RESEARCH ON THE INFLUENCE OF THE PEDO-CLIMATICAL CONDITIONS ON*CAMELINA SATIVA* YIELD, GROWN FOR BIOKEROSENE PRODUCTION

ABSTRACT

PhD student: MoraruAndra Cecilia; Adviser: Professor ȘtefanaJurcoane

Key words:*Camelina sativa*, *Brasssicaceae*, biofuel, low-input, productivity indicators (plant density/m^2, average number of seeds/silicule, TKW, number of silicules/plant), plant height, row distance, different sowing dates,yield, polluted lands, qualitative seed analyses, chemical properties of soil, fertilization

Camelina sativa is an annual plant, studied for sustainable biofuel production and used in aeronautics. Camelina crop is considered to be low-input, having the following main features: frost and drought resistance, early harvest, low quantity of fertilizers, as well as resistance to certain diseases and pests typical of *Brassicaceae*family. Camelina oil has a high content of polyunsaturated fatty acids, mostly Omega-3. In addition, the camelina meal (the mass resulted from seed crushing) has nutritive properties, being included in stockfeed.

The aim of the present paper was to research the productivity of various Camelina cultivars in different geographical areas, as well as the impact of agronomic practices on the Camelina cultivars (fertilization with different quantities of nitrogen and phosphorus, different sowing dates and row distances).

The main objectives of the paper deal with testing the *Camelina sativa* crop in different pedo-climatic conditions, carrying out a comparative study regarding the tested cultivars, identifying the influence of agronomic practices on plant growth and development, analyzing crop productivity and quality, and offering proper suggestions concerning the optimization of camelina cultivation technology.

The biological material tested consisted in different *Camelina sativa* cultivars: *Camelia* (Romanian cultivar created by Eng. PhD. Ion Toncea, INCDA Fundulea), *GP 202* and *GP 204* (provided by Camelina Company Espana) and*Calena*(from Austria).

Plant samples were collected from all the locations tested so that biometrical measurements be made during plant growth (plant height, number of branches), and then productivity indicators were analyzed (plant density/m^2, average number of seeds/silicule, TKW, number of silicules/plant).

The data obtained were statistically interpreted using variance analysis. The areas where the experiments were conducted were thoroughly described, taking into account the temperatures and the amount of precipitation recorded, as well as the soil type. All the technological factors were taken into consideration.

The experiments were conducted on experimental fields in various areas of the country (MoaraDomnească didactic field, Ilfovcounty; Ţigănaşi, Iaşicounty; lands polluted by industrial activities). Laboratory analyses were carried out in the Agrochemistry and Agrotechnics (Soil Biology) laboratories within the University of Agronomic Sciences and Veterinary Medicine of Bucharest and in the laboratories of the National Agricultural Research and Development Institute, Fundulea, and in the Science and Engineering laboratories within Manchester Metropolitan University.

The thesis is comprised of two main parts, as follows:

The first part deals with data obtained from the literature regarding the investigated topic and contains one chapter:

Chapter I tackles the history and importance of the plant and its distribution area, and provides information concerning its importance as raw material in sustainable biofuel production. It provides a detailed description of camelina plant and the impact of technology on camelina yield.

The second part of the thesis consists in the original contribution made throughout the research.

Chapter II thoroughly describes the experimental locations:MoaraDomnească didactic field, Ilfov county; Ţigănaşi, Iaşi county; lands polluted by industrial activities, located in CopşaMică, Sibiu county. Data are provided regarding geographical positioning, relief, hydrographic network, soil type and its chemical features, and climate.

Chapter III deals with the scope and the objectives of the research, describing the biological material used, the methods used in the lab for seed quality and soil chemical analysis, the methods used in the field and the design of the experiments.

Chapter IV- deals with the results obtained from the experiment. In each subchapter, the results were presented for each location and experimetal year.

Chapter V provides the results obtained and gives recommendations regarding further research on this topic and presents the innovations of these research topics.

The experimental results obtained between 2011-2012 using GP 202 and GP 204 cultivars in two different sowing periods (autumn – November and spring – March, beginning of April) at SC Agricola Moldova-SA farm in Țigănași, Iașicounty, showed the following:

- The plants sown in autumn had better growth, with a higher number of branches and silicules/plant. That owes to the earlier emergence and, therefore, to the more rapid growth of the plant in spring.

- The best yields were obtained in autumn for GP 202 cultivar (3,300 kg/ha), whereas the same cultivar had a lower yield when sown in spring (1,883 kg/ha);

- In order to provide optimal conditions for camelina growth and development, it is very important to know the best sowing period.

The results of the experiments conducted between 2012-2013 on the reddish preluvosoil in Moara Domnească, Ilfov county, showed the following:

- The camelina plants had optimal growth and development conditions when they were added 120 kg N s.a./ha, the plants being fertilized using 100 kg P s.a./ha and 150 kg P s.a./ha, respectively, the two nutrients being essential to camelina nutrition on condition that a balanced ratio of the two elements be maintained;

- Out of the four camelina genotypes studied during the experiment, the most productive ones proved to be GP 202 cultivars and Camelia. In the case of GP 202 cultivar, the plant density was of 350, 1,050 and 1,400 germinable seeds/m^2, while Camelia had a plant density of 700 and 1,050 germinable seeds/m^2;

- The evolution of the productivity elements formation can be seen in the final yield, which varied between 653 kg/ha, when no fertilizer and 100 kg P s.a./ha were applied and 2722 kg/ha, when the fertilization scheme raised to$N_{120}P_{150}$;

- It can be thus seen that there is an increase in plant density which is directly proportional to the increase in the seed rate and inversely proportional to the increase in row distance. The highest yield was obtained for a1b4 (row distance of 12.5 cm, seed rate of 16 kg/ha);

- The increase of plant height is directly proportional to the increase in the seed rate and inversely proportional to the increase in row distance. When these conditions are fulfilled, the number of branches is lower, the plant having the tendency to grow heigher. This phenomenon can also owe to plant competition for growing factors;

- The best yields were obtained when the row distance was of of 12.5 cm, varying between 806 kg/ha and 1,502 kg/ha, with an average of 1,190 kg/ha.

The results of the experiments conducted between 2013-2014 on the reddish preluvosoil in Moara Domnească, Ilfov county, showed the following:

- For the cultivar sown in autumn:

- The number of branches/plant increased significantly once 120-160 kg s.a. N/ha and 60 kg P s.a/ha fertilizers were applied.

- In order to stimulate the increase in the number of branches/plant a balanced amount of N and P should be applied.

- As the amount of N and P increased, the yield was higher, the best results (1,100 kg/ha) being obtained when 30-60 kg P s.a./ha and 120-160 N s.a./ha were applied.

- For the cultivar sown in spring:

- The number of branches/plant increased significantly once 120-160 kg s.a. N/ha and 60 kg P s.a/ha fertilizers were applied.

- To stimulate the number of seeds/silicula, phosphorus fertilization was applied before camelina crop sowing. That was absolutely mandatory, this nutrient being essential in forming yield components;

- The yield values as the average of the three experimental factors (genotype x fertilization with nitrogen x fertilization with phosphorus) varied between 253 and 1649 kg / ha, with an average of 941.5 kg / ha for the whole experiment.

The results of the experiments conducted during 2013-2014 on the polluted soils from Copșa Mică area, Sibiu county, showed the following:

- The estimated yield is similar to the yield obtained on other non-polluted lands in Romania, which led to the conclusion that camelina has a real potential of being cultivated on heavy metal polluted lands;

- For Cd and Pb the concentrations are much higher than the admitted threshold - in the case of Cd 2-3 times more, for Pb being almost double.