

BEHAVIOR OF WHITE AND BLUE LUPINE VARIETIES IN PEDOCLIMATIC CONDITIONS OF THE A.R.D.S. SECUIENI

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Abstract

Lupine is a source of protein as well as dietary fiber. Lupine seeds are an excellent meat substitute for people who adopt a vegetarian lifestyle and have significant cholesterol-lowering properties, contributing greatly to cardiovascular health. Taking into account the growing interest, in recent years, for this crop, within A.R.D.S. Secuieni was followed the behavior of six varieties of lupine (3 varieties of white lupine and 3 varieties of blue lupine) in the pedoclimatic conditions in Central of Moldavia. In the first year of testing lupine culture, compared to the yield recorded by the control (average experience - 2736 kg/ha), very significant yield increases were recorded for the varieties Wars (3063 kg/ha) and Dieta (4050 kg /Ha). In the second year of testing, only one variety obtained a control higher yield of 2519 kg/ha (Medi). On average, in the two years of testing, lupine yield varied from 2138 kg / ha obtained by the Menhit variety (blue lupine) to 3205 kg/ha at the Dieta variety (white lupine).

Key words: white and blue lupine, pedoclimatic conditions, yield

Lupine is a legume, which belongs to the genus *Lupinus* and has a high protein content, being consumed in Middle Eastern countries. Lupine seed contains an alkaloid considered toxic in both human and animal diet, but laboratory tests on lupine biscuits and lupine drinks have concluded that these products are good for consumption (Lee HaeWon *et al*, 2020). Lupine culture is beginning to present a growing interest in research, due to the high nutritional value of seeds and the fact that many foods products can be made (Khan *et al*, 2018).

White lupin seed is known for its relatively high protein value. Its seed protein content ranges between 30 - 40% (Moss *et al*, 1996; Gdala *et al*, 1999). However, the alkaloid content in lupin, especially in bitter varieties, limits its use as human food and livestock feed.

Vegetable proteins are of growing interest to food producers as consumers move away from meat-based diets. Lupine has a high content of protein (~ 40%) and fiber (~ 40%), is low in starch and does not contain gluten, therefore it can play an important role. Despite its nutritional but even proven health benefits, lupine is underused and still does not play an important role in the human diet (Lo *et al*, 2021). There is a growing demand for vegetable protein due to the growing number of consumers are looking for healthier food options.

Proteins found in lupine seeds are a viable source of vegetable protein due to their high protein content (Al-Ali *et al*, 2021). Lupine has the advantage of high tolerance to soil acidity and excellent seed quality, but its current production potential is weak, especially in areas with low rainfall (Iqbal *et al*, 2019).

Lupine is an undervalued legume, despite its high protein and dietary fiber content but also its health benefits (Villarino *et al*, 2016).

White lupin is one of the four widely known, commercially important, large seeded, annual lupin species in the world. According to Gladstones (1998) the centre of origin for white lupin is the Mediterranean basin, the old world. It is adapted to well drained, light to medium textured, moderately acidic or neutral soils with a pH range of 4.5-7.5 (Jansen, 2006).

White lupin is relatively new innovative crop in contemporary crop production and agriculture. Unlike other ancient traditional crops (wheat, peas, soybeans) it has become a cultural species later. There is an increasing interest in this crop during the 20th century (Artyukhov, 2015).

Lupin, as legume, can fix atmospheric nitrogen into nitrate (NO₃), usable form of nitrogen by the companion or succeeding crop. Potentially lupin can fix and accumulate a total of 150 to 400

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kg/ha per year nitrogen (Takunov and Yagovenko 1999; Reeves et al 1990).

This paper presents results on the behavior of some white and blue lupine varieties in the pedoclimatic conditions of Central of Moldavia.

MATERIAL AND METHOD

The research was realized in the period 2019-2020, in the experimental field from A.R.D.S. Secuieni, and aimed to establish the adaptability to pedoclimatic conditions in Central of Moldavia of a number of six varieties of lupine, of which three varieties of white lupine (Medi, Dieta, Mihai) and three varieties of blue lupine (Menhit, Dalbor, Wars).

The experience takes place in the experimental field of the unit, on a typical cambic faeoziom (chernozem) soil, with medium texture, characterized as being well supplied with phosphorus (P₂O₅ - 39 ppm) and mobile potassium (K₂O - 161 ppm), moderately supplied with nitrogen, the soil nitrogen index being 2.1, weakly acidic, with pH values (in aqueous suspension) of 6.29 and poorly fertile, with a humus content of 2.3%.

The cultivation technology specific to the conditions in Central of Moldavia was applied, and the data obtained were processed and interpreted statistically according to the method of analysis of variance (Ceapoiu, 1968).

The two years of experimentation were characterized differently, both in terms of rainfall and temperature.

Throughout the vegetation period of lupine culture, from sowing to physiological maturity, the deviation from the multiannual average varied between 0.2 °C (2020) and 0.6 °C (2019). Under the temperatures appearance, the period of lupine vegetation in the two years of experimentation, compared to the multiannual average was characterized as normal (figure 1).



Figure 1 Temperature graph recorded by the A.R.D.S. Secuieni, 2019-2020

In terms of precipitation throughout the vegetation period of lupine, deviations from the multiannual average were different, their distribution was uneven, and extremely uneven on the phenophases of growth and development of the plant (figure 2).

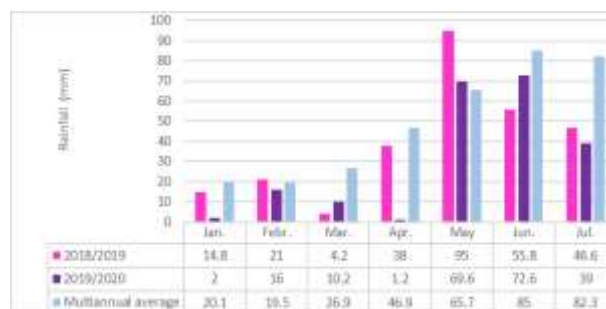


Figure 2 Graph of precipitation recorded by the weather station at the A.R.D.S. Secuieni, 2019-2020

RESULTS AND DISCUSSIONS

During the entire vegetation period of lupine culture, a series of determinations were made to characterize the studied varieties.

On average, the average number of pods/plant ranged from 11.4 pods/plant (Wars) to 19.9 pods / plant (Medi).

In the first year of experimentation the number of pods per plant varied from 10.6 pods / pl. (Mihai) and up to 19.8 pods/pl. (Medi). In the next year, the Medi variety obtained the highest number of pods per plant (20 pods/pl.), and the minimum obtained was at the Wars variety (9.4 pods/pl.) (figure 3).

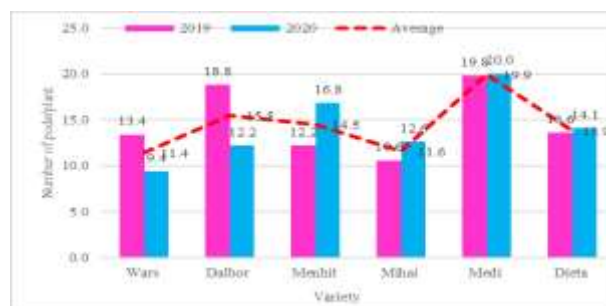


Figure 3 Determinations regarding the number of pods per plant, on average 2019-2020

The average number of grains/plant varied mainly depending on the number of pods / plant and was between 37.6 grains/plant at the Mihai variety and 68 grains / plant, a value recorded by the Medi variety (figure 4).



Figure 4 Determinations regarding the number of grains per plant, average 2019-2020

The weight of the grains/plant varied in very high limits, from 5 gr./plant, registered by the Wars variety and up to 23.7 gr./plant to the Medi variety.

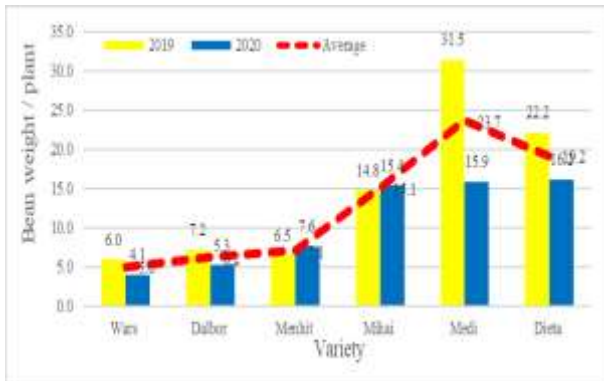


Figure 5 Determinations regarding the weight of the grains per plant, average 2019-2020

The experimental results obtained during the analyzed period indicate a significant difference in the production of the studied white and blue lupine varieties. Thus, in the first year of experimentation the average lupine productions varied between 1916 kg/ha (Menhit) and 4050 kg/ha (Dieta). Compared to the production recorded by the control variant (average experience - 2736 kg/ha), very significant production increases were registered for the varieties Wars (3063 kg / ha) and Dieta (4050 kg/ha).

In the second year of experimentation the productions varied from 2051 kg/ha (Wars) to 2519 kg/ha (Medi). Compared to the control variant (average experience) of the six white and blue lupine varieties studied, only one variety obtained a higher yield of 2519 kg/ha (Medi), a production that was statistically assured and interpreted as significant.

On average, in the two years of experimentation the productions varied from 2138 kg/ha (Menhit) to 3652 kg/ha (Dieta). Compared to the control, higher productions were obtained at two varieties, Medi (2705 kg/ha) and Dieta (3652 kg/ha), these being statistically assured and interpreted as significant and very significant (Table 1). With lower adaptability to the conditions of the area, the varieties Dalbor (2231 kg/ha), Menhit (2138 kg/ha) and Mihai (2329 kg/ha) were identified, which achieved significant negative or very significant negative production differences (table 1).

Table 1

Productions obtained at white and blue lupine varieties, in the pedoclimatic conditions from A.R.D.S. Secuieni

Variety	Production kg/ha 2018-2019	Production kg/ha 2019-2020	Average production 2018-2020
Wars	3063 ***	2051 ⁰⁰⁰	2557
Dalbor	2226 ⁰⁰⁰	2236 ⁰	2231 ⁰⁰
Menhit	1916 ⁰⁰⁰	2360	2138 ⁰⁰⁰
Mihai	2309 ⁰⁰⁰	2349	2329 ⁰⁰⁰
Medi	2891	2519 *	2705 *
Dieta	4050 ***	2359	3652 ***
Media - MT	2736	2304	2520
DL 5%	162	208	185
DL 1%	228	292	260
DL 0,1%	321	412	367

CONCLUSIONS

In 2018-2019 superior productions, compared to the control (average experience) were obtained by the varieties Wars (3063 kg/ha) and Dieta (4050 kg/ha), these being statistically assured and interpreted as very significant;

In the second year of testing the white and blue lupine varieties, the Medi variety (2519 kg/ha) obtained a higher production than the control (average experience), which was statistically assured and interpreted as significant;

The average production of the six white and blue lupine varieties experienced at A.R.D.S. Secuieni varied within high limits, being between 2138 kg/ha obtained at the Menhit variety and up to 3205 kg / ha by the Dieta variety.

Yields higher than the control (average experience) were obtained by the varieties Medi (2705 kg/ha) and Dieta (3652 kg/ha), these being ensured statistically and interpreted as significant and very significant, which shows a good adaptability to pedoclimatic conditions from the Center of Moldavia.

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