DETERMINATIONS THROUGH BIOMETRICAL MEASURES CONCERNING THE QUANTITY OF RAW COTTON/PLANT AND THE AVERAGE WEIGHT OF FIBERS/PLANT TO THREE SPECIES OF COTTON (GOSSYPIUM sp.) IN THE YEAR 2009 IN WEATHER CONDITIONS OF TIMISOARA

Liliana ROȘCULEȚ (BABĂ), V. TABĂRĂ

Banat's University of Agricultural Sciences and Veterinary Medicine, Faculty of Agricultural Sciences, Timisoara, Aradului Street, no. 119, RO-300645, Romania, E-mail: baba.liliana@gmail.com

Abstract: *Through behavior analysis of three species of cotton in pedoclimatic conditions of Timisoara, it was made determination through biometrical measures under fertilization influence concerning the quantity of raw cotton/plant, the average weight of fibers/plant and seeds/plant weight. The three species of cotton taken in study were: Marismas and Coko from Greece and Canada, North America provenance. Investigations developed during the period 2008-2010. Analysis was made through evolution maintenance and monitoring in vegetation of experimental factors and its entire experience, and also pedoclimatic factors monitoring during the vegetation period. During vegetation period, phonological observations were made: emergence, growing, plant development (apparition of the floral buds, blooming, fecundation, fruitification formation, capsules development evolution, capsules maturity). It was followed the elements calculation of variant rows obtained through biometrical measures made in the field and laboratory. Results interpretation obtained after results calculation obtained from the accounting was made through variation analysis method and of answer curves. Bifactorial experience was placed in the field after subdivided parcels method. Experimental factors established were: factor A- agrofield (A1-N0P0K0, A2- N30P30K30, A3- N60P30K30, A4- N90P60K60, A5- N120P60K60, A6- N30P30K30 plus foliar fertilization); factor B- species (b1- Marismas- Greece, b2- American provenance, b3- Coko- Greece). Positive evolution of characters taken in study registered to all the three species of cotton on agrofield A4- N90P60K60, when a dose of 90 kg/area azoth applied on a field of phosphorus and potassium base in doses of 60 kg/area every one, face to testifier variant A1- N0P0K0 (NPK dose applied to germinal layer preparation under complex chemicals forms of type 15:15:15). The weather conditions of year 2009 determined low productions (raw cotton, fibers and seeds) to all the cotton species face to the ones of 2008, the entrance in vegetation of plants with a delay of approximate of 11 days, it was the dominant factor. Investigation brought a data base of valorous reference about cotton cropping in Western of Romania.*

Key words: *cotton, agrofield, quantity, weight*

INTRODUCTION

It is the most important textile plant. It assured 70-75% from global production of vegetal fibers and contributed with approximate 50% of total global production of natural and artificial fibers. Cotton fiber formed on seed tegument; the cotton was unicellular epidermal extension of bark plant seeds. Some of its characteristics gave it a distinct value of usage, making it at the degree of the most important industrial plant of the world: blandness, elasticity, breaking resistance, spinning, torsion and uniform coloring. In our country, for the crop it might to count on the first cone blooming (only from that one it could obtain valorous seed for seeding) and partial on capsules of the second cone.

MATERIAL AND METHODS

Experience was placed on a field of Didactical and Experimental Station of Timisoara, which functioned from judicial point of view under Banat's University of Agricultural Sciences and Veterinary Medicine. Investigation was made on behavior of three species of cotton (*Gossypium hirsutum* sp.): Marismas and Coko species of Greece and Canada species of North America, in the weather conditions of the year 2009. It made the pedoclimatic factors monitoring during vegetation period.

Table 1.

Monthly average temperatures registered to Regional Meteorological Center of Banat- Crisana-Meteorological Station of Timisoara, 2009

Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Year 2009	-1.1	1.4	6.6	14.7	18	20.1	23.2	23.7	20	12.3	8.3	4.3
Multiyearly average	-1.6	1.1	5.8	11.2	16.3	19.4	21.1	20.4	16.5	11.0	5.6	0.8
Abreviation209	2.7	0.3	0.8	3.5	1.7	0.7	2.1	3.3	3.5	1.3	2.7	3.5

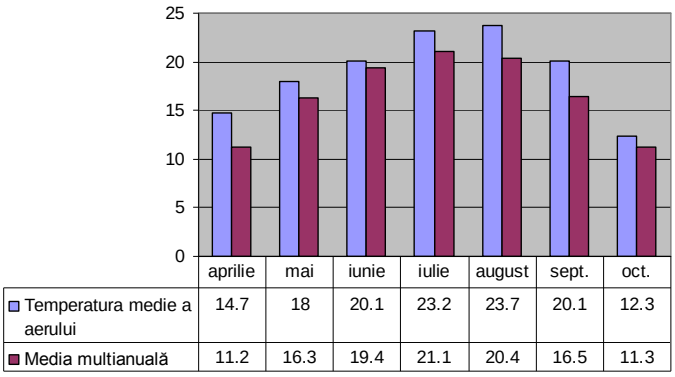


Figure 1. Graphical representation of the monthly average temperatures in comparison with multiyearly average, registered to Meteorological Station of Timisoara (2009)

Table 2.

Cotton requirements face to the temperature in different phases of vegetation (°C)

	Phases				
Temperatures	Germination Emergence	Plant (arising 3-4 leaves)	Preblooming	Blooming	Maturity
Minimal	12-15	15-16	19	15	12,6
Optimal	30-(34) (25-30 în sol)	25-30	25-32	23-26	25-28
Maximal	40	37(40)	37(40)	35	40(50)

In table 1 were the monthly average temperatures registered to Regional Meteorological Center of Banat – Crisana - Meteorological Station of Timisoara, in the year 2009. It observed (figure 1) that monthly average temperatures were bigger than multiyearly

monthly average temperatures, those value being bigger of 1°C until to 3.5°C. For vegetation period, resources specific like time of sun shining, active temperatures (∑T>0°C), and the ones effective (∑T>10°C), didn't determine significant variations in crops, because in specific conditions of investigated area, even in the most critic years the minimum of specific aloofness necessary to the best photosynthesis was realized.

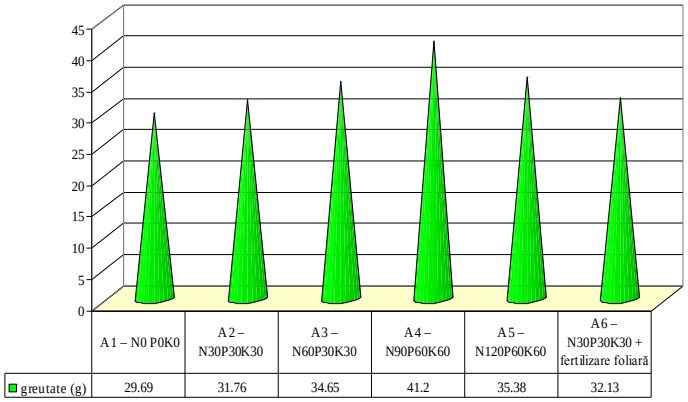
The soil where investigation had made was a cambic chernozem, phreatic clam, phreatic water, had found to depth of 1.5-2.0 m. Bifactorial experience was placed in the field after subdivided parcels method. Experimental factors established were: factor A- agrofield (A1-N0P0K0, A2- N30P30K30, A3- N60P30K30, A4- N90P60K60, A5- N120P60K60, A6- N30P30K30 plus foliar fertilization); factor B- species (b1- Marismas- Greece, b2- American provenance, b3- Coko- Greece).Technology applied for cotton crop was the specific one in great crop. An important role for production quality and quantity had the three fertilizer macroelements: azoth, phosphorus, potassium. To touch the established objects through investigation, the crop fertilization differently made on the 6 agrofields (A1-N0P0K0, A2- N30P30K30, A3- N60P30K30, A4- N90P60K60, A5- N120P60K60, A6- N30P30K30 plus foliar fertilization). For seeding it used cotton seed from crops before the first hoarfrost. Cotton seeded in 9 May. Seeding realized at 50-60 cm among rows. After emergence it gradual made density corrections. Plants' density controlling realized in the same time with hoeing. Evolution monitoring and maintenance in vegetation of experimental factors and entire experience were realized. Cropping begun when on every plant were 1-2 capsules opened very well, at absolute maturity. Moment cropping was chosen the one before first hoarfrost falling. Cropping was made between 25 September and 31 October. During the vegetation period were made phenological observations: emergence, growing, plant development (apparition of the floral buds, blooming, fecundation, fruitification formation, capsules development evolution, capsules maturity). Complementary with results interpretation and determination about raw cotton productions, fibers and seeds in laboratory it were made measures about quantity of raw cotton/plant, average weight of plant fibers, weight of plant seeds. All those determinations made for all the three species and for every agrofield in part. It was followed elements calculation of variants' rows obtained from biometrical measures made in the field and laboratory. Interpretation of results obtained after results calculation obtained from statistical account had made through variation analysis method and answer curves; it made the graphics as it followed.

RESULTS AND DISCUSSIONS

In figure 2 presented average weight variation of raw cotton on plant under agrofield influence to Marismas species in the year 2009 in weather conditions of Timisoara.

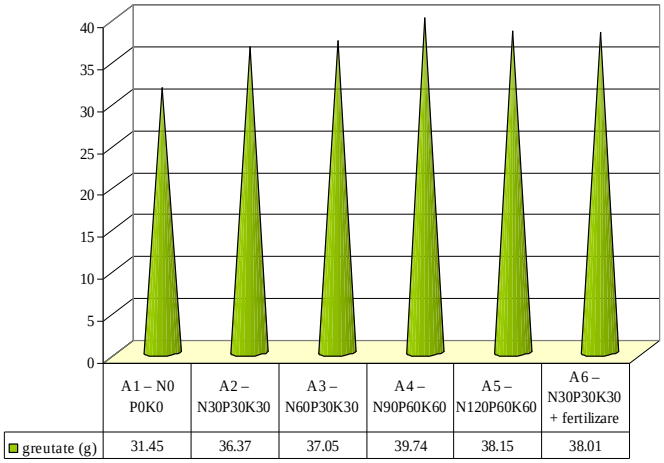
Analysis of graphic from figure 2 determined that the biggest value of average weigth of cotton increased along with azoth doses increasing until a quantity of cca 100 kg/area. It was important that the average weight of raw cotton on plant was negatively influenced by foliar fertilization. Foliar fertilizer application on N30P30K30 field determined the quantity reducing of raw cotton/plant with 3.25 g face to agrofield A5 and with 9.07 g face to agrofield A4. Having in view the values of variation index, the character was enough constant.

To Canada species the average weight variation of raw cotton on plant was represented in figure 3. Also, in case of Canada species the average weight variation of raw cotton on plant was dependent by azoth doses of agrofield. Average weight of raw cotton on plant would increase in the same time with azoth doses increasing. At a quantity of 90 kg/area applied on the agrofield, the average weight of raw cotton on plant was 39.74 g/plant. At azoth dose of 120 kg/area the average weight of raw cotton on plant was of 38.15 g/plant.



X	29.69	31.76	34.65	41.2	35.38	32.13
S²	99.85	6.45	64.07	62.59	49.69	69.10
S	9.99	2.54	8	7.91	7.05	8.31
Sx	0.99	0.25	0.80	0.79	0.71	0.83
S%	33.48	8	23.09	19.2	19.93	25.86

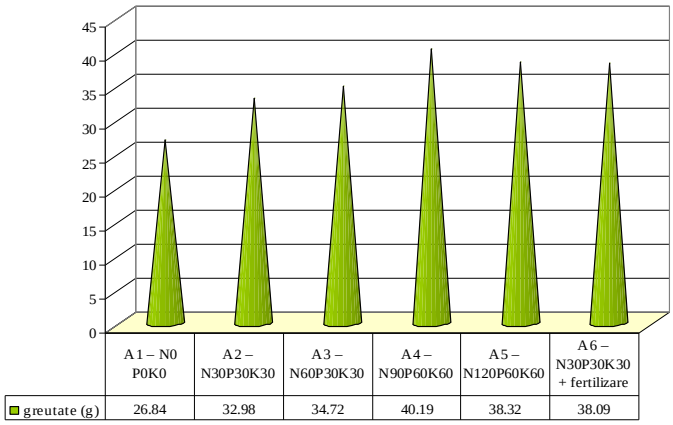
Figure 2. Average weight variation of raw cotton/plant/agrofield to Marismas species under fertilization influence in the year 2009 in weather conditions of Timisoara



X	31.45	36.37	37.05	39.74	38.15	38.01
S²	98.49	7.19	31.56	41.8	40.97	53.76
S	9.92	2.68	5.62	6.47	6.4	7.33
Sx	0.99	0.27	0.56	0.56	0.73	0.73
S%	31.54	7.37	15.17	15.17	19.28	19.28

Figure 3. The average weight variation of raw cotton (fibers plus seeds)/plant/agrofield to Canada species under fertilization influence in the year 2009 in weather conditions of Timisoara

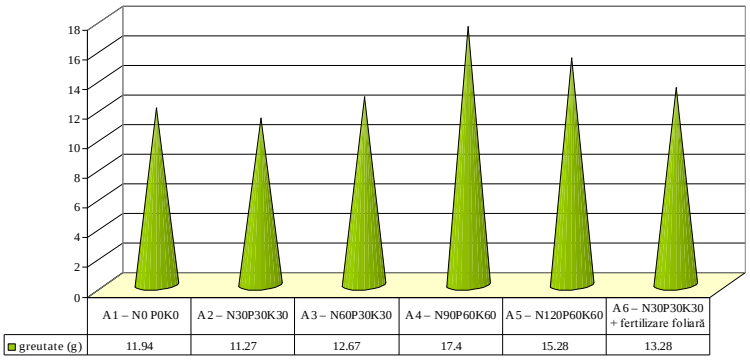
Results analysis represented in figure 2. it emphasized the fact of azoth dose necessary to obtain bigger quantities of raw cotton on plant and was caught between 90 and 120 kg/area. In case of Canada species, foliar fertilizer used had determined an increase of raw cotton production, 6.56 g/plant face to unfertilized variant and with 1.64 g/plant more than raw cotton weight obtained in variant with base fertilization to germinal layer preparation in doses N30P30K0.



X	26.84	32.98	34.72	40.19	38.32	38.09
S^2	6.16	28.72	81.49	30.35	33.38	99.08
S	2.48	5.36	9.03	5.51	5.78	9.95
S_x	0.25	0.54	0.96	0.55	0.58	1.00
$S_{\%}$	9.24	16.25	26.01	13.71	15.08	26.12

Figure 4. Average weight variation of raw cotton (fibers plus seeds)/plant/agrofield to Coko species under fertilization influence in the year 2009 in weather conditions of Timisoara

In figure 4 were represented average weight values of raw cotton on plant under agrofield influence to Coko species. From results analysis it determined the fact that also the production of raw cotton was conditioned by azoth doses in agrofield. Thus, in function of agrofield the biggest value of raw cotton weight obtained to azoth dose of 90 kg/area applied on a field of P60K60- 40.19 g/plant. The following place was occupied by agrofield with 120 kg/area azoth – 38.32 g/plant under average weight aspect of raw cotton. Comparing values of raw cotton production on plant, obtained on agrofields N90P60K60 and N120P60K60, it could deduce the fact that maximal production of raw cotton on plant obtained to Coko species at azoth doses between 90 kg/area and 120 kg/area, applied on a field of phosphorus and potassium of 60 kg/area each one. Also, in case of Coko, foliar fertilization didn't determine production increases, but foliar fertilizer used had determined a production increase of raw cotton on plant of 11.25 g/plant face to unfertilized variant, of 5.11 g/plant face to variant with base fertilization in preparation of germinal layer in doses of N30P30K30. Variation coefficient analysis for the character, raw cotton weight on plant under agrofield influence showed that it had values smaller in case of agrofields: N0P0K0- 26.84 g/plant, N0P30K30- 32.98 g/plant, and N60P30K30- 34.72%. On agrofields N90P60K60- 40.19%, N120P60K60- 38.32% and N30P30K30 plus foliar fertilization- 38.09%, the variation coefficient was medium to big, so, bigger doses amplified the character variability of raw cotton on plant.

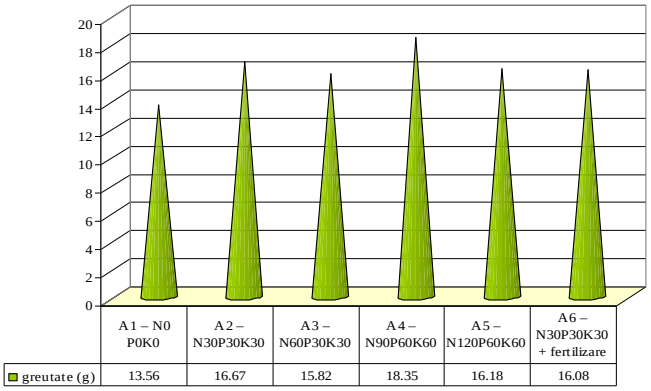


X	11.94	11.27	12.67	17.4	15.28	13.28
S²	23.44	31.08	20.63	24.08	14.69	20.04
S	4.84	5.57	4.54	4.91	3.93	4.48
Sx	0.48	0.56	0.45	0.49	0.38	0.45
S%	40.54	72.06	35.8	28.19	25.07	33.73

Figure 5. Average weight variation of fibers/plant/agrofield to Marismas species under fertilization influence in the year 2009 in weather conditions of Timisoara

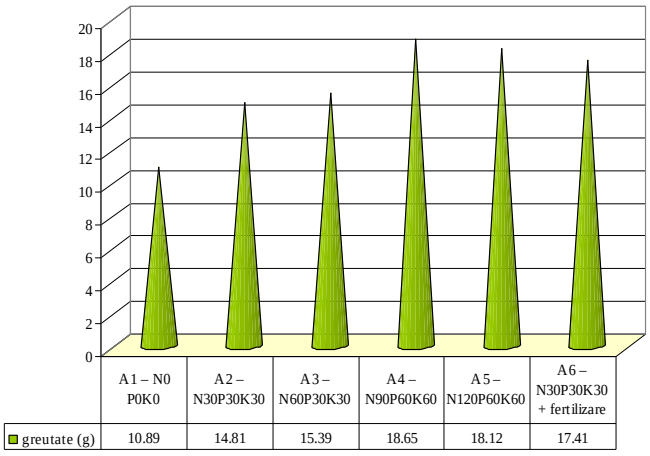
In figure 5 were represented average productions of fibers on plant under agrofield influence to Marismas species. From results analysis it observed that species fibers production was conditioned by azoth doses of agrofield. Thus, in function of agrofield the biggest value of weight cotton's fibers obtained to azoth dose of 90 kg/area applied on a field of P60K60-17.40 g/plant. The following place under average weight aspect of raw cotton, obtained on agrofields N90P60K60 and N120P60K60, it could deduce the maximal production of raw cotton fibers on plant had obtained also to Marismas species at azoth doses between 90 and 120 kg/area, applied on a field of phosphorus and potassium of 60 kg/area each one. In case of Marismas species, foliar fertilization determined increases of production of 1.34 g/plant face to unfertilized variant and of 2.01 g/plant face to the one in which was used an agrofield of base N30P30K30. Variation coefficient analysis for the character, average weight of cotton fibers/plant, under agrofield influence, showed that smaller values of agrofields: N0P0K0- 11.94 g/plant, N30P30K30- 11.27 g/plant N60P30K30- 12.67 g/plant.

Average weight of fibers on plant to Canada species obtained under agrofield influence was represented in figure 6. From graphic's analysis it observed that average weight of fibers on plant to Marismas species was dependent by azoth doses of agrofield. On unfertilized agrofield the average weight of fibers on plant had been 15.82 g, 18.35 g, 16.18 g. In case of fertilized variant with azoth in dose of 120 kg/area the weight value of fibers on plant registered a low decreasing with 2.17 g/plant face to agrofield A4- N60P30K30, that meant azoth dose assured a maximum of weight value of fibers on plant situated between those two doses (90,120 kg/area). From weight value analysis of fibers on plant to Canada species it had observed through foliar fertilization with Fertileader product 954, the fibers weight on plant became from 16.08 g/plant to 2.52 g/plant more than unfertilized variant and with 0.59 g/plant smaller than in fertilized variant in equilibrated reports NPK at a level of 30 kg/area of every one of three fertilized elements.



X	13.56	16.67	15.82	18.35	16.18	16.08
S^2	25.37	2.46	9.73	8.71	12.48	9.97
S	5.04	1.57	3.12	2.95	3.53	3.16
Sx	0.5	0.16	0.31	0.3	0.35	0.32
S%	37.17	9.42	19.72	16.08	21.82	19.65

Figure 6. Average weight variation fibers/plant/agrofield to Canada species under fertilization influence in the year 2009 in weather conditions of Timisoara



X	10.89	14.81	15.39	18.65	18.12	17.41
S^2	0.35	11.97	21.65	5.82	9.13	27.2
S	0.59	3.46	4.65	2.41	3.02	5.22
Sx	0.06	0.35	0.47	0.24	0.30	0.52
S%	5.42	23.36	30.21	12.92	16.67	29.98

Figure 7. Average weight variation of fibers/plant/agrofield to Canada species under fertilization influence in 2009 in the weather conditions of Timisoara

In figure 7 were represented average values of average weight of cotton fibers to Coko species under fertilization influence. From graphical representation analysis it observed that fibers production to Coko cotton species was dependent by fertilization, in the main by azoth doses of agrofield. Foliar fertilization on a field of N30P30K30 would bring to average production increasing of fibers on cotton plant. On testifier agrofield N0P0K0 average production on plant was of 10.89 kg/area. On agrofield N30P30K30 average production of fibers on plant was of 14.81 g. In case of N60P30K30 and N90P60K60 the average production of fibers on plant was of 15.39 g, respectively of 18.65 g. On the agrofield with the biggest azoth dose N120P60K60 the average production of fibers was of 18.12 g/plant. From graphical representation of average productions of fibers on plant it observed that maximal production of fibers on plant, and to Coko species it had obtained to azoth ose of 100 kg/area. In case of foliar fertilization's variant, the used product determined an increase of 7.12 g/plant face to unfertilized variant and with 1.24 g/plant fewer than registered value on agrofield A4- N90P60K60.

CONCLUSIONS

Evolution monitoring and maintenance in vegetation of experimental factors and of entire experience, also pedoclimatic factors' monitoring during vegetation period permitted determinations through biometrical measures about quantity of raw cotton/plant, average weight of fibers on plant and seeds weight on plant. The conclusion was:

1. The three species of cotton presented a good adaptability to weather conditions of Timisoara;
2. A positive evolution of characters taken in study registered to all the three species on agrofield A4- N90P60K60 face to testifier variant A1- N0P0K0;
3. Weather conditions of year 2009 determined low productions (raw cotton, fibers and seeds) to all the cotton species face to those of the year 2008, an entrance in vegetation of the plants with an approximate of 11 days delay that being the determinate factor.

BIBLIOGRAPHY

1. BAILEY N. T. J., 1959 – Statistical methods in biology. The english universities press ltd, 102 Newgate street, London, E.C. 1.;
2. BĂLAN I.M., 1949– Bumbacul şi cultura lui, Editura de Stat, Bucureşti;
3. BĂLAN I. M., 1974– Tehnologia culturii bumbacului, MAIA;
4. HERA C., BORLAN Z., 1980– Ghid pentru alcătuirea planurilor de fertilizare, Ed. Ceres, Bucureşti;
5. REINHARDT V., 1952 – Cultura bumbacului în regiuni noi, Editura de Stat, (Moskva, 1948), Bucureşti;
6. TABĂRĂ V., 2005– Plante tehnice, oleaginoase şi textile, vol.I, Editura Brumar, Timişoara;
7. SMITH C., W. 1995– Cotton (*Gossypium hirsutum L.*), capitol 6, în Crop Production: Evolution, History and Tehnology,; John Wiley and Sons, in New York, pp. 287 – 349