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RESEARCH REGARDING OILSEEDS CROPS SPECIES GROWING IN ECOLOGIC AGRICULTURE PRODUCTION SYSTEM, IN NORTH DOBRUDJA

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Abstract

The importance of this academic paper comes from the present role of ecologic agriculture and from its perspectives on a global, european and national basis, on the grounds of protecting the environment and the biodiversity of natural ecosystems. The present project aims to study the spreading possibilities of oilseeds crops a species like Helianthus annuus L., Brassica napus L. ssp. oleifera Metzg, Glycine max L. Merr., Carthamus tinctorius L., Camelina sativa L. Crantz, Lallemantia iberica,. The main goal of the research carried out in the South-East region of Romania, in North Dobrudja, Tulcea County, it was to study the behaviour of these oilseeds crops, the existent damaging organisms (weeds, diseases and pests) and the ways for fully control them. During the research, experimental research has been made in field conditions in order to study the biology and ecology of the crops, pointing out their role in the ecologic agriculture production system. Furthermore, there has been made laboratory analysis regarding the seeds chemical composition, the seeds harvest and quality, in order to obtain high quality ecological products.

Key words: *ecologic agriculture, oilseeds crops, crop biodiversity, North Dobrudja.*

INTRODUCERE

Ecologic agriculture represents a relatively new sector, but it has a wide perspective in Romania. Our country has proper conditions in order to develop ecologic agriculture, including fertile and productive soils and a reduced level of pollution in comparison with the developed countries, which have a high degree of urbanisation and industrialisation and which use super intensive technologies, based mainly on chemical fertilizers and synthesis pesticides.
In the last 10 years, the ecologically cropped Romanian territory has grown more than ten times, from 17,438 ha in 2000 to almost 200,000 ha in 2010. In Romania, ecological crops are mainly represented by forage crops and pastures, cereals, oilseeds crops and grain legumes, plus, fruits, mushrooms, medicinal and aromatic plants harvested from the wild flora.
From the ecologic crops, the industrial crops group includes crops that supply raw materials oriented towards industrialization in order to produce food (oils, proteins, sugar, and starch) and other non-food products.
For Romanian agriculture and economy, the most important industrial crops are sunflower, soybean, rapeseed, potato and sugar beet.
It must be pointed out that ecological agriculture is not a "simplistic" type of agriculture, a come back to the "traditional agriculture", nor is it similar to "poverty agriculture". On the contrary, it is based on strict and rigorous rules and principles, in accordance with national and internationals guides and standards.
Ecologic agriculture is based on a series of principles and ideas like: conservation of natural systems of cyclical transformation, use of renewable resources in the production and processing systems, protection of vegetal habitats and of wild animals, increase of biodiversity, rational use of water, and support of creating a socially integrated cropping system which is protects the environment.
Carthamus tinctorius L. is cropped for this achenes rich in oil (37-42%) semisiccative, iodine index of 140-152. The oil is high-quality and dietetic, having a high content of linoleic acid (74%), oleic acid (21%) and saturated acids (3%).

In our country, safflower can be extended on less rich soils from the droughty regions, where it can have better crops than the sunflower.

Figure 1. Aspect from *safflower* experiment (Topolog Experimental Field, 2010)

From an economic point of view, *Camelina sativa* L. Crantz is important because it is used in human nutrition due to the potential of its oil. Camelina was traditionally grown as an oleaginous crop aiming to produce vegetable oil.

The interest in this plant is increased in some areas because the cold, dry and high altitude clime limits the growth capacity for a wide variety of crops. According to Zohary and Hopf, *Camelina sativa* L. Crantz was an important crop for oil in Eastern and Central Europe until 1940 and, at present, it continues to be cultivated in some parts of Europe for its seeds, which are used in oil extraction and it was used in petrol lamps (until the modern spread of natural gas, propane, and electrical energy) and as an eatable oil, as well. Recent studies showed that the natural oil made of Camelina seeds contains an excellent balance of fatty acid, who are not present in any other oleaginous crops (for instance omega-3 and essential fatty acids), and a high level of tocopherols, with a unique stability to oxidation.

The main components are alpha-linolenic acid - (omega-3 fatty acid about 35-45%) and linoleic acid - (omega-6 fatty acid about 15-20%).

The oil is also rich in natural oxidants like tocopherols, making this oil very stable and resistant to oxidation and to growing rancid. It contains 3% erucic acid.

The oil has an almond flavour and it can become an important and famous alimentary oil in the future.

Figure 2. Aspect from *camelina* experiment (Topolog Experimental Field, 2010)

Lallemantia iberica, its eatable parts are the leafs and the seeds.

The leafs are used for tea. The seeds are rich in lipids and eatable oil is made of them. After having been dried out, the seeds contain 30% oil. The oil is used for lighting, for paint and as grease.

Figure 3. Aspect from *lallemantia* experiment (Topolog Experimental Field, 2010)

Lallemantia may be a replacement of flax oil and it has the same purposes.

The oil has a wide range of purposes: it is the basic ingredient of paint, it is used in wood conservation, in furniture furbishing products, in printing inks, in the production of soap and also in the production of linoleum.

It is cropped for the seeds from which oil is extracted. The oil can also be used in food products and as a tanning agent.

Glycine max L. Merr., soybean oil is used in alimentation, in the process of obtaining margarine, in plastic production, in linoleum

production. Soybean is also characterized by a high lipid content, which is regularly between 13-27%.

In their chemical composition, there are palmitina, stearin, olein, linoleina, fitosterina, cholesterin and lecithin. The lecithin content of the beans is 2-4%. Semisiccative oil with iodine index 107-139, solidifies at -8…-16°C. In the global oil production, soybean has the first place with about 30%, being followed by sunflower, with about 15%.

In Romania, the first attempts to introduce soybean crops, dating from 1911-1913, have failed due to the lateness varieties tested.

Helianthus annuus L.is the most important oil crop in Romania and one of the most important oil plants at a global level.

In Romania, sunflower represented in 2010 78% of oil production, having the first place and being followed by rapeseed with 11.4% and soybean with 10.3%.

Figure 4. Aspect from *sunflower* experiment (Topolog Experimental Field, 2010)

Sunflower oil is considered to be a valuable eatable oil due to its high level of linoleic acid and oleic acid (unsaturated fatty acids), which represent together 85-90% of fatty acids composition. It can be added the low content of saturated fat and cholesterol, as well as a high content of vitamins (E, B_5, B_3, B_1, K, D, A) and the lack of toxic or anti-nutritional substances. *Brassica napus* L. ssp. *oleifera* Metzg has now an extremely important place in world economy, as a source of vegetable oil. The seeds contain 42-48% oil used in alimentation, in the production of margarine, as well as in industry. Lately, the rape oil has a greater percent in human nutrition or in biodiesel processing industry. Rape seeds have a high lipids content of 37.2-49.6%. In the chemical composition of rape oil, for the traditional oils, there is a high proportion of erucic acid and eicosenoic acid.

MATERIALS AND METHODS

The main goal of the research was the study of biology, ecology and productivity of some oleaginous species in order to find their adaptability to the pedoclimatic conditions from the Kastanozion soil region from North-West part of Tulcea County and to crop them in the ecologic agriculture system.

During these experiences, an observation programme has been developed, as well as measurements regarding: morphological and biological particularities of the studied species, productivity elements and the seed production, chemical composition and harvest quality.

The field research has been done on the Didactic Field of Agricultural School Group Topolog, which is situated at 60 km from Tulcea City, in the region of Kastanoziom soil from the North West past of Tulcea County, North Dobrogea, during 2009-2011. In the field research, there has been made an experiment with some oleaginous species. It was a monofactorial experience, being made by multiple-stage blocs method.

The tested biologic material:

- Safflower (*Carthamus tinctorius* L.), variety CW 1221 (NARDI-Fundulea); varieties 2106, 354 and 351 (SAATEN UNION).
- Camelina (*Camelina sativa* L. Crantz), varieties: Camelumba, Lindo, Calena (from NARDI-Fundulea).
- Soybean (*Glycine max L. Merr*), variety Columna (NARDI-Fundulea).
- Lalemanţia *(Lallemantia iberica),* local variety (Department of Field Crop Production, University of Agronomic Sciences and Veterinary Medicine of Bucharest).
- Sunflower *(Helianthus annuus* L.*),* hybrids: Arena, Flux MS SIRENA
- 9AG1811 (AGRICOVER); hybrids: MAS 92 B, MAS 94 C, MAS 96 A
- (MAISADOUR SEMINCES, Mont-de-Marsan).
- Rapeseed *(Brassica napus* L. ssp. Oleifera Metzg*),* variety Heros (SAATEN UNION).

Protective tape sunflower																
Repetition 1																
S. t. sunf	V_1	V_2	V_3	V_4	V_5	V_6	V_7	V_8	V_9	V_{10}	V_{11}	V_{12}	V_{13}	V_{14}	V_{15}	S. t. sunf
Repetition 2																
S. t. sunf	V_6	V_7	V_8	V_9	V_{10}	V_{11}	V_{12}	V_{13}	V_{14}	V_{15}	V_1	V_2	V_3	V_4	V_5	S. t. sunf
Repetition 3																
S. t. sunf	V_{12}	V_{13}	V_{14}	V_{15}	V_1	V_2	V_3	V_4	V_5	V_6	V_7	V_8	V_9	V_{10}	V_{11}	S. t. sunf
Protective tape sunflower																

Figure 5. Experimental scheme of oilseed crops
(Topolog Experimental Field, 2010-2011)

RESULTS AND DISCUSSIONS

Table 1. Experimental results concerning oilseed crops productions in 2010

Nr. crt.	Variety / hybrid	Production		Diff. limit
		kg/ha	%	
1.	**Arena**	2467	100	Control
	Flux	2311	93.67	-156
	MAS 92B	1480	59.99	-987
	MAS 94C	2623	106.32	156
	MAS 96A	2033	82.40	-434
2.	**Heros**	1638	66.39	-829
3.	**Lalemantia**	1268	51.39	-1199
4.	**Columna**	2458	99.63	-9
5.	**Calena**	1208	48.96	-1259
	Camelumba	1516	61.45	-951
	Lindo	1362	55.20	-1105
6.	**CW 1221**	2304	93.39	-163
	345	2105	85.32	-362
	2106	1936	78.47	-531
	351	1906	77.38	-558

Table 1 shows the seed production of oil crops in 2010, in kg/ha. From this table, it may be concluded that the maximum production of the sunflower crop was registered at MAS 94 C hybrid, being 2623 kg/ha, and the minimum production at MAS 92 B hybrid, of 1480 kg/ha. At the camelina crop, the maximum production was 1516 kg/ha at Camelumba variety and the minimum was 1208 kg/ha at Calena variety. For safflower crop maximum was 2304 kg/ha, at CW 1221 variety and the minimum was 1906 kg/ha at variety 351.

From Figure 6, it turns out that the maximum productions were registered in sunflower hybrids (Arena, Flux, MAS 94 C), soybean (Columna), and safflower (CW 1221). The medium productions were in sunflower hybrids (MAS 96 A), rapeseed (Heros) and safflower (2106, 345 and 351). The minimum productions were in sunflower hybrids (MAS 92 B), lalemantia and camelina (Calena, Camelumba and Lindo).

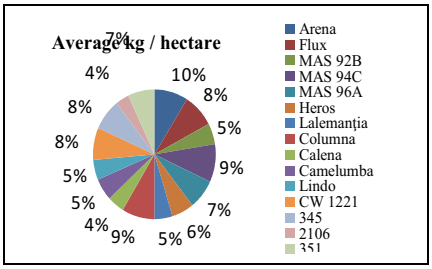

Figure 6. Graphical representation of oils crops seeds production in 2010

Making a comparison between 2010 and 2011, we will notice that the production increased in the majority of crops. In sunflower, the maximum production was at Arena hybrid, being 3165 kg/ha, and the minimum was still at MAS 92 B hybrid, being 2325 kg/ha. Data indicates that camelina crop production decreased to 1412 kg/ha for Camelumba, and to 1108 kg/ha for variety Calena.

Safflower crop production was maximum in variety CW 1221, at 2412 kg/ha and minimum production was recorded at variety 2016, was of 2066 kg/ha.

Figure 7 show that, just like in 2010, the highest production was in sunflower hybrids (Arena, Flux, MAS 94 C) and soybean (Columna). The medium productions were in sunflower hybrids (MAS 92 B and MAS 96 A), in safflower (CW 1221, 2106, 345 and 351) and in rapeseed (Heros). The lowest

productions were in lalemantia and camelina (Calena, Lindo and Camelumba).

Table 2. Experimental results concerning oil crops seeds production in 2011

Nr. crt.	Variety / hybrid	Production		Diff. limit
		kg/ha	%	
1.	**Arena**	3165	100	Control
	Flux	2864	90.48	-301
	MAS 92B	2325	73.45	-840
	MAS 94C	3079	97.28	-86
	MAS 96A	2392	75.57	-773
2.	**Heros**	1881	59.43	-1284
3.	**Lalemantia**	1148	36.27	-2017
4.	**Columna**	2875	90.83	-290
5.	**Calena**	1108	35.00	-2057
	Camelumba	1412	44.61	-1753
	Lindo	1262	39.87	-1903
6.	**CW 1221**	2412	76.20	-753
	345	2264	71.53	-901
	2106	2066	65.27	-1099
	351	2318	73.23	-847

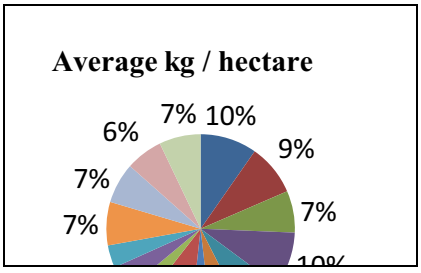

Figure 7. Graphic representation of the seeds productions oil crops in 2011

Table 3. Experimental results concerning seeds oil content

Nr. crt.	Species	Variety / hybrid	Average (% s.u.)
1.	**Sunflower**	**Arena**	50.37
		Flux	46.43
		MAS 92B	51.28
		MAS 94C	45.99
		MAS 96A	46.64
2.	**Rapeseed**	**Heros**	43.43
3.	**Lalemanţia**	**Lalemanţia**	45.58
4.	**Soybean**	**Columna**	30.97
5.	**Camelina**	**Calena**	31.70
		Camelumba	32.06
		Lindo	31.77
6.	**Safflower**	**CW 1221**	28.63
		345	27.77
		2106	27.46
		351	28.01

As far as the oil content of the seeds is concerned, sunflower, lalemantia and rape have the highest percentage, as follows: at sunflower seeds, MAS 92B hybrid has a 51.30% oil content (dry matter), the lalemanţia seeds have a 45.63% oil content (d.m.), and the rape crop seeds from the Heros species have a 43.92% oil content (d.m.).

The lowest oil content was in the seeds of following crops: camelina Camelumba variety (32.09% oil content in d.m.), followed by soybean Columna variety (31.24% oil content in d.m.) and safflower: (27.09% oil content in d.m.).

CONCLUSIONS

The research area is characterized by favourable natural conditions 2011 for oil crops growing.

In the two experimental years, the seeds yields ranged between 1480 and 3079 kg/ha for sunflower, 1638 and 1881 kg/ha for rape, 1148 to 1268 kg/ha for lallemantia, 2458 to 2875 kg/ha for soybean, to 1108 to 1516 kh/ha for camelina and 1906 to 2412 kg/ha for safflower.

Experimental year 2011 was was a favourable agricultural year for tested oil crops, except camelina for which seeds production decreased slightly compared to 2010.

Starting from the fact that vegetable oils have an essential role in human nutrition and an agro-food product dedicated to international trade, it is necessary that agriculture delivers the industry increased quantities of raw materials, provided by a oleaginous plant range as wide as possible.

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