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PERSPECTIVES OF WORLD SCIENCE AND EDUCATION

ABSTRACTS OF IX INTERNATIONAL SCIENTIFIC AND PRACTICAL CONFERENCE MAY 20-22, 2020

OSAKA 2020

PERSPECTIVES OF WORLD SCIENCE AND EDUCATION

Abstracts of IX International Scientific and Practical Conference

Osaka, Japan

20-22 May 2020

Osaka, Japan

2020

UDC 001.1
BBK 79

The 9th International scientific and practical conference "Perspectives of world science and education" (May 20-22, 2020) CPN Publishing Group, Osaka, Japan. 2020. 1073 p.

ISBN 978-4-9783419-8-3

The recommended citation for this publication is:

Ivanov I. Analysis of the phaunistic composition of Ukraine // Perspectives of world science and education. Abstracts of the 9th International scientific and practical conference. CPN Publishing Group. Osaka, Japan. 2020. Pp. 21-27. URL: http://sci-conf.com.ua.

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UDC 633.367.3

HISTORICAL ASPECTS OF ORIGIN AND DISTRIBUTION AREA OF THE WHITE LUPINE (LUPINUS ALBUS)

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Abstract. The analysis of literature data is carry out and the historical tendency of formation of white lupine as culture is established. The main centers of origin and economically valuable and reclamation features of this culture are determined.
Key words: lupine, origin, history, ameliorant, extractives, fodder value.

The most important feature of organic farming is the activation of natural nitrogen-fixing systems, which ensure the accumulation of biological nitrogen due to legumes, including lupine [1]. Lupine is one of the most productive crops of modern crop production. The area under white lupine crops in Ukraine is unreasonably small. However, unlike other legumes grown for export, lupine has a positive effect on soil fertility, in particular, accumulates biological nitrogen and reduces the cost of growing subsequent crop rotations, which is very important for agriculture.

The development of lupine sowing in Ukraine as a whole and in some regions is constrained by insufficiently substantiated zonal adapted technologies of culture cultivation. Based on this, conducting such research is important in both practical and

scientific terms. The problem of plant protein deficiency has aroused increased interest in growing lupine. The high content of valuable protein in the plant and a set of other valuable traits for the economy makes lupine an indispensable forage crop [2]. Along with the valuable economic properties of lupines are consider as a source of balanced, easily digestible and environmentally friendly protein and as a factor in the biologization of agriculture. It helps to preserve and restore the natural fertility of the soil and can be use as a cheap source of biofuels.

Lupine is one of the most ancient crops grown before our era in Egypt, Greece and the Roman Empire. Lupine has long been grown in Rome, which was almost indistinguishable in quality from modern ones. Even then, the Romans and Greeks were well aware of the medicinal, valuable agricultural, nutritional and toxic properties. Lupine was grown as a grain crop, which was used in the preparation of daily affairs and fed to animals.

Lupines are first mentioned in literary works by the Greek physician Hippocrates (460-364 BC). In his book "On human nutrition», he assesses its economically valuable characteristics, comparing it with other legumes. Theophrastus reported more in detail about lupines as an agricultural crop in his History of Plants and Plant Physiology (375-289 BC). Since ancient times, lupine have been treated as a cereal, getting rid of the bitterness in order to be used as food and animal feed. Lupine is mention as a useful edible and medicinal-cosmetic plant by prominent scientists of the ancient world - Dioskoryd, Avitsena, Halen, Plinii and others. It is know that lupine was use as a green fertilizer to improve soil fertility.

In the Middle Ages, lupines were grown in Mediterranean countries, such as Italy, France, Spain, and Portugal, where they were first known as a good green manure crop with good phytomeliorative qualities, and later as food and fodder. Somewhat later, lupines were introduce to the countries of Central Europe. In Germany, this crop wasn't successful for three reasons: late ripening, the need for constant import of seed from other countries and the defeat of Fusarium wilt. Therefore, in Germany they began to grow not white, but yellow and narrow-leaved lupines. The time of domestication of yellow and blue lupines is consider a new stage in the history of this

culture (1940). By the end of the twentieth century, the sown area in Germany reached 40 thousand hectares. However, cultivated species have retained many of the characteristics of wild plants, which by the 1930s had helped to halve the area under crops.

In 1916, T. Remer first introduced the idea of depriving plants of bitterness and poisoning in order to make full use of non-alkaloid lupines. Later attempts were made by D. M. Prianyshnykov in 1924. The main obstacle to the emergence of non-alkaloid species of lupine in this regard was the lack of cheap and fast methods for determining alkaloidity. This technique was first develop at the Central Institute of Genetics in Munich (Germany) by breeder Zenhbushem, who identified new stable non-alkaloid forms of lupine. On this basis, the selection work of the crop for fodder purposes began. Soon they became interested in white lupine in Poland, where they not only carried out selection work, but also began to develop agronomic methods of cultivation. In the Soviet Union, the first information about lupines as a forage crop dates back to 1811, and it was not until the 1860s that the first articles and scientific papers appeared in the scientific literature.

Great credit in the future belongs to S. M. Bohdanovu and academician D. M. Prianyshnykovu, who are the founders and founders of the doctrine of the genus Lupinus L. On the territory of Ukraine in scientific publications published the results of collective research (Chernihiv, Volyn, Kyiv, Mogilev 13 province) in 1910-1914, which showed the effectiveness of growing lupine on green manure. In 1931, in the biochemical laboratory under the leadership of NN Ivanov, an express method for the analysis of lupine plants for alkaloidity was developed.

According to N. N. Ivanova, the discovery of non-alkaloid lupine is a discovery of exceptional interest to agricultural science. This time is considered to be the initial reference to the establishment of lupine as a forage crop. Nosivskyi 3 became the first variety of domestic selection. Already in 60-70 years the sown areas of lupine for grain purposes in the USSR amounted to 500 thousand hectares, and for green fodder and silage - 1.5 million hectares. The discovery of non-alkaloid varieties of lupine, including white in the late 20's and early 30's of the twentieth century contributed to

the formation of a new stage of lupinization, which opened up great opportunities to strengthen the feed base and increase vegetable protein production. Since then, culture has occupied a significant place in world agriculture.

Lupine in the wild still found around the perimeter of the Mediterranean Sea and in northern Africa. Of the 12 lupine species originating from this genetic center, six have been introduce to other regions of the world, where they are select to create varieties adapted to the conditions of new regions and the requirements of modern agriculture. Significant results in the selection of lupine have been achieved in countries such as Australia, Canada, Germany, Poland, Russia, Portugal, France, Spain, Italy, Peru, Chile and others, where its cultivation is given much attention [3].

On the territory of Europe, three species of annual lupine were introduce into the culture - white lupine (L. albus L.), yellow lupine (L. luteus L.) and narrow-leaved lupine (L. angustifolius L.). White lupine is able to form higher seed yields compared to other types of lupine. Due to the great efforts of breeders from bitter wild forms of all mentioned species created varieties with low alkaloid content and high - nutrients that are suitable for use in animal feed and even for human consumption [6]. There are other known areas of economic use of lupine - for example, from its seeds are obtained vitamins and proteins that are used in the production of certain types of glue and plastics [1, 6, 7].

Among legumes, lupines, along with soybeans, have the highest protein content in seeds - with fluctuations, depending on the species, variety and growing conditions, from 33 to 45%. The protein content of 1 ton of lupine seeds is equivalent to 4.5 tons of barley grain or 5-6 tons of corn. Lupine protein in terms of essential amino acids and biological value is equivalent to the most complete soy protein. It contains all eight essential amino acids, including arginine (3.6%), valine (4.3%), lysine (4.3%) and leucine (9.8%). The high content of digestible protein in the seeds indicates its high value as a component in the production of protein-balanced concentrated feed. In addition to protein, lupine seeds contain 25-40% of nitrogen-free extractives, up to 10% of oil, which also increases its nutritional nutrition. 100 kg of seeds contain an average of more than 100 feed units. Green mass of fodder lupine, which contains up

to 3% protein, vitamins A, C and minerals (calcium, potassium, phosphorus, manganese, iron, sulfur), is also a good food for animals, which is fed in the form of green fodder, silage, hay, grass meal.

100 kg of green mass contains about 15 feed units, each of which has 150–28 160 g of digestible protein [4, 18, 36, 46, 168, 176, 194, 240–242, 256, 257, 301]. Lupine plays an important role in increasing soil fertility, especially sod-podzolic, sandy and loamy. Researchers have shown that when plowing the green mass of white lupine, the soil is enriched by 150-230 kg / ha of biological nitrogen and 35-40 t / ha of organic matter, which is equivalent to the introduction of 40-45 t / ha of manure. The soil is significantly enriched with organic matter and biological nitrogen, even when plowing only post-harvest residues that remain after harvesting lupine for grain [1, 7]. Lupine is an excellent biological ameliorant, which not only increases the fertility of poor soils, but also improves their physical and chemical properties. Due to a well-developed root system, it is able to actively absorb insoluble nutrient compounds from the soil, and also has a specific ability to convert insoluble chemical elements into digestible form for other crops, especially phosphorus, which is very important in fertilizer balance [2].

Many foreign and domestic scientists note that lupine, due to its biological characteristics, is one of the best precursors for the vast majority of crops. After its cultivation, even on sandy soils it is not necessary to apply a significant amount of mineral nitrogen fertilizers [3]. Due to the general deterioration of the ecological state of our planet, scientists from different countries have proposed systems of organic farming, one of the main principles of which is to preserve soil fertility and enrich them with organic matter through the use of various organic fertilizers, including green. Of all crops, lupine has a set of properties that allow us to consider it as the basis of a resource-saving system of agriculture. Lupine provides a high accumulation of nutrients in biomass, which is the cheapest, environmentally friendly of all types of organic fertilizers [26, 142, 180, 224, 313, 339, 29 346, 347,349].

White lupine (Lupinus albus Linnaeus) is an annual herbaceous plant with a very strong stem 70-100 cm tall, which can form shoots of I, II and III orders. Lupine

plants have a well-developed taproot, which reaches a length of 2 m or more, which provides the ability to absorb water and nutrients from deep soil layers. At the beginning of the growing season, nodules are form on the roots of plants, where Rhizobium bacteria are located. It is due to the effectiveness of symbiosis with lupine bacteria has a high nitrogen-fixing ability.

Lupine is use as fodder and green manure. Lupins began to be grow for fodder purposes in the 1930s. After removal of sweet non-alkaloid varieties, which contain in the seeds no more than 0.0025% of alkaloids (lupine, lupanin, sparteine, etc.). Low alkaloid varieties of lupine with alkaloid content up to 0.1 - 0.2% have limited fodder value). The nutritional value of lupine is determine by the chemical composition of seeds and green mass. The seeds contain 33-50% protein, 25-40% without nitrogenous extractives, 4.5-9.5% fat, 3.5-4.2% ash. 100 kg of grain contains more than 100 feeds. From and 290-367 g of digestible protein per feed unit. The protein content of 1 grain of lupine is equal to 4.5 quintals of barley grain or 5 - 6 quintals of corn, which is evidence of the high value of lupine seeds as a component in the production of protein-balanced concentrated feed.

The green mass of lupine is use for feed in the form of green fodder, silage, hay, grass meal. Green mass is rich in protein (up to 15%), vitamins A, C and minerals. 100 kg of green mass corresponds to 14-15 feed units with a content of 1 feed. from 150-160 g of digestible protein. Lupine is extremely important as one of the best green manure crops. It plays an important role in improving the fertility of sod-podzolic, sandy and loamy soils of Polissya. The advantages of lupine as a crop for green manure are determine by its high nitrogen-fixing ability.

When plowing 350 c / ha of green mass as green manure, the soil is enriched with 180-200 kg / ha of biological nitrogen and 35-40 t / ha of organic matter, which is equivalent to 45-48 t / ha of manure. In addition, having a well-developed root system that penetrates deep into the soil, lupine has the ability to absorb insoluble nutrients from the soil, especially phosphorus. Lupine is also use as a raw material for the processing industry. Protein concentrates are obtain from seeds, which are using for the production of artificial fiber, glue, plastics, etc.

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