RESEARCHES CONCERNING THE INTRODUCTION OF WHITE LUPIN (*LUPINUS ALBUS*) INTO THE AGRICULTURAL CROP IN DEPRESSIONS FROM THE WESTERN PART OF ROMANIA

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Abstract. *White lupine is a species cultivated as fodder plant for beans and also as green fertilizer as main crop or as secondary culture because it is a very good breeder of soil properties (1, 3, and 4). The research was conducted in Depression Gurahonț, Arad county, between 2012 – 2014. From a climate perspective, the area where were performed research is of type cfbx after Köppen classification. The average annual temperature in the reference area is around 10^0C and annual rainfall exceeding 600 mm. From soil type perspective, the experimental field was placed on a stagnic luvisol (2). In the experimental research cycle 2012-2014 the purposes were the introducing of white lupine as grain crop and as crop rotations plant in situations when a leguminous plant has to be a part from the crop rotation. From the synthesis of results concerning the sowing technology, we determine that the yields from experimental trials have a range between 1758 kg / ha and 2962 kg / ha, depending on the time of sowing and plants genotype. On average from three periods of sowing tested in experimental field, the highest yield was recorded at Medi variety originating from ARDS Livada, county Satu Mare, followed by Vojvodina a Serbia's origin and by the provenance from Turkey. Also, there have been made a number of biometric measurements depending on the genotype and on the time of sowing plant height (cm), the number of branches / plant, number of flowers / plant, number of pods / plant. It was also established and change in mass of 1000 grains by genotype and by sowing period in experimental cycle 2012-2014.*

Key words: *Lupinus albus, crop technology*

INTRODUCTION

From soil science point of view, on hilly areas and respectively on the depressions from hilly areas, the dominant soil tips are acid soils with low fertility potential (4). Aiming the improvement of acid soils a long period of time there was used calcareous amendments. Since lately this kind of amendments are increasingly hard to be found and their price increase year after year, farmers affected need to find fast other alternative solutions to increase the yield potential of this kind of soils which have a significant share from our country agriculture. White lupine (*Lupinus albus L.*) is a species that, by its biological peculiarities, not only grain suitable to be grown with good results in climatic conditions from the acidic soil, but also it is an excellent precursory plant for most crops, especially because enriches the soil with large amounts of nitrogen, while improving soil characteristics(5,6). The main aim of the research is to bring a contribution to the development of a better technology in order to achieve an economically motivated production. Research conducted during 2012 - 2014 had the following objectives:

- research on the influence of sowing period of production;
- behavior of the three genotypes from different countries in experimental field organized on the study interest area;

MATERIAL AND METHOD

In the experimental field it was used seeding material produced with courtesy of Agricultural Research and Development Station from Livada (Satu Mare county) and it consists from variety Medi, a Turkey provenance and De Voivodina provenance. Experimental field was organized after two experimental factors model. The experimental factors were as follows:

Factor A – the genotype, with three graduations:

- a1 – Romanian variety Medi;
- a2 – provenance De Voivodina from Serbia;
- a3 – provenance De Turcia from Turkey;

Factor B – the sowing period with three graduations:

- b1 – between 20 – 30 of March;
- b2 – between 10 – 20 of April;
- b3 – between 20 – 30 of April;

The precursory plant was autumn wheat.

The technology used was the specific one with the particularity that the fertilizers were applied uniformly on amount of $P_{60}\,K_{60}$. Sowing was done on rows at 50 cm distance and with a sowing density of 50 seeds / m^2.

RESULTS AND DISSCUTIONS

The synthesis of yield results obtained in the experimental cycle 2012 – 2014 is in table 1

Table 1

Yield results synthesis after genotype and sowing period in experimental cycle 2012-2014.

Genotype	Sowing period			Averages of factor A			
	20-30 march	10-20 April	20-30 April	Yield	%	Differences (kg/ha)	Signify.
Medi	3316	2844	2727	2962	100	-	-
De Voivodina	2805	2420	1652	2292	77	-670	0
De Turcia	2265	1730	1280	1758	59	-1204	000

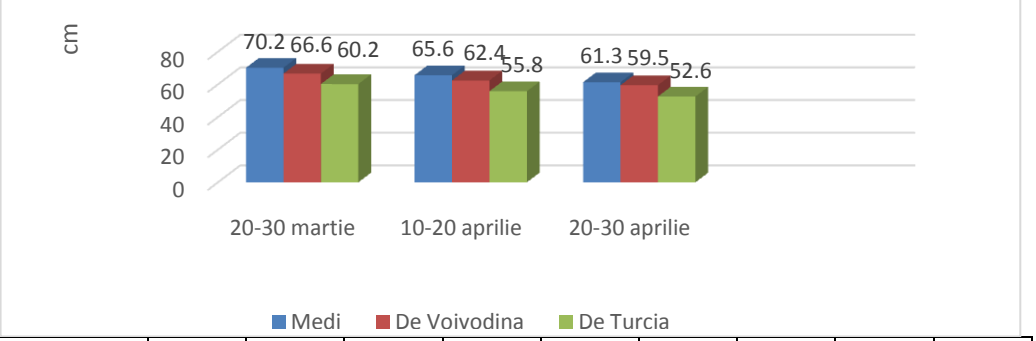
DL5%= 493 kg/ha
DL1%= 716 kg/ha
DL 0,1%= 880 kg/ha

Averages of factor B

Specification	20-30 March	10-20 April	20-30 April
Yield (kg/ha)	2795	2331	1886
%	100	80	67
Difference (kg/ha)	-	-464	-909
Significance	-	00	000

DL5%= 312 kg/ha
DL1%= 381 kg/ha
DL0,1%= 505 kg/ha

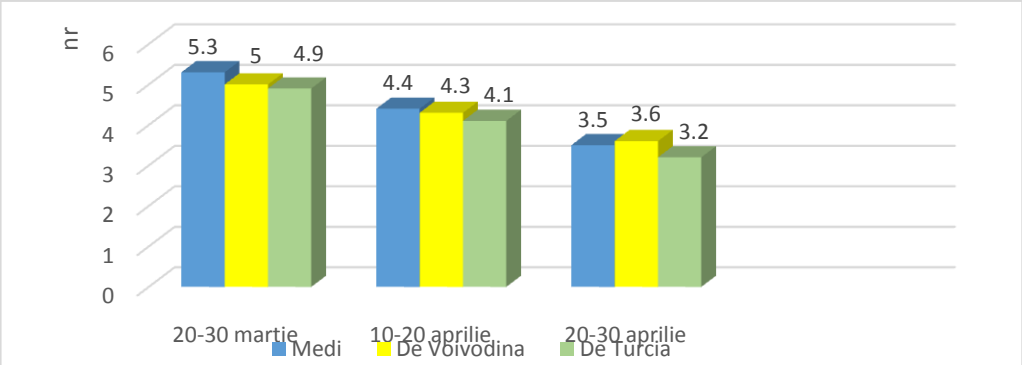
Yield results point out the superiority of Medi variety on which the yield average over the three sowing period tested was at 2962 kg / ha. On the second place was genotype De Voivodina with an average yield of 2292 kg/ha and on the last place was genotype De Turcia with a yield average of just 1758 kg/ha. Analyzing the influence of sowing period on yield, all results point out the necessity of an early sowing when temperature at the level of sowing depth is at 4° C. This argument is sustained by the fact that the plots sowed on the last decade of March has an yields increased with 20 % than those from the plot sown on the second decade of April and with 33 % higher yield than plot sown on the last decade of April. From statistic point of view the yield difference of 464 kg/ha is placed at a distinct significant difference to witness and 909 kg /ha is placed at a very significant difference on witness. During plants growing season there was carried out some biometric measurements concerning plants height, the number of flowers and the number of pods / plant. In figure 1 there are presented the evolution of plants height.



Plants height	70,2	65,6	61,3	66,6	62,4	59,5	60,2	55,8	52,6
Sowing period	20-30 March	10-20 April	20-30 April	20-30 March	10-20 April	20-30 April	20-30 March	10-20 April	20-30 April
Genotype	Medi			De Voivodina			De Turcia		
X	65,7			62,8			56,2		
%	100			95			85		

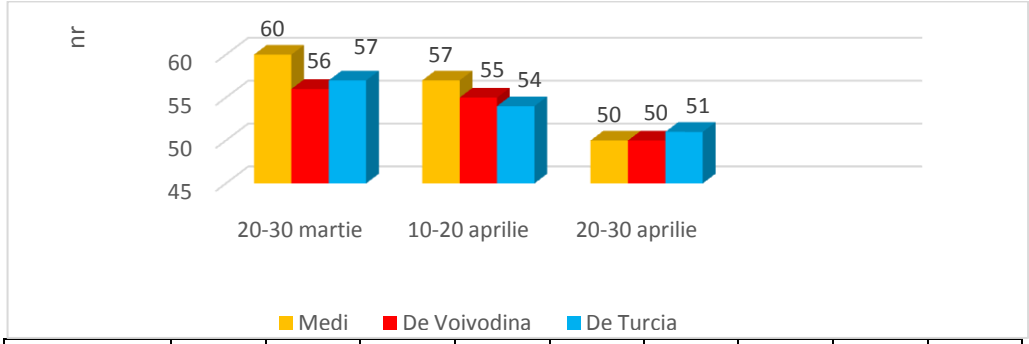
Figure 1.Plants height (cm) evolution depending on genotype and sowing period

Results point out that on all three genotypes the higher plants was obtained in the trials sown earlier, on the last decade of March. From the tested genotypes the highest plants was on variety Medi. On figure 2 are presented results concerning the evolution of plants branching degree. On this plants characteristic it was found an obvious plants tendency to reduce the branch number is direct dependent on sowing delay for all three genotypes tested. On the figure 3 are presented results concerning the number of flowers / plant depending on genotype and sowing period.



Number of branches	5,3	4,4	3,5	5,0	4,3	3,6	4,9	4,1	3,2
Sowing period	20-30 March	10-20 April	20-30 April	20-30 March	10-20 April	20-30 April	20-30 March	10-20 April	20-30 April
Genotype	Medi			De Voivodina			De Turcia		
X	4,4			4,3			4,0		
%	100			98			91		

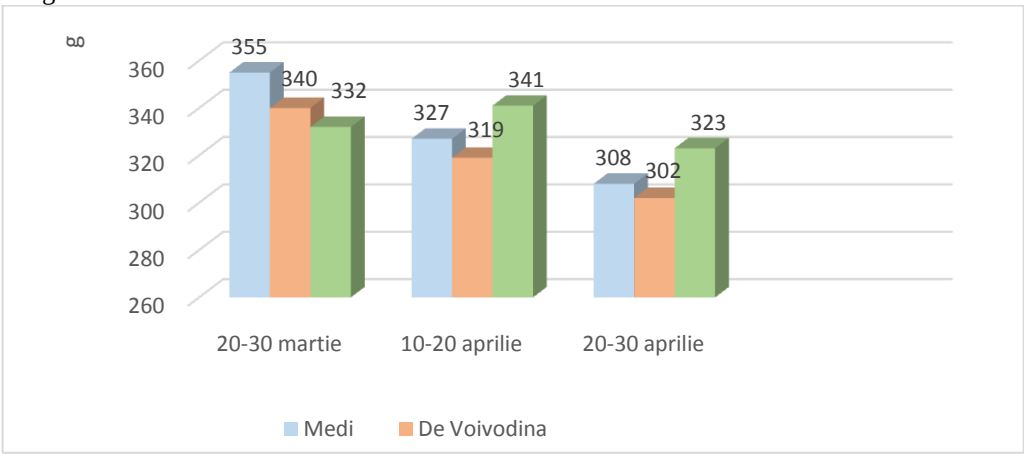
Figure 2. Evolution of plants branch number depending on genotype and sowing period.



Number of flowers / plant	60	57	50	56	55	50	57	54	51
Sowing period	20-30 March	10-20 April	20-30 April	20-30 March	10-20 April	20-30 April	20-30 March	10-20 April	20-30 April
Genotype	Medi			De Voivodina			De Turcia		
X	55,6			53,6			54,0		
%	100			96			97		

Figure 3. Evolution of flowers number / plant depending on plants genotype and sowing period.

In figure 4 there are data concerning the evolution of pods number / plant depending on genotype and sowing period. After the abortion of a large number of flowers, the pods number was reduced on all genotypes. The highest number of pods on all genotypes was at experimental trials sown later, on the last decade of March. The synthesis of results concerning the evolution of the mass of 1000 grains in relation with sowing period on tested genotypes is in figure 5.



MMB g	355	327	308	340	319	302	332	341	323
Sowing period	20-30 March	10-20 April	20-30 April	20-30 March	10-20 April	20-30 April	20-30 March	10-20 April	20-30 April
Genotype	Medi			De Voivodina			De Turcia		
X	330			320			332		
%	100			97			101		

Figure 5. Thousand grains weight (MMB) evolution depending on plants genotype and sowing period.

CONCLUSIONS

The researches during experimental cycle 2012 – 2014 in Gurahonţ Basin on a stagnic luvic soil type point out that white lupins could be considered a valuable plant for areas with comparable soil and whether conditions.

1. Crop yield could be over 3300 kg / ha if it is used variety Medi, sown on the last decade of March with 50 cm between rows and with 50 grains / m^2 and with a fertilizers background of $P_{60}K_{60}$, This means that this crop is economic ensured both by yield level and by protein quantity obtained per cultivated hectare and also by the nitrogen quantity which remain in soil after harvesting.
2. Between tested genotypes, variety Medi which is created at SCDA Livada, on Satu Mare county, the yield average over all tested sowing periods exceeded the yield of genotype De Voivodina (from Serbia) with 23 % and exceeded the yield of genotype De Turcia(from Turkey) with 41 %.
3. Sowing earlier, on the last decade of March, ensure higher yields, an average of tested genotypes with 20 % higher than sowing on the second decade of April and with 33 % higher than sowing on the last decade of April.
4. Plants height has an average over 60 cm at variety Medi and genotype De Voivodina and a height of 50 - 60 cm on genotype De Turcia.
5. Branching degree over all the research variants was between 4 and 5, the flower number / plants was between 50 to 60 and the number of pods / plant was between 7 and 9.
6. Thousand grains weight(MMB) has a variation between 302 g and 355 g. On all genotypes, the highest values were recorded at variant sown on the last decade of March, at it was by 335 g at variety Medi, 340 g at genotype De Voivodina and by 332 at genotype De Turcia.

BIBLIOGRAPHY

1. BĂRBULESCU AL., POPOV MATEIAŞ M.C, 2002 – Bolile şi dăunătorii culturilor de câmp Bucureşti, Ed. Cereş
2. BÎLTEANU GH., 1998 – Fitotehnie. Bucureşti, Ed. Cereş vol I
3. BĂRBUTIU A. LEONTINA, 2011 – Contribuţii la tehnologia de cultivare a lupinului în condiţiile pedoclimatice din partea de Vest a ţării. Teza de doctorat USAMVB Timişoara.
4. BORCEAN I., BORCEAN A., 2003 – Cultura şi protecţia plantelor leguminoase cultivate pentru boabe; Timişoara, Ed de vest
5. DAVID GH., PÎRŞAN P., IMBREA FL., 2006 Tehnologia plantelor de câmp , cereale, leguminoase pentru boabe şi plante tehnice, Timişoara Ed. Eurobit, 2006
6. MUNTEAN L.S., BORCEAN I., AXINTE M., ROMAN GH., 2003 Fitotehnie. Iaşi Ed. Ion Ionescu de la Brad
7. WHITE P. F., ROBSON A.D., 1989 – Effects of soil pH and texture on the grow and nodulation of lupins. Anst – J – Agric – Res. Melborne, V.40 (1)