RESEARCHES CONCERNING SEEDS PRODUCTION TO THREE COTTON GENOTYPES (GOSSYPIUM HIRSUTUM SP.) UNDER AGROFIELD INFLUENCE IN THE CLIMATIC CONDITIONS FROM TIMISOARA

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Abstract. *In this paper, the main objective was to determine the influence of agrofield and the climatic conditions from Timisoara on seed production to three cotton genotypes (Gossypium hirsutum sp.): Marismas and Coko genotypes from Greece and Canada genotype from the USA, in the year 2010 of investigation. Bifactorial experience was placed in the field after subdivided parcels methods. The experimental factors established were: Factor A - agrofield (a_1 - $N_0P_0K_0$; a_2 - $N_{30}P_{30}K_{30}$; a_3 - $N_{60}P_{30}K_{30}$; a_4 - $N_{90}P_{60}K_{60}$; a_5 - $N_{120}P_{60}K_{60}$; a_6 - $N_{30}P_{30}K_{30}$ plus foliar fertilization); factor B - genotypes (b_1 – Marismas - Greece, b_2 - Canada - the USA, b_3 - Coko - Greece). An important role for quality and quantity production had the three fertilized macroelements: azoth, phosphorus and potassium. Analysis of vegetation conditions for the cotton was made during the period May - October; active vegetation period between 1st May and the first hoarfrost of autumn (the cotton needed 170-180 days from germinal seeds, to the first hoarfrost falling. The best average production of seeds obtained to Marismas genotype, several 1072 kg/ha, comparative with the others genotypes at which realized the following average production: genotype Canada - 1057 kg/ha and to Coko genotype - 1051 kg/ha. The biggest production of seeds for the three genotypes of cotton Marismas, Canada and Coko obtained on agrofield a_4 - $N_{90}P_{60}K_{60}$ (1128 kg/ha for Marismas genotype, 1130 kg/ha for Canada genotype and 1136 kg/ha for Coko genotype) comparative to control agrofield (a_1 - $N_0P_0K_0$). Fertilization dose until 90 kg/ha positively influenced the production of cotton seeds, the increases of production statistical being assured of significant and distinct significant on agrofields a_4 - $N_{90}P_{60}K_{60}$ and a_5 - $N_{120}P_{60}K_{60}$. The obtained results were statistically processed the analysis of variance and differences at $p<0.05$ were considered statistically significant. The foliar fertilization determined distinct significant increases of production, also. The three genotypes of cotton presented a good adaptability to weather conditions of Timisoara, in the year 2010.*

Key words: seed cotton, production, climatic conditions, agrofield.

INTRODUCTION

The cotton is the most important textile plant. It insures 70-75% from the global filabile vegetal fibers and contributes with around 50% to the global total production of natural and artificial fibers. The cotton seeds contain 20 -27% semi - siccative oil, rich in amino acids compounds with phosphorus and vitamins. The cotton oil, from quantitative point of view, occupies the fourth place in worldwide oil production, in competition with the peanut oil. The core of the seeds has a high protein level, 21.2 - 29.4 %, and is used in the meat products, cakes and bread. Practically, the cotton is an important source of vegetable protein. The cotton seed oil is used for the margarine, soap and glycerin production. The cakes and rests obtained from the oil extraction are used in moderate amount in the animal nutrition due to the gossypol alkaloid (a polyphenol aldehyde), with a certain degree of toxicity. The cakes consumed act as galactogen, increasing the percentage of the butter and casein from milk. In the last period they are also used for human food. So mixt with wheat flour they are used in bread and cakes

industry. This wide usage is due to their content: 34% substances isoteic, phosphorus, calcium, the complex of vitamin B. The protein concentrates obtained from seeds are used in sausages, soups, canned meat, in the nutrition in the diabetic and hyperglycemic people (being poor in hydro carbonates and low calorie potential), in the treatment of wine, in gaseous beverages and juices industry, candies and pastries (S. Muntean and I. Borcean, 2001). The peels contain 45% cellulose and are used in the paper and carton packaging industry, plastic industry, petroleum refining, as a fertilizing material and not in the last place they used as fodder.

In table 1. we present the monthly averages of temperature registered in period May-October 2010 at the meteorological station from Timisoara.

Table 1.

The air temperature (^{o}C) registered at the Meteorological Station from Timisoara in May – October in year 2010 ((Banat-Crisana regional Weather Center Archive)

Months	Mai May	Iunie June	Iulie July	August August	Septembrie September	Octombrie October
Average temperature of the air (°C)-anul 2010	16.6	18.8	23.1	22.5	16.2	12.9
Annual average (1960-1999)	16.3	19.4	21.1	20.4	16.5	11.3

We can notice that the monthly average temperatures are higher than the monthly annual averages, the value of these temperatures are higher with 1°C up to 3°C. For the vegetation period, the specific resources like: the duration of sunlight brightness, the active temperatures (Σ T>0 °C), as well as the actuals (Σ T>10 °C), do not cause significant variations in the yield crops, because the minimum reserve necessary to obtain an optimum photosynthesis is realized even in the most critical years in the studied area.

The main objective was to determine the influence of agrofield, genotype and the climatic conditions from Timisoara on seed production to three cotton genotypes (*Gossypium hirsutum sp.*): Marismas and Coko genotypes from Greece and Canada genotype from the USA, in the year 2010 of investigation.

MATERIAL AND METHODS

The main purpose of that work was to emphasize the behavior of three cotton genotypes in Timisoara climatic conditions, Marismas and Coko genotypes from Greece, Canada genotypes from USA.

The experimental field was placed on a terrain which appertained to Didactic Station and Experimental Timisoara. The experience of bifactorial type was placed in the field to the parcels after split divided method. The existing factors experimental were: Factor A- agrofield and Factor B - genotype.

The experimental factors were:

-Factor A: agrofield (a_1 - $N_0P_0K_0$, a_2 - $N_{30}P_{30}K_{30}$, a_3 - $N_{60}P_{30}K_{30}$, a_4 - $N_{90}P_{60}K_{60}$, a_5 - $N_{120}P_{60}K_{60}$, a_6 - $N_{30}P_{30}K_{30}$ and foliar fertilization.

- Factor B: Genotype (b_1 - Canada - American provenience; b_2 - Marismas - Greece; b_3 - Coko - Greece).

The obtained results were statistically processed using the analysis of variance (Ciulca, 2006).

RESULTS AND DISCUSSIONS

In table 1. we present the analysis of the average cotton seed production (cleaned of fibers) for the three varieties of cotton under the influence of the agrofield in 2010 in Timisoara. In table 2. we present the effect of the genotype on the seed production for the three types of cotton in 2010 under the climatic conditions from Timisoara.

Table 2.

The effect of the agrofield on the seed production for the three cotton varieties in 2010 under the climatic conditions from Timisoara

Averages of FACTOR A						
FACT A AGROFIELD	FACT B CULTIVAR			Production kg/ha	%	Difference/ Significance
	Marismas	Canada	Coko			
a_1	965	985	983	978	100	-
a_2	1076	1030	1026	1044	107	66^{**}
a_3	1096	1106	1072	1091	112	113^{**}
a_4	1128	1130	1136	1131	116	153^{***}
a_5	1089	1092	1090	1090	111	112^{**}
a_6	1079	1001	1002	1027	105	49

LSD 5% = 43 kg/ha; LSD 1% = 57 kg/ha; LSD 0.1% =75 kg/ha

Table 3.

The effect of the genotype on the seed production for the three types of cotton in 2010 under the climatic conditions from Timisoara

Averages of FACTOR B			
FACT B CULTIVAR	Marismas	Canada	Coko
Production kg/ha	1072	1057	1051
%	100	99	98
Difference/ Significance	-	-15	-21

LSD 5% = 75 kg/ ha; LSD 1% = 99 kg/ha; LSD 0.1% = 131 kg/h

From the analysis we noticed that the cotton seed production is influenced positively by nitrogen doses applied on all studied agrofields. On the unfertilized agrofield the seed production is 978 kg/ha. On the agrofield $N_{30}P_{30}K_{30}$ the seed production is increased by 7 %, the difference is 66 kg/ha compared to the reference agrofield, the production is 1044 kg/ha. On the agrofield $N_{60}P_{30}K_{30}$ the seed production is 1091 kg/ha, 12% higher than the reference one, the production increase is 113 kg/ha and is statistically considered as distinctively significant. Increasing doses of nitrogen at 90 kg/ha on double dose of phosphorus and potassium has as result the increase of the production to 1131 kg/ha with 16% higher than the reference one, meaning a production increase of 153 kg/ha, statistically considered as very significant. An increase of the nitrogen dose by 30 kg/ha from agrofield a4 and a constant maintenance of the dose of phosphorus and potassium dose reduces the seed production to 1090 kg/ha, with 11% higher than the reference one, with a 1% greater than on the agrofield a_3- $N_{90}P_{60}K_{60}$ and 5% higher than on the agrofield with the best production, a_4 - $N_{90}P_{60}K_{60}$, the production increase of 112 kg/ha is statistically considered as distinctively significant. The application of the foliar fertilizer on a balanced background of nitrogen, phosphorus and potassium leads to an increase of the production, with only 5% compared to the reference one,

the production increase being of 49 kg/ha compared to the reference one. Regarding the behavior of varieties in terms of seed production we noticed that between the three varieties there are small differences of potential. The best production is obtained for Marismas genotype, 1072 kg/ha. For the Canada genotype the seed production obtained is 1057 kg/ha, and for Coko genotype 1051 kg/ha, with 1 %, respectively 2% smaller than the production of Marismas genotype.

Table 4.

Cotton seed production (kg/ha) under the agrofield influence for Marismas genotype in 2010 in the climatic conditions from Timisoara

AGROFIELD	PRODUCTION kg/ha	%	Diference/Significance
a_1	965	100	-
a_2	1076	111	111^{**}
a_3	1096	114	131^{***}
a_4	1128	117	163^{***}
a_5	1089	113	124^{***}
a_6+ foliar fertilization	1079	111	114^{**}

LSD 5% = 71 Kg/ha; LSD 1% = 94 kg/ha; LSD 0.1% = 124 kg/ha

In table 4. is presented the analysis of the average seed productions (cleaned of fibers) for Marismas genotype under the agrofield influence in 2010 in Timisoara

The analysis of the results shows that the cotton seed production is influenced positively by the nitrogen dose levels on all studied agrofields. On the unfertilized agrofield the seed production is 965 kg/ha. On the agrofield $N_{30}P_{30}K_{30}$ the seed production has increased by 11% compared to the reference production, this being of 1076 kg/ha, and the production increase of 111 kg /ha being statistically considered distinctively significant. On agrofield $N_{60}P_{30}K_{30}$ the seed production is 1096 kg/ha, with 14% higher than on the reference one and the difference is 131 kg/ha, statistically considered as very significant. The increase of nitrogen doses to 90 kg/ha on double dose of phosphorus and potassium has as result a production increase, 1128 kg/ha, with 17% higher than the reference production, the difference of 163 kg/ha is statistically considered as very significant.

An increase of the nitrogen dose by 30 kg/ha compared to the agrofield a_4 and the constant maintenance of the phosphorus and potassium dose reduces the seed production to 1089 kg/ha, with 13% higher than the reference one, the difference of 124 kg/ha is statistically considered as very significant.

The application of the foliar fertilizer on a balanced background of nitrogen, phosphorus and potassium results in the production increase with only 11% compared to the reference unfertilized variant, the registered production increase is 114 kg/ha. Regarding the varieties' behavior in terms of seed production we can notice that for the three studied types there are differences of potential.

Table 5.

Cotton seed production (kg/ha) under the agrofield influence for Canada genotype in 2010 in the climatic conditions from Timisoara

AGROFIELD	PRODUCTION kg/ha	%	Diference/Significance
a_1	985	100	-
a_2	1030	104	45
a_3	1106	112	121**
a_4	1130	114	145***
a_5	1092	110	110**
a_6+ foliar fertilization	1001	101	16

LSD 5% = 81 kg/ha; LSD 1% = 108 kg/ha; LSD 0.1% = 142 kg/ha

In table 5. we present the analysis of the average seed productions for Canada genotype. Also for this genotype we notice that the seed productions depend on the agrofield. When nitrogen, phosphorus and potassium fertilizers are not applied the seed production is only 985 kg/ha. When a balanced fertilization with nitrogen, phosphorus and potassium is applied at a level of 30 kg/ha s.a. of each, the seed production is 1030 kg/ha, with 4% higher than the unfertilized variant representing an increase of 45 kg/ha. On the agrofield where the nitrogen dose is doubled to 60 kg/ha, the phosphorus and potassium remaining with constant dose level of 30 kg/ha, the seed production reaches 1106 kg/ha; with 12% higher than the unfertilized reference production. The production increase of 121 kg/ha is statistically considered as distinctively significant. Increasing the nitrogen doses to 90 kg/ha and to 120 kg/ha s. a, with double quantities of phosphorus and potassium, determines the seed production increase of Canada genotype, with 14 %, respectively 10% higher than the unfertilized reference variant. The production increase of 145 kg/ha, respectively 110 kg/ha are statistically considered as a very significant. In the case of the agrofield where foliar fertilizer is applied on a background of 30 kg/ha of nitrogen, phosphorus and potassium, the seed production increases compared to the unfertilized variant with 3% and is less with 29 kg/ha than the production obtained from the agrofield with fertilization of 30 kg/ha nitrogen, phosphorus and potassium s.a. $N_{30}P_{30}K_{30}$.

Table 6.

Cotton seed production (kg/ha) under the agrofield influence for the Coko genotype in 2010 in the climatic conditions from Timisoara

AGROFIELD	PRODUCTION kg/ha	%	Diference/ Significance
a_1	983	100	-
a_2	1026	104	43
a_3	1072	109	89*
a_4	1136	115	153**
a_5	1090	110	107*
a_6+ foliar fertilization	1002	101	19

LSD5% = 80 kg/ha; LSD 1% = 140 kg/ha; LSD 0.1% = 187 kg/ha

In table 6. we present the average seed productions obtained for the Coko genotype in 2010 under the fertilization influence. Also in the case of Coko genotype the seed production is positively influenced by the increase of the doses of nitrogen fertilizers. On the agrofield $N_{30}P_{30}K_{30}$ the seed production is 1026 kg/ha with 4 % higher than the seed production obtained on the unfertilized variant. Increasing the dose of nitrogen on an agrofield with $P_{30}K_{30}$ leads to

a production increase of 9% compared to the unfertilized one, with a production increase of 89 kg/ha, statistically considered as significant. The seed production increases by 15% on agrofield where a dose of nitrogen of 90 kg/ha was applied on a background where the doses of phosphorus and potassium were doubled (60 kg/ha, etc.). The production increase obtained in this case is 153 kg/ha and is statistically considered as distinctively significant. In the case of the agrofield where the dose of nitrogen is 120 kg/ha s.a. on a background of 60 kg/ha phosphorus and potassium, the seed production for Coko genotype reaches 1090 kg/ha with 10% higher than the unfertilized reference production. The seed production increase obtained for the dose of 120 kg of nitrogen s.a. is 107 kg/ha and is statistically considered as significant. In the case of the agrofield were combined and foliar fertilization was used (basic NPK), the seed production Coko genotype increases by 1% compared to the unfertilized one, and is higher than the production obtained on the agrofield were basic fertilization was used ($N_{30}P_{30}K_{30}$). The production increase compared to the reference one is 19 kg/ha.

CONCLUSIONS

1. The best average seed production was obtained for Coko genotype, respectively 1136 kg/ha, compared to the other varieties where the following productions were obtained: Canada genotype 1130 kg/ha and Marismas genotype 1128 kg/ha;

2. The seed production per plant is strongly influenced both by the climatic conditions specific for the culture year and by the agrofield.

3. The three genotypes of cotton presented a good adaptability to weather conditions of Timisoara, in the year 2010.

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