

EVALUATION OF THE MORPHOBIOLOGICAL AND PRODUCTIVE INDICATORS OF CHAYOTE (*Sechium edule* L) IN THE REGION OF MYZEQE, LIBOFSHË, FIER

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Abstract

Prickly potato - Chayote (*Sechium edule* L) is an exotic plant that grows and is cultivated in Costa Rica. It has been brought to Albania since 2004 and has been studied several times in different areas, mainly in the warm zone. It is a plant that has many synonyms and uses. Sometimes it is called prickly eggplant or prickly gourd and in some places it is called Kayota. The fruit grows above the ground and the plant develops as a pergola with long shoots. The fruit is used cooked in different forms: fried, dish, and or casserole. The leaves are used to make various pies and it is very tasty, especially when cooked with milk. The fruits are planted in March by placing them in the soil and covering them with 5-8 cm. During the vegetation, measurements of biometric and productive indicators were made: Number of shoots/plant, length of shoots/plant (sum), longest shoot, shortest shoot, number of leaves/plant, leaf color, flower color, the shape of the leaf, the shape of the tuber, the color of the skin of the tuber, the color of the tuber pulp, the placement of the buds on the tuber, yield/plant (kg/plant), number of tubers/plant, average tuber weight (kg), the weight of the largest tuber (kg), the weight of the smallest tuber (kg), yield kv/ha. The fruits were chemically analyzed to determine the main chemical indicators: the content of starch and the most important chemical elements.

Keywords: Prickly potato - Chayote, shoot, leaf, starch, element, chemistry, yield.

1. Introduction

There is an exotic fruit with many uses: stir-fry as a regular potato, vinegar salad, Russian salad, boiled and mashed. It is used separately and or mixed with other vegetables or the common or sweet potato.

Caring for a small vegetable garden also means having a space to experiment with growing semi-unknown or forgotten vegetables. Such is the prickly potato that has started to be cultivated in Albania in recent years.

2. Scientific methodology

The study for the evaluation of the morphological and productive indicators of prickly pear (*Solanum spinosa* L) was undertaken on the private soil (at the house) of the student Olgers SHUKE. It was planned to keep records for:

A. Field indicators and biometrics

1. The date of planting
2. The date of germination
3. The date of budding
4. The date of flowering

5. Date of fruit formation
6. The date of fruit ripening
7. Number of shoots (branches/plant)
8. Number of leaves/shoot
9. Number of buds/plant
10. Number of flowers/plant
11. Number of fruits/plant
12. Weight of fruit/plant
13. The minimum weight of the fruit
14. The maximum weight of the fruit
15. The average weight of the fruit
16. Shoot length
17. Number of leaves/shoot
18. Weight of leaves/shoot
19. The number of internodes / shoot
20. Weight of roots/plant
21. The number of fruits / shoot

B. Methodologies used for the chemical analysis of prickly potatoes

1. Dry matter

By drying in a thermostat to constant weight.

2. Ash S SH ISO 5520:2001

Water soluble ash. Burning in the muffle at a temperature of 550 °C.

3. Determination of titratable acidity according to S SH ISO 750:2001.

4. Determination of fat with the Soxhlet apparatus. S SH 2228/5:87

This method is based on the repeated extraction of a certain amount of material (previously dried at a temperature of 105-110°C) with organic solvents, in our case petroleum ether, since, unlike carbohydrates, fats are not soluble in water but in organic solvents.

After the end of the extraction, the distillation process continues to remove as much solvent as possible from the fat in the pot. The solvent evaporates completely in a thermostat with a temperature below 100°C.

The fat crystallizer, after cooling in the desiccator, is accurately weighed on an analytical balance.

5. Determination of protein by the Kjeldahl method.

The method consists of chopping and homogenizing the sample and disaggregating the material with concentrated sulfuric acid. After burning, distillation is done, and then titration with HCl.

6. Determination of starch by acid hydrolysis.

Starch molecules are broken down by the action of HCl into glucose molecules and the latter is determined by acid hydrolysis. For this, 4 g of material is usually taken and transferred to a 300 - 400 ml Erlenmeyer flask, washing it with 150 ml of 1% HCl. It is closed with a cork that has a coolant tube in the middle and is heated in a water bath for three consecutive hours. At the end, a test is made for the end of starch hydrolysis with KJ. After the end of the hydrolysis, the obtained solution is neutralized with 10% NaOH. In an alkaline environment, sugar decomposes. By neutralizing the solution, the albumins are precipitated, for this, lead acetate is gradually added to the flask according to the probable content of albuminous matter. After the precipitation of the lead acetate extract is finished, the solution is filtered with a double dense filter and used for the determination of glucose according to the Bertrand or cyanide method.

7. Determination of Phosphorus

The wet material is burned in the muffle at 550 - 600 until it becomes ash and this is saturated with HCL, so the organic phosphorus goes into solution in the form of phosphoric acid with this solution phosphorus is determined by the phosphomolybdate method.

The standard solution of phosphorus is prepared by constructing the scale of standards.

8. The determination of cellulose is done by taking 2-3 g of ground material, which we pass into a 400-600 ml beaker, in which we add H₂SO₄ 1.25%, letting it boil and occasionally adding water to not increase the concentration of the acid boiling over cellulose.

Then boiling is done with NaOH 1.25%. At the end, the filter is rinsed with ethyl alcohol or ether. Protein and ash are subtracted from crude cellulose to determine pure cellulose. The difference gives pure cellulose.

2. The results and their interpretation

The study was set up on the private soil of Dritan Trifon SEMA.

The soil on which the experiment was set up was analyzed and the indicators are water pH 6.95, saline pH 6.7, K.E. 0.100, Humus 2.2 %, Nitrogen 0.14 %, Phosphorus ppm 11.6, Potassium ppm 13.27, CaCO₃ 1.64 %, and 36.6 %, silt 31.3 % and clay 32.1 %. They are suitable soils for the cultivation of prickly potatoes.

III. 3. Phenological indicators

Table 1. Phenological indicators of the plant

No	Plant number	Planting date	Date of beginning of the budding phase	Date of the beginning of flowering	Date of fruit formation	Date of the beginning of ripening of the fruit
1	I	05.04	19.05	06.06	18.06	07.10
2	II	05.04	16.05	08.06	15.06	04.10
3	III	05.04	21.05	10.06	22.06	13.10
4	IV	05.04	23.05	13.06	24.06	15.10
5	V	05. 04	19.05	13.06	20.06	14.10
6	VI	05.04	19.05	08.06	19.06	07.10
7	VII	05.04	18.05	07.06	16.06	04.10
8	VIII	05.04	20.05	10.06	20.06	13.10
9	IX	05.04	20.05	13.06	24.06	15.10
10	X	05. 04	20.05	13.06	20.06	14.10

III.3. Biometric indicators

Table 2. Vegetative biometric indicators of prickly potato

No	Plant number	Number of shoots/ plant	Number of leaves/plant	Number of buds/plant	Number of flowers/plant	Number of fruits/plant
1	I	10	132	134	122	115
2	II	10	136	136	123	114
3	III	9	134	146	134	121
4	IV	10	138	138	135	112
5	V	9	142	141	138	124
6	VI	10	135	145	141	126
7	VII	11	141	167	156	142
8	VIII	12	145	136	134	122
9	IX	10	136	145	144	115
10	X	12	142	136	134	119
∑		103	1381	1424	1341	1210
X		10.3	138.1	142.4	134.1	121.0

During the vegetation, notes were kept on the stages of plant development and they are presented in the tables above. There were no major changes between the plants. They are justified by agrotechnical differences.

Table 3 Production indicators of prickly potatoes

No	Plant number	Fruit/plant production (kg/plant)	Minimum fruit weight (g)	Maximum fruit weight (g)
1	I	24.7	188	420
2	II	26.2	200	310
3	III	24.6	150	222
4	IV	25.8	95	203
5	V	26.7		
6	VI	24.6		
7	VII	25.4		
8	VIII	25.7		
9	IX	24.7		
Σ		81.9	643	
X		20.475	160.75	288.75

After harvesting, fruit/plant measurements and weighing were done. The average fruit weight is 170.8 g and yield/plant is 20.4 kg.

The total length of the shoots is 1150 - 1270 m, with an average length of the shoot 151 - 160 cm. The more shoots there are, the shorter they are, and vice versa.

The number of leaves/ shoot varies from 9 to 15. Early shoots have more leaves and higher leaf weight. The number of internodes varies from 6 to 14 and the weight of the roots is 420 - 600 g.

III.4. Chemical composition

Chemical analyzes were performed in accordance with the standard methods used for the evaluation and determination of the chemical indicators of starchy plants.

Table 4 The chemical composition of the prickly potato fruit

No	The name of the indicator chemicals analyzed	Method/Reference	Analysis results according to harvest dates		
			24.11.20	23.12.20	12.01.2021
1	Dry matter (në %)	100°C	6.53	8.2	8.5
2	Water (në %)		93.47	91.8	91.5
3	Ash (në %)	Combustion at 550°C	0.58	0.55	0.46
4	Protein (në %)	Kjeldal	1.99	1.82	1.71
5	Acidity (në %)	Volumetric	0.09	0.07	0.07
6	Fat (në %)	Soxlet	0.5	0.57	0.51
7	Crude cellulose (%)	Sharrer	8.33	8.16	8.13
8	Pure cellulose (in %)	Sharrer	2.93	2.75	2.54
9	Carbohydrates (in %)	Fehling	1.57	1.4	1.52
10	Starch (in %)	By acid hydrolysis	12	11.5	11.5
11	Phosphorus (in %)	Spectrophotometers	0.35	0.38	0.35

The analyzes were carried out in the laboratory of QTTB-Lushnje.

Table 17 Data of production indicators

No	Harvest	Harvest date	Harvested production weight (kg)	Number of fruits harvested	Average grain weight (g)
1	I	24. 11. 2020	127.0	288	415.0
2	II	23. 12. 2020	128.1	312	410.57
3	III	12. 01. 2021	25.0	62	403.22
Σ	Amount		280.1	662	423.31

The first two harvests have the highest production while the third harvest has the lowest production. Even the grain weight is lower in the third harvest.

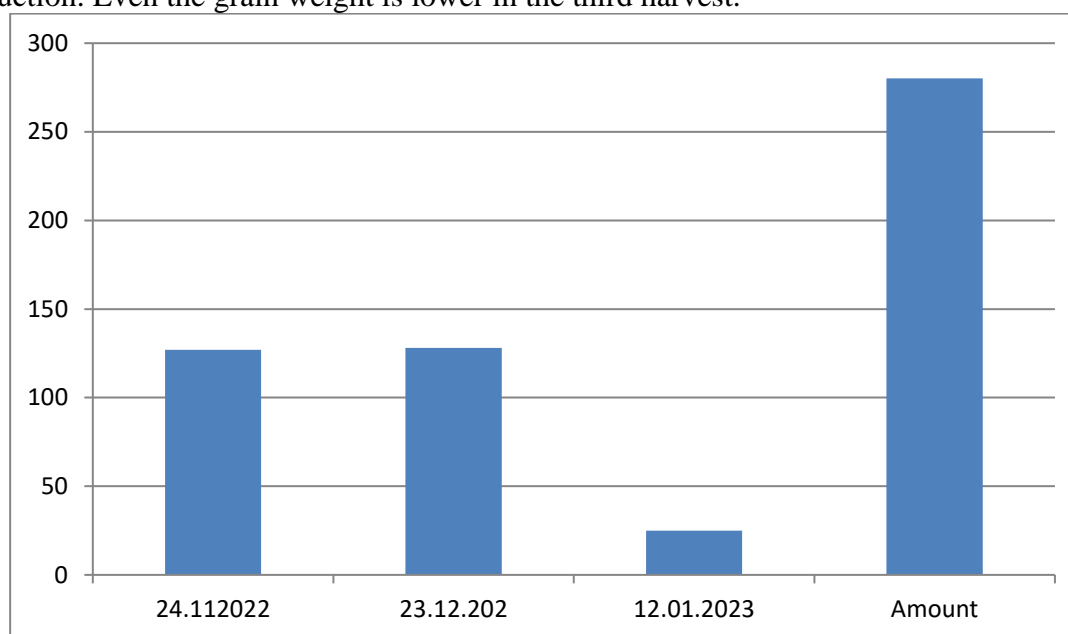


Chart 1 Production progress according to harvests

4. Conclusions and recommendations

From the study of the prickly potato (*Sechium edule*) we can draw some conclusions and give recommendations:

4.1. Conclusions : In summary, we draw these conclusions:

First: It is suitable for cultivation in the area of Myzeqe. (Fier, Lushnje and Berat).

Second: It gives a high yield, 20.4 kg/plant, and number of plants of 1600 - 2100 plants/ha with a yield of over 550 kv/ha.

Third: It is resistant to pests and diseases and is easily stored in warehouses.

Fourth: It has a low cost in cultivation and produces a lot of vegetative mass being used as a soil fertility improver.

4.2. Recommendations: From the field study and the chemical analyses carried out we advise:

First: To continue the further study of this plant to clarify the changes in agrotechnical terms and the phenological variation in different areas.

Second: We advise that after a repeated study over time (years) and several areas, a complete and accurate determination to cultivate in Albania will be resulted. This will be followed by culinary studies and fruit processing technology.

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