BEHAVIOUR OF MAIZE HYBRIDS IN SOIL AND CLIMATE CONDITIONS FROM SCDA LOVRIN IN 2014

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Abstract: *This study aimed at testing four maize hybrids for grains, Severo (FAO270), Kinemas (FAO350): Kornelius (FAO400) and KWS 3381 (FAO450), planted over two consecutive periods with a view to certifying the issue regarding their behaviour under the climate of Banat, SCDA Lovrin area, and to determining their production capacity. The bi-factorial experiment was placed in the experimental field according to the subdivided lots method. The experimental field stretches across 768,4 m^2, with the distribution of the four hybrids in six rows of 8m each, three repetitions. The area cultivated with a hybrid is of 33,6 m^2. They were planted at a depth of 6-7cm. The density was established at 62000-65000 harvested plants per hectare, and the distance between the rows was 70cm. The fertilization was done with 20:20:0 complex fertilizer, while weeds were fought with chemical products by pre-emerging weed control with Adengo – 0.4l dosage, and post-emerging with Mustang – 0,5l/ha dosage and Gat Motion – 1,5l/ha dosage. During the vegetation period several observations in different phenological stages were made: emergence, flowering, silk, maturation, and their correlation with the climatic and soil conditions. Planting early hybrids in the third decade of April ensures a temperature of over 10°C and the necessary humidity for germination, which leads to bigger productions of grains (STAS 11580 kg/ha) compared to their planting in the first decade of May (11568kg/ha). These hybrids show a good tolerance to draught and heat. The grain productions were: Severo 9130kg/ha in R1/season II, Kinemas 10781kg/ha in R1/season I, Kornelius 10975kg/ha in R1/season I, and the most productive was KWS 3381 with 11580kg/ha in R1/season I. When harvested, the average humidity of the grains was at 15,8-21,5%.*

INTRODUCTION:

Maize (Zea mays L) is one of the most valuable cultivated plants due to its quite high productivity and multiple uses of its products in human nourishment, husbandry and industry.

In the light of applying new increasingly performant cultivation technologies, corroborated with the positive effects of the heterosis phenomenon and with the new maize hybrids, there were conditions for the maize productions to record dramatic increases. The rhythm of maize average productions increase is also due to the use of a growing quantity of chemical fertilizers, to the increase in the density of plants per hectare, and lastly to the performant technology.

MATERIALS AND METHODS:

The bi-factorial experiment was placed in the experimental field according to the subdivided lots method. The experimental field lies on an area of 768,4m^2, with the distribution of the four hybrids on six rows of 8m, three repetitions. The area cultivated with a hybrid is of

33,6 m^2. The planting area was established at 62000-65000 harvested plants per hectare, with the following factor grades:

- **Factor A – planting season**

A_1 – season I - 24 April – 1 May

A_2 – season II - 01 May – 8 May

- **Factor B - cultivated maize hybrid**
  - **Simple hybrids**

B_1 = Kinemas

B_2 = Kornelius

  - **Trilinear hybrids**

B_3 = KWS 3381

B_4 = Severo

The chernozem soil is subdivided into two profiles: slightly gleyic, with alkalization in depth, epicalcic and salsodic, slightly gleyic, proxixalcic?.

By combining factors and grades, an experiment type 4x2=8 variant in three repetitions has resulted.

In 2014, the preliminary plant for the maize crop from the comparative field established within SCDA Lovrin was wheat.

During the vegetation period, in the field, we made observations and measurements regarding the: planting date, emergence, growth dynamics, flowering, silking, physiological maturity, harvest date and humidity during harvest.

In the field, we followed the effect of the planting season on the maize hybrids and determined the STAS grain productions.

RESULTS AND DISCUSSION

Rainfall is uneven during the year. The average annual rainfall in Lovrin area is 503,4 mm (in 1996 it was 517,6 mm). Table 2.2 shows monthly rainfall obtained according to the meteorological records from the Agricultural Research-Development Station Lovrin, between 2011-2015.

Table 1.

Monthly average temperatures °C recorded at SCDA Lovrin, between 2011-2015

Year/month	IX	X	XI	XII	I	II	III	IV	V	VI	VII	VIII
2011-2012	20.6	10.3	2.4	5.8	0.6	-2.1	3	11.8	16.6	22.5	25	21.7
2012-2013	20.5	12.6	7.9	-0.5	0.1	3.2	4.8	13	17.6	20.4	23.8	24.1
2013-2014	15.7	13.1	8.3	1.2	3.2	5.1	8.7	12.9	16	20.1	21.9	21.3
2014-2015	17.6	12.7	7.8	-1.9	-2.4	1.5	5.1	10	16.5	21.9	25.6	25.4
2015-2016	18.8	10.7	6.5	2.8	-0.3	6.1	7.4	13.6	16.2	19.6	24.3	25.3
Multiannual average	16.8	11.1	5.5	1.1	-1.1	0.8	5.1	10.7	16.3	19.9	22.1	21.7

The peak temperatures and the drought from 2012, 2013 and 2015 greatly affected the pollination of the KWS maize hybrids under study.

In 2014, the temperature was more favourable compared to the other years.

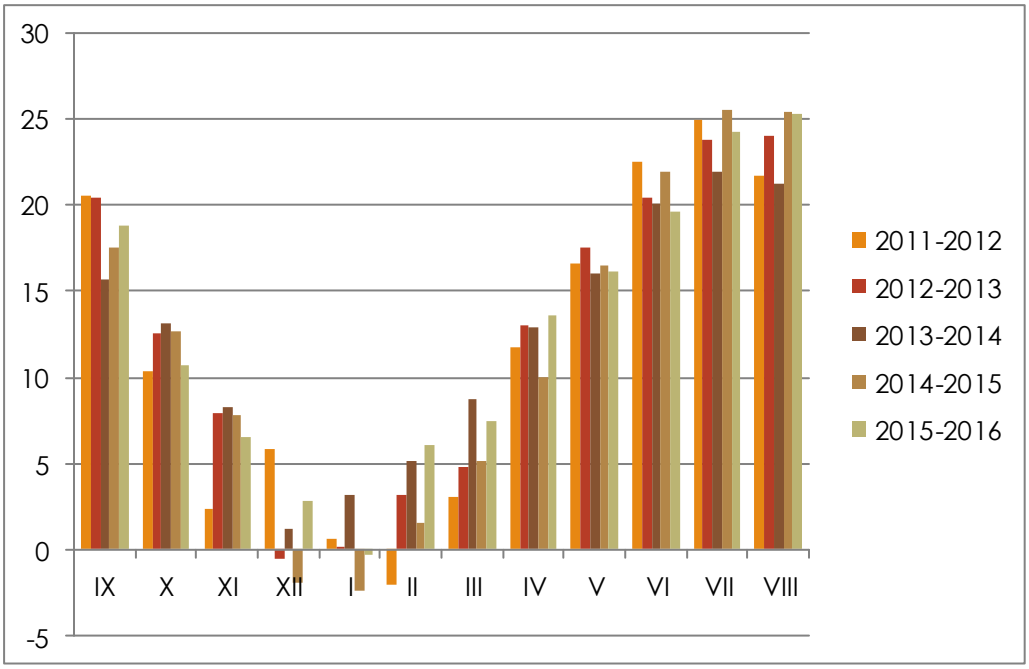

Figure 1. Monthly average temperatures °C recorded at SCDA Lovrin between 2011-2015 compared to the multiannual averages

Table 2.

Monthly rainfall (mm) recorded at SCDA Lovrin between 2011-2015

Year/month	IX	X	XI	XII	I	II	III	IV	V	VI	VII	VIII
2011-2012	13.8	36.8	15.5	0.2	7.8	55.8	32.3	126.2	64.2	27.2	59.2	3.0
2012-2013	11.2	34.9	13.2	49.6	49.4	31.1	95.1	27.7	67.2	20.6	59.2	50.6
2013-2014	49.8	29.5	42.2	5.6	24.1	28.3	22.4	5.1	197.1	38.4	211.0	31.4
2014-2015	105.7	75.6	14.9	22.0	15.0	21.9	16.7	4.0	50.4	89.3	26.7	84.7
2015-2016	89.6	125.9	62.4	9.4	52	147.2	56	26.2	109.4	100	85.2	50
Multiannual average	42.6	39.5	48.4	40.7	32.2	29.5	32.8	42.7	57.2	67.8	55.8	32.3

By correlating the temperatures with the maize productions and the rainfall we notice that during the pollination and growing of grains in the years 2012, 2013 and 2015 there are poorer results compared to 2014.

According to the graph in figure 2, the year 2014 was the most favourable from the point of view of rainfall.

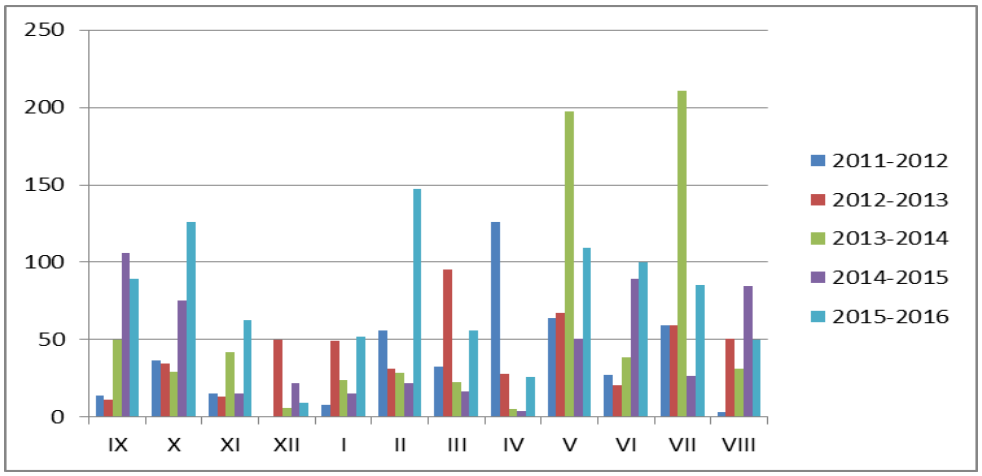

Figure 2. Monthly rainfall (mm) recorded at SCDA Lovrin between 2011-2015, compared to the multiannual averages

Results of maize crop obtained in the experimental field from SDCA Lovrin in 2014

Table 3.

The influence of hybrids on the maize production in 2014

Cultivated hybrid	Productions		Difference kg	Significance
	Kg/ha	%		
SEVERO	**8828,5**	**100,0**	**mt**	
KINEMAS	**10087,5**	114,3	1259,0	***
KORNELIUS	10334,5	117,1	1506,0	***
KWS 3381	10941	123,9	2112,5	***

DL 5% = 343,33 kg DL 1% = 481,35 DL 0,1% = 680,36

Compared to the **hybrid-witness SEVERO**, all hybrids gave significantly higher production rates.

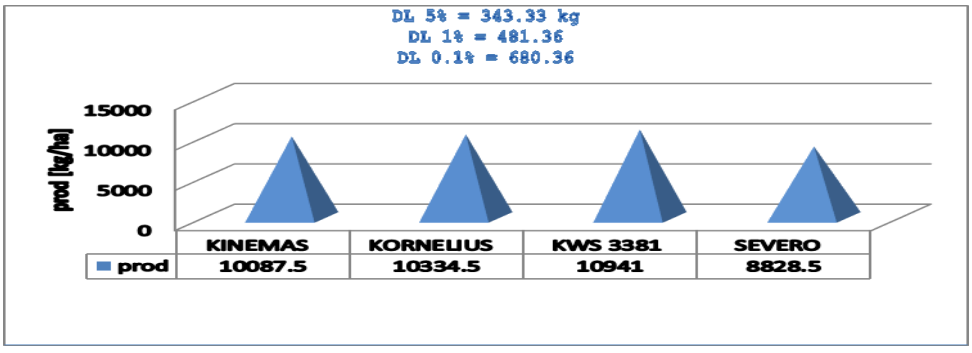

Fig.3. Results of the maize grains production (kg/ha) under hybrids' influence in the experimental year 2014 at SCDA Lovrin

Table 4.

The influence of the planting season on the maize production obtained at SCDA Lovrin under the conditions of the experimental year 2014

Factor A – planting season	**Productions**		**Difference kg/ha**	**Significance**
	Kg/ha	**%**		
Season I	10355	106,3	614,6	**
Season II	**9740,4**	**100**	**mt**	

DL 5% = 242,53 kg DL 1% = 559,41 DL 0,1% = 1780,99

The difference between the two planting seasons is quite significant.

With hybrids planted in season I we had higher production rates compared to the ones planted in season II, the differences being quite significant.

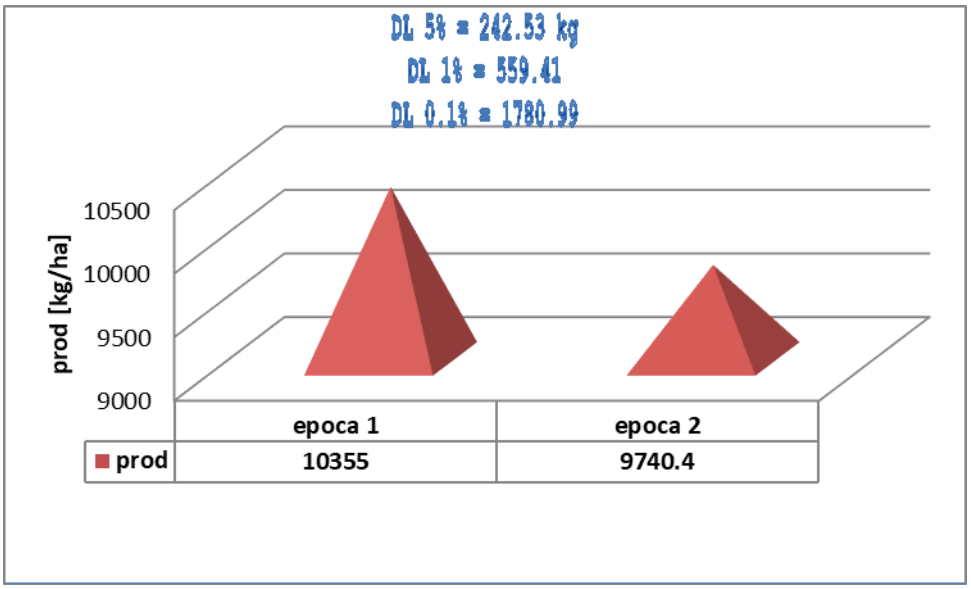

Fig.4. The variation of maize yield for the 4 hybrids according to the two planting seasons in 2014 at SCDA Lovrin

Table 5.

Synthesis of the results of maize production obtained (kg/ha) according to the two planting seasons in 2014 at SCDA Lovrin

Factor A – planting season **Factor B - cultivated hybrid**		**Productions**		**Difference kg/ha**	**Significance**
		Kg/ha	**%**		
	SEVERO	**8633**	**100,0**	**mt**	
	KINEMAS	10530	122,0	1897	***
	KORNELIUS	**10744**	124,5	2111	***
Season I	KWS 3381	11513	133,4	2880	***
Season II	**SEVERO**	**9024**	**100,0**	**mt**	

	KINEMAS	9645	106,9	621	*
	KORNELIUS	9925	110,0	901	**
	KWS 3381I	10369	114,9	1345	***

DL 5% = 485,54 kg DL 1% = 680,74 DL 0,1% = 962,1

In the planting season I all hybrids gave significant production rates compared to the **hybrid-witness SEVERO.**

In the planting season II the KWS 3381 hybrid obtains significant production rates compared to the **hybrid-witness SEVERO,** the KORNELIUS hybrid had significant production rates, and the KINEMAS hybrid had significant production rates compared to the **hybrid-witness SEVERO.**

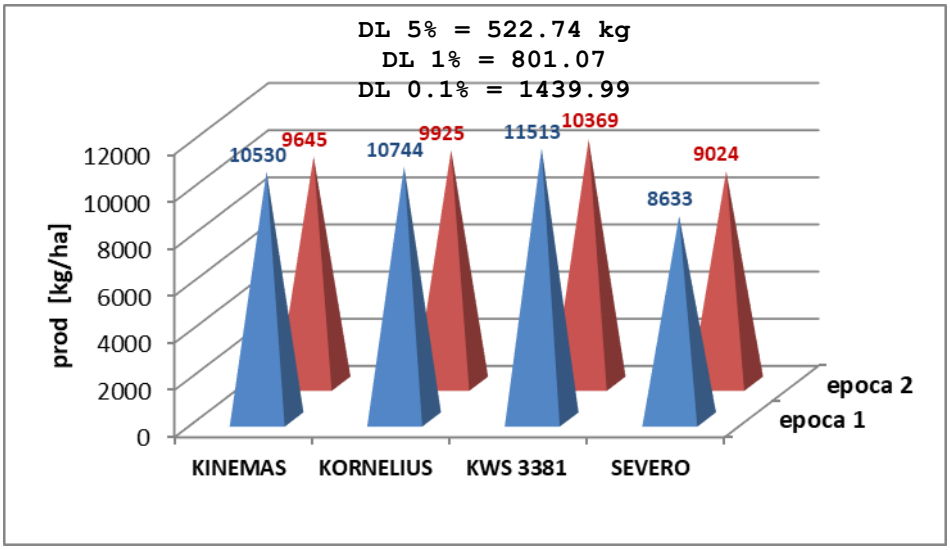

Fig.5. Synthesis of the results of maize production obtained according to the two planting seasons in 2014 at SCDA Lovrin

CONCLUSIONS

In 2014 the biggest production rate (approx. 11500 kg/ha) is obtained with the KWS 3381 hybrid, at the planting season I, the production rate obtained by this hybrid is distinguished by the Kinemas, Severo and Kornelius hybrids at the planting seasons I and II, and the KWS 3381 hybrid at the planting season II. The lowest production rate, approximately 8600 kg/ha is obtained with the hybrid-witness SEVERO at the planting season I. As a conclusion, in 2014, the best hybrid was KWS 3381, planting season I.

Under the soil and climate conditions from SDCA Lovrin, choosing the planting season induces significant differences of production at the maize hybrids under study. Planting early hybrids better withstands low temperatures during germination, but they are more sensitive to the heat and drought during summer.

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