

Nutraceutical value and production of the sweet potato (*Ipomoea batatas* L.) cultivated in South-West of Romania

Valoarea nutraceutică și producția de cartof dulce (*Ipomoea batatas* L.) cultivat în sud-vestul României

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ABSTRACT

In Romania, the sweet potato is recently cultivated, especially in the South-West region. This region has a temperate continental climate that is characterized by the lack of water in the soil and atmosphere and by a diversity of soil types, very important factors for the cultivation of this species. The lack of information about the real effects of the environmental factors on the nutritional quality and the production of sweet potatoes grown in this area led to this study. Therefore, the present paper aims to evaluate the nutraceutical content of 5 sweet potato genotypes, such as: TSS (total soluble substance), total carotene, reducing sugars, vitamin C, phenolic compounds, flavonoid content and antioxidant activity (determined by DPPH and ABTS) grown in the specific climatic conditions of this region. There was found a differentiated nutritional quality depending on the genotype, so that genotype 5 was rich in carotene (59.29 µg/g FW) and vitamin C (36.56 mg/100 g FW). The data presented in this study also refer to the total number of roots/plant, the average weight/root, the total production/ha, the biomass production/ha and the production index. Regarding these elements, genotype 3 recorded a biomass production of 39.5 t/ha and a total tuber production of 50.3 t/ha. The results presented in this study indicate that the production of this species is climate dependent, which influences important metabolites in tubercles, that plays an essential role in organoleptic properties.

Keywords: sweet potato, genotypes, production, antioxidant activity, quality

REZUMAT

În România, cartoful dulce este introdus recent în cultură, în special în regiunea de Sud-Vest. Această regiune are un climat temperat continental care se caracterizează prin lipsa apei din sol și atmosferă și printr-o diversitate a tipurilor de sol, factori foarte importanți pentru cultura acestei specii. Lipsa informațiilor despre efectele reale ale factorilor de mediu asupra calității nutriționale și a producției la cartoful dulce cultivat în această zonă a condus la realizarea acestui studiu. Prin urmare, lucrarea de față își propune să evalueze conținutul nutraceutic din 5 genotipuri de batat, cum ar fi: SUT (substanța uscată totală), carotenele totale, zaharurile reducătoare, vitamina C, compuși fenolici, conținutul în flavonoide și activitate antioxidantă (determinată prin DPPH și ABTS), cultivați în condițiile climatice specifice acestei regiuni. S-a

constatat o calitate nutrițională diferențiată în funcție de genotip, astfel, că genotipul 5 a înregistrat un conținut bogat în caroten (59,29 $\mu\text{g/g}$ FW) și cel mai mare conținut de vitamina C (36,56 mg/100 g FW). Datele prezentate în acest studiu fac referire și la numărul total de rădăcini/plantă, greutatea medie/rădăcină, producția totală/ha, producția de biomasă/ha și indicii de producție. În ceea ce privește aceste elemente, genotipul 3 a înregistrat o producție de biomasă de 39,5 t/ha și o producție totală de tuberculi de 50,3 t/ha. Rezultatele prezentate în acest studiu indică faptul că producția de cartof dulce este dependentă de climă. Aceasta, influențează metaboliți importanți din tuberculi, jucând un rol esențial în proprietățile organoleptice ale speciei.

Cuvinte cheie: cartof dulce, genotipuri, producție, activitate antioxidantă, calitate

INTRODUCTION

The sweet potato (*Ipomoea batatas* L.) records very important yields worldwide (Šlosár et al., 2016). The sweet potato production in Europe has the lowest share of the global production (0.1%) (Krochmal-Marczak et al., 2018). The main potato-producing countries in Europe are Spain and Italy. China is the leading producer of sweet potatoes at the global level. This species has an unlimited number of cultivars and varieties that differ by the colour of the flesh and skin. This can range from white to cream, to yellow and red for the orange varieties and to purple. The fresh potato tubercles have antidiabetic, antioxidant and antiproliferative properties due to the presence of components that are valuable for health such as carotenoids or vitamin C and can also be used as food for babies (Odebode et al., 2008; Tan, 2015).

The orange flesh varieties are rich in bio-available beta-carotene, which the body turns into vitamin A and those with purple flesh turn it into antioxidants. All the morphological parts of the plant of this species are used in human nutrition. The leaves are used for human consumption and are prepared in different forms, or can be consumed fresh due to their properties (Dinu et al., 2018; Krochmal-Marczak et al., 2018), they can also be used to feed the animals. The tuberous roots are used as nutraceuticals in the pharmaceutical industry (Sawicka et al., 2018) or can be economic means of income growth for many farmers who have low fertility land areas. The sweet potato is an industrial crop due to the presence of starch in the tuberous roots. Also due to dyes, it can be used in the textile industry. The shape and colour of the leaf, the length of the petiole and the distance between the leaves can make this species to be used in ornamental

arrangements, as well as in the eroded landscaping sites (Loebenstein et al., 2003). The sweet potato roots can be processed in various bakery and pastry products, the orange and purple colour being an asset in attracting the consumers.

It is known that the sweet potato (*Ipomea batatas* L.) contains certain bioactive compounds capable of lowering free radicals and reducing the risk of degenerative diseases. These (phytochemical) compounds are biologically active substances that give the plant its flavour, freshness and resistance to diseases and extend the storage period. They also have beneficial effects on the human body. Many of them have an active role in protecting the body against diseases, neutralize the action of free radicals, lower blood pressure and cholesterol levels. These antioxidant properties are due to the presence of substances such as phenols, anthocyanins, various contents of flavonoids (Cao et al., 1997). Some of the natural antioxidants found in plants include vitamins, phenols, flavonoids, etc., (Soare et al., 2018). According to Zhang et al., (2003), sweet potatoes have an important role in human health as well as medicinal values because they contain different nutrients such as carotene, vitamin (B_1 , B_2 , C, E), dietary fibers, minerals (K, Ca, Fe, P and Se). There have also been studies demonstrating the benefits of sweet potato on the anticancer activity (Philpott et al., 2004).

The culinary qualities of sweet potatoes in Europe are not well explored if we refer to the high yield that can be obtained. This is probably the reason why most of the cultivars on the market are for fresh consumption and are less of foreign origin or for industrial processing. The food processing industries require species with high dry matter content, high efficiency of flour, and high starch

content. These characteristics in terms of quality in sweet potato make this species useful for industries such as textiles, paper, pharmaceuticals, etc. which use starch as raw materials and bakeries that require high quality flour. Therefore, this paper aims at investigating the production and chemical characteristics of 5 sweet potato genotypes in the climatic conditions in the South-West Romania.

MATERIALS AND METHODS

The experiment was placed in the didactic field of the Faculty of Horticulture in Craiova, in the south-west of Romania. Five sweet potato genotypes from South Korea were studied. The morphological characteristics of the tuberous roots are presented in Table 1. The experimental design was in randomized blocks, in three repetitions with an experimental plot/repetition of 9 m². The culture was established with cuttings obtained by forcing the tuberous roots in a heated greenhouse. The cuttings were planted in turn on May 5, 2017 and May 4, 2018, in layers 30 cm high.

Table 1. Endophytic isolates obtained from two soybean cultivars

Genotype	The shape of the tuber	The color of the rhizoderm	Pulp color
1	Ovate-elongated	Red-purple	beige
2	Ovate-elongated	Red-purple	beige
3	Ovate	Red-purple	White-yellow
4	Ovate	Red-purple	White-yellow
5	Ovate	Light purple	orange

The planting material was formed of rooted cuttings with 3 nodes per each cutting. The planting scheme was 70 cm between the rows and 40 cm between plants per row (35.714 plants/ha). The crop was fertilized when was planted with N-P-K 15:15:15 complex fertilizers applied in line on the rows. Sweet potato reacts moderately to mineral fertilization during vegetation (Soares et al., 2002). The rows were mulched with black polyethylene foil to create a favourable microclimate to the formation of tuberous roots and to avoid the formation of adventitious roots, a phenomenon that reduces production. The drip

irrigation system was installed under the mulch foil. Harvesting was performed 120 days after planting.

The sweet potato, for high productions, needs in July-August an average temperature of about 32 °C (Vinatoru et al., 2019). This species is resistant to drought, but can also react very well to irrigation, especially on permeable soils. It prefers sandy or mixed soils where thickened roots grow evenly and has a high adaptability to environmental factors (Soares et al., 2002). In relation to the requirements of the species, it is found that the South-West area of Romania responds perfectly to them. From the data of Table 2 it is found that the average temperature during the vegetation months is optimal for the growth and development of sweet potato plants. The weather conditions were very variable during the two years of study. The year 2017, with reference to precipitation was very dry especially in June (2.2 mm, requires drip irrigation) and August (10.0 mm).

The year 2018 was optimal in terms of total precipitation (372 mm) (Sawicka et al., 2018) over the 5 months of vegetation, but unevenly distributed, more in the first three months and less in August and September. The relative humidity of the air is not high in this area and does not obviously influence the formation of adventitious roots. The harvest of sweet potato tubers was carried out on October 6, 2017 and September 13, 2018.

Samples preparation

From five sweet potato genotypes tuberous roots were harvested manually on September 4 for both years and brought to the laboratory where they were washed and then they were wiped with paper towels. They were placed in a blender for 1 min, resulting in a homogeneous purée. The experiments were performed three times in order to measure the parameters analysed in the study and the results were expressed as a means of the repetitions. The data presented in tables 3-5 represent the average values of the 2 years of study (2017-2018). All the reagents used for the analysis were from Sigma Aldrich, Germany.

Table 2. Air temperature, relative humidity and total rainfall during the vegetation period of sweet potato (*Ipomoea batatas*), data retrieved from the weather station in Craiova (2017-2018)

Month	Temperature (°C)						The relative humidity of the air (%)		Rainfall (mm)	
	minimum		maximum		medium		2017	2018	2017	2018
	2017	2018	2017	2018	2017	2018				
May	4.8	10.1	29.6	30.0	16.7	19.3	73	67	58.0	57.0
June	12.0	10.0	32.2	32.4	23.4	21.6	57	71	2.2	134.0
July	14.0	12.6	38.4	31.6	24.2	22.3	59	73	84.0	148.0
August	10.4	14.8	39.6	33.0	25.4	24.2	50	63	10.0	16.0
September	5.5	1.9	34.3	32.6	19.4	19.2	57	61	21.0	17.0
TOTAL									175.2	372.0

The production characters were determined by counting and weighing, by variants and repetitions and are presented as average values over the two years of study.

The production index indicates the relative distribution of photosynthesis between the storage capacity in the root and the amount of biomass of the plant above the soil (Kays, 1985). The production index was calculated according to the formula:

$$PI = \text{Total tuberized root production} / \text{Biomass production}$$

The total soluble solids (TSS) content was determined using a Portable Refractometer from Optech Optimal Technology, Germany.

The determination of the total carotene content. The weighed samples, having been put separately in 95% acetone (50 ml for each gram), were homogenised with a Braun MR 404 Plus for one minute. The homogenate was filtered and was centrifuged using a Hettich Universal 320/320R centrifuge at 2,500 rpm for ten minutes. The supernatant was separated and the absorbances were read at 400–700 nm on a Cary 50 spectrophotometer.

It was recorded the total carotene at 470 nm. The value of these pigments was calculated according to the formulas Dere et al., (1998). The results were expressed as mg/100 g FW.

The vitamin C was determined by iodometric method, and reducing sugars (%) by colorimetric method using 3.5 dinitrosalicylic acid (DNS). Reducing sugars (%) were extracted in distilled water (1:50 w/v) and assayed colorimetric with 3.5 dinitrosalicylic, (Soare et al., 2018).

The total phenolics content (TPC) was determined colorimetric at 765 nm by the Folin Ciocalteu. Gallic acid was used to construct standard curve and the results were expressed as mg of gallic acid equivalents (GAE) 100 g FW (fresh weight).

The total flavonoids content (TFC) was determined by colorimetric method with 10% Al(NO₃)₃ and 5% sodium nitrite (NaNO₂) in alkaline medium. The absorbance was read at 500 nm and the results were calculated from quercetin calibration curve and expressed as mg quercetin equivalents per gram fresh weight (QE g FW).

Antioxidant activities were evaluated by two methods: DPPH (2,2-diphenyl-1-picrylhydrazyl) radical and ABTS (2,2'-azino-bis-(3-ethylbenzothiazoline-6-sulfonic acid) cation radical scavenging assay.

DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging assay was determined colorimetric at 517 nm, on a spectrophotometer Varian Cary 50 UV-Vis. The degree discoloration of the purple color from DPPH indicates the radical scavenging potential of the samples. Percentage of inhibition of the DPPH radical was calculated according to the following equation:

$$\% \text{ scavenging} = [(A_0 - (A_1 - A_s)) / A_0] \times 100$$

where A_0 is the absorbance of DPPH alone, A_1 – the absorbance of DPPH + extract, A_s – the absorbance of the extract only. The standards calibration curves using ascorbic acid were plotted as a function of the percentage of DPPH radical scavenging activity. The results of antioxidant activity were expressed as micromole ascorbic acid equivalents per 100 grams fresh weight ($\mu\text{MA}_s\text{A}$ 100 g FW).

ABTS 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid) radical cation scavenging activity was measured colorimetric at 734 nm. Ascorbic acid (AsA) were used as standards. The standards calibration curves were plotted as a function of the percentage of ABTS radical cation scavenging activity calculated using equation (1). The results were expressed as micromole ascorbic acid equivalents/100 g fresh weight ($\mu\text{MA}_s\text{A}$ 100 g FW). All determinations were performed in triplicate, and all results were calculated as mean.

Statistical analysis of results

For each analysis three measurements have been performed, and the results were expressed as mean values and standard deviation. Statistical analysis was performed with one-way ANOVA in Microsoft Excel 2010 and significant differences between samples were determined by multiple range tests. Differences were considered significant at level $p \leq 0.05$.

RESULTS AND DISCUSSIONS

The observations conducted on the production referred to: the number of tuberous roots formed on the plant, the average weight of roots, the total root production for every genotype, the biomass production and production index (Table 3).

The average number of roots per plant ranged from 3.2 for genotype 5 to 8.6 for genotype 3. Our results are similar with those of Zihin et al., (2011) in a study conducted in Turkey. This large variation between the genotypes planted in the same cultivation conditions demonstrates their genetic diversity and different ways

of behaviour that influenced the number of tubercles/plants. I agree with the results of the study conducted by Hoza et al., (2017).

The average weight of the tuberous roots varied from 148.5 g for genotype 3 to 472 g for genotype 5. There is a direct correlation between the average number of tuberous roots/plant and the average weight of a root, and the lower the number of roots, the higher the average weight of a root. The fact that the roots have a lower weight is an advantage when sold for fresh consumption, with the larger roots being more suitable for industrialization, a statement made also by Zihin et al., (2011). The results on the average root weight in this study are consistent with those reported by Krochmal-Marczak et al., (2018). Ellong et al., (2014) reported values ranging from 300.2 g to 647.7 g in a study of 8 cultivars in Martinique. This characteristic is greatly influenced by the pedo-climatic conditions of the area of culture and the studied genotype.

The total production obtained in our study recorded average values ranging between 41.6 t/ha for genotype 1 and 50.3 t/ha for genotype 5. The yield of this species worldwide is estimated at 15 t/ha (FAOSTAT, 2019). Oliveira et al., (2010) and Agbede and Adekiya (2011) said that a sweet potato culture on poor soils can record yields between 13.1 and 15.4 t/ha. Krochmal-Marczak et al., (2018) reported productions of 28.3 t/ha on brown soils in Central-Eastern Poland, and Sawicka et al., (2019) report 36.9 t/ha in the same region, but in a fertilized crop. The present study demonstrates that the sweet potato production is significantly influenced by genotype and type of soil.

The biomass production, recorded in the 5 sweet potato genotypes, highlights genotype 3 with values of 39.5 t/ha, recording the highest quantity, and genotype 1 with 20.3 t/ha, with the lowest production. The results in the present study are superior to those obtained by Neumann et al., (2015) on a number of 20 sweet potato cultivars, but are consistent with those of Silva et al., (2011) which recorded productions ranging from 18.52 to 64.62 t/ha. It can be said that the amount of biomass

indicates that the plant vigour is determined by genotype. The biomass is an important source for feeding the animals (Silva et al., 2011) but it is also used for human consumption due to its high nutritional properties (Dinu et al., 2018).

The production index indicates the relative distribution of photosynthesis between the storage capacity in the root and the amount of biomass of the plant above the soil (Kays, 1985). The genotypes in our study had a production index ranging from 1.07 for genotype 3 to 2.06 for genotype 2. Further, Table 3 shows that genotypes 4 and 5 recorded the highest yields but had the production index lower and also genotype 3, which means they do not have a high storage capacity in the tuberous roots. Kays, (1985) asserts that the varieties with high storage capacity generally have a higher harvest index than those

with low capacity. The varieties with a high harvest index should be selected as this will increase the yield of the roots at the surface unit. The selection of genotype as a source of germ plasm, based on both total biomass and fresh roots yield, depends on the management of crop technology and environmental factors.

Hegedúsová et al., (2018) defines soluble solids as the content of dissolved substances, mainly sugars, from vegetables, expressed as Brix degrees. In our study the highest average TSS content was recorded in genotype 3 (11.8 °Brix), followed by genotype 4 (10 °Brix), 6 and 2 with 9.3 and 9.2 °Brix (Table 4).

The lowest value was recorded for Genotype 1 with 7.6 °Brix (Table 3). The results of the present study are superior to those reported by Šlosár et al., (2016) which claim that the dry matter content in white flesh potatoes

Table 3. The production characteristics of the studied sweet potato cultivars*

Genotype	No of roots/plant	Average weight/root (g)	Total production (t/ha)	Biomass production (t/ha)	Production index (IP)
1.	5.0c	250.0ab	41.6c	20.3d	2.04a
2.	4.3d	325.0ab	46.5b	22.5d	2.06a
3.	8.6a	148.5b	42.4c	39.5a	1.07c
4.	5.6b	261.5ab	48.7ab	26.9c	1.80a
5.	3.2c	472.0a	50.3a	37.4b	1.34b
LSD	0.59	295.6	2.8	2.5	0.26

*Data presented as mean. Mean values followed by the same letter within columns are significantly different according to multiple range test ($p \leq 0.05$)

Table 4. The characteristics in terms of quality of the sweet potato genotypes*

Genotype	TSS (°Brix)	Total carotene ($\mu\text{g/g}$ FW)	Reducing sugars (%)	Vitamin C (mg/100g FW)	Phenolic content (mg GAE/100g)	Flavonoids content (mg/100g)
1.	7.6d	17.17b	7.66a	13.71e	21.95c	44.88a
2.	9.20c	2.04d	4.25b	19.04d	46.80a	36.03b
3.	11.8a	6.69c	1.15c	24.67c	49.68ab	20.16e
4.	10.0b	2.38d	3.56b	33.30b	32.17b	25.58d
5.	9.30c	59.29a	4.63b	36.56a	48.69a	33.53c
LSD	0.52	0.82	2.23	1.05	2.95	2.18

*Data presented as mean. Mean values followed by the same letter within columns are significantly different according to multiple range test ($p \leq 0.05$)

is higher than that of coloured flesh. The results of this study comprised only white flesh sweet potato with a cream-white colour for genotype 5. Low results than those reported by us were found by Nair et al. (2015) with values ranging from 7.9 to 8.8 °Brix. Krochmal-Marczak et al., (2014) reported TSS content in white flesh sweet potato varieties of 3.85 g/100 g FW, lower than the values recorded in this study. The genotypes 3 and 4, through their high content of TSS, can be recommended as a raw material in the food industry.

The total carotene content in the statistical analysis of the obtained results had significant differences ($p < 0.05$) between the studied genotypes (Table 4). The average values of total carotenes ranged from 2.04 µg/g FW for genotype 2 to 59.29 µg/g FW for genotype 5. The results of this study are consistent with those reported by Alam et al., (2016) who studied nine orange flesh sweet potatoes and observed a total carotene variability ranging between 3.8 and 72.4 mg/kg FW. This variability of the orange flesh potato was also reported by Tomlins et al., (2012), with values ranging from 8.5 to 72.5 mg/kg FW. Tang et al., (2015), in a study of 5 sweet potato cultivars of different colours, found greater variability in the coloured flesh potatoes than in the ones with white flesh, from 157.9 mg/kg FW to 2.85 mg/kg FW. The high variability in carotene in the white flesh genotypes is due to the genotype synthesis capacity. Ellong et al., (2014), Hussein et al., (2014) and Leighton et al., (2010) also found the variability in sweet potato tuberous roots, depending on the colour of the flesh.

The reducing sugars in the studied sweet potato genotypes ranged from 1.15 to 7.66%, the genotype 1 having the highest percentage of sugars in fresh tubercles (Table 4). The genetic variation of the studied genotypes determined the accumulation of reducing sugars. These genotypes, due to the high content of reducing sugars can serve as a dietetic food and easy to digest for both children and diabetics. All the studied genotypes were superior to those reported by Ofori et al., (2009) and Krochmal-Marczak et al., (2014). Ofori et al., (2009) asserts that the reducing sugars oscillate, depending on the variety and

growth conditions, from 0.53 to 1.62 g/100 g. According to the USDA National Nutrient Database for Standard Reference (2007), the content of soluble sugars in fresh weight of sweet potato is about 4.18 g/100 g, including reducing sugars (especially fructose and glucose), which is about 1.66 g/100 g.

Sanoussi et al., (2016) determined a significantly higher content of sugar in orange flesh sweet potato varieties (22.45 g/100 g FW) compared to white flesh varieties (17.95 g/100 g FW). In a study by Ellong et al., (2014), it was found that the white flesh sweet potato varieties had a sugar content ranging between 26.79 and 33.12 g/100 g FW compared to the purple flesh variety with values of 33.62 g/100 g FW, so there were recorded very close values. Thus, the accumulation in sugars can be influenced by the colour of the flesh.

The variance analysis for vitamin C content revealed statistically significant differences ($p < 0.05$) between the 5 studied sweet potato genotypes (Table 3). The average vitamin C content ranged from 13.71 mg/100g FW for genotype 1 to 36.56 mg/100g FW for genotype 5. These results are consistent with those reported by Krochmal-Marczak et al., (2014) in Poland, by Dinu and Soare, (2015) in the south-west of Romania and by Zihin et al., (2011) in Turkey. The results of this study are inferior to those reported by Šlosár et al., (2019) who recorded 179.66 mg/kg in white flesh sweet potato, but higher than those reported by Soare et al., (2018) in potato with coloured pulp. The differences observed in the chemical composition of tubercles are conditioned by the phenotypic and genotypic variability of sweet potato genotype and by environmental factors. According to Sawicka et al., (2000), the chemical composition of tubercles is the combined result of genetic and environmental variations.

The phenolic compounds ranged between 21.95 mg GAE/100 g and 49.68 mg GAE/100 g (Table 3). Genotypes 1 and 4 had lower values than the other three, which recorded values above 40.00 mg GAE 100 g. The results of this study are inferior to those reported by Tokusoglu et al., (2005) who detected phenolic compound values

ranging from 0.06 to 184.47 mg/100 g, but Choong et al., (2007) in a study on 19 sweet potato clones reported total polyphenol values ranging from 0.003 to 0.792 mg GAE/g and Hua Ji et al., (2015) on a study of 4 sweet potato cultivars reported total polyphenol values of 9.6 and 54.3 mg/g dw, a range of values similar with the ones recorded by us. It is found that this variation is determined by the genotype.

Compared to nutritionally important components such as starch, vitamins and minerals, the sweet potato tuberous roots also contain components that are important for health such as the flavonoids. These are secondary metabolites, present in large quantities in sweet potato and known because of the ability to modify certain body reactions to allergens, viruses and carcinogenic substances. In this study, the five genotypes ranged from 20.16 mg/100 g to 44.88 mg/100 g. Genotype 1 showed significant differences ($p < 0.05$) in the accumulation of this component, i.e. 44.88 mg/100 g versus the other genotypes (Table 4). This variability is mainly attributed to genotype, similar observations being made by Seow-Mun Hue et al., (2012).

The antioxidant activity was also quantified in the roots of the studied sweet potato genotypes by two methods, DPPH (free radical scavenging method) and ABTS, and the results are expressed in $\mu\text{MAsA}/100\text{ g}$. This content varied from 30.16 to 52.60 $\mu\text{MAsA}/100\text{ g}$, by DPPH with the lowest values for genotypes 3 and 1 and the highest for genotype 2 (Table 5). The results of this study are superior to those reported by Padda and Picha (2007) which showed that the antioxidant activity in the sweet potato mature roots (over 200 g) was 31.11 TE mg/g dry weight.

In the present study, the antioxidant activity determined by the DPPH method revealed much lower values than those obtained by the ABTS method. By this method, the values varied from 66.91 $\mu\text{MAsA}/100\text{ g}$ for genotype 5 to 153.13 $\mu\text{MAsA}/100\text{ g}$ for genotype 2. It can be said that the antioxidant activity in sweet potato was influenced by the genotype, biomass production and environmental conditions.

Table 5. The antioxidant activity in sweet potato tuberous roots*

Genotype	Antioxidant activity DPPH ($\mu\text{MAsA}/100\text{ g}$)	Antioxidant activity ABTS ($\mu\text{MAsA}/100\text{ g}$)
1.	30.30d	72.77d
2.	52.60a	153.13a
3.	30.16d	103.49b
4.	34.53b	85.61c
5.	32.17c	66.91c
LSD	1.22	2.23

*Data presented as mean. Mean values followed by the same letter within columns are significantly different according to multiple range test ($p \leq 0.05$)

CONCLUSIONS

The sweet potato can be a niche crop for small farmers due to the high yield per surface unit obtained by genotype 5 (50.3 t/ha) and with a remarkable carotene content (59.29 $\mu\text{g}/\text{g}$ FW) compared to other genotypes. Also, cultivar 3, with white-yellow pulp was distinguished by the amount of biomass of 39.5 t/ha, the TSS content of 11.8 °Brix and the total polyphenol content of 49.68 mg GAE/100 g. These productivity and quality characteristics indicate a good adaptability of the species to environmental factors and reddish brown preluvosoils in South-West Romania. The rich content of flavonoids and total polyphenols, the antioxidant activities, the phenolic composition of the studied sweet potato genotypes are an indication that this species is well adapted to the climatic conditions in which were tested. The medicinal properties are worth to be taken into consideration and will contribute in the future to the nutraceutical potential of the species explored in the management of free radical-dependent disorders.

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