THE INFLUENCE OF CLIMATE CHANGE ON THE QUALITY OF THE SWEET POTATOES GROWN ON SANDY SOILS IN SOUTHWESTERN OLTENIA

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Abstract. Climate change in recent years is strongly related to agricultural production, water resources, and species diversity. Sweet potato culture has great potential in light of the imminent challenges associated with drought as a negative effect of climate change. The results obtained with regard to the production and quality of sweet potato tubers on sandy soils in south-west Oltenia are similar to those obtained in different countries of the world. The studied varieties showed a high production and large quantities of total dry matter, starch and C vitamin. The analysed varieties were influenced differently by the sum of the temperature degrees and precipitations, in terms of the quality of the tubers. The total dry matter content and starch of sweet potato tubers content was not significantly influenced by STD and precipitations. The amount of total dry matter exceeded most varieties 30% at a STD of 3700-3800 ^{0}C. The largest amount of starch in sweet potato tubers was determined in 2016 at a precipitations rate of 350mm (17.06%) and, depending on the STD at 3700 °C during vegetation, starch is assimilated into tubers in a high percentage. Depending on precipitations, tuber production has an insignificant growth trend. The production of sweet potato tubers was significantly influenced almost all varieties of STD during the vegetation period, and the highest yields were obtained in STD, between 3650-3700 ^{0}C. The data obtained in sandy soils are similar to those obtained by (EARL & DAVIS, 2003; BAGAMBA et al., 2012; PLACIDE et al., 2013; FALOLA & ACHEM, 2017 etc.), who consider sweet potato as a culture tolerant to drought and potential food security.

Keywords: quality, sweet potato, temperature.

Rezumat. Influența schimbărilor climatice asupra calitații cartofului dulce cultivat pe solurile nisipoase din sud-vestul Olteniei. Schimbările climatice din ultimii ani sunt puternic legate de producția agricolă, resursele de apă, precum și de diversitatea speciilor. Cultura de cartof dulce are un mare potențial în lumina provocărilor iminente asociate cu seceta ca efect negativ al schimbărilor climatice. Rezultatele obţinute cu privire la producţie şi calitatea tuberculilor de cartof dulce pe solurile nisipoase din sud vestul Olteniei sunt similare cu cele obţinute în diferite ţări ale lumii. Soiurile studiate au prezentat o producţie ridicată şi cantităţi mari de substanţă uscată totală, amidon şi vitamina C. Soiurile analizate au fost influenţate diferit de suma gradelor de temperatură şi de precipitaţii, din punct de vedere a calităţii tuberculilor. Conţinutul de substanţă uscată totală şi amidon din tuberculii de cartof dulce nu a fost influenţat semnificativ de SGT şi de precipitaţii. Cantitatea de substanţă uscată totală a depășit la majoritatea soiurilor 30% la o SGT de 3700-3800 ^{0}C. Cea mai mare cantitate de amidon în tuberculii de cartof dulce a fost determinată în anul 2016 la o cantitate de precipitații de 350mm (17.06%), iar în funcție de SGT la 3700 ^{0}C pe perioada de vegetație, amidonul este asimilat în tuberculi în procent ridicat. În funcție de precipitații, producția de tuberculi are o tendință nesemnificativă de creștere. Producția de tuberculi de cartof dulce a fost influenţată semnificativ la aproape toate soiurile de SGT din perioada de vegetație, iar cele mai mari producții au fost obținute în anii cu SGT cuprinsă între 3650-3700 ^{0}C. Datele obținute în condițiile solurilor nisipoase sunt similare rezultatelor obținute de (EARL & DAVIS, 2003; BAGAMBA et al., 2012; PLACIDE et al., 2013; FALOLA & ACHEM, 2017 etc.) care consideră cartoful dulce ca pe o cultură tolerantă la secetă și potențială a securității alimentare.

Cuvinte cheie: calitate, cartof dulce, temperatură.

INTRODUCTION

Climate change is an inevitable phenomenon of natural and anthropogenic nature against which mitigation and adaptation measures are needed to reduce impact and vulnerability in order to avoid risks in crop farming and to ensure the sustainable living environment of the agricultural community (KOUNDINYA et al., 2017).

Agronomic practices such as resource conservation technologies, mulching, organic agriculture, carbon sequestration by harvesting systems and agro-forestry offer a number of possible strategies for addressing climate change impacts on vegetable production, the necessary adjustment measures.

Sweet potato is a vegetable species that began to grow in our country, although it is very little known. Culture has great potential in light of the imminent challenges associated with drought as a negative effect of climate change. A number of researches have highlighted that sweet potatoes are a culture that has a broad ecological adaptation, drought tolerance, and a short 3 to 5-month maturity. The culture is highly nutritious and surpasses most carbohydrate foods in terms of the content of vitamins, minerals, dietary fibre and protein (WOOLFE, 1992; BOVELL-BENJAMIN, 2007; AGILI et al., 2012).

For sweet potatoes, drought represents an annual yield loss of 25% compared to a production loss of more than 50% or the total failure of basic crops such as maize. Despite this advantage, its importance as a culture of food security is still underestimated and does not attract sufficient attention from agricultural researchers. Numerous studies and researches highlight the importance of sweet potatoes from an agronomic perspective as a traditional drought tolerant culture and potential food security (PLACIDE et al., 2013; EARL & DAVIS, 2003; BAGAMBA et al., 2012; FALOLA & ACHEM, 2017 etc.).

Sweet potato offers a balanced diet for the human body. The crop contains significant amounts of carbohydrates compared to other starch crops such as rice, maize and sorghum, although the protein content is slightly lower than in potatoes and other cereal crops. It contains almost all macro- and trace elements, substantial amounts of vitamin C, moderate amounts of B complex vitamins (vitamin B1, B2, B5 and B6) and folic acid, as well as satisfactory amounts of vitamin E (WALTER et al., 1983; WOOLFE, 1992; BOVELL-BENJAMIN, 2007).

Sweet potato is also popular in low-fat diets and is recommended for its low glycaemic index (gI) (BOVELL-BENJAMIN, 2007; MUKHOPADHYAY et al., 2011).

In terms of food security, sweet potatoes are an excellent crop because they often survive if the underlying crops fail. It contributes to the availability of food by providing a high yield per land unit (yields of about 3.9-9.5 t / ha in communal agriculture, compared to less than 1-3 t / ha reported for similarly managed maize) and can swerve on soils with low fertility. The fact that it has more energy than maize also highlights its potential role as a food safety harvest (WOOLFE, 1992; AGILI et al., 2012; LAURIE & MAGORO, 2008).

On the sandy soils of southern Oltenia the sweet potato finds favourable conditions of culture, although in the summer months the maximum air temperature exceeds 40° C on many days, and the periods during which the rainfall is missing may exceed 30 days. The research carried out during 2015-2017, in the climatic conditions of sandy soils in Romania, revealed the role of fertilization and the density of plants on the growth and development of sweet potato plants (Ipomoea batatas) (DRAGHICI et al., 2017). Also, DIACONU et al. (2018), highlights the role of the variety and the planting age in the field as a determinant of plant productivity. The results obtained with the varieties studied during 3 field planting epochs (10-15 May, 25 May-05 June, 10-15 June) highlight the Juhwangmi variety planted in the first epoch with an average production over the two years of 43750 kg / ha. The delay in fielding of potato shoots causes the production of tubers to be reduced by 13,068.27 kg / ha.

DRAGHICI et al. (2018) showed that all studied varieties had a total dry matter content of over 30% and the highest content was determined in KSC1 (38.87%). Also, the results obtained with respect to the content of soluble carbohydrates, starch and C vitamin are similar to those in the literature, the differences being due to the studied genotypes and climatic conditions in the culture area.

The production potential of sweet potatoes in the conditions of sandy soils in southern Oltenia is 24-29 t / ha, and the Iuhwangmi variety can reach 48 t / ha planted at the optimal age and mulching with transparent mulch (DIACONU et al., 2019).

MATERIAL AND METHOD

Starting from the assumption that air tempreature is increasing and the periods of drought are more and more frequent on the sandy soils of southern Oltenia, researches regarding the productive behaviour and the quality of the tubers were initiated, on different varieties of sweet potatoes in 2015-2018. The studied varieties were: Yulmi, Juhwangmi, Hayanmi, KSP1 and KSC1. In these varieties the nutritional quality of the tubers was determined by analysing the specific quality indices and their quantitative stability as well as the production under the climatic conditions of the study period.

Samples of tubers were harvested 120 days after planting, and the following determinations were made in the laboratory:

1. water and total dry matter (TDM)(%) - gravimetric method;
2. soluble dry matter (SDM)(%) - refractometric method;
3. soluble carbohydrates (%) - Fehling Soxhlet method;
4. C vitamin (mg / 100g s.p.) - iodometric method;
5. starch (%) - gravimetric method;
6. recording climatic elements at the SCDCPN Dăbuleni weather station and their interpretation in the context of climate change (sum of temperature degrees (STD) and precipitations).

The results obtained from the researches performed were statistically processed by the variance analysis method (SĂULESCU N. A. & SĂULESCU N. N., 1967).

RESULTS AND DISCUSSIONS

The experiment was performed on a soil that was poorly supplied (with some well-supplied portions) in total nitrogen (0.02-0.13%), medium to very well supplied in phosphorus (36-110ppm) and reduced to medium in potassium exchangeable 25-95 ppm). Organic carbon showed values in the range of 0.21% - 1.11%, the state of supply of soil in organic matter being reduced to medium in some parts, which is characteristic of sandy soils, and the soil reaction was slightly acidic to moderately acidic.

From a climatic point of view, the four years of study have differentiated both as temperature values and as rainfall values (Table 1). The warmest years were 2017 and 2018, with average temperatures during the vegetation period of 20.8 ° C in 2017 and 21.0 ° C in 2018. The year 2016 was considered the driest for sweet potato culture 345.9 mm), and 2018 was the richest in rainfall (498.2 mm). In all four years the amount of precipitation was very unevenly distributed during the vegetation period, from 1mm in August 2016 to 195.2 mm in June 2017.

Table 1. Monthly average air temperature and amount of rainfall during the growing season of sweet potato culture (2015-2018).

Climate element	Year	May	June	July	August	September	October	Average/ Amount	STD (^0C)
Average temperature (°C)	2015	19.2	20.5	24.8	24.3	20.1	11.2	20.0	3680
	2016	16.8	23.6	24.8	23.5	20.4	11.5	20.1	3698.4
	2017	17.8	24	24.8	24.8	20.2	13.4	20.8	3827.2
	2018	20.7	22.5	23.6	25.1	20.5	13.4	21.0	3864
Precipitations (mm)	2015	52.4	134.2	11.0	48.4	84.8	93.8	424.6	-
	2016	104.4	53.2	31.6	1.0	37.6	118.1	345.9	-
	2017	78.6	17.4	120.8	28.8	18.2	120.4	384.2	-
	2018	106.6	195.2	148.7	30.0	12.6	5.8	498.2	-

In terms of tuber quality, the five sweet potato varieties behaved differently in climatic conditions on sandy soils in south-west Oltenia. The results obtained in the period 2015-2018 (mean years) are presented in Table 2. The total dry substance ranged between 31.85% for the Juhwangmi variety and 39.27% for the Hayanmi variety, with an average of 36.28%. The largest amount of total dry matter was determined at the Yulmi variety in the climatic conditions of the year 2017 (considered a warm and dry year for the sweet potato).The literature indicates a total dry matter content in sweet potato tubers ranging from 19.69% to 39%, depending on the variety, climatic conditions and culture technology (UKOM et al., 2009; KAREEM, 2013; KROCHMAL-MARCZAK et al., 2014). RUMBAOA et al. (2009), determined in some Taiwanese native varieties a total dry matter content of between 26.9% and 35.4%, results that are similar to those cultivated in other regions.

SANOUSSI et al. (2016) of the Republic of Benin have determined in 10 selected varieties a total dry substance content ranging from 25,09% to 46,12%. These values are similar to those reported by ELLONG et al. (2014) in Martinique (29.56% -39.32%), but higher than reported by LAURIE et al. (2012c) in South Africa (18.5% -30.5%).

Table 2. The influence of the variety on the biochemical composition of sweet potato at 120 days after planting (2015-2018).

Number of days	Variety	Year	Total dray matter (%)	Soluble dray matter (%)	Soluble carbohydrates (%)	Starch (%)	C vitamin (mg/100g f.s*)
120 days	Yulmi	2015	37.19	6.60	5.50	13.87	6.16
		2016	38.81	11.4	9.50	15.14	9.85
		2017	42.23	12.4	10.31	12.05	10.56
		2018	38.76	8.2	6.85	12.97	13.20
	Average		**39.25**	**9.65**	**8.04**	**13.51**	**9.94**
	Juhwangmi	2015	37.26	7.40	6.15	13.63	9.68
		2016	32.13	10.7	8.90	17.06	10.56
		2017	28.81	10.0	8.37	12.61	9.68
		2018	29.18	7.3	6.00	14.98	11.44
	Average		**31.85**	**8.85**	**7.36**	**14.57**	**10.34**
	Hayanmi	2015	38.77	8.40	7.00	12.80	4.40
		2016	38.92	12,8	10.62	13.53	10.55
		2017	39.08	10.7	8.90	11.29	10.56
		2018	40.31	9.0	7.50	13.84	9.68
	Media		**39.27**	**10.23**	**8.51**	**12.87**	**8.80**
	KSP1	2015	34.33	6.70	5.60	13.90	6.16
		2016	31.03	11.8	9.82	13.69	11.00
		2017	35.10	11.0	9.11	12.46	11.44
		2018	34.85	9.1	7.58	13.46	10.56
	Average		**33.83**	**9.65**	**8.03**	**13.38**	**9.79**
	KSC1	2015	38.87	5.30	4.40	13.15	3.52
		2016	38.93	12.5	10.40	14.58	10.38
		2017	37.65	11.2	9.32	11.33	10.56
		2018	33.88	10.0	8.35	13.13	8.80
	Average		**37.33**	**9.75**	**8.12**	**13.05**	**8.32**
Average			**36.31**	**9.63**	**8.01**	**13.47**	**9.44**

f.s*- fresh substance

The results obtained on sandy soils are similar to those obtained in different corners of the world. With the accumulation of total dry matter, the amount of water in the tubers decreases. The amount of soluble dry matter was between 8.85% for the Juhwangmi variety and 10.23% for the Hayanmi variety, with an average of 9.63%.

The highest amount of soluble dry matter in sweet potato tubers was determined in 2016 and 2017, years with a low precipitation amount during the maximum accumulation period of assimilation into tubers. The varieties at which higher soluble dry matter values were determined also had a higher content of soluble carbohydrates, which ranged between 7.36% for the Juhwangmi variety and 8.51% for the Hayanmi variety with an average of 8.01%.

The starch content of sweet potato tubers in the studied varieties ranged between 12.87% for the Hayanmi variety and 14.57% for the Juhwangmi variety, with an average of 13.47%. Within the years of study the most optimal climatic conditions for the accumulation of starch in tubers were in 2016. In all varieties the highest content of starch was determined, and the highest value was recorded in the Juhwangmi variety, of 17.0 %.

THAO & NOOMHORM (2011), determined a sweet potato starch content ranging between 12.38% and 17.52%.

BABU & PARIMALAVALLI (2014), purchased sweet potatoes from the local market in Salem, Tamil Nadu, India, and determined a starch content of between 14.11% and 17.76%, similar to the results obtained by TSAKAMA et al. (2010) and SURAJI et al. (2013) who, under the climatic conditions in Sri Lanka, found 14.2-17.2% starch in sweet potatoes.

Despite the high carbohydrate content, sweet potato has a low glycaemic index due to low digestibility of starch making it suitable for diabetics (ELLONG et al., 2014; FETUGA et al., 2014; OOI & LOKE, 2013).

C vitamin is the main vitamin synthesized by plants, participating in the processes of formation of unsaturated fatty acids, the degradation of amino acids in carbohydrate metabolism, iron metabolism, etc. The C vitamin content of vegetables and fruits varies very widely, depending on the species, variety and agro-climatic conditions. The C vitamin content at harvest ranged from 8.32 mg / 100g fresh substance to KSC1 variety and 10.34 mg / 100g fresh substance to Juhwangmi variety with an average of 9.44mg. In the four years of study, the amount of vitamin C in the tubers showed different values depending on the climatic conditions. In most varieties, the highest amount of vitamin C was determined under the climatic conditions of the year 2018, a warm year but also with significant precipitation during the vegetation period. The highest content was determined at the Yulmi variety of 13.20mg / 100g s.p.

The analysed varieties were influenced differently by the sum of temperature degrees (STD) and precipitations, in terms of tuber quality. In the Yulmi variety, the amount of total dry matter was not significantly influenced by the sum of temperature degrees (STD) and precipitation in the analysed period (2015-2018) (Table 3). The regression equations have insignificant correlation coefficients: r = -0.67 and r = -0.30. These results show that the total dry matter accumulates in tubers at a high percentage, in the climatic conditions specific to sandy soils in the southwestern Oltenia. None of the five varieties were significantly influenced by the accumulation of total dry matter in tubers by the amount of precipitation. The data obtained in the conditions of sandy soils confirm the results obtained by (PLACIDE et al., 2013; EARL & DAVIS, 2003; BAGAMBA et al., 2012; FALOLA & ACHEM, 2017 etc.) who consider sweet potato as a crop tolerant to drought and the potential of food security.

The varieties Juhwangmi, Hayanmi and KSC1 showed significant correlation coefficients between accumulation of total dry matter (TDM) in tubers and sum of temperature degrees (STD). Hayanmi and KSC1 varieties accumulate a large amount of TDM at a STD of between 3700-3800 ^{0}C, and the Juhwangmi variety gives the best results at an SDT of 3650-3700 ^{0}C.

Table 3. Regression equations and correlation coefficients between TDM content of tubers, SDT and precipitations of sweet potato varieties studied during 2015-2018.

Variety	Studied factors	Equation	Correlation factor
Yulmi	Total dray matter (TDM) x Sum of temperature degrees(STD)	$Y = -6.223x^2 + 517.5x - 6929$	r = -0.67
	TDM x Precipitations	$Y = -1.639x^2 + 121.7x – 1836$	r = -0.30
Juhwangmi	TDM x STD	$y = 4.783x^2 – 336.7x + 9585$	r = +0.96*
	TDM x Precipitations	$y = 4.527x^2 – 301.5x + 5372$	r = +0.58
Hayanmi	TDM x STD	$y = -270.5x^2 + 21529x - 42431$	r = -0.95^0
	TDM x Precipitations	$y = 161.8x^2 - 12742x + 25110$	r = + 0.92
KSP1	TDM x STD	$y = 51.49x^2 – 3364.x + 58516$	r = + 0.88
	TDM x Precipitations	$y = -15.33x^2 + 1033.x - 16956$	r = -0.71
KSC1	TDM x STD	$y = -19.79x^2 + 1406.x - 21053$	r = -0.99^{00}
	TDM x Precipitations	$y = 5.457x^2 – 419.9x + 8460$	R = + 0.87

Starch is the most abundant reserve of carbohydrates in plants and is found in leaves, flowers, fruits, seeds, different types of stems and roots. Starch is used by plants as a source of carbon and energy. The biochemical chain responsible for starch synthesis involves glucose molecules produced in plant cells by photosynthesis. The starch is formed in the chloroplasts of green leaves and amyloplasts, the organs responsible for the synthesis of starch reserves in cereals and tubers. Starch production in chloroplast is diurnal and is carried out quickly by plants. On the contrary, amyloplastic starch reserves are stored within a few days or even weeks.

The starch content of sweet potato tubers was not significantly influenced by STD and precipitation (Table 4). Only the Juhwangmi variety showed a significant correlation factor depending on the precipitation. The largest amount of starch in sweet potato tubers was determined in 2016 at a precipitation rate of 350mm (17.06%), and depending on the STD at 3700 °C during the vegetation period, starch is assimilated into tubers in a high percentage.

Table 4. Regression equations and correlation coefficients between starch, STD and potato starch content in potato varieties studied during 2015-2018.

Variety	Studied factors	Equation	Correlation factor
Yulmi	Starch x Sum of temperature degrees (STD)	$y = 0.8591x^2 - 63.44x + 4494.2$	r = + 0.91
	Starch x Precipitations	$y = 2.5347x^2 - 78.595x + 1009.6$	r = + 0.21
Juhwangmi	Starch xSTD	$y = -8.1185x^2 + 226.73x + 2209.9$	r = -0.38
	Starch x Precipitations	$y = -24.08x^2 + 709.4x - 4744.1$	r = -0.95^0
Hayanmi	Starch xSTD	$y = 111.13x^2 - 2792.8x + 21196$	r = +0.90
	Starch x Precipitations	$y = 22.412x^2 - 539.72x + 3625.6$	r = +0.45
KSP1	Starch xSTD	$y = -280.18x^2 + 7265.1x - 43196$	r = -0.91
	Starch x Precipitations	$y = -143.25x^2 + 3777.6x - 24442$	r = -0.77
KSC1	Starch xSTD	$y = -6.468x^2 + 127.6x + 3212.2$	r = - 0.58
	Starch x Precipitations	$y = -37.854x^2 + 968.88x - 5733.7$	r = - 0.89

The C vitamin content of sweet potato tubers was influenced by the climatic conditions and the variety of the studied variety. In Yulmi and Juhwangmi early varieties, the amount of C vitamin in sweet potato tubers increases significantly with the increase in the amount of precipitation (Table 5). Precipitations during plant growth and initiation of tubers, from May to August, are more beneficial for the accumulation of reserve substances in tubers. Hayanmi, KSP1 and KSC1 varieties in tubers a higher amount of C vitamin at a SGT that may exceed 3800 ^{0}C and 400mm during the vegetation period. Due to the fact that the depth at which the tubers develop can reach up to 20-40 cm, it can maintain a high soil moisture that positively influences the accumulation of biochemical components in tubers.

Table 5. Regression equations and correlation coefficients between the C vitamin content of tubers, STD and precipitations of sweet potato varieties studied during 2015-2018.

Variety	Studied factors	Equation	Correlation factor
Yulmi	C vitamin x Sum of temperature degrees(STD)	$y = 2.261x^2 - 16.027x + 3688.9$	r = +0.88
	C vitamin x Precipitation	$y = 8.5732x^2 - 155.16x + 1054.2$	r = + 0.99**
Juhwangmi	C vitamin x STD	$y = 142.56x^2 - 2948.2x + 18934$	r = + 0.76
	C vitamin x Precipitation	$y = 136.11x^2 - 2821.3x + 14961$	r = +0.97*
Hayanmi	C vitamin x STD	$y = -26.906x^2 + 392.72x - 782.47$	r = $-0{,}97^0$
	C vitamin x Precipitation	$y = -24.185x^2 + 375.21x + 2497.3$	r = -0.82
KSP1	C vitamin x STD	$y = -11.493x^2 + 221.37x + 2753.3$	r = -0.64
	C vitamin x Precipitation	$y = -24.791x^2 + 422.79x - 1238.5$	r = -0.69
KSC1	C vitamin x STD	$y = -12.853x^2 + 171.49x - 19.568$	r = $-0{,}94^0$
	C vitamin x Precipitation	$y = -12.162x^2 + 182.67x + 3188.3$	r = -0.77

The studied biochemical components showed greater stability in rainfall variations from 345.9 mm to 498.2 mm during the vegetation period, showing the drought resistance of sweet potato and strengthening its potential food safety harvesting role.

Tuber production in the studied period ranged from 17,000 kg / ha for KSC1 in the conditions of 2017 (year with excessive thermal stress) and 47,618 kg / ha for the Juhwangmi variety. SUT from tubers to the studied varieties had a tendency of percentage growth, with the increase in production, but the results are insignificant (Table 6).

Depending on the rainfall, the production of sweet potato tubers has an insignificant growth tendency, with an increase in the quantity of water, and the highest yields are obtained in the years when the amount of rainfall recorded during the vegetation period is higher in May- July, which corresponds to the growth and growth period of the tubers. The production of sweet potato tubers was significantly influenced by almost all SGT varieties during the vegetation period, and the highest yields were obtained in STD years between 3650-3700 ^{0}C. The strongest correlation was determined in the Juhwangmi variety, which recorded a production of 47618kg / ha at a STD of 3698.4 ^{0}C, with a very significant correlation factor r = -0.99^{00} (Table 6).

Table 6. Regression equations and correlation coefficients between tuber production, total dry matter content (TDM) from tubers, sum of temperature degrees (STD) and precipitations of sweet potato varieties studied during 2015-2018.

Variety	Studied factors	Equation	Correlation factor
Yulmi	Production x TDM	$y = -5E-08x^2 + 0.0026x + 4.8375$	r = -0.86
	Production xSTD	$y = -3E-06x^2 + 0.1477x + 1677.8$	r = -0,98^0
	Production x Precipitations	$y = -8E-07x^2 + 0.0541x - 451.02$	r = -0.79
Juhwangmi	Production x TDM	$y = 4E-08x^2 - 0.0024x + 64.078$	r = + 0.81
	Production xSTD	$y = -1E-06x^2 + 0.0924x + 2434.2$	r = -0,99^0
	Production x Precipitations	$y = -1E-06x^2 + 0.0819x - 888.49$	r = -0.91
Hayanmi	Production x TDM	$y = 4E-07x^2 - 0.0169x + 223.07$	r = +0.97*
	Production xSTD	$y = -6E-06x^2 + 0.2683x + 768.18$	r = -0.74
	Production x Precipitations	$y = -1E-06x^2 + 0.0774x - 580.74$	r = -0.29
KSP1	Production x TDM	$y = 6E-08x^2 - 0.0036x + 84.097$	r = +0.80
	Production xSTD	$y = -9E-07x^2 + 0.0356x + 3486.9$	r = -0,96^0
	Production x Precipitations	$y = -5E-07x^2 + 0.0255x + 118.63$	r = -0.32
KSC1	Production x TDM	$y = 2E-08x^2 - 0.001x + 48.177$	r= +0.52
	Production xSTD	$y = -2E-07x^2 + 0.0023x + 3857.4$	r = -0.73
	Production x Precipitations	$y = -2E-07x^2 + 0.0118x + 248.5$	r = -0.21

CONCLUSIONS

Climate change in recent years is strongly related to agricultural production, water resources and species diversity.

The results obtained with regard to the quality of sweet potato tubers on sandy soils in south-west Oltenia are similar to those obtained in different countries of the world. The studied varieties showed a high content of TDM, starch and C vitamin.

The analysed varieties were influenced differently by the sum of temperature degrees (STD) and precipitation grades in terms of tuber quality.

The total dry matter content and starch sweet potato was not significantly influenced by SGT and precipitation. The amount of total dry substance exceeded 30% for most varieties at a STD of 3700-3800 ^{0}C.

The largest amount of starch in sweet potato tubers was determined in 2016 at a precipitation rate of 350mm (17.06%), and depending on the STD at 3700 ^{0}C during the vegetation period, starch is assimilated into tubers in a higher percentage.

Hayanmi, KSP1 and KSC1 varieties in tubers have a higher amount of vitamin C at a STD that may exceed 3800 ^{0}C and 400mm during the vegetation period.

Depending on the rainfall, the production of sweet potato tubers has an insignificant growth tendency, with an increase in the quantity of water, and the highest yields are obtained in the years when the amount of rainfall recorded during the vegetation period is higher in the month of May, which corresponds to the period of formation and growth of tubers.

The production of sweet potato tubers was significantly influenced in almost all STD varieties during the vegetation period, and the highest yields were obtained in years with STD between 3650 and 3700 °C. The strongest correlation was found in the Juhwangmi variety, which recorded a production of 47618kg / ha at a STD of 3698.4 ^{0}C, with a very significant correlation factor r = -0.99 ^{00}.

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