

POTATO CROP PRODUCTION IN PERI-URBAN BUCHAREST AREA (MOARA DOMNEASCA - ILFOV)

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Abstract

Potato (Solanum tuberosum L.) is one of the most important food plants worldwide and holds over 18.6 million ha all over the world (FAO, 2011).

In Romania, potato crops occupied areas between 250 and 300 thousand hectares after 1950, ranking 18th in the world and 2nd - 3rd in Europe in terms of total tuber production.

The expansion of potato crops, including in southern Romania, is based on the extensive research conducted under ICAR between 1950 and 1967 and ICCS Brasov in 1967.

Research conducted on the chromic luvisoil of Moara Domneasca Didactic Farm in 2013 aimed at checking the suitability of three potato varieties for the conditions of the area - Riviera, Bellarosa and Everest; the varieties were grown both as a non-irrigated and moderately irrigated crop (at a hydric regime specific to the normal one in the area).

Observations and measurements were made on the emergence and development of plants, tubers, tuber production and commercial quality.

In 2013, the variety Bellarosa achieved a maximum tuber yield 29,203 kg/ha, of which 25,494 kg/ha were tubers over 55 mm in size.

Keywords: *Solanum tuberosum L., potato, irrigated, tuber yield.*

INTRODUCERE

Potato (*Solanum tuberosum* L.) is one of the most important crop plants, owing to its role both as food and raw material for industry. Although it has high ecological plasticity, potato manifests some demands for climate and soil conditions (Berindei, 1960, 1977).

In Romania potato has occupied an important place in agricultural production, the annual grown areas generally varying between 250 and 300 thousand ha after 1950, which made Romania rank 2nd - 3rd in Europe (FAO Database 2011, MADR 2010, Romanian Statistical Yearbook 2012).

Research conducted after 1950 by the Romanian Institute of Agronomic Research (ICAR) and since 1967 by the Potato and Beetroot Research Institute (ICCS) have contributed to the expansion of the potato crop to other Romanian ecological areas.

Potato is a volume product; therefore, it involves the transport of large amounts of goods from the production site to the

consumer's location, with direct effects on the selling price. Therefore, it is very useful to produce these food types close to the consumer's location, especially in the large urban areas.

MATERIALS AND METHODS

The experiment was established within the Moara Domneasca Didactic Farm - Ilfov, belonging to the University of Agronomic Sciences and Veterinary Medicine of Bucharest, located at about 15 km far from the Capital. The soil type was chromic luvisoil.

We used three potato varieties: Riviera, Bellarosa and Everest, grown under non-irrigated and moderately irrigated crop conditions.

Crop fertilization was based on organic mineral, i.e. 25 t/ha manure and chemical fertilizers (NPK complex and urea), in order to provide macroelements at rates of 120 kg a.s./ha nitrogen, 70 kg a.s./ha phosphorus, and 100 kg a.s./ha potassium.

The crop was established on 20 March 2013, at a density of 5 tubercles/m². Pre-emergent herbicidation by Sencor 1 kg/ha.

We applied two weeding works, two treatments with Ridomil Gold Plus (3 kg/ha) for blight control - *Phytophthora infestans*, and one treatment at the end of June, based on Calypso 480 SC (0.1 l/ha) for the control of the pest *Leptinotarsa decemlineata*.

Watering included moderate water amounts, i.e. 250 m³/ha, applied between May and July; the total amount, i.e. 1,000 m³/ha (100 mm) increased the hydric regime of the area (slightly over the normal standard).

During the vegetation period, we performed biometric obserations and measurements – emergence time, talk number, stalk height, leaf number, stalk biomass, tubercle number, tubercle calibre.

RESULTS AND DISCUSSIONS

Climatic conditions in the Moara Domneasă area

The climatic conditions for 2013 (Table 1) have exerted a direct influence on crop plant development. The thermal and pluviometric regime recorded deviations from the multiannual average values. In March-July 2013, rainfalls recorded 206.3 mm, i.e. 90.9 mm less than the normal standard (297.2 mm)

while the average temperature was 1.8⁰C higher than the normal standard.

In June 2013, the 99 mm rainfalls recorded a favourable influence on the tubercle yield.

Table 1. Climatic conditions at Moara Domneasă

Month	Temperature (°C)		Rainfalls (mm)	
	Year 2013	Normal	Year 2013	Normal
March	4.9	4.4	27	31.6
April	13.1	11.2	19.1	48.1
May	19.5	16.5	44	67.7
June	22.6	20.3	99	86.7
July	23.3	22.1	26.2	63.1
Average /Sum Mar – Jul	16.68	14.88	206.3	297.2

Crop plant development

Tables 2 present aspects of potato plant development on June, depending on the variety and hydric regime. The Bellarosa variety recorded the highest values of the parametres under analysis, both under irrigated and non-irrigated conditions, while the Riviera variety recorded the lowest values.

In 2013, irrigation determined an average increase in stalk height by 14.2%, leaf number/stalk by 9.8%, and leaf length by 9.3% (Table 3).

Table 2. Influence of variety on some morphological parametres of potato plants, 2013

Variant	Variety	Stalk height (cm)	%	Average leaf number/ stalk	%	Average leaf length (cm)	%
Non-irrigated	Riviera	31.3	80.7	11.5	94.3	17.2	88.7
	Bellarosa	49.2	126.8	13.0	106.6	22.0	113.4
	Everest	36.0	92.8	12.0	98.4	19.0	98.0
	Average (C)	38.8	100	12.2	100	19.4	100
Irrigated	Riviera	34.0	76.8	13.0	97.1	19.0	89.7
	Bellarosa	56.4	127.3	14.0	104.5	23.2	109.4
	Everest	42.5	95.9	13.3	99.3	21.5	101.4
	Average (C) (C = Control)	44.3	100	13.4	100	21.2	100

Table 3. Influence of water supply on some morphological parametres of potato plant, average values of the three varieties in 2013

Variant	Stalk height (cm)	%	Average leaf number/stalk	%	Average leaf length (cm)	Stalk height (cm)
Non-irrigated	38.8	100	12.2	100	19.4	100
Irrigated	44.3	114.2	13.4	109.8	21.2	109.3

Tubercle yield

The dynamic analysis of the tubercle yield in the three potato varieties and in accordance with water supply (Table 4) shows that, at the end of May, the Riviera variety had resulted in a tubercle yield 19.4% higher than the average of the varieties grown under non-irrigated conditions and 21.2% higher than the irrigated crops.

The additional water supply in May (250 m³/ha) resulted in a 17.8% average increase in the yield, compared with the non-irrigated crop. The tests performed on 30 June 2013 showed that the Bellarosa variety recorded the highest production, i.e. 19,677 kg/ha under non-irrigated conditions, and 24,211 kg/ha under irrigated conditions, exceeding the average of the experimental variants by 11.6% and 10.4%, respectively.

The last harvest occurred on 20 July 2013, when the average yield of the three potato varieties was 20,842 kg/ha under non-irrigated conditions and 26,291 kg/ha under irrigated conditions (irrigation resulted in an average yield increase of 26.1%). The highest yield, i.e. 29,203 kg/ha, was recorded in the Bellarosa variety under irrigated conditions. The Riviera variety recorded the best response to irrigation, achieving a 33.2% increase in the yield, compared with the non-irrigated crop.

Tubercle size was significantly influenced by watering (Table 5). The share of tubercles exceeding 55 mm in diameter recorded an average increase of 45.7%, compared with the non-irrigated crop (22,970 kg/ha). The Bellarosa recorded the highest level of 25,494 kg/ha large tubercles, while the Riviera variety recorded the best response to irrigation by increasing the share of large tubercles, compared with the non-irrigated variant (61.5% increase).

Average tubercle weight depending on the variety and hydric regime

The average tubercle weight depending on the variety (Table 6) on 20 July 2013 varied between 70 g in the Everest variety and 76.27 g in the Bellarosa variety under non-irrigated conditions, and between 81.35 g in the Bellarosa variety and 89.3 g in the Riviera

variety under irrigated conditions. Large tubercles (over 55 mm) recorded an average weight of 84.4 g (the highest was 92.6 g in the Bellarosa variety) under non-irrigated conditions, and 102.3 g (the highest was 106.6 g in the Riviera variety) under irrigated conditions. Crop irrigation under the conditions of Moara Domneasca in 2013 resulted in increased average weight of the tubercles by 14.6% and 21.2% in the mass of tubercles over 55 mm in diameter.

Table 4. Tubercle yield rate depending on variety and hydric regime, Moara Domneasca, 2013

Variety	Non-irrigated		Irrigated		Increase % compared with non-irrigated variant
	Yield kg/ha	%	Yield kg/ha	%	
25 May 2013					
Riviera	8,944	119.4	10,690	121.2	119.5
Bellarosa	7,698	102.8	8,986	101.9	116.7
Everest	5,824	77.8	6,781	76.9	116.4
Average (C)	7,489	100	8,819	100	117.8
30 June 2013					
Riviera	17,347	98.4	22,589	103.0	130.2
Bellarosa	19,677	111.6	24,211	110.4	123.0
Everest	15,891	90.1	18,928	86.3	119.1
Average (C)	17,638	100	21,909	100	124.2
20 July 2013					
Riviera	19,802	95.2	26,374	100.3	133.2
Bellarosa	23,795	114.4	29,203	111.1	122.7
Everest	18,928	91.0	23,296	88.6	123.1
Average (C)	20,842	100	26,291	100	126.1
LSD 5%= 1612.4 kg; LSD 1%= 2346.2 kg; LSD 5%= 3525.9 kg;					

Table 5. Yield of edible tubercles over 55 mm

Variety	Non-irrigated		Irrigated		Increase % compared with non-irrigated variant
	Yield kg/ha	%	Yield kg/ha	%	
Riviera	14,554	92.3	23,499	102.3	161.5
Bellarosa	19,131	121.3	25,494	111.0	133.3
Everest	13,628	86.4	19,918	86.7	146.2
Average (Control)	15,771	100	22,970	100	145.7
LSD 5%= 918.8 kg; LSD 1%= 1517.9 kg; LSD 5%= 2159.3 kg;					

Table 6. Influence of variety and hydric regime on average tubercle weight, 20 July 2013

Variety	Non-irrigated				Irrigated					
	Average tubercle weight g	%	Average tubercle weight >55 mm g	%	Average tubercle weight g	%	% compared with non-irrigated variant	Average tubercle weight >55 mm g	%	% compared with non-irrigated variant
Riviera	74.38	101.4	83.3	98.7	89.30	106	117.1	106.6	104.2	128
Bellarosa	76.27	103.7	92.6	109.7	81.63	96.9	107	97.3	95.1	105.1
Everest	70.00	95.0	81.9	97.0	82.35	97,7	117.6	104.1	101.8	127.1
Average (Control)	73.53	100	84.4	100	84.26	100	114.6	102.3	100	121.2

CONCLUSIONS

The rainfalls that occurred during the vegetation period were under the normal standard of the area. However, given that a significant amount of the rainfalls (96.2 mm) was recorded at the end of June, they played an important part in crop formation.

Under the irrigation conditions of 2013, the plants recorded an average increase in stalk height by 14.2%, leaf number/stalk by 9.8%, and leaf length by 9.3%, compared with the non-irrigated plants.

At early harvest (25 May), the Riviera variety recorded the best yield, exceeding the average of the varieties by 19.4% under non-irrigated conditions, and by 21.2% under irrigated conditions.

Starting with June, the Bellarosa variety ranks first in the yield level. Total tubercle yield was 23,795 kg/ha in the Bellarosa under non-irrigated conditions, and 29,203 kg/ha under irrigated conditions.

In all the three variants, the yield of tubercles over 55 mm in diameter was 15,771 kg/ha under non-irrigated conditions, and 22,970 kg/ha under irrigated conditions; the highest level was recorded in the Bellarosa variety.

The irrigation resulted in increased average weight of the potato tubercles by 14.6%, and of the tubercles over 55 mm in diameter by 21.2%.

The crop conditions specific for Moara Domneasca provide high tubercle yield and potato commercial quality, which offers the possibility to grow potato in this peri-urban area of Bucharest.

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