Testing Some Potato (*Solanum tuberosum L.*) Cultivars Regarding the Content of Mineral Substances in Kosovo Plain

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Abstract

This paper presents testing of eleven types of potato cultivars during the vegetation in 2013. Research was conducted in Pestova(in Researching Farm / Kosovo Plain).
Laboratory testing of the potato samples was conducted in laboratory of Kosovo Institute of Agriculture. We test eleven types of potato cultivars like: Sinora, Faluka, Ambition, Arnova, Zafira, Exelent, Mantiou, Rudolph, Marlen, Ambasador dhe Kondor.
For planting we used a quality seed, Class A, imported from Netherland (AGRICO) and after harvest, samples were taken for each treatment. Samples were analyzed for ash content and mineral nutrients, such as, Zn, Cu, Ca, K, Na, Mg and P (mg/kg). Ash content was determined using the Infrascan-NIR machine. Microwave plasma-atomic emission spectrometry (MP-AES) was used to determine (Zn, Cu, Ca, K, Na, Mg, Fe), the sample are digested in a mixture of hydrochloric acid/nitric acid (3:1). All determinations were performed using aqueous standards for calibration. Phosphorus we measure by using a Spectrophotometer. The scientific data for ash content show that the values of this parameter ranged between 0.44-1.90%. Results behave within these values. The highest ash content was found for cultivar Kondor (1.048%) and the lowest ash content was found for cultivar Faluka (0.790%). The highest level of zinc content was found in cultivar Kondor (4.7 mg/kg) and the lowest in cultivar Zafira (2.5 mg / kg). The highest level of iron content was found to Mantiou cultivar (16.2mg/kg) while the lowest cultivar to Ambition (10.3 mg / kg). Whereas, other varieties were between these values and the mineral substances content was in average values.
KEYWORDS: ash, potato, methods, mineral substances.

INTRODUCTION

The chemical composition of potato tubers is different depending on the cultivar, respectively, their genetic potential, applied agro-technology and environmental conditions of production. Ingredients of potato tubers are not equally distributed in all its contents, most of them located on the side of bulbs (cortex) and less on the inside of her (mineral substances, vitamins, etc.). Bulb components, with particular importance in terms feeder, are carbohydrates (9.1-22.6%) and proteins (0.8-4.2%) (Beatrice 2008), (Kulkarni, 1996).
Carbohydrates most part represented by starch (about 70% of the dry matter, DM).
Mineral that contains tubers, composed in most of the 22 chemical elements (K, Mn, Na. Ca, Mn, etc,) that have an important role, but also contain other elements (Tubers are rich in vitamins A, B, C, D, H, K, N Vitamins group B and C are in substantial quantities. Sylvana P & Janice A. FAO (2008)

Taking into consideration the nutritional values of potato in relation to the human needs as food, potato is rich in potassium, iron and iodine, but poor in calcium and sodium. Potato tubers contain almost all soluble vitamins of group B and C. Sylvana P & Janice A (2008): Potatoes, nutrition and diet. International Year of the Potato. FAO

The aim of the study was the determination of ash content and mineral nutrients, such as, Zn, Cu, Ca, K, Na, Mg and P, of 11 potato cultivars under Kosovo Plain climate conditions, and evaluation of the quality of these potato cultivars in terms of nutritional values.

MATERIAL AND METHOD

Field surveys were conducted in Pestov, Kosovo Agriculture Institute farm in Peja (Dukagjini Plain). We test eleven type of potato cultivars like: Sinora, Faluka, Ambition, Arnova, Zafira, Exelent, Mantiou, Rudolph, Marlen, Ambasador dhe Kondor.For planting we used a quality seed, Class A, imported from Netherland (AGRICO) and after harvest, samples were taken for each treatment.

Fields are planted in four repetitions according to plan system completely random (PPRB) in block, with four lines for each cultivar and replication.

Research was conducted on two levels:

1. Field research: in the plot is set a vegetative period of cultivars,
2. Laboratory tests: To determination the ash we used the Infrascan-NIR, for minerals (Zn, Cu, Ca, K, Na, Mg,Fe), we used the Microwave plasma-atomic emission spectrometry (MP-AES) ,the sample were digested in a Aqua Regia ISO 11466:1995, mixture of hydrochloric acid/nitric acid (3:1).

Three (3) gram of the dried sample was extracted with 28 ml of aqua regia and we put in the microwave in the temperature 103^{o}C for two hours after that allowed to cool down, transferred quantitatively to a volumetric flask and filled to 100ml with doubled deionised water and we measuring with the Microwave plasma-atomic emission spectrometry (MP-AES).

All determinations were performed using aqueous standards for calibration.

Phosphorus was measured using Spectrophotometer.

RESULTS AND DISCUSSION

Vegetation surveys were conducted during 2012, and the results obtained are presented in the following tables, depending on the parameter researched.

Determination of maturity

Plants involved in research are followed throughout the vegetation period, especially after the flowering period, in order to determine the maturity of different cultivars. Cultivars have significant changes in the plant period and divided into four main groups:
(Table 1).

Table 1. Studied cultivars and their vegetative period (maturity)

No.	Cultivars	Vegetative period		Origin
1	Arnova	15.07	Very early	Agrico - Holand
2	Ambasador	20.07	Early to very early	Agrico - Holand
3	Sinora	30.07	Early	Agrico - Holand
4	Faluka	20.08	Second early	Agrico - Holand
5	Zafira	20.08	Second early	Agrico - Holand
6	Mantiou	20.08	Second early	Agrico - Holand
7	Marlen	20.08	Second early	Agrico - Holand
8	Kondor	20.08	Second early	Agrico - Holand
9	Ambition	30.08	Early maincrop	Agrico - Holand
10	Exelent	30.08	Early maincrop	Agrico - Holand
11	Rudolph	30.08	Early maincrop	Agrico - Holand

Exelet, Arnova and Ambasador(70-90 day), mean early the cultivar Sinora (90-120 day), cultivar with plant period average are Falluka, Zafira, Mantiou, Marlen and Kondor(120-135) and the late cultivars are Ambition, Exelent dhe Rudolph(135-150).

MINERAL MATTERS

Potatoes are rich with mineral matter,in the form of assimilated by the human body, such as salts of potassium, calcium, magnesium, phosphorus, etc. Generally mineral salts in potato have alkaline reaction, this feature increases his even more potatoes value.

The amount of ash in researched potato cultivars has been different and the results obtained are presented in Table 2 and Figure 1

Table 2. DMV for ash content (%) in the studied cultivars

No.	Cultivars	Replication				Mean
		I	II	III	IV	
1	Sinora	0.99	0.98	0.99	0.97	0.98
2	Faluka	0.79	0.80	0.78	0.79	0.75
3	Ambition	1.01	1.0	1.03	0.99	1.01
4	Arnova	0.89	0.90	0.89	0.91	0.90
5	Zafira	1.05	1.06	1.0	1.04	1.04
6	Exelent	0.92	0.93	0.94	0.99	0.94
7	Mantiou	1.01	1.05	1.07	1.09	1.06
8	Rudolph	1.03	1.01	1.06	1.04	1.03
9	Marlen	1.01	1.0	1.01	1.02	1.01
10	Ambasador	0.94	0.97	0.95	0.92	0.95
11	Kondor	1.07	0.99	1.04	1.09	1.05
LSD 0.05% 0.0329 LSD 0.01% 0.0432						

The highest level of mineral substance content found to Mantiou cultivar (1.06%), while the lowest in Faluka cultivar (0.75%). The other cultivars in the % ash content was between these values. There are statistical differences observed between cultivars.

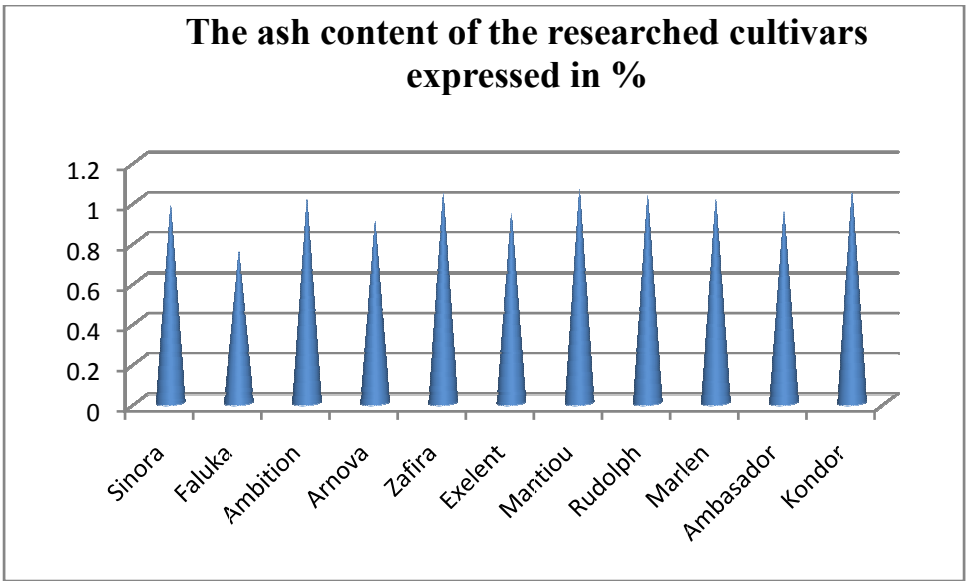

Table 3. The content of mineral elements of studied cultivars (ppm or mg/kg)

Nr.	Cultivars	Mineral elements of studied cultivars expressed (mg/kg)						
		Zn	Fe	Mg	Ca	Na	K	P
1	Sinora	3.5	11.4	274.1	79.0	56.4	3132	345.2
2	Faluka	3.4	13.2	193.6	40.4	44.5	5733	365.2
3	Ambition	4.1	10.3	198.9	32.8	60.1	6557	489.5
4	Arnova	4.3	15.2	174.5	78.5	61.3	5766	362.2
5	Zafira	2.5	12.0	238.7	42.9	46.1	4677	345.5
6	Exelent	3.2	13.9	182.8	34.0	52.2	6265	437.6
7	Mantiou	4.4	16.2	179.6	56.3	49.4	5605	309.4
8	Rudolph	3.9	14.2	212.3	86.9	63.9	3979	487.0
9	Marlen	3.4	15.2	216.8	38.2	47.1	4680	399.7
10	Ambasador	3.7	11.1	257.8	45.1	48.0	5785	425.7
11	Kondor	4.7	14.3	266.1	39.9	35.1	4621	483.3

CONCLUSIONS AND RECOMMENDATIONS

From experimental studies conducted through field and laboratory analysis during 2013,cultivars that were studied are dedicated for fresh consumption and processing.

The highest level of content of mineral substances respectively ash is found to Mantiou cultivar (1:06%) while the lowest in Faluka cultivar (0.75%). The other cultivars in the % ash content was between these values.There are statistical differences observed between cultivars.

Agro-ecological conditions of these two areas are favorable for cultivation intensive potato production.

The highest level of the zinc content was found to cultivar Kondor (Peja 4.7 mg / kg) and lowest in cultivar Zafira (Peja 2.5 mg / kg). While other cultivars were between these values and can say that its content was in average values..

The highest level of iron content was found to Mantiou cultivar (Peja 16.2mg/kg)

The lowest level of magnesium was found in cultivar Arnova (174.5 mg/kg). The highest level of calcium and sodium content was found to cultivar Rudolph (86.9 mg/kg and 63.9 mg/kg, respectively).

The lowest level of the potassium content was found to cultivar Sinora (436.25 mg/kg).

We recommend that in cultivation Zafira and Ambition cultivars to spreads which give the highest yield.

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