PROCEEEDINGS OF INTERNATIONAL BIOLOGICAL, AGRICULTURAL AND LIFE SCIENCE CONGRESS

NOVEMBER 7-8, 2019

LVIV, UKRAIN

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WELCOME NOTES

You are welcome to our BIALIC Congress that is organized by Trakya University. The aim of our conference is to present scientific subjects of a broad interest to the scientific community, by providing an opportunity to present their work as oral or poster presentations that can be of great value for global science arena. Our goal is to bring three communities, namely science, research and private investment together in a friendly environment of Lviv, Ukraine in order to share their interests and ideas and to benefit from the interaction with each other.

In November 2019, it will be held the first edition of the BIALIC Congress, with ambition of the organizers to make it a periodical event. We are proud to announce that in the BIALIC 2019 will take part more than 300 scientists and researchers from all over the world. There were submitted 376 scientific papers, of which 226 will be presented as oral talks and 150 as poster presentations. The full author list of all submitted papers comprises 936.

Our conference is a premier international science, technology and business forum focusing on Agriculture, Biology and Life Science. The technical sessions highlight invited and volunteer speakers. We love our nature and care about the environment. We wanted to make our conference as much greener as possible, using less paper. The participants' posters were submitted via conference web page and will be presented on electronic poster screens, developed particularly for this purpose. Abstract book is published in electronic version in bluetooth in the web which will be provided on each participant.

Conference Topics:

Agriculture, Forestry, Life Sciences, Agricultural Engineering, Aquaculture and Biosystems, Animal Science, Biomedical science, Biochemistry and Molecular Biology, Biology, Bioengineering, Biomaterials, Biomechanics, Biophysics, Bioscience, Biotechnology, Botany, Chemistry, Chemical Engineering, Earth Sciences, Environmental Science, Food Science, Genetics and Human Genetics, Medical Science, Machinery, Pharmaceutical Sciences, Physics, Soil Science.

Lviv is not only a very nice, lovely and historical city at the edge of Europe, but located just at the heart of Eastern Europe region. We are much pleased to host all of you in Lviv, Ukraine.

We would like to thank all of you for joining this conference and we would like to give also special thanks to our sponsors and collaborators for giving us a big support to organize this event.

We wish you nice stay in Lviv!

Prof Dr Yalcin KAYA

Head of the Organizing Committee

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COMPARATIVE ANALYSIS OF FATTY ACIDS COMPOSITION BETWEEN GRASS AND LUCERNE FORAGE

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Forages represent a major part of ruminant diets. Fatty acids composition of forage feed has major influence on energy intake and productivity of animals and also has significant effects on nutritional quality of milk and meat. The fatty acids composition of forages depends on many factors, including: species, variety, climate, growth stage, growth period, fertilization and conservation method. The aim of this study was to perform comparative analysis of fatty acid composition between grass and lucerne forage. The reliability and accuracy of the analytical method for the detection of fatty acids were ensured by use of the certified reference matrix that consisted of FAME standards of $C_{14:0}$; $C_{14:1}$; $C_{16:0}$; $C_{16:1}$; $C_{18:0}$; $C_{18:1}$; $C_{18:2}$; $C_{18:3}$ and $C_{20:4}$, purchased form Supelco, Sigma-Aldrich. The content of the particular component was expressed as percentage from the sum of all analyzed fatty acids. According obtained results from analysis of fatty acid profile of feed samples higher content of saturated fatty acids was noted in samples of grass forage (41,87 %), compared with lucerne (31,24 %). The contents of monounsaturated fatty acids in samples of grass forage was 11,28 % and 11,08 % in samples of lucerne forage, while contents of polyunsaturated fatty acids in samples of grass forage was 33,59 % and 43,80 % in samples of lucerne forage. The contents of unsaturated fatty acids in meat and milk depend of their contents in animal feed. Forage feeding is main approach to increase the supply of beneficial fatty acids from plants into ruminant products. Analysis of fatty acids profiles of grass and legume forage is very important because of their effect on nutritional quality of and health benefits of ruminant products.

Key words: fatty acids; GC-FID; grass forage, lucerne forage.

INTRODUCTION

Forages provide substantial lipids and fatty acids in ruminant diets. In most farming systems forages form a major part of ruminant diets, and sometimes contain significant amounts of fat and polyunsatured fatty acids. Diets based on forages can improve the nutritional quality of milk and meat by shifting their fatty acid composition toward less saturated fatty acids and more polyunsatured fatty acids (Boufaïed et al., 2003; Dewhurst et al., 2006). In organic grassland livestock farming forages provide high quality fodder (Steinshamn, 2010). The nature and composition of forages influence fatty acids metabolism in the rumen, and because of this there are interest to study the factors that can modify fatty acids composition of forages. Ruminant diet composition is the major factor influencing the fatty acid composition of meat and milk from ruminants because the fatty acids which reach the duodenum are, at least in part, of dietary

origin as well as the result of rumen microbial biohydrogenation of dietary lipids (Buccioni et al., 2012).
Factors affecting fat and fatty acid composition of forages are: plant species; effect of vegetation stages (comparing different dates of harvest or re-growth intervals, numbers of cuts, etc.); effect of conservation (fresh forages compared with ensiled, wilted, hay, etc.) effect of fertilization (Steinshamn, 2010).
The fatty acid profile in plant species constantly is subject to turnover. However, this do not have an important influence on the fatty acid composition during normal growing conditions. But, the fatty acid profile may change significantly during senescence of the plant, and during storage (Elgersma et al., 2003). At harvest, the concentration of linoleic and linolenic acid decreases in forage due to oxidation and degradation by different enzymes, which act as plant defense mechanism initiated in damaged tissues (Elgersma et al., 2003; Dewhurst et al., 2006). Environmental factors such as temperature, light intensity have a huge influence on the fatty acid composition in plants, as well as stage of maturity and season (Elgersma et al., 2003). The leaf/stem ratio may also have an effect on the fatty acid composition in early season due to the fact that the galactolipids are mainly located in the metabolically active leaves (Ström, 2012).
Literature data indicate that inclusion of botanically diverse plant species in the pastures increases the content of polyunsaturated fatty acids (PUFA) in ruminant products (Lourenço et al., 2008). Increasing the content of PUFA in milk is currently of great interest because these fatty acids have beneficial effects on human health and may act as anticarcinogenic agents, and the easiest way to affect the fatty acid profile in ruminant products is by nutritional changes (Chilliard et al, 2001; Çetingül and Yardimci, 2008). Including more diverse plant species in the pasture mixtures may lead to opportunity to increase the content of these fatty acids in ruminant products (Glasser et al., 2013).
The aim of this study was to perform comparative analysis of fatty acid composition between different forages grass and lucerne.

MATERIAL AND METHODS

Samples of grass (n=20) and lucerne (n=20) forages were taken from local dairy farms and then were grinded.

Chemical analysis of forages
The analysis of chemical composition of forages samples was done and the following parameters were analyzed: moisture (ISO 6496:1999), ash (ISO 5984:2002), crude protein content (ISO 5983-1:2005), crude fat content [ISO 6492:1999(E)], and crude fiber content (ISO 6856:2000).

Analysis of fatty acid composition of forages
Fat from forage samples was extracted according the method ISO 6492:1999(E). To minimize oxidative degradation of fatty acids the butylated hydroxytoluene was added as a preservative. Fatty acids were than trans-esterified with BF3/Methanol into fatty acid methyl esters (FAMES). Fatty acids methyl esters (FAMEs) were prepared according to AOAC Official Method 996.06. Analyses of the FAMEs were carried out on a GC-FID, (GC Agilent Technologies 7890 GC System, CN 11251075, USA). Column HP88 (J&W 112 -8867; 250°C; 60m x 250mm x 0.2 mm, Agilent, USA) was used for FAMEs analysis. Carrier gas was helium, and total run was 38.50 minutes. The reliability and accuracy of the analytical method for the detection of fatty acids were ensured by use of the certified reference matrix that consisted of FAME standards of $C_{14:0}$; $C_{14:1}$; $C_{16:0}$; $C_{16:1}$; $C_{18:0}$; $C_{18:1}$; $C_{18:2}$; $C_{18:3}$ and $C_{20:4}$, purchased form Supelco, Sigma-Aldrich. The calculation of the results was done with Chemstation software, and results were expressed as percentage (%) of the total analyzed fatty acids.

RESULTS AND DISCUSSION

Obtained results of chemical analysis of grass and lucerne forages have shown differences between analyzed groups of samples. Higher content of crude proteins and fats was noted in lucerne forage samples, but grass forage samples had higher content of dry matter, ash, crude fibers and moisture (table 1).

Table 1. Chemical composition of grass and lucerne forages

Parameter	Grass forages	Lucerne forages
Moisture (%)	7,78 ± 2,93	4,30 ± 2,87
Ash (%)	5,87 ± 0,33	5,29 ± 3,55
Crude proteins (%)	6,79 ± 1,68	9,89 + 6,61
Crude fats (%)	1,33 ± 0,19	2,04 ± 1,88
Crude fibers(%)	36,03 ± 0,49	24,39 ± 16,26
Dry matter (%)	92,22 ± 2,93	70,59 ± 47,06

Regarding analysis of fatty acid profiles of samples of grass and lucerne forages, obtained results have shown that the most abundant fatty acid in both groups of samples is palmitic acid $C_{16:0}$ (41,87% in grass forage, and 30,11% in lecerne forage samples). Despite palmitic acid, lucerne forage samples contain also the following saturated fatty acids: myristic $C_{14:0}$ (0,62%) and stearic $C_{18:0}$ (0,50 %). However, the lucerne forage samples contained less saturated fatty acids than grass forage (31,24 % in lucerne and 41,28% in grass; figure 1).

Table 2. Fatty acids composition of grass and lucerne forages

Fatty acids (%)	Grass forages	Lucerne forages
$C_{14:0}$	/	0,62 ± 1,24
$C_{14:1}$	/	0,48 ± 0,96
$C_{16:0}$	41,87 ± 3,05	30,11 ± 4,77
$C_{16:1}$	/	3,88 ± 2,79
$C_{18:0}$	/	0,50 ± 0,17
$C_{18:1}$	11,28 ± 4,43	6,72 ± 4,17
$C_{18:2}$	26,20 ± 6,71	23,96 ± 2,25
$C_{18:3}$	7,38 ± 3,22	19,84 ± 6,59

Based on analysis of fatty acid composition of samples (table 2 and figure 1) the contents of monounsaturated fatty acids in samples of grass forage was 11,28 % and 11,08 % in samples of lucerne forage. The most abundant monounsaturated fatty acid in both groups of samples was oleic $C_{18:1}$ (11,28% in grass and 6.72 in lucerne forage). Samples of lucerne forage contained also myristoleic $C_{14:1}$ (0,48%) and palmitoleic acid $C_{16:1}$ (3,88%). Contents of polyunsaturated fatty acids in samples of grass forage was 33,59% and 43,80% in samples of lucerne forage. The most abundant polyunsaturated fatty acid in both groups of samples was linoleic acid $C_{18:2}$ (26,20% in grass and 23,96% in lucerne forage). Samples also contained linolenic acid $C_{18:3}$ (grass 7,38% and 19,84% lucerne samples).

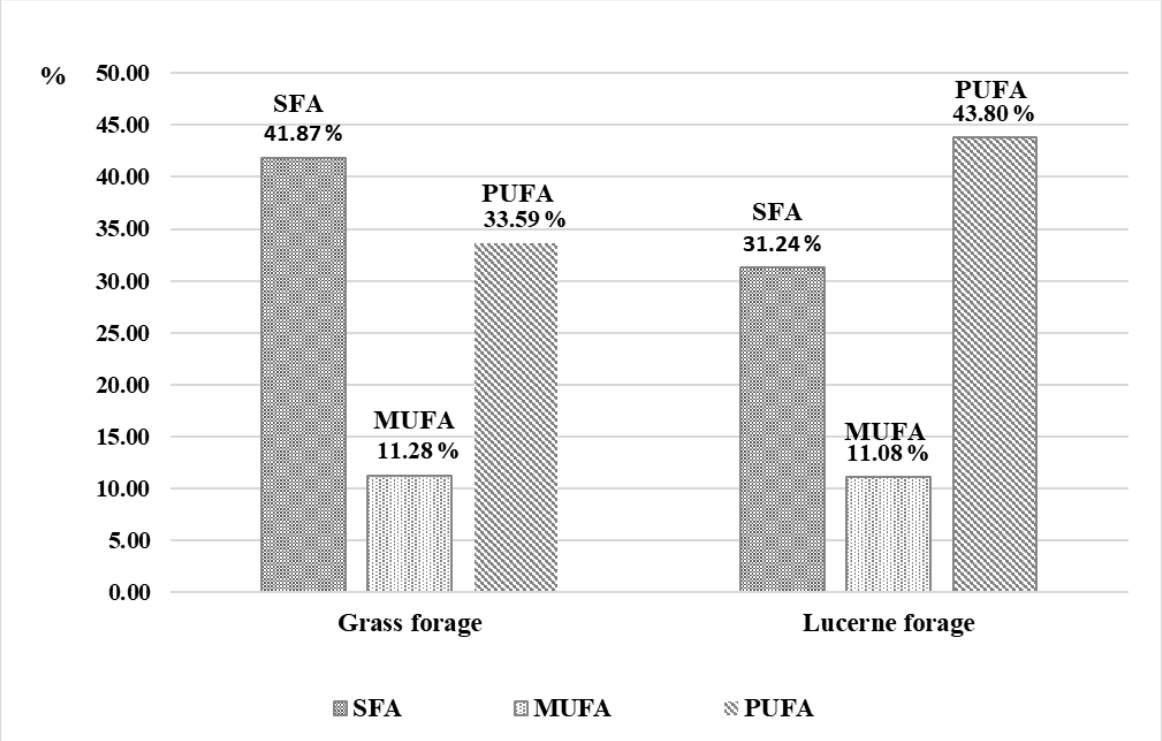

Figure 1. Saturated (SFA), monounsaturated (MUFA) and polyunsaturated fatty acids (PUFA) in grass and lucerne forages

According literature data fatty acids content in forages is at relatively low level, however, forages are major source of fatty acids in ruminant diets.

Numerous studies have indicated that compared with grass forage alone the inclusion of legumes in the ruminant diets lead to the increase in the proportion of the nutritionally beneficial α-linolenic acid in ruminant products (milk and meat), particularly when red clover-based diets are fed. In general inclusion of lucerne in ruminant diet lead to increase of polyunsaturated fatty acids content in ruminant products milk and meat (Dewhurst et al., 2009; Steinshamn, 2010; Sinclair et al., 2015).

The main factors influencing the fat and FA content and composition of forages are affected by numerous factors such as plant species and variety, climate, day length, rainfall, fertilization and vegetation stage (Dewhurst et al., 2006; Kalač and Samkova 2010; Khan et al., 2012; Sinclair et al., 2015).

CONCLUSIONS

Forages represent a major part of ruminant diets, and their fatty acids composition have significant impact on the improvement of the nutritional quality of milk and meat, For

optimization of ruminant diet, the fatty acid composition of the dietary feedstuffs has crucial role. The obtained results of this study indicate that according differences in fatty acid profiles, inclusion of diverse plant species in the ruminant diets provides opportunities to change the fatty acid composition of the ruminant milk and meat products as they would be more beneficial for a human health.

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