QUALITATIVE EVALUATION OF SOME GENOTYPES OF BIRD'S-FOOT TREFOIL (*LOTUS CORNICULATUS* L.) UNDER THE CONDITIONS OF ARDS LOVRIN

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Abstract.*The species Lotus corniculatus L. is an important component of grassland ecosystems, due to the fact that it has a great potential to adapt to a number of abiotic stressors, at the same time, the feed also being an important source of protein for animals. The aim of the research was to evaluate the protein content of some Bird's-foot trefoil genotypes at the flowering stage, along with the dry matter content and plant height. As a biological material, we used 16 genotypes of Bird's-foot trefoil, in the third year of vegetation, in the experimental field at ARDS Lovrin. In flowering phenophase biometric measurements were taken and fresh fodder samples were taken for protein and dry matter determinations. The protein was determined with the Kjeldahl apparatus, according to the protocol, and the dry matter was determined in the oven. The results of the research show a great variability of the analyzed parameters of Bird's-foot trefoil (Lotus corniculatus L.), in the conditions of the experimental year 2022. In flowering phenophase, at scythe I, the maximum plant height was 48 cm recorded in genotype LV.2 and the raw protein content was between 7.7 % in LV.12 and 13.97 % in LV.15. An analysis of linear regression shows that the content in protein is not dependent on the height of the plants. In the forms of Bird's-foot trefoil analyzed in the paper, the dry matter shows the greatest variations between 40 and 48%; the protein content between 48 and 60%, while the height of the plant shows the contribution of the variation between 60 and 100%. The analysis shows that the dry matter has a variation of approx. 8%, protein content 12%, while plant height shows the greatest variation (40%). The differences may be associated with growth conditions.*

Keywords: *Bird's-foot trefoil, protein, variability, Scythe I*

INTRODUCTION

Bird's-foot trefoil (*Lotus corniculatus L.*) is part of the flora structure of grassland habitats in Europe and has a key role in maintaining the balance of these ecosystems (DRAGOMIR, 2005, DROBNÁ, 2010). The benefits of Bird's-foot trefoil meadows have been addressed in several studies related to the protection of the environment, the biodiversity of the meadows (MOISUC ET AL., 1998) and the quality of feed in animal nutrition (VUCKOVIC ET AL., 2007, DRAGOMIR ET AL., 2011, CHURKOVA, 2011).

Bird's-foot trefoil has the ability to adapt to a number of abiotic stressors by the plant's ability to withstand extreme conditions: Low winter temperatures, summer drought and excess humidity at certain times (STEINER AND SANTOS, 2001). Bird's-foot trefoil covers areas with cold and acidic soils (SOFFELLA ET AL., 1998, AYRES ET AL., 2007) and even strongly alkaline soils, where alfalfa and clover fail to do so (VARGA ET AL., 1976, MOISUC ET AL., 1994, UZUN AND DÖNMEZ, 2016, COPĂCEAN ET AL., 2019).

It is estimated that even though the Bird's-foot trefoil is less productive compared to alfalfa (MAZĂRE ET AL., 2019) and clover, however, it has a nutritional quality similar to clover and alfalfa (COJOCARIU ET AL., 2008, RADU ET AL., 2010) this increases its value even more (SAREEN, 2004, DÖNMEZ AND UZUN, 2016).

Administered in animal feed, Bird's-foot trefoil ensures the increase in milk production (COȘMAN ET AL., 2020). The digestibility of Bird's-foot trefoil feed, harvested at flowering, is between 68.61 and 74.45%, and the metabolizable energy content ranges from 10.18 to 11.03 MJ/kg DM (KARABULUT ET AL., 2006).

Bird's-foot trefoil may contain a variable amount of condensed tannins (FERGUSON, 2017, SEONI ET AL., 2021). Condensed tannins, contained in legumes, can have beneficial or harmful effects on animals, but essential in animal nutrition is their content in the ration of animals (WAGHORN, 2008, MUELLER-HARVEY ET AL., 2019).

The compounds contained in it can be considered an important medicinal plant with possible therapeutic properties, such as antioxidant and anti-inflammatory effects (KOELZER ET AL., 2009, PEREIRA ET AL., 2011, KHALIGHI-SIGAROODI, 2012), hepatoprotective action (BAALI ET AL., 2020) and ability to combat intestinal parasites (Marley et al., 2003). Phytochemical studies performed at *Lotus sp*. Report a number of constituents, such as polyphenols, flavonoids, terpenoids, saponins (MEZRAG ET AL., 2014; ABDALLAH ET AL., 2016), with antioxidant and curative properties against various medical conditions.

Harvesting or grazing in the vegetative and flowering stage ensures the highest yield of raw protein and metabolizable energy (KARABULUT ET AL., 2006), it achieves a year-to-year production uniformity and allows the accumulation of back-up substances in autumn to a satisfactory level.

Several authors indicated that the protein content of Bird's-foot trefoil hay was closely associated with the maturity stages, and the CP content decreased with the maturity of the plant (KÖTELES AND PEREȘ, 2013, GRABBER ET AL., 2014).

In this context, the objective of the research was to evaluate the protein content of 16 genotypes of Bird's-foot trefoil *(Lotus corniculatus L.).* in the flowering stage, along with the dry matter content and height of the plants.

MATERIALS AND METHODS

1. Conditions of experimentation

The experiments with Bird's-foot trefoil were carried out in the research fields for the improvement of fodder plants at the Agricultural Research and Development Station Lovrin (Figure 1). Lovrin is located in the low Plain of Banat, at an altitude of about 100 m.

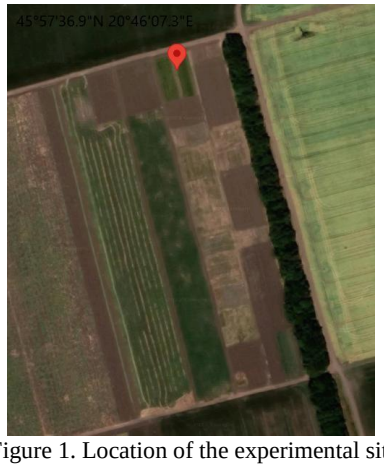

Figure 1. Location of the experimental site

The experimental site is located in the specific climatic conditions of the Banat Plain, with high temperatures, especially in the summer period and varying amounts of precipitation, both from one year to another and from one season to another (Figure 2). According to meteorological data recorded at Lovrin Station, in the experimental year 2022 climatic conditions were variable and influenced the growth and development of Bird's-foot trefoil plants (Figure 2)

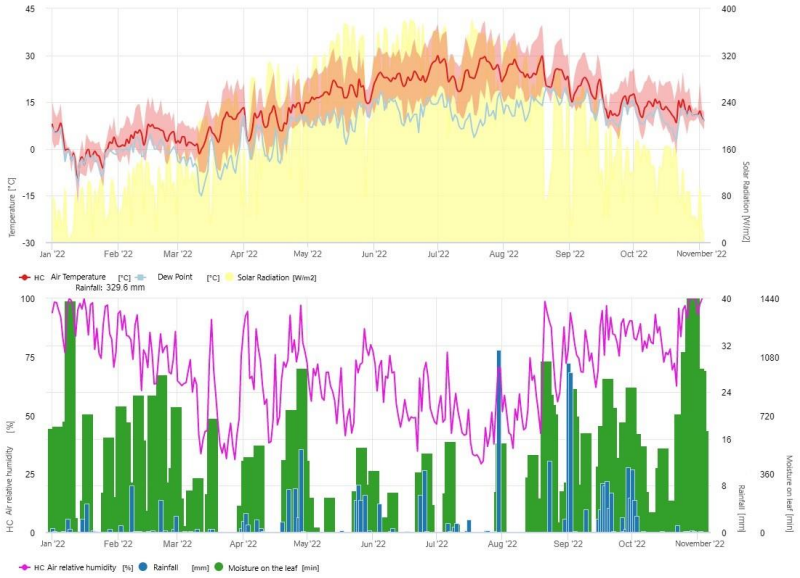

Figure 2. Variation of meteorological parameters recorded at the Lovrin Station (2022)

2. Biological asterial

As biological material, we used 16 genotypes of Bird's-foot trefoil, noted LV.1…LV.16, in the third year of vegetation. The original material comes from the flora of the meadows of Banat.

The plants were harvested manually from the plots, at the flowering stage, according to the BBCH Code (MEIER ET AL., 2009, MEIER, 2018). Samples were taken from the mowed fresh fodder to determine the dry substance and protein content.

3.Chemical analysis

The dry matter content was determined by drying the average samples taken from the field at a programmed temperature of 105 °C for 8 hours. The dry matter (noted as DW) was expressed in grams.

The nitrogen content (N) was measured using the Kjeldahl method (AOAC 1990). The raw protein (P) was calculated as N X 6.25.

All chemical analysis were performed in three repetitions (200 g).

4. Statistical data

The interpretation of the data obtained was performed using the programs: Excel 2010, PAST 10 (free version).

RESULTS AND DISCUSSION

The nutritional value of the 16 genotypes of Bird's-foot trefoil (*Lotus corniculatus* L.) was evaluated as potential feed for animals. In the study, fresh fodder samples were taken to determine the content of dry matter and protein when the plants were in flowering phenophase; at which time the average height of the shoots was determined (Figure 3).

The dry matter content, when harvested, was very high, which can be attributed to unusually high temperatures in April, May, and June, due to low rainfall that forced the Bird's-foot trefoil. This aspect also influenced the ratio between the stem and the leaves: Lignified stems and a lower percentage of leaves.

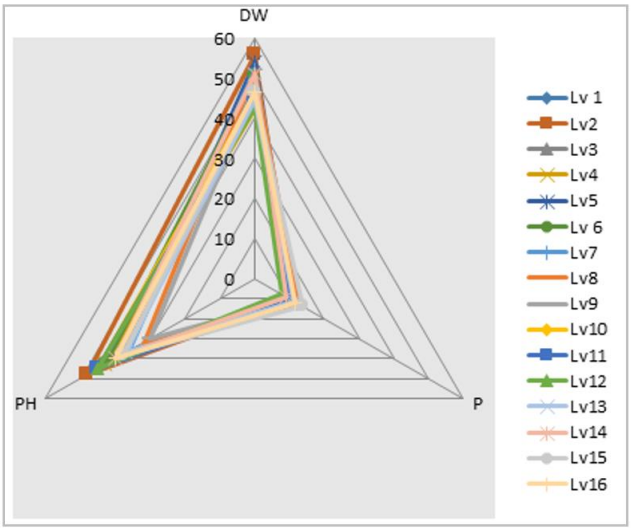

Figure 3. Evolution of plant parameters

[Legend: DW – Dry matter (g), P- Protein (%), PH - Height of the plant (cm)]

The possible interelations between plant height and raw protein content in the Bird's-foot trefoil genotypes studied were analyzed in Figure 4 and Figure 5.

From Figure 4, we can see that we have six peaks that stand out in terms of plant height: LV.2 (48 cm); LV.10, LV.11, LV.12 (45 cm) as well as LV.4 and LV.6 (43 cm). These genotypes will continue to be followed in the process of improvement. This is of particular practical importance because the height of the plants directly influences the amount of feed (GOLUBINOVA AND MARINOV-SERAFIMOV, 2019; RECHIȚEAN ET AL., 2020, COȘMAN ET AL., 2020).

The protein content (Figure 4), in 2022 conditions, was variable in the Bird's-foot trefoil genotypes analyzed, with values ranging from 7.70% at LV.12 to 13.97% at LV.15. The reduced percentage of leaves of the Bird's-foot trefoil and indirectly the impact of temperatures and precipitation in the experimental year are also found on the protein content.

Specialized literature, under other conditions and in other varieties of Bird's-foot trefoil, reports a higher content of protein (NAYDENOVA ET AL., 2013, CHURKOVA, 2013). Karabulut et al., 2006, consider that the vegetation stage has an influence on the content of raw protein, and Churkova B. (2020) considers climate conditions as a “key” factor along with the genetics of the variety.

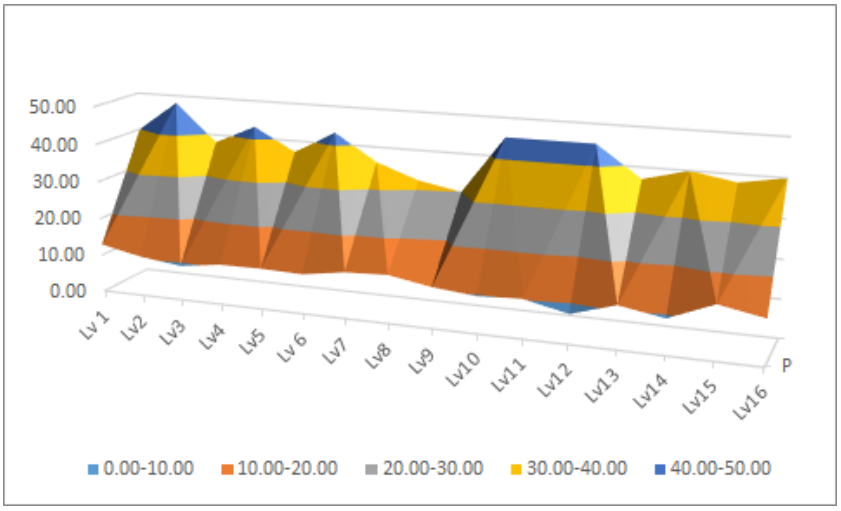

Figure 4. Spatial distributionof plant height and protein content
[Legend: P- Protein (%), PH - Height of the plant (cm)]

Figure 5 shows that between the two parameters analyzed, namely plant height and protein content, there is no dependence.

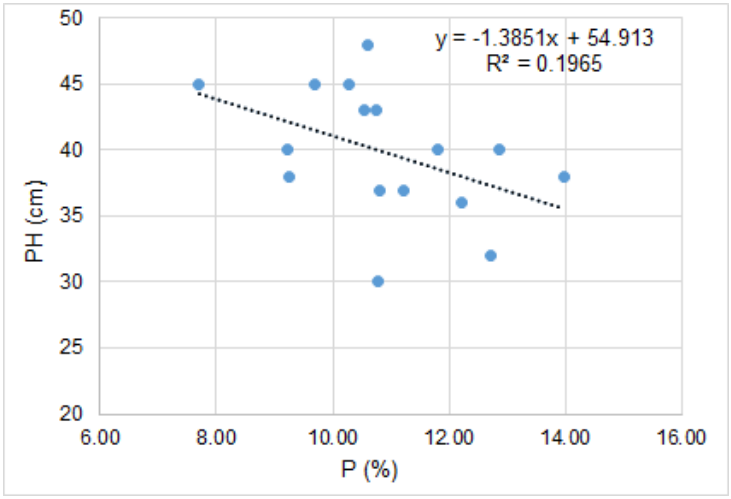

Figure 3.
Figure 5. Relationship of plant height (PH) and protein content (P)
[Legend: P- Protein (%), PH - Height of the plant (cm)]

The method of interpolation kriging for linear prediction of results was used for the design of data recorded in the Bird's-foot trefoil genotypes studied for the parameters - dry matter (g), protein % and plant height (cm).

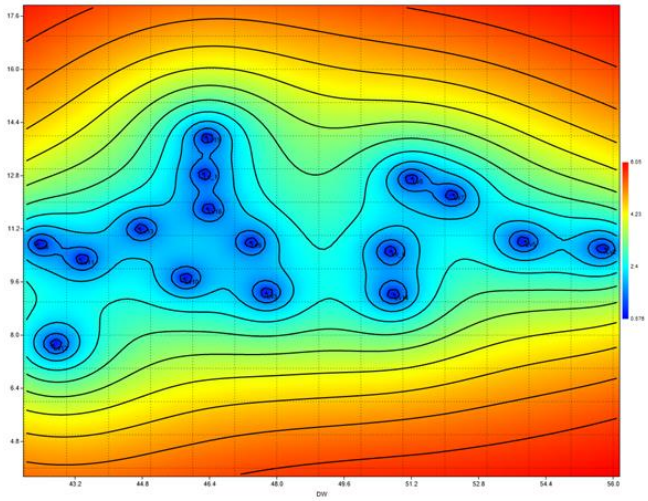

Figure 6. Evolution of plants based on spatial interpolation of DW , P and PH
[Legend: DW – Dry matter (g), P- Protein (%), PH - Height of the plant (cm)]

The prediction model (Figure 6) suggests that we have dispersed groups as a mode of behaviour of the 16 genotypes of Bird's-foot trefoil. However, the model gives us the clues and the perspective of the evolution of the analyzed parameters in the forms of Bird's-foot trefoil.

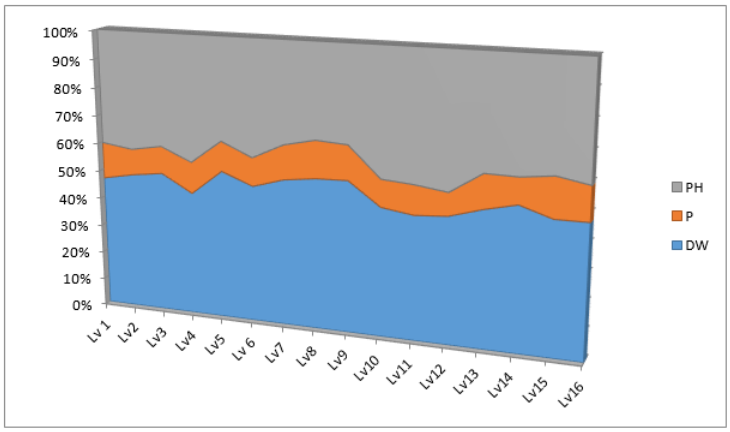

Figure 7. The percentage of parameters participation
[Legend: DW – Dry matter (g), P- Protein (%), PH - Height of the plant (cm)]

As for the percentage of participation of the analyzed parameters in the Bird's-foot trefoil, in Figure 7, it can be found that the dry matter shows the greatest variations between 40 and 48%; the protein content between 48 and 60% while the height of the plant shows the contribution of the variation between 60 and 100%. This means that the dry matter has a variation of approx. 8%, protein content 12%, while plant height shows the greatest variation (40%).

The raw protein content recorded in the Bird's-foot trefoil (Lotus corniculatus L.), under the given conditions, was consistent with those reported by RAMIREZ-RESTREPO ET AL. (2006) who found that the raw protein content in the Bird's-foot trefoil varieties analyzed (in flowering) varied between 10.56 and 21.93% and decreased with the increase in maturity.

CONCLUSIONS

The results of the research show a great variability of the analyzed parameters at the Bird's-foot trefoil *(Lotus corniculatus L.),* in the conditions of the experimental year 2022.

In the flowering phenophase, at the I scythe, the genotype LV.2 with a height of 48 cm is noted in terms of plant height. Two other groups (LV.10, LV.11, LV.12 and LV.4, LV.6) at which the height of the plants was between 43 and 45 cm are still worth following.

In the Bird's-foot trefoil forms analyzed, the crude protein content ranged from 7.7 % at LV.12 to 13.97 % at LV.15.

An analysis of linear regression shows that the content in protein is not dependent on the height of the plants.

In the forms of the Bird's-foot trefoil analyzed in the paper, the crude protein content varies between 48 and 60%, while the height of the plant shows the contribution of the variation between 60 and 100%. The differences may be associated with growth conditions.

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