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# RESEARCH REGARDING NUTRITIONAL VALUE OF SOME OILSEEDS CROPS PROMOTED IN ORGANIC AGRICULTURE

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***Abstract***

The paper present the results of the research made in the years 2007-2009 regarding chemical composition and nutritional value of some oilseeds crops promoted in organic agriculture: safflower, camelina, oil pumpkin and oil flax.
The biochemical compounds (glucides, proteins, lipids and minerals) have been analyzed by using the chemistry laboratory methods: for glucides, Bertrand Method; for proteins, Kjeldahl Method; for lipids, Soxhlet Method; for minerals, Spectrophotometer Method.
In average, the chemical composition of these crops cultivated in Moara Domneasca Experimental Field was the following: for safflower – 12.60% proteins, 28.37% lipids, 46.41% glucides, 3.60% minerals, and the energetic value was 505.78 kcal; for camelina – 20.29% proteins, 31.68% lipids, 36.28% glucides, 4.29% minerals, while the energetic value was 526.63 kcal; for oil pumpkin – 29.50% proteins, 36.92% lipids, 18.50% glucides, 5.41% minerals, and the energetic value was 540.15 kcal; for oil flax - 22.56% proteins, 34.10% lipids, 27.73% glucides, 5.25% minerals, while the energetic value was 558.45 kcal.
The study of the nutritional value of these oilseeds crops in organic agriculture conditions evidenced the very special role which should they occupy in the development of biodiversity, environmental protection and diversification of food.

***Key words****: oilseeds crops, chemical composition, nutritional value.*

## INTRODUCTION

Oil crops include both annual (usually called oilseeds) and perennial plants, whose seeds, fruits or mesocarp and nuts are valued mainly for the edible or industrial oils that are extracted from them (www.fao.org.).
Oil is found in large amounts usually in the seeds of the plants and occasionally in the fleshy part of the fruit, as in the olive and the oil palm.
Seeds may contain from 1 percent to more than 60 percent oil.
The oil is a reserve of high-energy food for use by the germinating seed, and large amounts of oil are associated with large amounts of protein. After the oil is extracted from the oilseeds, the residual meal, or cake, remaining is so important a by-product that it frequently determines the value of an oil crop. Usually this meal is used as a protein concentrate to feed livestock and poultry; if it is poisonous, as with castor beans and tung nuts, it is used as fertilizer (www.britannica.com).
The bio-chemical composition and quality of the oilseeds and their products are important for food and feed purposes. Edible oils are the concentrated sources of energy. The energy content of oil is much higher (39.80 MJ/kg) than protein (23.88 MJ/kg) or glucides (16.76 MJ/kg). They contain useful glucides, essential fatty acids and vitamins A, D, E and K, and provide essential fatty acids. Oil cakes/oil meals are rich sources of protein (40-60%) to human and animals. They can also be used as organic manures (www.angrau.ac.in).
Oil quality for food purpose can be described in terms of Saturated Fatty Acid (SFA), Mono unsaturated Fatty Acid (MUFA) and Poly Unsaturated Fatty Acid (PUFA).
Vegetable oils are used principally for food (mostly as shortening, margarines, and salad

and cooking oils) and in the manufacture of soap and detergents, in paints and varnishes, and for a variety of other industrial items.

## MATERIALS AND METHODS

The paper present the results of the research made in the years 2007-2009 regarding chemical composition and nutritional value of some oilseeds crops promoted in organic agriculture: safflower, camelina, oil pumpkin and oil flax (figure 1).
The experiment was organized based on the multi-stage block method with randomized variants, in 4 replications.

Figure 1. Aspects from oil crops experiment (Moara Domnească Experimental Field, 2009)

The biochemical compounds (glucides, proteins, lipids and minerals) have been analyzed by using the chemistry laboratory methods: for glucides, Bertrand Method; for proteins, Kjeldahl Method; for lipids, Soxhlet Method; for minerals, Spectrophotometer Method

## RESULTS AND DISCUSSIONS

After analyzing the chemical composition of oilseed yields, the highest protein content was registered at oil pumpkin seeds (29.5%), followed by oil flax with 22.56% protein, while the lowest values were determined at safflower seeds i.e. 12.60%. Camelina seeds had a medium protein content of 20.16%-20.43% (table1).
The lipids content of the studied species ranged between 28.37 and 36.92%, the average being 32.55%.
Higher lipids content was observed at oil flax seeds i.e. 34.10% and at oil pumpkin i.e. 36.92%. The lowest values were registered at safflower (28.37%) and camelina seeds (31.61% and 31.75% respectively).
Regarding the glucides, higher contents (over 46.41%) can be observed at safflower seeds, and of 18.50% at the oil pumpkin seeds.
Oil pumpkin and oil flax had a mineral content which ranged between 5.41% and 5.25%, compared with 4.28% and 4.30% at camelina genotypes and 3.60% at safflower.
Energy values of oilseeds ranged from 505.78 kcal at safflower and 558.45 kcal at oil flax. Oil pumpkin and camelina seeds had medium energy values of 540.15 and 525.54-527.73 kcal respectively.
Protein yields at the studied oil species ranged between 2.00 q/ha and 5.14 q/ha, the average of the experiment being 3.28 q/ha (table 2). The average was exceeded by a single species, namely oil flax, which had a protein yield of 5.14 q/ha, with an increase of 1.86 q/ha, which is statistically ensured (very significant). The protein yields of other species were below the average as follows: 2.00 q/ha at oil pumpkin, i.e. 1.28 q/ha lower than the average; 3.06 q protein/ha at safflower, i.e. 0.22 q/ha lower than the average and 3.07 q/ha at camelina, Slovenia genotypes, i.e. 0.21 q/ha lower than the average.
The lipid yields ranged from 2.50 q/ha and 7.77 q/ha, with an average of 5.36 q/ha. Safflower and oil flax seeds registered lipids yields above the average namely 6.90 q/ha at safflower (1.54 q/ha over the average) and 7.77 q/ha at oil flax (2.41 q/ha over the average). Lower lipid yields were registered at oil pumpkin, which produced 2.50 q/ha i.e. 2.86 q/ha lower than the average, at camelina-Slovenia genotypes, which produced 4.75 q/ha (0.61 q/ha lower than the average) and camelina-Fundulea genotypes with 4.92 q/ha (i.e. 0.44 q/ha lower than the average) (table 3).

Table 1. Oil seeds chemical composition (% d.m.)
(Moara Domneasca Experimental Field, 2009)

| Species | Protein | Fats | Glucides | Minerals | Energy value (kcal %) |
|---|---|---|---|---|---|
| Safflower | 12.60 | 28.37 | 46.41 | 3.60 | 505.78 |
| Oil pumpkin | 29.50 | 36.92 | 18.50 | 5.41 | 540.15 |
| Oil flax | 22.56 | 34.10 | 27.73 | 5.25 | 558.45 |
| Camelina-Slovenia genotype | 20.16 | 31.61 | 36.30 | 4.30 | 525.54 |
| Camelina-Fundulea genotype | 20.43 | 31.75 | 36.27 | 4.28 | 527.73 |
| **Average** | **21.05** | **32.55** | **33.04** | **4.56** | **515.13** |

Table 2. Oil crops protein yields
(Moara Domneasca Experimental Field, 2009)

| Species | Protein yields | | Differences (kg/ha) | Significance |
|---|---|---|---|---|
| | kg/ha | % | | |
| Safflower | 3.06 | 93.29 | -0.22 | o |
| Oil pumpkin | 2.00 | 60.97 | -1.28 | ooo |
| Oil flax | 5.14 | 157.62 | 1.86 | *** |
| Camelina-Slovenia genotype | 3.07 | 93.59 | -0.21 | o |
| Camelina-Fundulea genotype | 3.17 | 95.52 | -0.11 | - |
| **Average** | **3.28** | **100** | **Mt** | **–** |

$DL_{5\%}$= 0.146 q/ha
$DL_{1\%}$= 0.222 q/ha
$DL_{0.1\%}$= 0.356 q/ha

Table 3. Oil crops lipids yields
(Moara Domneasca Experimental Field. 2009)

| Species | Lipids yields | | Differences (kg/ha) | Significance |
|---|---|---|---|---|
| | q/ha | % | | |
| Safflower | 6.90 | 128.73 | 1.54 | ** |
| Oil pumpkin | 2.50 | 46.64 | -2.86 | ooo |
| Oil flax | 7.77 | 144.96 | 2.41 | *** |
| Camelina-Slovenia genotype | 4.75 | 88.62 | - 0.61 | - |
| Camelina-Fundulea genotype | 4.92 | 91.79 | -0.44 | - |
| **Average** | **5.36** | **100** | **Mt** | **–** |

$DL_{5\%}$= 0.910 q/ha
$DL_{1\%}$= 1.390 q/ha
$DL_{0.1\%}$= 2.237 q/ha

## CONCLUSIONS

The lowest glucides content was recorded at safflower (26.41%), and the highest values were registered at camelina seeds (over 36%). The highest proteins content was found at flax seeds (22.56%) and the lowest values were determined at safflower seeds i.e. 12.60%.

Camelina had medium contents of proteins, namely 20.43%.

The lipids content ranged between 28.38% and 34.10%, the average being 31.24%. The lowest content was registered at safflower, and the highest content at flax.

The minerals content ranged between 3.60% at safflower and 5.25% at oil flax.

The nutritional value of oil crops seeds was as follows: 505.78 kcal/100 g at safflower, 528.56 kcal/100 g at camelina, 540.15 kcal/100 g at oil pumpkin and 558.45 at oil flax.

The study of the nutritional value of tested oilseeds crops in organic farming conditions evidenced the very special role which should they occupy in the diversification of food, as well as in the development of biodiversity.

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