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A MISUNDERSTANDING BUT VERY PROMISING CROP: LUPINS

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Abstract

Grain legumes, also called pulses, are crops of the botanical family *Fabaceae*. Genus *Lupinus* spp. Is also included in this family. There are over 150 different species of lupines. Some of them are ideally suited to agricultural production due to their nature as nitrogen fixing grain legumes that develop seeds with high protein and high energy contents, which can be grown effectively in northern and southern climates. There are three lupine species of agricultural significance at present: narrow-leafed (*L. angustifolius*), white (*L. albus*) and yellow (*L. luteus*).The inclusion of lupine in crop rotation positively influences biodiversity and soil fertility as the bacteria at the root of lupine symbiotically absorb nitrogen (N) from the air.). Despite the low European production of grain legumes, European countries exhibit suitable soil-climatic conditions in order for this crop to be cultivated.

Introduction

The value of lupine in recent centuries has grown considerably over the past few years. As a legume, Lupine provides nitrogen to the soil by setting a very good choice for crop rotational systems Although humans have been consuming lupines for many years, beneficial properties in human and animal body have become known in recent years through scientific research. The lack of knowledge regarding the great benefits of lupines for dairy products has led to a global decline in world production (Naumkin *et al.*, 2015*;* Tan *et al.*, 2014). Nowadays, lupine cultivation has begun to grow again by creating new varieties that eliminate the disadvantages of cultivation. Lupine plant residues contain about 32-96 kg N/ha, while in its biomass the nitrogen content is 199-372 kg/ha. (Unkovich et al., 1994). Lupine is one of the best choices for animal feeding due to the high protein and carbohydrate content and the low starch levels**.**

Picture 1. Lupine cultivation from the experimental fields of the University of Thessaly.

Soil, Yield and Cultivars

Despite the low European production of grain legumes, European countries present suitable edapho-climatic conditions to cultivate lupines.

- Yellow lupine (*L. luteus*) breeding is restricted in Europe. Despite the fact that it is extremely resistant to drought and that it can withstands pH=4, due to the low resistance to diseases,it is not cultivated. (Gresta *et al*., 2017).
- Narrow-leafed lupine (*L. angustifolius*) is grown in northern Europe and requires a wide range of pH values between 5 and 6.8(Gresta *et al*., 2017). ha and related to the ‘Boregine’, ‘Haagena’ and ‘Sonate’ varieties. The largest yields in Germany over the period 2009-2011 were 3.5-5 (Guddat *et al*., 2011).
- White lupine (*L. albus*) is well adapted to different soil types, with greater preference for loamy and light clay soils.(Gresta *et al*., 2017).

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Picture 2. Lupine cultivation from the experimental fields of the university of Thessaly.

Tolerance to biotic stress

White lupine is predominantly attacked by an insect called *Phorbiaplatura*. The infestation occurs in the roots and hypocotyls of the larvae have a higher incidence during autumn sowing. (Huyghe, 1997). *Pleiochaetasetosa* is characterized mainly by the appearance of brown spots on the leaves of the plant and, secondly, by the destruction of the roots of *L. angustifolius*. (Cowling, 1988). *Uromyceslupinicolus* occurs in hot and dry periods such as in summer period. The reduction in biomass production and leaves premature fall can be treated by the application of triazole group fungicides (Huyghe, 1997).*Colletotrichum gloeosporioides*, known as Anthracnose, primarily affects the seed. Consequently, the appearance of the symptoms (cankers on the stems) occurs in the early stages of the plant's life cycle resulting in its destruction before flowering (Von Baer and Hashagen, 1996).

Tolerance to abiotic stress

Abiotic stress is mainly due to drought, high pH and frost (Huyghe, 1997). The varieties sown in autumn are highly resistant to frost (Huyghe and Papineau, 1990).Primarily, when sowing takes place in the early autumn, the plants have a better developed and larger root system and therefore have greater resistance to soil cooling. White lupine is cold-tolerant, but temperatures of -6^{0}C to -7^{0}C are harmful at germination. Cool temperate weather conditions are important during the vegetative stage. Temperatures lower than 10^{0}C and short days are required to induce flowering (Putnam, 1993).

A second abiotic factor is water logging, which can cause root damage resulting in *Fusarium* and *Botrytis cinerea* infection. The solution to this problem is the early sow (Huyghe, 1997).White lupine thrives on soils with pH ranging from 4.5-7.5. However, aluminium toxicity and iron chlorosis have been observed at values below 4.5 and above 7.5.Lupine is susceptible to alkalinity due to free lime. In high alkaline, *L. pilosus* has shown high resistanceto other white lupine varieties (Gerke *et al*., 1994).

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