

INCREASING THE PRODUCTIVITY OF HUNGARIAN SAINFOIN BY OPTIMIZING THE BASIC TILLAGE METHODS AND DEPTH

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Among the perennial herbs that are grown mainly in most natural and climatic zones of Ukraine, one of the leading places belongs to sainfoin. In particular, Hungarian Sainfoin is a good nitrogen fixer of agronomical importance, which has an erosion preventive property, and is the best precursor for grain and forage crops. It has the advantage over other perennial leguminous herbs which is in greater resistance to adverse growing conditions, and is a less demanding plant [2, p. 7].

Therefore, the cultivation of sainfoin is a very important direction of greening and biologization of crop production, a reserve for successful solution to the problems of the production of high-quality feed and the improvement of soil fertility being of particular relevance [3, p. 81-85].

With the application of a technological approach to the intensification of agriculture, the environment is mainly polluted with toxic substances, soil erosion is significantly distributed, the species diversity of useful flora and fauna is significantly reduced, the risk of mass destruction of agrocenoses by diseases and pests increases.

The analysis of data in this regard shows that the strategy of comprehensive intensification of farming systems is vulnerable. It is increasingly evident that such strategy has both resource and environmental limitations [4, p. 47].

The guarantee of obtaining environmentally friendly and biologically complete products is the introduction of perennial legumes into the structure of the acreage of field, feed and special crop rotations, solutions to the problems of protein, the transformation of air nitrogen into plant protein due to bacteria that fix nitrogen, enriching the soil without the application of mineral nitrogen fertilizers, biological loosening and soil structuring by the root system of plants.

With its forage properties sainfoin is considered to be one of the best fodder grasses. All animals willingly eat it both in the form of green forage and hay. While

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feeding green mass of sainfoin, animals do not have tympanitis (gastric flatulence), which often happens when using pure alfalfa and clover [1, p. 22].

The growing of sainfoin is a very important direction of the crop production greening, a reserve for successful solution to the challenges connected with both the production of high-quality feed and the improvement in soil fertility.

The obtaining of full-fledged sprouts, the optimal growth and development of sainfoin plants depend on a favorable combination of hydrothermal and soil conditions, the individual response of the crop to environmental factors, as well as the proper state of the seed layer. It is commonly known that the basic tillage, which is performed by different types of tools and depends on the conditions of crop growing, has a significant influence on the state of the arable and sowing layer of the soil.

The selection of soil treatment system for each crop should be carried out taking into account the soil and climatic conditions and depend on the predecessor, the biological characteristics of the cultivated crop, the degree and nature of the field contamination, surface relief. In modern conditions, the classical ploughing in crop rotations is not dominant. It is mostly differentiated with the use of plowing, disking, and chisel-plow tillage for individual crops and its differentiation at a depth from 6-8 to 40-45 cm.

The basic soil tillage has a direct impact on the change in its structure, the surface density and nature, effects the infiltration and evaporation of moisture. Soil density is one of the main factors of fertility as it characterizes the whole complex of physical conditions of the soil [5, p. 9-11].

The combination and solution of the above problems have caused the need to study the influence of methods and depth of the basic soil tillage on the growth and development of Hungarian Sainfoin.

The tillage systems change periodically. Some systems are replaced by others, but the fundamental types of basic soil tillage, such as plowing and plowless tillage remain.

The effective impact of tillage on the soil is enhanced when its depth, methods and measures are carried out in a scientifically sound sequence and in close cooperation with all parts of the farming system [6, p. 5-11].

Given the above, the methods and depth of basic tillage, and their influence on its agrophysical condition are an integral component of the process of obtaining high-quality forage and, therefore, have caused the need to conduct research and proper study of these relevant issues.

Among the perennial grasses that are grown in the North-Eastern Steppe of Ukraine, one of the leading places belongs to sainfoin. The high nutritional value of forage and positive aftereffect in crop rotations, that is the accumulation of biological nitrogen in the soil, make conditions for the wide spread of this crop.

The research to establish the impact of methods and depth of basic tillage on the growth and development of Hungarian Sainfoin was carried out in the Institute of Agriculture of the North-East of the National Academy of Science of Ukraine, Sumy region during 2015-2016. The experimental design included the following options: 1. Combined tillage (KLD-2.0) – 14-16 cm (check), 2. Combined plowless tillage

(KLD-2.0) – 10-12 cm, 3. Combined plowless tillage (AG-2.4-20) –10-12 cm, 4. Direct sowing.

According to the research results, a significant impact of the methods of basic tillage has been established on the productivity of sainfoin. The collection of nutrients, namely: feed units, digestible protein, forage units, is the highest under plowless tillage (KLD-2.0 to a depth of 14-16 cm) and is equal to 7.75; 0.65; 7.13 t/ha, respectively.

In terms of yield of green mass, the combined tillage (KLD-2.0) to a depth of 14-16 cm exceeded the combined plowless tillage (AG-2.4-20) to a depth of 10-12 cm by 8%, the combined plowless tillage (AG-2.4-20) to a depth of 10-12 cm – by 20%. Under no-tillage (the option of direct sowing), the yield of green mass was lower by 26% compared to the check option.

It has been found that the maximum indicators of the sainfoin growth and development are obtained under the combined tillage (KLD-2.0) to a depth of 14-16 cm – the plant stand density is 188 plant pcs/m², a number of stems are 397 pcs/ha, plant height is 101.4 cm. The less favorable conditions by biometric indicators are observed under direct sowing.

References:

1. Sobko M.H. (2010). Program of feed production development in Sumy region for the period 2011-2015 [Prohrama rozvytku kormorobstva Sums'koyi oblasti na period 2011-2015 rr.]. Sumy: SOT Publisher “Kozatskyi Shaft” JSC. 42 p.
2. Tsandur M.O. (2000). Perspectives on modern and future forage production [Pohlyady na suchasne ta maybutnye kormovyrobnytstva]. *Bulletin of Agrarian Science. Special Issue*, p. 7.
3. Aksenov I.V. (2013). Influence of the main tillage on the agrophysical properties of the soil and contamination of crop rotation in the Steppe of Ukraine [Vliyaniye osnovnoy obrabotki pochvy na agrofizicheskiye svoystva pochvy i zasorennost' posevov kul'tur sevooborota v usloviyakh Step'i Ukrainy]. *Bulletin of the Belarusian State Agricultural Academy*, no. 3, p. 81–85.
4. Bomba M. (2001). Complex influence of tillage and fertilization upon acidity and biological activity of Ukraine grey forest soils [Kompleksnyy vplyv obrobittu gruntu ta zaplidnennya na kyslotnist' ta biolohichnu aktyvnist' sirykh lisovykh gruntiv Ukrainy]. III Scientific Conference “Natural and anthropogenic causes and effects of soil acidification”. Lublin, p. 50.
5. Medvedev V.V. (2001). Optimization of soil-agrochemical factors [Optymizatsiya gruntovo-ahrokhimichnykh faktoriv]. *Bulletin of Agrarian Science*, no. 2, p. 9–11.
6. Tanchik S.P. (2009). Efficiency of farming systems in Ukraine [Efektyvnist' system zemlerobstva v Ukraini]. *Bulletin of Agrarian Science*, no. 12, p. 5–11.