the botanical composition and cutting regime [13]. Statistical analysis test applied and compare with experimental mean was a significant at LSD*p*=0. 05 probability level. The obtained results of Iron (Fe) and Magnesium (Mg) showed that had higher variation between studied treatments for level of probability LSD*p*=0. 01. Overall average value of Iron (Fe) was 0. 19 g kg^{-1} respectively for magnesium (Mg) 1. 33 1. 32 g $kg^{-1.}$ The treatment (H) with harrowing shoved the higher average values for Iron (Fe) and Magnesium (Mg) on values 0. 27 and 1. 38 g kg^{-1} respectively. Compare with Control (C) the differences for Iron (Fe) were +0. 13 g kg^{-1} or expressed in percentage 68. 42%. While for Magnesium the differences were +0. 18 g kg^{-1} or 13. 5 %. Overall mean for Manganese (Mn) was 0. 20 g kg^{-1}, while genetic variation between treatments were +0. 14 or with variation 70%. Also, the content of Phosphorus (P), Natrium (Na) and Zinc (Zn) was very interesting. Data pertaining to the mineral composition in grasses are presented in Table. 1. In Figure. 1 Clearly showed that the total deviation of values for each treatment compared with the control

was higher. With higher deviation which is manifested in our research in relation to the control was for Calcium (Ca) which has a very high genetic variation in relation to the control on values (-1. 27 and +0. 97), this value were realized in treatment B one week latter without harrowing. Also, the significant differences were realized for Potassium (K), and Manganese (Mn) with different extreme values. Figure. 1. showed the results depend from treatments with different mineral composition and with average.

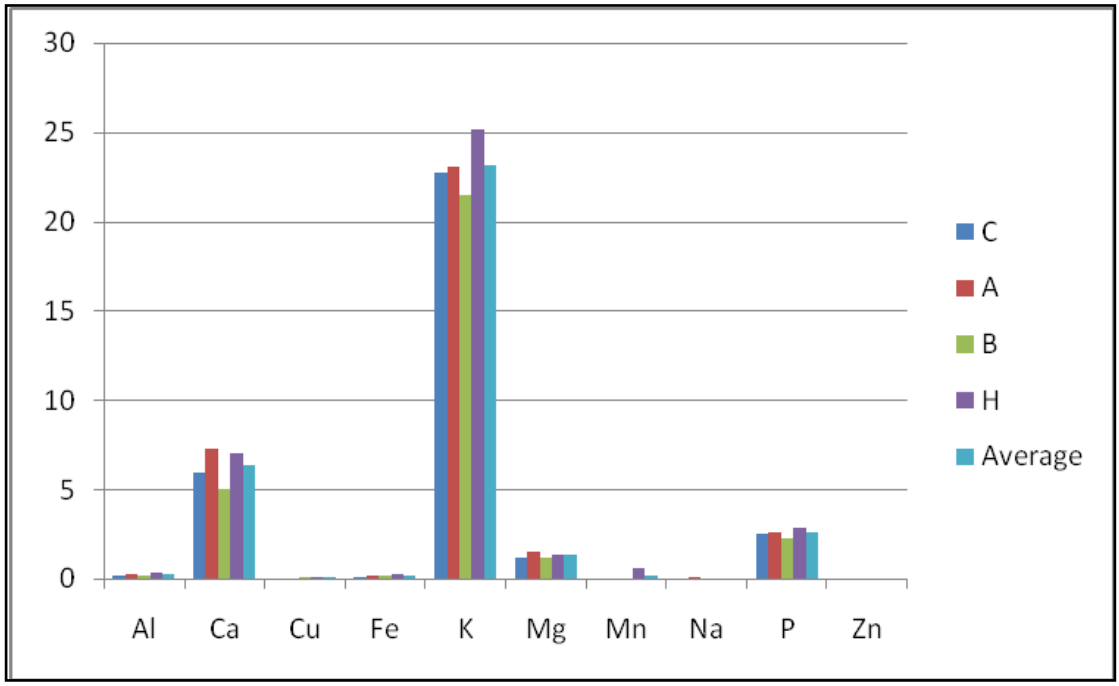

Figure. 1. Distribution of mineral composition depend from treatments

Conclusions

Our study showed that, in general, the grassland provided herbage with greater concentrations of most macro minerals and some micro minerals. Mineral concentrations in the grassland differed between the treatments. The mineral composition changed from treatments and the botanical composition of the grass–legume–herb mixture, and consequently indirectly influenced mineral concentrations in the total herbage.

References

1. Danish plant directorate:**Vejledning om økologisk jordbrugsproduktion** (*Guideline for organic agricultural production*). 2010.
2. Foster L: **Herbs in pastures –** development and research in Britain, 1850–1984. *Biological Agriculture and Horticulture. 1988.* 5, 97–133.
3. Fisher G, Bakler L and Tiley D: **Herbage production from swards containing a range of grass, forb and clover species and under extensive management.** *Grass and Forage Science*. 1996. 51, 58–72.
4. European commission: **Eurostat.** Available at:http://epp. eurostat. ec. europa. eu/portal/page/portal/ agriculture/data/database. 2006.
5. European commission: **Community registers of feed additives**. http://ec. europa. eu/food/. 2010.
6. Kuusela E**: Annual and seasonal changes in mineral contents (Ca, Mg, P, K and Na) of grazed clovergrass mixtures in organic farming**. *Agricultural and Food Science.* 2006. 15, 23–34.
7. Hogh J, Nilesen B and Thamsborg S. M: **Productivity and quality, competition and facilitation of chicory in ryegrass / legume-based pastures under various nitrogen supply levels**. *European Journal of Agronomy*. 2006. 24, 247–256.
8. Underwood J and Suttle N. F: **The mineral nutrition of livestock**. Wallingford, UK: *CABI Publishing*. 1999.
9. Jones G. E and Martin D. : **Eco zone suite of model, for FAO training service**.. *Eco zone Gough SAC Edinburgh Policy Analysis Division*. 1994. Rome.
10. Mace G, Norris K, Alastair F. : **Biodiversity and ecosystem services: a multilayered relationship.**

Trends in Ecology and Evolution, 2012. 27(1):19-26

11. **Ministry of Agriculture, Forestry, Rural Development of Kosova**. : Statistical data, 2002.
12. Pratt D. J, Gall F. L, Haan C. D: **Investing in pastoralism; sustainable natural resources use in arid Africa and the Middle Eas**t. *The International Bank of Reconstruction and Development. 1997.*
13. Rusinovci I, Aliu S, Fetahu Sh, Thaqi M and Bislimi K: **Yield component and mineral content in grassland cultivated in Kosova.** *International Conference for Ecology.* 2013. Tirana,
14. Soder J and Stout W. L**: Effect of soil type and fertilization level on mineral concentration of pasture: potential relationships to ruminant performance and health.** *Journal of Animal Science. 2003. 81, 1603–1610.*
15. Sanderson M. A, Skinner. H, Barker D. J, Edwars G. R, Trayce B. F. and Wedin D. A. : **Plant species diversity and management of temperate forage and grazing land ecosystems.** *Crop Science*. 2004. 44, 1132–1144.
16. Underwood, E. J., and N. F. Suttle: In: **The Mineral Nutrition of Livestock** *3rd Ed. CABI Publishing, CAB International, Wallingford, Oxon*. 1999.
17. Walzl K, K Søegaard, H. Høgh-Jensen, J. Eriksen, M. A. Sanderson, J. Rasmussen and J. Rasmussen: **Forage herbs improve mineral composition of grassland herbage.** *Blackwell Publishing Ltd. Grass and Forage Science.* 2011. *66, 415–423.*
18. Wilman D and Derrick. W: **Concentration and availability to sheep of N, P, K, Ca, Mg and Na in chickweed, dandelion, dock, ribwort and spurrey, compared with perennial ryegrass**. *Journal of Agricultural Science, Cambridge.* 1994. *122, 217–223.*
19. Whitead D. C: **Nutrient elements in grassland: soil– plant–animal relationships**. *Wallingford, UK: CABI Publishing.* 2000.