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LOTUS CORNICULATUS L. – A MULTIPURPOSE PLANT IN THE REPUBLIC OF MOLDOVA

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Legumes constitute an important component of grassland vegetation, characterized by high nutritional value and ecological adaptability. Due to their rich content of proteins, vitamins and minerals, legumes improve forage quality when present in pasture vegetation [1].

Among perennial forage legumes, *Lotus corniculatus* L. (bird’s-foot trefoil) is a remarkable species, widely recognized for its persistence, adaptability and forage value. It belongs to the genus *Lotus* (Fabaceae family), which comprises approximately 150-200 species, distributed mainly throughout temperate regions, particularly the Mediterranean basin. In the flora of Bessarabia, two species are recorded: *L. corniculatus* and *L. tenuis* [2, p. 388]. *L. corniculatus* has a very large distribution range, occurring in the wild throughout almost the entire territory of Europe, in the Caucasus and the mountains of Central Asia, as well as North-Eastern Africa [3]. It is also been introduced and cultivated over extensive areas in Canada, the United States, South America, Australia and New Zealand. In the United States it occupies approximately 1 million ha, while in Canada it is grown on about 200,000 ha [4]. This species is commonly included in forage crop rotations and typically reaches its highest level of development during the second and third years of growth. After mowing, it regrows rapidly and may flower repeatedly during the same growing season [5].

Bird’s-foot trefoil is a perennial herbaceous species, reaching 15-40 (55) cm in height. It is characterized by deep taproot and numerous ascending stems. The leaves are odd-pinnately compound with five leaflets, each borne on a short petiole. The inflorescences are umbel-like, consisting of 3–5 (7) flowers, each 17-20 mm long. The corolla is yellow with claw-like petals. The fruit is a cylindrical pod, 15-20 mm long and 2-3 mm wide, containing reddish-brown, ovoid to globose seeds [2. p. 451]. The species is tolerant of low temperatures but requires high light availability for optimal development and productivity.

The present study was conducted at the “Alexandru Ciubotaru” National Botanical Garden (Institute) of Moldova State University, within the collection of forage, melliferous and energy plant. A local ecotype of *Lotus corniculatus* was used as the experimental material. Plants were propagated by direct sowing in open ground, in early April, at a depth of approximately 2 cm. Phenological

observations and analyses of the biometric characteristics of *L. corniculatus* plants were made throughout the growing season. Green biomass samples were harvested at the budding-flowering stage to determine dry matter content, followed by an assessment of biomass quality.

Biomass quality was evaluated based on several parameters, including the content of crude protein (CP), crude fibre (CF), total soluble sugars (TSS), crude ash (CA), acid detergent fibre (ADF), neutral detergent fibre (NDF) and acid detergent lignin (ADL). All biochemical analyses were performed using near-infrared spectroscopy (NIRS) with a PERTEN DA 7200 instrument at the Research and Development Institute for Grassland in Brașov, Romania. The carbon content of the substrates and the biochemical methane potential were calculated according to the equations provided in the specialized literature [6, 7].

Lotus corniculatus develops a loose, bushy growth habit with numerous ascending, branched shoots. It is suitable for hay production, grazing and the restoration of degraded permanent grasslands when grown in mixtures with other species from the Fabaceae and Poaceae families. Under the climatic conditions of the Republic of Moldova, the flowering stage may occur from May to September depending on the sowing date and lasts approximately 33-42 days. Flowering begins about 45 days after the onset of vegetation and approximately 60 days after sowing. Flowering is sequential, with individual shoots simultaneously bearing 4-7 inflorescences at different developmental stages, including budding, flowering, full bloom and fruit development. The prolonged flowering period ensured a continuous supply of nectar and pollen for pollinating insects. The species has a potential honey yield of approximately 30-60 kg/ha [5, 8].

L. corniculatus is an important nectar source for pollinating insects and a larval host plant for several Lepidoptera species [9]. *Lotus corniculatus* is an insect-pollinated species whose principal pollinators are honeybees (*Apis* spp.) and bumblebees (*Bombus* spp.). Radic et al. (2014) reported that seed production under controlled pollination by *Apis mellifera* and *Bombus* spp. was lower than under open (free) pollination, whereas seed set in the absence of insect pollination was substantially reduced, highlighting the importance pollinator diversity for this species [10].

A B C D

Fig. 1. *Lotus corniculatus*: A – experimental plot, B – flowering stage; C – inflorescences at different development stages, D – fresh biomass

Under the local conditions, *L. corniculatus* plants exhibited a high regenerative capacity, allowing three to four harvests per growing season while maintaining relatively high biomass production. During the study period, bird's-foot trefoil demonstrated high annual productivity, ranging from 3.69 to 4.42 kg/m² of fresh biomass or 0.87-0.97 kg/m² of dry matter. Its value as a forage crop is reflected by its chemical composition, characterized by 16.3-24.4% crude protein, 10.8-13.3% ash, 18.9-27.6% cellulose, 12.4-15.6% hemicellulose and 10.05-11.41 MJ/kg of metabolizable energy on a dry matter basis. The combination of high protein content, moderate fibre concentration and favourable energy value emphasizes the importance of *L. corniculatus* as a high-quality perennial forage crop.

Beyond its agricultural and apicultural importance, *L. corniculatus* also shows considerable potential as an energy crop. The harvested fresh biomass of bird's-foot trefoil can be used as a co-substrate in anaerobic digestion systems for biomethane production, with an estimated methane yield of approximately 330 L/kg volatile solids.

The combined value of *L. corniculatus* for apiculture, forage production and bioenergy generation highlights its multifunctional role in sustainable agricultural systems and supports its integration into circular bioeconomy strategies.

CONCLUSIONS

The study conducted at the “Alexandru Ciubotaru” National Botanical Garden (Institute) confirmed that the local ecotype of *Lotus corniculatus* is well adapted to the pedoclimatic conditions of the Republic of Moldova, representing a valuable species for beekeeping, agriculture and renewable energy production. Under the local conditions, bird's-foot trefoil is characterised by stable biomass production, high forage quality and prolonged flowering. These characteristics suggest its high value as forage crop, and its potential use as a co-substrate for biomethane production. In addition, due to its high adaptability, the species can also be used in the restoration of degraded permanent grasslands, in mixtures with other species. Furthermore, its prolonged flowering period provides a continuous source of nectar and pollen for beneficial insects throughout the summer, supporting pollinator populations.

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