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STUDY OF THE INFLUENCE OF THE SEEDING PERIOD AND SEED NORMA ON THE RAPESEED GENOTYPE

Gabriela Alina CIOROMELE [1], Maria CONTOMAN[2], Nicoleta AXINTI[1]

[1]University „Lower Danube" Galati, Faculty of Engineering and Agronomy Braila,
29 Calarasilor Street, Braila, Romania
[2]University „Lower Danube" Galati, Faculty of Food Science and Engineering,
111 Domneasca Street, Braila, Romania

Corresponding author email: acioromele@ugal.ro

Abstract

The research paper aimed the comparative study of Artoga variety rapeseed on the Moşescu V. Dobre II farm of Brăila County, in the agricultural year 2012 - 2013, sowed at different periods and densities, during which researches were carried out in the laboratory and on the experimental field. During the rapeseed vegetation there were analyzed climatic elements (temperature and precipitation), phenological observations in the field and biometric measurements in the laboratory. For the statistical interpretation of results, each variant of the experimental field was placed in triplicate and the data revealed a significant interaction between the two factors analyzed (sowing season and plant density/sq.) where it was found that with the delay of sowing date, the obtained yields of the variants were decreased significantly, being statistically ensured.

Key words*: rapeseed, seeding date, density.*

INTRODUCTION

Lately rapeseed experienced a rapid explosion of the cultivated fields both global and national, due to its yield per area unit, its sources of vegetable oils and economic value.
The rapeseed cultivation technology is a very important link for the sowing period because this work clearly influences a constant production (Diepenbrock, 2000; Bîlteanu, 2001; Muntean et al., 2011).
Sowing period is determined by the evolution of soil temperatures and depends on the area climate, and other important factors such as soil physical characteristics (Contoman, 2005).
Seeding period and crop density can significantly influence the productive components of rapeseed culture, so that for Romania the investigations revealed that the optimum sowing period is from late August to mid-September (Bîlteanu, 2001; Muntean et al., 2011; Buzdugan, 2013).
Seeding period significantly affects the crop yield and also the productive components of rapeseed (Karamanas et al., 2002; Munteanu et al., 2011). Optimal density for autumn rapeseed culture is influenced to a lesser extent by the morphological features of the genotypes currently in culture (Ştefan, 2011; Taylor et al., 2002).
An important role in the establishment of the sowing period is also presented by the vegetation period that needs to be covered by the rapeseed plants in order to achieve frost resistance and the adverse conditions during winter (Muntean, 1997; Camp, 2005).
Gîngioneanu believes that rapeseed sowing in September leads to production declines by 35-50% due to insufficient development during autumn.
Late sowing makes plants grow weaker, reduce the ability of branches forming and form a small number of primary leaves while the optimum sowing period leads to a normal development and under optimal parameters of the physiological processes (Schulz, 1995).

MATERIALS AND METHODS

The experiment took place in the agricultural year 2012-2013 and was located on a farm from Braila County, Lanurile City, on a saline chernozem soil type, using as a biological material the Artoga rapeseed variety.
The main objectives of this paper aimed the determination of the optimum sowing period

and the rapeseed crop density in the agro-pedological area of Moşescu V. Dobre II society.

As a method for the positioning of the field the subdivided parcels method was used, thus the experimental scheme included the following factors:

- A factor represented by the sowing period that had 3 graduations:
  - a1 - September 01;
  - a2 - September 10;
  - a3 - September 20.
- B factor represented by the plant density / sq. with 3 graduations:
  - b1 - 40 grains germinate / sq.;
  - b2 - 50 grains germinate / sq.;
  - b3 - 60 grains germinate / sq.

The polyfactorial experiment was placed in order to investigate and assess the real influence of two factors on the rapeseed production on the farm, which has a number of 9 variants, each variant being placed in three repetitions.

During the vegetation period, phenological observations were made on the plant vegetation period of the experimental variants in regard to the action of the two analyzed factors and the determinations of productivity elements: the number of emerged plants/sq., the percentage of resistant plants to climatic conditions of the analyzed agricultural year, the number of branches / plant, number of siliques per plant, number of seeds in a capsule, the 1000 grains weight, hectoliter mass and determination of physical production.

The statistical processing of the results was performed by the analysis of variance method, using MS Office Excel – Anova test, where as a witness the average of all experiments was used.

RESULTS AND DISCUSSIONS

Mobile P presented values between 45 ppm and 51 ppm while the mobile K had values that ranged between 212 and 223 ppm, values obtained on the depth profile of 0-40 cm, the soil being characterized through a very good supply of nitrogen and phosphorus and good for potassium.

Table 1. Chemical properties of saline chernozem soil in the experimental field

Horizons	Ap	Am	ACsc
Depth (cm)	0-10	30-40	40-60
Water pH	7.91	7.99	8.11
Carbonates ($CaCO_3$%)	0.88	1.81	3.4
Humus (%)	3.25	3.16	2.84
Nitrogen index	3.21	3.16	2.82
Reserve humus (t/ha)	129		
Mobile P (ppm)	51	45	-
Mobile K (ppm)	233	212	-

Climate particularities of the 2012-2013 agricultural year showed much wormer and precipitations poor seasons in comparison to the previous period proving that these features had profound effects on the vegetation condition of crops.

During the rapeseed culture vegetation period, taken as the experiment, the precipitations recorded positive values above normal average in September, October, December, January, February, March and May, the highest values recorded were recorded in December (107 mm) when the normal average was exceeded by 74 mm (Figure 1).

From the thermal point of view, the agricultural year 2012-2013, during the vegetation period, was characterized as a normal year compared with the normal average.

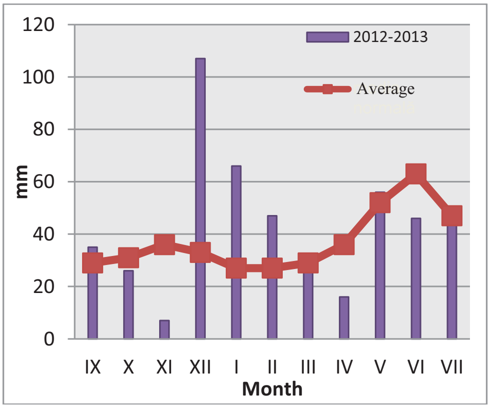

Figure 1. Precipitations recorded during the vegetation period

The largest positive temperatures were recorded in September, month in which was placed the experiment, when the difference from the normal average normal was + 4.4°C (Figure 2).

In terms of climate, the year 2012-2013 can be characterized as a normal year in terms of temperatures but much richer in precipitation.

It should be noted that in March of 2013 the temperatures fell sharply on 26.03.2013 when there was a temperature -2^{o}C and a snow layer of 10 cm that persisted for 2 days.

The highest moisture deficit was recorded in November, when the recorded values were lower by 29 mm precipitations against the normal value.

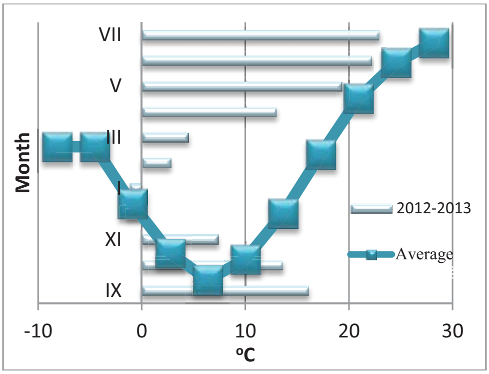

Figure 2. Temperatures during the vegetation period

From sowing to physiological maturity, the rapeseed goes through several phases of growth that produce a number of important changes both qualitative and morphological. The vegetative cycle of rapeseed can be divided into two stages, separated by the floral initiation.

Table 2. The vegetation period of Artoga hybrid depending on the sowing period

Nr.	Phenophase	01.09.2012	10.09.2012	20.09.2012
1	Sowing	01.09.2012	10.09.2012	20.09.2012
2	Plant emergence	10.09.2012	18.09.2012	01.10.2012
3	Stem elongation	14.03.2013	19.03.2013	24.03.2013
4	Bud	16.04.2013	18.04.2013	20.04.2013
5	Blooming	22.04.2013	25.04.2013	27.04.2013
6	Formation of siliques	13.05.2013	15.05.2013	18.05.2013
7	Curing - harvesting	17.06.2013	20.06.2013	23.06.2013
Total growing season		290 days	283 days	276 days

Thus, in the first step of the terminal bud the leaves are formed and in the second stage the inflorescence is formed. Thus, the variants sown on 09/20/2014 recorded the shortest period while the variants sown in the first decade of September recorded the longest vegetation period (290 days).

The average percentage of emerged plants fluctuated between 87.5 and 96% (Table 3), the average percentage of emerged plants in regard with the whole experiment being 92.35%.

Table 3. The percentage of plants emerged in the experimental plot

Variant	Germinated grains/sqm	Emerged plants/sqm	Emerged plants %
a_1b_1	40	38	95
a_1b_2	50	48	96
a_1b_3	60	56	93.3
a_2b_1	40	37	92.5
a_2b_2	50	46	92
a_2b_3	60	56	93.3
a_3b_1	40	35	87.5
a_3b_2	50	45	90
a_3b_3	60	55	91.6
Experiment average			92.35

The number of emerged plants/sqm of the sown variants in the first decade of September showed higher values compared to the variants sown in September 10 and September 20, 2012.

Table 4. The percentage of resistant plants during winter in the experimental plot

Variant	Emerged plants/sqm	Resistant plants/sqm	Resistant plants %
a_1b_1	38	35	92.1
a_1b_2	48	44	91.6
a_1b_3	56	51	91.07
a_2b_1	37	33	89.19
a_2b_2	46	41	89.1
a_2b_3	56	51	91
a_3b_1	35	29	82.8
a_3b_2	45	37	82.2
a_3b_3	55	48	87.2
Average experience			88.47

The average percentage of resistant plants ranged between 82.2 and 92.1%, experiment average was 88.47% resistant plants.

Following the data presented in Table 4 it can be seen that the percentage of plants from variants sown in the first decade of September had the highest values, it exceeds 90% regardless of the number of grains sown. The variants which recorded maximum values of 87% were those sown in the last decade of September, thus being observed that a3b1 and a3b2 variants obtained the lowest percentage of resistant plants.

From the data obtained it can be concluded that the farm area of where was set the experimental field, the sowing period significantly influenced the plant resistance to winter, while the B factor action (crop density) did not affect this percentage.

The observations on the number of branches per plant were performed on 03/10/2013, being selected 10 plants of each 5 points from each experimental variant.

Their number varied between 7 and 16 ramifications, it being higher in variants exhibiting a density of 40 gb/sqm (Table 5).

From the results shown in Table 5 the interaction of the two analyzed factors was ensured statistically in almost all variants. A_2b_1 variant achieved a very significant positive difference whereas the a1b1 and a3b1 variants obtained significantly distinct positive differences.

Table 5. Interaction influence between the sowing period and the thickness sowing on the number of branches / plant

Variant	No. of branches/ plant	%	Difference	Significance
a_1b_1	14	124.7	2.78	**
a_1b_2	11	98.03	-0.22	-
a_1b_3	9	80.21	-2.22	°
a_2b_1	16	142.6	4.78	***
a_2b_2	12	106.95	0.78	-
a_2b_3	8	71.30	-3.22	°°
a_3b_1	14	124.77	2.78	**
a_3b_2	10	89.12	-1.22	-
a_3b_3	7	62.38	-4.22	°°°
Average	11.22	100	-	-

DL 5% = 1.75; DL 1% = 2.42; DL 0.1% = 3.33
DL - difference limit

A_1b_3, a_2b_3, a_3b_3 variants registered negative differences and were statistically ensured. Compared to the average of the variants with a smaller number of branches/plant was recorded for the variants that had the highest density at sowing (60 grains/sqm).

The maximum number of branches was recorded by a_2b_1 variant, followed by a_1b_1 variant.

Under the action of the two factors used in the experimental field it was followed also another element of productivity the number of siliques/plant. It fluctuated between 509 and 663 capsule/plant, the maximum was recorded by a_1b_1 variant.

In the variants sown with 40 grains/sqm, the number of siliques was directly proportional to the seeding period, so that the agropedological conditions of the area where the experimental field was placed thus the minimum number of siliques/plant was recorded for the variant sown on 20 September (Figure 3).

In the case of the variants sown on 20 September the number of siliques/plant was inversely proportional to the density of sowing. Thus for the data obtained, the lowest number of siliques was recorded for the sown variant with 40 grains/sqm while the maximum was obtained for the a_3b_3 version.

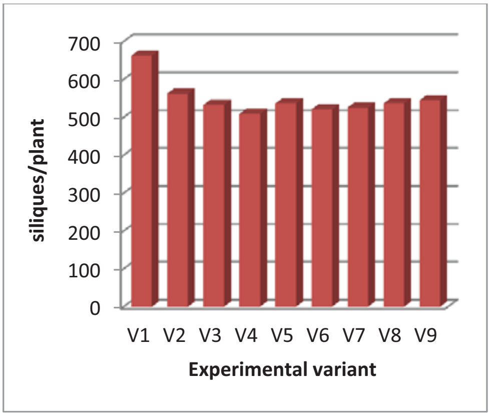

Figure 3. Number of siliques/plant

The average number of seeds in siliques ranged between 25 and 28 seeds, the a1b1 variant recording the greatest number of seeds.

The MMB of seeds was not influenced by the action of the two analyzed factors this varying between 4.0 and 4.2 g in all experimental variants, while the hectoliter mass varied between 65.8 and 67.5, the two qualitative indices was not influenced by the combined action of the factors examined in the experiment.

In agricultural production, both natural factors and those by which man does not interfere in an isolated way on plants, but simultaneously, thus were influencing each other (Dimancea S., 1966).

In the case of the experimental field experience, the total production was clearly influenced by seeding period, which was reflected in the recorded yields because the Artoga genotype genetic capacity is much higher.

Table 6. Production obtained in experimental variants and statistical interpretation

Variant	Harvest Kg/ha	Difference from control	Significance
a_1b_1	3729.5	+ 1072.34	***
a_1b_2	2976	+318.8	**
a_1b_3	2608	-49.16	-
a_2b_1	2975	+ 317.8	**
a_2b_2	2642	-15.16	-
a_2b_3	2380	-277.16	°°
a_3b_1	2272	-385.16	°°°
a_3b_2	2281	-376.16	°°°
a_3b_3	2051	-606.16	°°°
Average	2657.16	-	

DL 5% = 195.22 kg/ha
DL 1% = 268.89 kg/ha
DL 0.1% = 370.18 kg/ha

The recorded productions shown in Table 6 demonstrate that the technological link for rapeseed crop and also the seeding period influenced the production. The maximum average yields were recorded for all variants sown on 01.09.2012, these oscillating between 2608 and 3729.5 kg/ha, their average exceeding the average of yields of the variants sown on 10 September and 20 September 2012 (Table 6).
Statistically speaking, a_1b_1 variant achieved a very significant difference from the control (the average of variants), while a_1b_2 and a_2b_1 variants obtained significant differences.
A_3b_1, a_3b_2 and a_3b_3 variants achieved very significant negative differences and a_2b_3 variant obtained significant distinct negative differences compared to the control.
An important role in the obtaining of high production for the experiment had placed the first factor (seeding period) while the action of b factor (crop density) influenced to the lesser extent.

CONCLUSIONS

The number of branches per plant was significantly influenced by plant density /sqm, density of 40 gb/sqm with an increase of approximately 50% compared to the density of 60 pl/sqm.
The number of siliques/plant was influenced by both the sowing period and also by the plant density; the number of seeds in a capsule was approximately constant, with no significant difference due to the combined action of the two analyzed factors.
The sown variants in the first decade of September showed positive differences very distinctive and significantly distinctive, the striking action of the factor on production.
Negative meanings were recorded in all variants sown in the last decade of September;
For the farm area, the optimal sowing period was between 1-10 September and the norm was 40 germinate grains/sqm, overcoming them entailing a significant decrease in production.

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