

## RESEARCH ON THE PRODUCTION CAPACITY OF SOME DIOECIOUS VARIETIES UNDER THE CONDITIONS OF THE AGRICULTURAL RESEARCH AND DEVELOPMENT RESORT LOVRIN IN THE YEARS 2014-2016

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**Abstract.** *Worldwide hemp is present in very many products, besides fibres hemp flour is rich in protein with essential acids and contains exceptional oil with the most balanced ratio between omega 3 and omega 6(1:3 ratio) found in nature. Until 1990 worldwide the hemp crop occupied cca. 337.000 ha of which cca 40.000 ha in Romania fibre hemp and 9.000 ha seed hemp. Today there in our country there are under 1000 ha. Research on hemp breeding at SCDA Lovrin began in 1962-1964. From the beginning, the main objective was to obtain dioecious varieties suitable for fibre production, an important part of the hemp crop from an economic standpoint. The first variety of Lovrin 110 dioecious hemp was certified in 1981, and was one of Europe's finest dioecious hemp varieties. Two more varieties of hemp followed: Silvana and Armanca. Silvana variety in quantitative and qualitative terms is currently considered as the standard for hemp in the EU. The research has been aimed at demonstrating the potential of stem production, fibre content, fibre production and seed production. The main objective of the paper is: The production potential of certified and cultivated dioecious hemp varieties and some cultivars that serve the breeding process as the initial material.*

**Keywords:** *dioic hemp, seed production, variety.*

### INTRODUCTION

From the beginning, the main objective was to obtain dioecious varieties for fibre production, an important part of the hemp from an economic point of view. The first variety of Lovrin 110 dioecious hemp was approved 1981, and was one of Europe's finest dioecious hemp varieties.

Hempseed belonging to the five Romanian varieties are rich source of nutrients (Ca, Mg, K) and unsaturated oil easily digestible by the body, but the presence of Cd concentrations above the upper limit puts a question mark over the use of seeds in various food products. Hemp extracts easily certain metals from the soil. Significant amounts of Fe (1133–2400 mg.kg<sup>-1</sup>), Mn (63–110 mg.kg<sup>-1</sup>), Zn (42–94 mg.kg<sup>-1</sup>) and Cd (1.3-4.0 mg.kg<sup>-1</sup>) are found in hemp seeds. Hemp (*Cannabis sativa* L.) is included among plants suitable for phytoremediation of soil contaminated with cadmium, zinc and iron (Mihoc M. 2012).

The average seed production obtained from the experiments conducted in the 2011-2013 years is 640 kg / ha, ranging from 547 to 727 kg / ha.

The production capacity of hemp is heavily influenced by climatic conditions, with average seed production varying from one year to the next. The canopy has a good tolerance to drought and a good adaptability to hydric stress conditions. (Mihoc M. 2013)

Two more varieties of hemp followed: Silvana and Armanca. Silvana variety in quantitative and qualitative terms is currently considered as the standard for hemp in the EU. The research has been aimed at demonstrating the potential of stem production, fibre content, fiber production and seed production. The production potential of approved and cultivated dioecious hemp varieties and cultivation that serve the breeding process as the initial material.

### MATERIAL AND METHODS

The research material consisted of the three varieties homologated at SCDA Lovrin: Lv 110, Silvana, Armanca and seven other varieties and varieties of various origins (Bulgaria, Ukraine, Hungary, etc.).

Research Method:

The experience was placed in the field by randomized block method in three repetitions. The technology applied was that specific to hemp fibre culture.

Harvesting took place at the time of technical maturity (the mastic plants ended up blooming, the stem colour was greenish-yellow).

The fibre content was determined in the laboratory by the modified Bredemman method. The calculation and interpretation of the experimental results was made by the variant analysis method (N.Săulescu, 1959; N.A., Săulescu and N.N., Săulescu 1967).

The number of variants in the experimental cycle (2014-2016) was variable, which required the analysis of variants in cycles of two and three years.

### RESULTS AND DISCUSSIONS

Considering that in the experimental cycle 2014-2016 the number of variants was variable, six variants covered the experimental cycle 2014-2016, seven variants 2014-2015, and seven variants in the years 2015-2016, we analysed the results obtained of each. The experimental cycle in part for the number of experimental variants that partially or completely covered the experimental cycle.

Results obtained in 2014-2016.

Table 1 summarizes the experimental results obtained in the bifactorial experience 2014-2015 in which seven hemp varieties were studied.

Table 1

Synthesis of strain yields on seven varieties of dioecious hemp under the conditions of SCDA Lovrin in the years 2014-2015

Varyety B Year A	b1	b2	b3	b4	b5	b6	b7	Average /Yield Kg/ha	% Vs. control	Dif. +/- Kg/ha	Semnific.
	Lovrin 110	Silvana	Armanca	Silistra	Carmagnola	Hungary 139	Zakarparie 127				
2014 – a1	376,0	300,3	274,0	305,3	397,0	347,3	394,3	342	100	Mt.	
2015- a2	227,3	206,7	264,3	267,3	251,3	222,3	209,0	235	69	-133	

#### Factor B averages

Average /Yield Kg/ha	301,7	253,5	269,2	286,3	324,2	284,8	301,7
% vs. control	100	84,0	89,3	95,0	108,0	94,0	100
Dif. +/- Kg/ha	Mt.	-48,2	-32,5	-15,3	22,5	-16,8	-0,0
Semnification	-	-	-	-	-	-	-

DL5% - 80,3 kg/ha;  
DL1% - 185,2kg/ha;  
DL0,1% - 589,7 kg/ha

DL5% - 53,6 kg/ha; DL1% - 72,7kg/ha; DL0,1% - 97,4kg/ha

Because of different climatic conditions, the production potential of the varieties studied was lower.

Table 1 presents the synthesis of seed yields for seven hemp varieties obtained at SCDA Lovrin during 2014-2015.

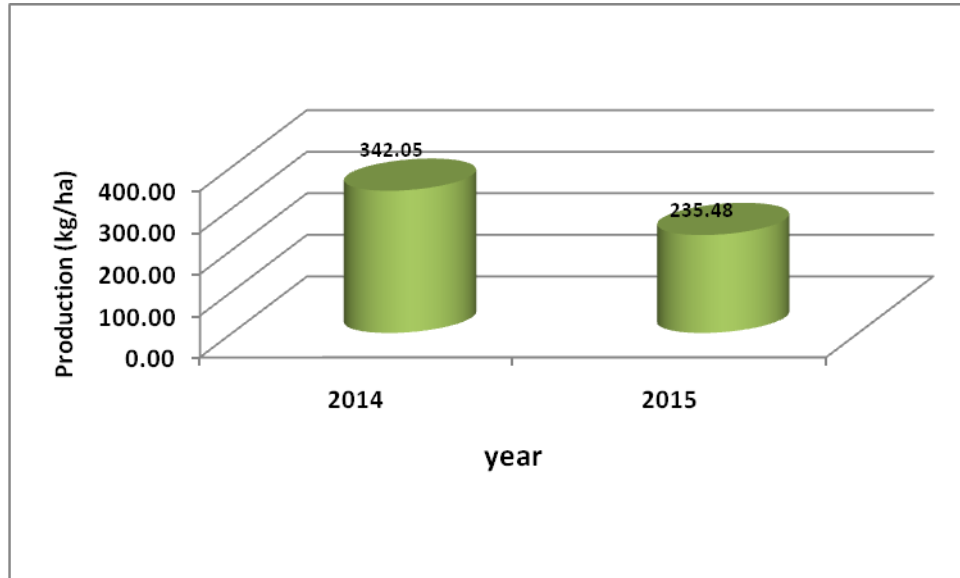


Fig.1 Seed Hemp yield in 2014 and 2015

The analysis of the results shows that:

The level of seed production in the seven hemp varieties in the two experimental years is different in the sense that in 2015 (235,48 kg/ha) the average seed yield is higher than in 2014 (342,05 kg/ha) by 106.56 kg/ha (Fig.1) the difference being statistically ensured distinctly significant. As for the varieties in the analysis of the results it is found that in the vast majority of them (5 out of 6) they yielded a seed production below that of the control variety.

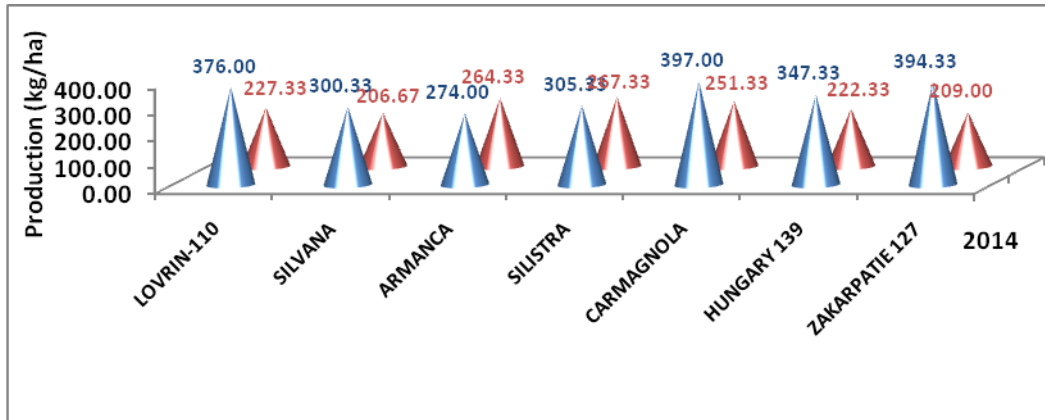


Fig.2 Seed Hemp yield in 2014

One Carmagnola variety records an average seed yield of two years over the control variety Lv 110.

Both the differences in production yields of the Carmagnola variety are not statistically assured (Fig. 2).

The results of average seed yield for seven varieties of hemp are shown in Table 2.

Table 2

The synthesis of the dioecious hemp production under the conditions obtained at SCDA Lovrin in the years 2015-2016 results of average seed yields for seven varieties of hemp

Variety B Year A	b1	b2	b3	b4	b5	b6	b7	Average yield Kg/ha	% vs. control	Dif. +/- Kg/ha	Semnification
	Lovrin 110	Silvana	Armanca	Silistra	Carmagnola	Hungary 139	Zakarparie 127				
2015 - a1	227,33	206,67	264,33	267,33	251,33	222,33	219,67	237,00	100	Mt.	
2016 - a2	603,67	787,00	934,33	632,33	688,00	717,33	734,00	728,10	307	170,10	x

Factor B averages

Average yield Kg/ha	415,5	496,8	599,3	449,8	469,7	469,8	476,8
% vs. control	100	120	144	108	113	106	115
Dif. +/- Kg/ha	Mt.	81,30	183,80	34,3	54,2	54,3	61,3
Semnification	-	xx	xxx				x

DL5% - 75,5 kg/ha;  
DL1% - 174,1 kg/ha;  
DL0,1% - 554,2 kg/ha

DL5% - 55,7 kg/ha; DL1% - 75,4 kg/ha; DL0,1% - 101,0 kg/ha

Analysis of the results obtained in seven varieties of dioecious hemp at SCDA Lovrin in the years 2015 and 2016 in Figure 3, highlights the fact that 2016 provided more favourable climatic conditions for the seed production of the seven varieties studied, which are typical for the production of strains and fibre.

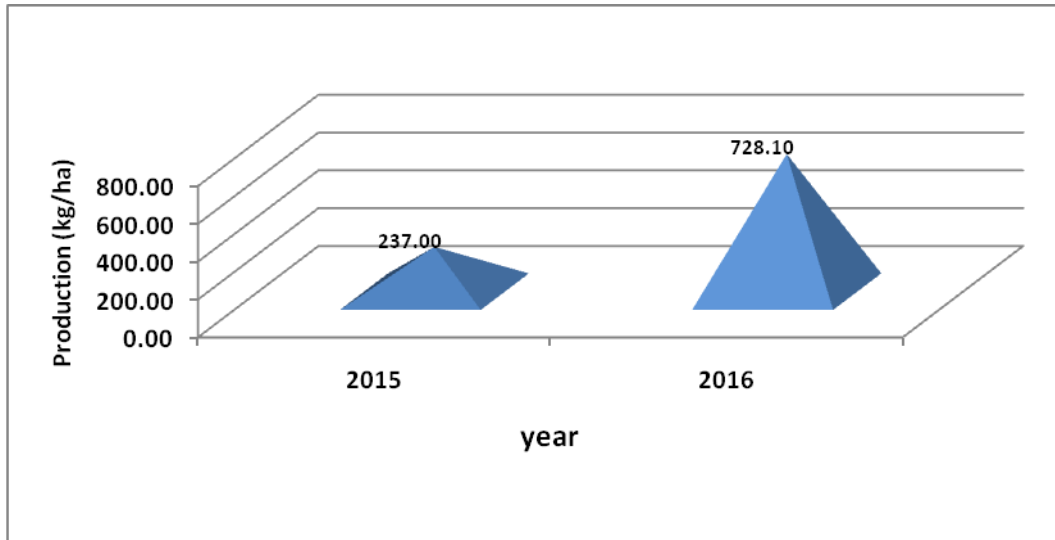


Fig. 3: Seed Hemp yield in 2015 and 2016

The seed production gain in 2016 is 170.10 kg / ha and is statistically significant.

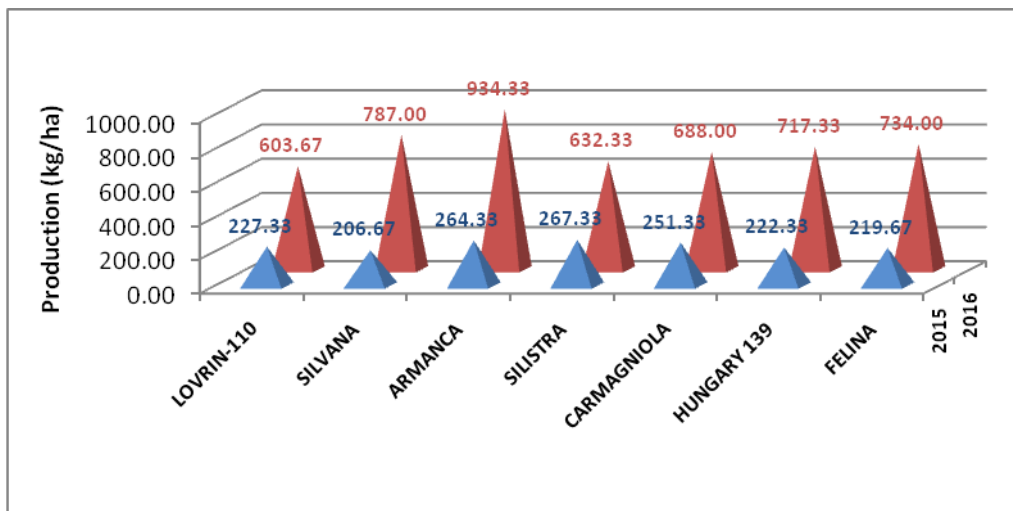


Fig. 4: Seed Hemp yield in 2015 and 2016

The analysis of average seed yields obtained at the seven hemp lines between 2015 and 2016 at SCDA Lovrin highlights a few things:

1. High potential of varieties studied to produce and seed when favorable conditions exist.
2. The varieties studied in their unanimity are superior to the potential to produce seed of the control varieties Lovrin 110.
3. The best seed yield results in Armanca varieties with an increase of 183,30 kg / ha is statistically ensured as very significant in the Silvana variety, the production increase to Lovrin 110 is 81,30 kg / ha is Statistically ensured as distinctly significant. In Felina variety, introduced in comparative culture in 2015 seed production is 476.8kg / ha with 61.3kg / ha

higher than that achieved with the witness variety Lovrin 110, the production increase is statistically significant.

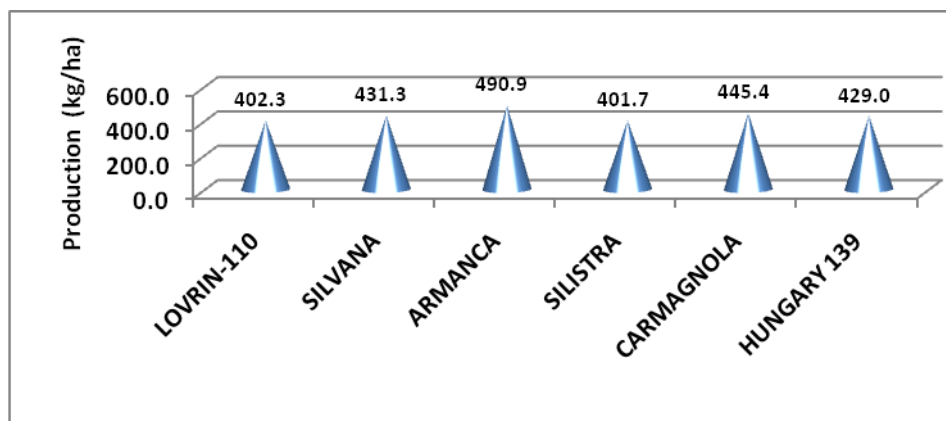


Fig. 5: The production of hemp obtained in the 6 media varieties of three years (2015-2016)

Synthesis of seed production on six varieties of hemp dioecious in the experimental period 2014-2016, under the conditions of SCDA Lovrin is shown in Table 3, with the yield difference of 393.78 kg / ha being statistically ensured as very significant.

Table 3

Synthesis of seed yields on several varieties of dioecious hemp under the conditions of SCDA Lovrin in the years 2014-2016

Variety B Year A	b1	b2	b3	b4	b5	b6	Average Yield Kg/ha	% Vs. control	Dif. +/- Kg/ha	Semnific
	Lovrin 110	Silvana	Armanca	Silistra	Carmagnola	Felina				
2014 – a1	376,0	300,3	274,0	305,3	397,0	347,3	333,33	100	Mt.	
2015 – a2	227,3	206,7	264,3	267,3	251,3	222,3	239,89	72	-93,94	00
2016- a3	603,7	787,0	934,3	632,3	688,0	717,3	727,12	218	393,78	xxx

Factor B averages

Average Yield Kg/ha	402,3	431,3	490,9	401,7	445,4	429,0
% Vs.control	100	107	122	100	111	107
Dif.+/- Kg/ha	Mt.	29	88,6	-0,5	43,1	26,7
Semnification	-		x			

DL5% - 47,1 kg/ha;  
DL1% - 78,1 kg/ha;  
DL0,1% - 146,1 kg/ha

DL5% - 44,2 kg/ha; DL1% - 103,3 kg/ha; DL0,1% - 136,6 kg/ha

The analysis of the seed yields of six varieties of dioecious hemp under the conditions of SCDA Lovrin highlights firstly that the climatic conditions of the year greatly influence the

seed production, leading to small yields in 2014, when we registered 333,3 kg/ha, in 2015 it dropped to 239,9 kg/ha and the highest yield of 727,9 kg/ha was obtained in 2016 (Fig. 5).

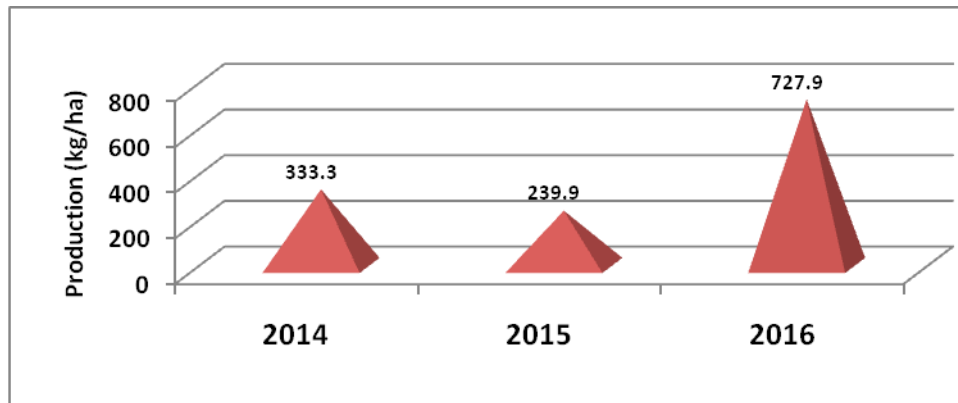


Fig. 6. The production of hemp in the three years (2014-2016)

From the data presented in Table 4 results that the lowest seed yields are obtained in 2015 - 239,89 kg/ha, when the difference from the average production of the variety Lovrin 110 - 333,33 kg/ha, of 98,94 kg / ha, is statistically ensured as distinctly significant.

The analysis of average seed yields from the crops studied shows that they range between 206,7 and 934,3 kg/ha.

In 2014, the dioecious hemp strain Carmagnola resulted in a seed quantity of 397,0 kg/ha, a value close to 376,0 kg/ha, only 12 kg/ha more than the control dioecious strain Lovrin 110, in the experimental conditions of SCDA Lovrin.

From the analysis of the results obtained in 2015, it is clear that the Silistra hemp variety ensures a statistically significant increase of the seed production of 17.6%, followed with a small difference by the Armanca variety of 16.3%.

From the favorability point of view of the experimental years, we can state that in 2016 the highest productions were obtained and that the obtained productions exceeded the control variety.

In terms of variety, the Armanca dioecious hemp is assured very significant statistically, with a production difference of 330,7 kg/ha. There is also a very good production capacity of the Silvana dioecious hemp strain of 183,3 kg/ha. Both varieties produce the largest yield, exceeding by 30,4% and 54,8%, respectively, the control variety.

Table 4: Production differences and their significance to the witness Lovrin-110 the average of the 6 varieties

Interaction factor A x B		Production		Difference kg	Meaning
		kg/ha	%		
a1-2014	<b>b1-LOVRIN-110</b>	<b>376.0</b>	<b>100</b>	<b>mt</b>	
	b2-SILVANA	300.3	79.9	-75.7	
	b3-ARMANCA	274.0	72.9	-102.0	0
	b4-SILISTRA	305.3	81.2	-70.7	
	b5-CARMAGNOLA	397.0	105.6	21.0	
	b6-HUNGARY 139	347.3	92.4	-28.7	
a2 - 2015	<b>b1-LOVRIN-110</b>	<b>227.3</b>		<b>100</b>	<b>mt</b>

	b2-SILVANA	206.7		90.9	-20.7	
	b3-ARMANCA	264.3		116.3	37.0	
	b4-SILISTRA	267.3		117.6	40.0	
	b5-CARMAGNOLA	251.3		110.6	24.0	
	b6-HUNGARY 139	222.3		97.8	-5.0	
a3 - 2016	<b>b1-LOVRIN-110</b>	<b>603.7</b>		<b>100</b>	<b>mt</b>	
	b2-SILVANA	787.0		130.4	183.3	***
	b3-ARMANCA	934.3		154.8	330.7	***
	b4-SILISTRA	632.3		104.7	28.7	
	b5-CARMAGNOLA	688.0		114.0	84.3	*
	b6-HUNGARY 139	717.3		118.8	113.7	**

DL 5% = 76.5 kg/ha ; DL 1% = 103. ; DL 0.1% = 136.6

In 2016 climatic conditions were more favourable to the hemp generative phase, the female plants having more favourable conditions of fructification, in 2016 the average seed production in the six varieties is 727.9 kg / ha, which represents an increase compared to 218% control spores, the increase of 393.78 kg / ha is statistically assured as very significant.

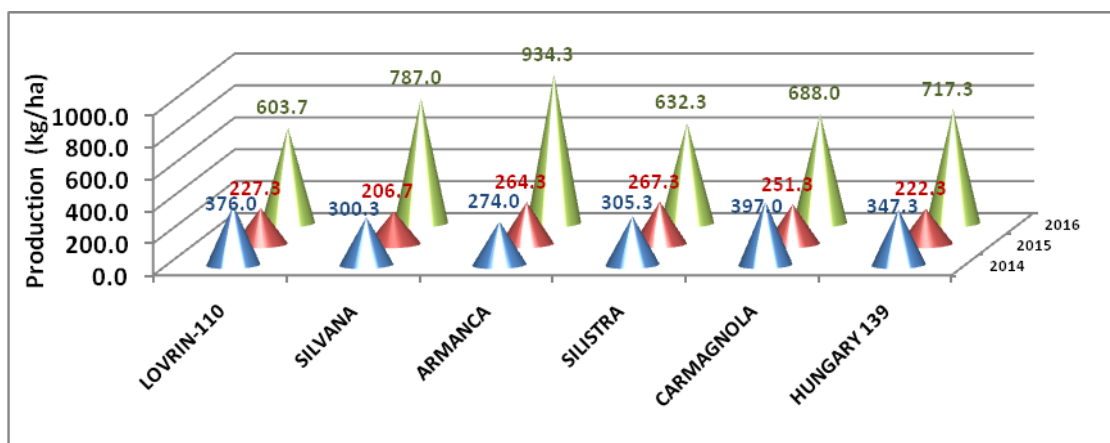


Fig. 7. The production of hemp in the three years (2014-2016)

## CONCLUSIONS

The results regarding the production of seeds in several varieties of dioecious hemp obtained at SCDA Lovrin during the period 2014-2016 allow us to draw some conclusions:

1. From a climatic point of view, the years have been very different between them;
2. Seed production of dioecious varieties specific to strain and fibre production is strongly influenced by the environmental conditions of the weather conditions;
3. The environmental conditions unfavourable to the crop year block the expression of the production potential of the varieties by levelling the yields;
4. The dioecious hemp varieties specific to the production of strains and fibers under favorable conditions express a good seed production potential;
5. In the pedo-climatic conditions of ARADS Lovrin dioecious hemp varieties with good seed production potential are: Armanca - 490.9kg / ha, three years average and 934.3kg / ha average 2016. Silvana 431.3kg / ha average for three years and 787, 0kg / ha, average 2016.



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