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Thermal water characteristics and their impact in maize production quality, in Diber area

Majlinda Hoxha[1], Enkelejda Kucaj[2], Uran Abazi[3]
[1](*World Vision Albania and Kosovo, Team Leader Dibra AP, Boulevard "Elez Isufi", Peshkopi,Albania)*
2(Departament of Environment, Polis University of Tirana, Albania)
[3](*Department of Agro-environment and Ecology, Agricultural University of Tirana, Kodër -Kamëz 1029, Tiranë, Albania).*

ABSTRACT: *The objective of this study has been the impact of thermal water in Peshkopi in maize characteristics and quality of its production in the area used this water for irrigation. The study period there has been during years 2011-2014. The indicators analyzed for water have been pH, CE, N, P_2O_5, K, $CaCO_3$, and Na. The experiment is taking place in Peshkopi, in the valley of Staravec stream, in the place called Banjishte, with two varieties of maize, one with short production cycle (MAS – 37 V) and the other with long production cycle (NS 444). The analysis of the humidity, greasy, proteins, cellulose, ashes indicators and P, Ca, Mg, CaO, MgO, are analysed for the dried leaves of maize, the corns and corns with bones at the Laboratory of the Transfer of Technologies in Fushe Kruje. The results are compared with the norms and standards of National Catalogue of Standards 2012. The results demonstrate an extension of the vegetation period of the plant, delay in maturity, higher content of P, Ca, Mg, CaO and MgO, increase of the % of fat, proteins, celulose and ash of the maize crops that is irrigated using the thermal waters compared with the crops of maize irrigated using the water within normal parameters.*
Keywords: *Water and soil Quality, Zea Mays, sustainable agriculture*

I. INTRODUCTION

Dibër is one of rural regions in Albania. It has a cold climate, with alternating seasons. Its main sources are agriculture, livestock, orchards and typical traditional products. Dibër is a somewhat isolated region in considerable distance from Tirana. This fact, together with the damaged infrastructure have turned it into a less developed area. The land is fragmented, with households possessing small land surfaces that on average go up to 0.5 ha / family. This makes families in general cultivate several crops on their farm, aiming at providing food for its members. Mechanization is at very low levels. This is not only because of the small size of farms, but also for the fact that farms are not organized into groups oriented towards collective reception of services or sale of products. [1]

The thermal waters of Peshkopi flow about 1.5 km from the city of Peshkopi, above the stream of Bellovë. There are a total of three sources, which have a water flow of 14 liters / sec. Source is at an altitude of about 750 meters above sea level, which creates the possibility that thermal waters together with the water coming from the stream of Bellovë be used for irrigation in the lower part of the fields of Dibër. According to information received from Dibër Regional Directorate of Agriculture, thermal waters are used in an area of 450 ha at three administrative units:

- Peshkopi 20 ha
- Tomin 310 ha (Pollozhan, Tomin, Pilafe, Rashnapojë, Ushtelenxë, Brezhdan, Zdojan)
- Kastriot 120 ha (Kander, Vakuf)

Length of the irrigation canal is 15 km. Since cultivation is not done in an organized manner by farmers, there is no accurate data in years regarding the respective cultivated cultures and surfaces and watered by thermal waters in the zone. However, the main crops are corn, alfalfa, wheat, orchards and few other crops. [2]So, corn is among the main crops for which the thermal waters are used to irrigate. Meanwhile, the obtained product is used as food for both people and animals. This was why the study of the impact of Peshkopi thermal waters in plant indicators and quality of corn grain was found of interest. [3]

II. MATERIAL AND METHODS

Multiple data obtained in different ways and from different sources were used to conduct the study. The main data are taken from the field study of the influence of water on the corn plant. Continuous observations were made for the three years of study, keeping data which are processed, analyzed, and evaluated to measure the impact of thermal waters. A category of data is held about direct measurements made regarding indicators of plant growth and production, number of ears per plant and length of the plant. Laboratory tests are performed and used in the study. Tests and evaluations are made based on the use of corn production. Since corn is used as food for people and animals analyzed indicators are defined by the nature of production. There are analyzed Weight of cob, Weight of plant, and length of plant and % of cob/plant. Cobs, leaves and grains are analyzed. Sample tests were carried out in the Laboratory of Fushë-Krujë. Test methods are based on the Albanian State Standard its Food Code of 65 120, approximated with the international ones in the year 2000. Samples were taken in three years of the study, in a representative way and at the same time of the year, thus reducing the human error in the findings. Data obtained from the above three methods are processed, analyzed, and will be interpreted, preparing recommendations that will serve farmers to judge on use or non-use of thermal waters for irrigation of corn crop in Dibër. [4]

III. RESULTS AND DISCUSSION

As mentioned above, the study was extended to 3 years, namely, 2013 - 2015. About 501 plants in 2 plots and 10 blocks were studied each year. Since both, short & long cycle hybrids are cultivated in Dibër, thermal waters are studied in indicators of plant production and product quality in both varieties.

The experiment is set up at the Stream of Staravec. Assess impact of thermal waters in corn production and quality, the experiment was set up in a newly opened land area. This is because thermal waters are commonly used for irrigation by farmers and if the experimental plot was previously watered with thermal waters, then the land surface for the experiment would compromise the results of the study.The same interventions and the same services were applied in the plots set up for experiment, in the same way and the same period in the respective years for both the blocks irrigated with thermal waters and for those irrigated with common waters. [5]One of the observed indicators is the average number of leaves per plant depending on the water used for irrigation. The study showed that both, the plants irrigated with thermal waters, as well as those irrigated with ordinary water, have on average 14 leaves per plant. Also in both cases, the plants have generally one ear, and only few of them have two.Whereas changes are observed in the early hybrid: In blocks irrigated with thermal water, about 70% of plants have 13 leaves, while 30% of plants have 12 leaves. As per the same hybrid irrigated with ordinary waters, about 40% of the plants have 14 leaves, 45% of the plants have 13 leaves and 15% of the plants have 13 leaves.

Unlike the long-cycle hybrid, the short-cycle one irrigated with ordinary water, about 29, 8% of the plants have 2 ears. While in the hybrid irrigated with thermal waters, about 28.9% of the plants have 2 ears.The study is based on analysis of quantitative indicators measured on the plants in both categories of blocks. For the short-cycle hybrid, data on average plant height, weight of the plant together with the ear, the weight of the ear itself and the ear / plant weight ratio are given below. [6].

Tab.1. Hybrid 95 days irrigated with normal water

Variant	Length of plant	Weight of plant	Weight of cob	Cob/plant %
V1	221,4	383,1	218,7	57.1

The results obtained show the negative influence of the use of thermal water for irrigation in the inhibition growth of the plant.

Tab.2. Hybrid 95 days irrigated with thermal water

Variants	Length of plant	Weight of plant	Weight of cob	Cob/plant %
V2	182,8	334	191	57,9
V3	187,5	280,6	164,8	59,9
V4	202,1	332,8	203,8	64,8
V5	210,1	396,3	201	45,7
Average of varieties	**195,6**	**335,9**	**190,2**	**57,1**

There are also measured the quantitative indicators for the cobs and grains which are provided in the following tables.

Tab.3. Hybrid 95 days irrigated with normal water

Variant	Weight of cob	Weight of grain	Number of grain	Weight of 1000 grains
V1	181,9	151,9	436	355,4

From the data given in tables 3 and 4 are noticed indicators in the higher value of the cobs for the lands irrigated with ordinary waters.

Tab.4. Hybrid 95 days irrigated with thermal water

Variants	Weight of cob	Weight of grain	Number of grain	Weight of 1000 grains
V2	171,3	147,4	421,2	350
V3	187,4	161	458,2	348,8
V4	161,4	134,3	399,5	336
V5	121,6	105	343,9	305,3
Average of varieties	**160,4**	**136,9**	**405,7**	**335,0**

The influence of thermal water used for irrigation in the inhibition growth of hybrid plants for 95 days is easily noticed only just with a naked eye. The above data will be processed and analyzed in order to assess the impact of thermal waters in the growth of maize within a certain level of security. [7]The same indicator of the plant and cob are also measured for hybrid SS 444. The results are shown in the following tables (5 and 6).

Tab.5. Variety 115 days irrigated with normal water

Variant	Length of plant	Weight of plant	Weight of cob	Cob/plant %
V1	220	408,6	190,4	46,6

Values obtained for measured indicators for the plant do confirm the hypothesis we raise for the hybrid irrigated 95 days. However, this will be statistically analyzed and evaluated.

Tab. 6. Hybrid 115 days irrigated with thermal water

Variants	Length of plant	Weight of plant	Weight of cob	Cob/plant %
V2	211,3	415,6	199,6	49
V3	201,3	363,6	184	51,5
V4	192,1	308,7	164,8	55,2
V5	194	316,3	149,9	49,8
Average of varieties	**199,7**	**351,1**	**174,6**	**51,4**

From the first sight, we can say the same thing for the indicators of cob. Thermal water has negative impact in growth of plants.

Tab.7. Hybrid 115 days irrigated with normal water

Variant	Weight of cob	Weight of grain	Number of grains	Weight of 1000 grains
V1	168	136	383	379

The parcels of land irrigated using ordinary water show higher values of the cob compared to the values of indicators obtained in the case when the maize is irrigated using the thermal water. **[8]**

Tab. 8. Hybrid 115 days irrigated with thermal water

Variants	Weight of cob	Weight of grains	Number of grains	Weight of 1000 grains
V2	179,6	154,4	388,4	397,5
V3	196,8	170,8	438	390
V4	138,8	120,8	338,5	356,9
V5	107	92,4	283,6	325,8
Average of varieties	**155,6**	**134,6**	**362,1**	**367,6**

However statistical analysis will certify the influence of thermal waters in the production of maize crops in Diber.

IV. CONCLUSION

Plants irrigated with thermal water have more intense green color than those irrigated with ordinary / normal water. [9]Thermal waters extend the plant's vegetation period with 1 (one) week, which is more obvious in the hybrid variety irrigated for 95 days. In the land plots irrigated with normal water, the earlier harvesting is clearly noticed even in a naked eye. The change in time for the harvesting of cob is about one week. For the maize production with a vegetation period of 115 days and more, the use of thermal waters delays harvesting as such creating a serious problem in getting the production. Irrigation of corn with thermal waters, especially in the hilly area of Diber, should not be applied in hybrid varieties with a late harvesting cycle. Use of thermal water for irrigation affects the number of leaves per plant and the average number of cobs per plant in late cycle hybrid. [10]. Thermal waters for irrigation negatively effects on increasing the number of leaves per plant in the early cycle hybrid. Regarding the impact of their use in regard to the average number of cobs per plant, the data obtained should be statistically evaluated because the information received from measurements do not have big differences.

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