THE EFFECT OF FLORAHUMUS AND ELICE VACCINES ON THE YIELD AND NUTRITIONAL VALUE OF SWEET POTATO

Adrienn SZARVAS[1], Botond BAZÁN[2]
[1]Institute of Plant Sciences and Environmental Protection, Faculty of Agriculture, University of Szeged, Hódmezővásárhely, HUNGARY
[2]University of Szeged, Faculty of Agriculture, Hódmezővásárhely, HUNGARY
**Corresponding author: szarvas.adrienn@szte.hu*

Abstract: *The experiment was set up in Zákányszék on sandy soil in South Hungary. The area of the experiment is 133 m2. The experiment was set up with Orleans sweet potato variety, the two most advantageous characteristics of Orleans are high yield and the appearance sought after on the markets. We tested is there any significant difference between the control and the other three treatments (Florahumus applied to the soil, Florahumus applied to the foliage and Elice vaccine) in the sweet potato yield and the content value (dry matter, %; crude fat, g/kg; crude protein, g/kg; crude fibre, g/kg; crude ash, g/kg). It was found that between the control and the other three treatments there was no significant differences in the content of the sweet potatoes. There was a significant difference between the three treatments and the yield classification. The second class of tubers showed significant differences test at 5% level of significance. This means that we can have more income because we have less second classified tubers. In the future, it is recommended to set up further experiments, in which plant physiological parameters such as shade, water and soil moisture utilization should be investigated. Further nutritional studies should also be carried out to investigate how carotene content is affected by plant conditioners.*

Key words: *sweet potato, nutritional value, treatments*

INTRODUCTION

The sweet potato cultivation is concentrated in tropical and subtropical countries throughout the world. In the warmer parts of the temperate zone, it is grown where its heat requirements can be met during its relatively long growing season. Sweet potato is the sixth most important arable crop in the world (MONOSTORI et al. 2020). The total global yield in 2020 was 89.5 million tonnes, grown on 7,400,472 hectares, with an average yield of 11 tonnes per hectare (FAO, 2021). Sweet potato has a wide range of soil requirements, but the best soil is friable, well drained and well worked in the top 25 cm. If the chemical and structural properties are right, excellent yields can be obtained. Sandy soils have lower nutrient content but higher yields, but soils with higher nutrient content often have lush stands with tubers that are too large and irregular. Sweet potato likes light acidic or neutral soils with an optimum Ph between 5.5 and 6.5. Soils that are too acid or alkaline often promote bacterial infections and will also have a negative effect on yield (CAIRO, 1980). Care should be taken to avoid excessive nutrient supply. In my own experiments, I have repeatedly found that either over-application of basic fertilisers, mainly N, or excess foliar fertilisers resulted in a significant reduction in yield instead of an increase. During the growing season, one indicator of the problem may be the development and densification of the foliage, which is more pronounced than is typical of the variety. JIN-YOUNG MOON and colleagues concluded that nutrient application with foliar fertilization had a greater impact on sweet potato yield (JIN-YOUNG MOON, 2019). KAY (1973) showed that sweet potato grow best on sandy soils and yield less on loam soils. Good drainage is essential as the crop does

not tolerate excessive waterlogging. Sweet potatoes can be grown in a wide range of soils, even in nutrient-poor soils, and yields are satisfactory in these areas (CHIPANGURA and JACKSON, 2003). They are excellent in sandy areas, are undemanding crops and do not require much nutrients. Ahmed (2017) and colleagues found that humic acid application significantly increased the total tuber yield and all measured growth parameters of sweet potato. Several researchers have found that sweet potato yield can be between 30 and 73 tons per hectare (HOSSAIN et al., 1987; SIDDIQE, 1988; HALL and HARMON, 1989; BHAGSARI and ASHLEY, 1990). In Hungary the yield can be 30-40 tons/ha. The earliest variety to harvest is Beauregard, which can be harvested after 90 days, but most varieties only reach the size at which they are worth harvesting between 120 and 130 days (THOMPSON et al., 2014). Sweet potato can be grown successfully in both flat and ridges cultivation technology. Cuttings are usually planted in one row in the bakhate and two or more rows in the bed (BIVALYOS, 2023). Montilla and colleagues examined the sugar content of nine sweet potato varieties in their study, finding that the average sugar content at harvest was 4-6% and 8.5% Brix. Sugar content more than doubled after two weeks of storage and heat treatment. Between the second and fourth week, the sugar content changed only slightly. Postharvest storage of sweet potato resulted in a significant increase in sugar content two weeks after heat treatment (MONTILLA at al., 2014). Sucrose is the most abundant sugar in raw sweet potatoes, with glucose and fructose in smaller amounts (BOUWKAMP, 1985). Sweet potato also contains proteins and carbohydrates mainly starch. They also contain some free sugars which give the tuber its sweet taste. Vitamin A and B are also present in significant amounts and the tubers are rich in vitamin C. Orange flesh sweet potatoes are high in carotenoids and β carotene (JAKAHATA et al ,1993).

MATERIAL AND METHODS

The experiment was set up in Zákányszék, which is located in South Hungary. The soil is sandy soil. The area of the experiment is 133 m^2. A soil sample was first taken in March and sent for testing. The area was planted with brassica as a previous crop. Soil preparation started on 19th of May. The soil preparation started with disking, which was done for mechanical weeding. The second operation was roto-tillage, to create a suitable crumbly soil surface and soil structure. Weeding was done by pre-sowing, in which Dual Gold 960 EC herbicide was applied. In the experiment, the internationally used row and plant to plant spacing of 100 cm x 30cm in sweet potatoes was used. The propagating material was provided by the Bivalyos Farm, from whom we received the cuttings the day before planting. In an experiment, 400 cuttings were used. Before planting, the area was irrigated with a watering drum to improve the water retention capacity of the soil. In all cases, nutrient application to the experimental plots was carried out with a backpack sprayer. Florahumus (humic acid) was applied to the second plot as a foliage conditioner at two times, the first time when the plants were in a few leaves and the second time when they were in flower stage. The first nutrient application was made on 30th of June 2023 at a rate of 0.5 l/ha, at a rate of 2 ml per plot of 40 m^2. The second nutrient application was made on the 20th of July 2023 at a rate of 0.5 l/ha, at a rate of 2 ml per plot of 40 m^2. In the third plot, Florahumus was used as a soil conditioner in a single application, it was applied on the firt of June 2023 with a rate of 0.5 l/ha, at a rate of 2 ml per plot, applied at 40 m^2 per plot. In a fourth treatment, Elice vaccine was applied at 30g/ha. Two applications were made, the first before

flowering and the second after flowering, at 0.12 g per plot of 40 m^2. We used 3 treatments compared to the control. Each row was planted with 100 slips of sweet potato, no replicates were used in the experiment. The tuber content measurements were carried out on the 22 of September in 2023 from the harvested sweet potato tubers. We tested is there any significant difference between the control and the other three treatments (Florahumus applied to the soil, Florahumus applied to the foliage and Elice vaccine) in the sweet potato yield and the content value (dry matter, %; crude fat, g/kg; crude protein, g/kg; crude fibre, g/kg; crude ash, g/kg). We also measured the sugar content of sweet potato (Bix%).

RESULTS AND DISCUSSIONS

No significant differences were found between the yields of plots treated with different plant conditioners when examining the data for the given year. When the yields in kg/ha are converted to tonnes/ha, it can be seen that the highest yield was 43.66 t/ha of Humicacid foliage (treatment 2), followed by 43.33 t/ha of Humicacid soil (treatment 3) and 40.66 t/ha of Elice vaccine. The control plot yielded the lowest yield of 33.33 t/ha (*Figure 1*). The difference in yield between the control plot and Treatment 2 was 10.33 t/ha.

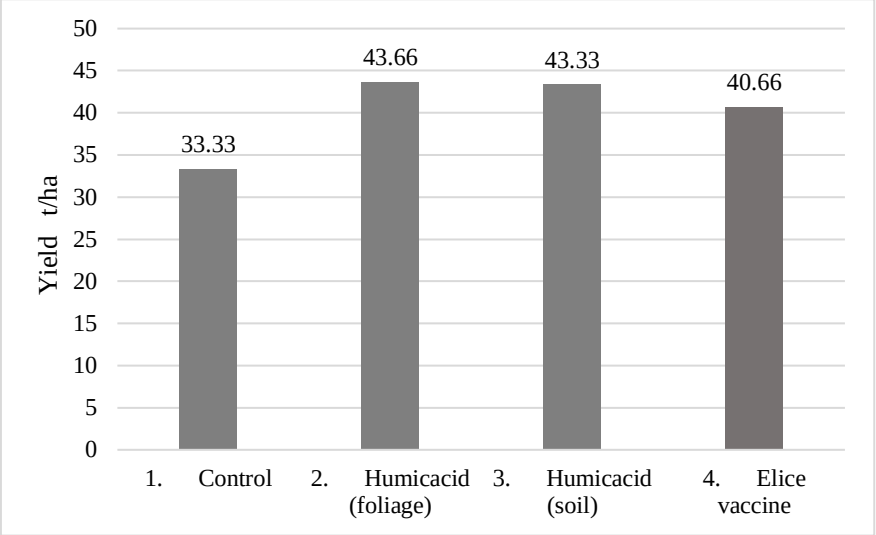

Figure 1. The effect of different treatment on sweet potato yield (t/ha) (Zákányszék, 2023)

We tested whether there was a significant difference between the control and the other three treatments (Florahumus applied to the soil, Florahumus applied to the foliage and Elice vaccine) in the sweet potato nutritional composition (dry matter, %; crude fat, g/kg; crude protein, g/kg; crude fibre, g/kg; crude ash, g/kg). Statistical methodology the x^2 trial was used (*Tables 1*).

It was found that none of the sweetpotato content indices of the control and the other three treatments showed significant differences. This means that none of the treatments applied

is relevant either in terms of increasing sweetpotato yield or in terms of significantly improving the content indices.

Table 1

The analysis of the nutritional value of sweet potato 1000 g

	Dry content. (%)	**Crude fat (g/kg)**	**Crude protein (g/kg)**	**Crude fiber (g/kg)**	**Crude ash (g/kg)**
1.	16,77	0,79	**10,20**	7,87	**8,21**
2.	14,98	0,85	8,24	**8,38**	8,20
3.	14,96	0,75	7,95	7,96	7,31
4.	**17,71**	**1,05**	7,92	7,05	7,08

1: Control, 2: Humicacid (foliage), 3: Humicacid (soil), 4: Elice vaccine

CONCLUSIONS

The study show that there were no significant differences between treated and control plots, but more yield was obtained between all treated plots compared to the control plot. The difference in yield between the control plot and Treatment 2 was 10.33 t/ha. It's very important to use plant conditioners, because we can achieve more yields and more income. In the future, it is recommended to set up further trials, in which plant physiological parameters such as shade, water and soil moisture utilization should be investigated. Further nutritional studies should also be carried out to investigate how carotene content is affected by plant conditioners. We hope that our research has highlighted the need for further studies in sweet potato, as there are still some gaps in nutrient status.

BIBLIOGRAPHY

AHMED E. ABD- ALL, ASHRAF E. EL-NAMAS, ESSAM M. EL-NAGGAR. (2017): Effect of Humic Acid and Foliar Application of Different Potassium Sources on Yield, Quality and Water Use Efficiency of Sweet Potato Grown under Drip Irrigation in Sandy Soil. https://asejaiqjsae.journals.ekb.eg/article_4032.html

BHAGSARI, A. S., ASHLEY. S. A. (1990): Relationship of photosy nthesis and harvesting index of sweet potato yield. J. Hort. Sci. 111. 288-293.

BIVALYOS TANYA. (2023): https://bivalyos.hu/3d-flip-book/edesburgonya-szantofoldi-termesztes-es-katalogus/

BOUWKAMP, J. C., (1985). Sweet potato products: a natural resource for the tropics. CRC Press, Inc., Boca Raton, FL.

CAIRO, P. (1980): Soil. Editorial Puebloy Educacion, Habana, Cuba.

CHIPANGURA, B., JACKSON J. (2003): Sweet Potato for high yield in Zimbabwe, Farming World, Harare, 5-12.

FAOSTAT 2021 (http://www.fao.org/faostat/en/#search/sweet%20potato)

HALL, M. R., HARMON, S. A. (1989): Coastal red sweet potato. Hort. Sci.24, 176-177.

HOSSAIN, M., SIDDIQUE, M. A., CHOWDHURY, B. (1987): Yield and chemical composition of sweet potato as influenced by timing of N and K fertilizer application under different levels of irrigation. Bangladesh J. Agricultural.12. 181-188.

JAKAHATA, Y., NODA, T., NAGATA, T (1993). HPLC determination of β carotene content in sweet potato cultivars and its relationship with colour value. Japan Jrl of Breed. 43: 421-427

JIN-YOUNG MOON1, BYEONG-KYU MIN1, JUNG-HO SHIN1, YONG-CHO CHOI1, HYEON-JI CHO1, YOUNG HAN LEE1, SUNG RAN MIN, JAE-YOUNG HEO1. (2019): Influence of Foliar Fertilization with Monopotassium Phosphate on Growth and Yield of Sweet Potato (Ipomoea batatas L.). pp.217.

KAY, D. E. (1973): Crop and product Digest 2: Root crops. Tropical Product Institute, London. pp. 245.

MONOSTORI T., SZARVAS A.; VÁRALJAI L., VÁRALJAI T., MARÓTINÉ TÓTH K., TÁBOROSINÉ ÁBRAHÁM ZS., BRÁJ R. (2020A): Az édesburgonya termesztésének lehetőségei a Dél-Alföldön. Agrofórum, 31(1): 38-42

MONTILLA C, HARRIS H, SMART, R, GORDON J, W. ZIMMERMAN. T. (2014): Influence of storage on sweetpotato sugar content. Uinversity of the Virgin Islands, Agricultural Experiment Station, St Croix, Virgin Islands 00850.

SIDDIQUE, M. A. R. (1988): Studies on the morphology, growth and yield of some sweet potato genotypes. M. Sc. (Agriculture) thesis, Dept. of Horticulture, Bangladesh Agricultural University, Mymensingh.

THOMPSON, P., WILLIAMS, M., BYRD, J., THOMAS, J., PARVIN, D., KILLEBREW, F. (2014): Commercial sweet potato production in Mississippi. Mississippi State University Extension Service. http://msucares.com/pubs/publications/p1678.html