

## INFLUENCE OF AGROECOLOGICAL CONDITIONS ON ROOT YIELD OF CELERIAC

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**Abstract:** What we have in the present paper are the results of analysis on how the amount of precipitation, temperature, type of soil, and drip irrigation can affect celeriac root yield.

The soil type had a considerable influence on yield. In both study years concerning two ways of growing – watering and dry cultivation, the celeriac root yield was higher on the chernozem soil type.

The higher amount of precipitation and higher temperature during the period of vegetation resulted in higher root yield the first study year (both locality and dry cultivation).

Compared with in dry cultivation, in both study years as well as both localities, drip irrigation had higher effects on celeriac root yield.

**Key words:** celeriac, drip irrigation, dry cultivation, root yield.

### I n t r o d u c t i o n

Celery (*Apium graveolens* L.) is a biennial herbaceous plant from the *Apiaceae* family. It is widely used and appreciated as vegetable but has found its place as a medicinal plant too. There are three varieties of this plant: celeriac (*Apium graveolens* L. var. *rapaceum*), smallage (*Apium graveolens* L. var. *secalinum*) and celery (*Apium graveolens* L. var. *dulce*). Celery and smallage are mostly grown in America. On the other hand, we have celeriac mass production in West Europe (France, Belgium, the Nederland and Germany) and in the countries of North Europe and Russia.

The subject of our research was celeriac. Its root is full of nutritive components. Pavlekova (1985) reports that celeriac contains: 84.0 – 90.5 %

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water, 0.24 – 0.81 % proteins, 0.25 – 0.39 % vegetable fats, 7.70 – 7.76 % NFE (nitrogen free extractives), 1.3 – 1.48 % cellulose and 0.84 – 1.76 % minerals.

Celeriac is mostly produced by seedling planting. Direct sowing is very rare. The planting of seedling is usually done in May or in the first half of June. The root is dug in autumn, before winter frosts (Pavlović and Jevdžović, 2002). The root yield was 30 – 40 t/ha, which is in agreement with the results of Pavlović et al., (2001), Pavlović et al., (2002).

The aim of this work was to show whether and how much watering, soil type, precipitation and temperature affect celeriac root yield.

### Material and Methods

For these researches we used the celeriac seedling grown in the plastic foil house of the Institute for Medicinal Plant Research "Dr Josif Pančić" in Pančevo. The researches were conducted two years (2004 and 2005) on the localities of Pančevo and Kačarevo, both situated at 70 m above sea level. The locality of Pančevo is characterized by its marsh dark soil with low acidity and average percent of humus (3.6 %), and phosphorus (12 mg/100 g), while it is rich in potassium (36 mg/100 g). The locality of Kačarevo is characterized by its cernozem soil with neutral reaction, with content of humus 4.3 %, phosphorus 9.8mg/100 g and potassium 41.0 mg/100 g.

The experiment was based on random block system. It was done in four repetitions for all variants. The size of the basic plot was 10 m<sup>2</sup>. In both years planting was done on both localities on May, 25. The distance between rows was 50 cm, and the distance between the plants in the row was 30 cm.

During the vegetation period usual measures of care and protection were taken in both variants – dry cultivation and drip irrigation.

In both years, during the experiment meteorological conditions were different (Table 1).

T a b. 1. - Distribution of average daily temperature and sum of precipitation during vegetation season of 2002 and 2003

Month	Precipitation			Temperatures		
	2004	2005	Average 30 years	2004	2005	Average 30 years
IV	54.2	60.4	57.4	13.4	12.1	11.7
V	44.3	38.1	66.2	16.3	17.2	16.9
VI	120.7	72.4	90.3	20.3	20.3	19.7
VII	73.4	67.0	80.2	24.5	22.4	21.2
VIII	91.3	117.5	57.4	22.5	20.8	21.3
IX	37.1	34.7	54.7	17.1	18.4	17.2

Root digging for all variants, localities and both years was on November, 7. The root was cleaned, washed and then measured.

The obtained data were processed by the methods of statistical variance: average value ( $I$ ), variance interval ( $I_v$ ) and variance coefficient ( $C_v$ ) (Hadživuković, 1991). Statistical significance of differences between investigated factors was calculated by the model of variance analysis (Snedecor and Cochran, 1967).

## Results and Discussion

The analysis of the influences of different meteorological and soil conditions on the fresh celeriac root yield shows the results of two – year field experiments conducted in different regions of the South Banat area. For successful production of celeriac watering is very important. During the last few years there has been not enough precipitation. That is why modern systems of irrigation find their place in the South Banat area. Drip irrigation system is one of them. It is used on the experimental field of the Institute for Medicinal Plant Research "Dr Josif Pančić" in Pančevo. On the other field (Kačarevo), the same system with the same characteristics was used, but the abilities of covering the field were less.

However, there are no conditions for high productive level on most cultivable soils used to grow seasoning vegetables. Therefore, we usually have considerably reduced quantity and quality of raw material yield because of adverse climate conditions. In spite of that, we can say that climate conditions during the years of experiment were satisfactory for growing celeriac. The results in dry cultivation show that the fresh celeriac root yield was considerably lower than the values from the watered localities.

Table 2 shows the celeriac root yield. We can see that the difference in both years was by 36 % higher in the variant with drip irrigation. The highest yield of fresh root mass in both years was achieved on the locality of Kačarevo in 2004 using drip irrigation (25,204 kg/ha). It was by 42.0 % more than the singularly lowest yield obtained from the locality of Pančevo in 2005, when the yield in dry cultivation was 14,625 kg/ha. The Kačarevo chernozem soil proved to be better locality for growing celeriac than the locality of Pančevo (marsh dark soil). Using drip irrigation, Kačarevo had by 5.8 % higher root yield and by 9.2 % in dry cultivation. The difference between experimental years in dry cultivation is 3.0 % and in irrigation 0.1 % and those are irrelevant values of this factor.

T a b. 2. - Statistical indicators of fresh root mass of celeriac (kg/ha)

Area	Ways of growing root					
	Dry cultivation			Watering		
	2004	2005	Average	2004	2005	Average
Pancevo	15.161	14.625	14.893	23.738	23.705	23.722
Kacarevo	16.601	16.198	16.400	25.204	25.175	25.190
Average	15.881	15.411	15.646	24.471	24.440	24.456
$I_v$	1.440	1.573	1.507	1.466	1.470	1.468
$C_v$ (%)	6.41	7.22	6.82	4.24	4.25	4.25

Table 3. presents the values of studied yields and statistical results calculated using LSD – test for the levels of significance of 5 % and 1 %. The only factor, which showed higher level of statistical significance for both ways of growing, was locality, while the study year and interaction between studied indexes were statistically irrelevant.

T a b. 3. - F – test and LSD test values of the celeriac root yield

Sources of variation	Ways of growing root					
	Dry cultivation			Watering		
	F – values	LSD		F – values	LSD	
0.05		0.01	0.05		0.01	
Area	8.5243*	1166.95	1676.46	44.8308*	496.02	712.58
Year	0.8279 <sup>ns</sup>	949.07	1364.56	0.0201 <sup>ns</sup>	403.73	580.01
Interaction	0.0166 <sup>ns</sup>	1633.76	2349.11	7.3123 <sup>ns</sup>	695.67	997.64

<sup>ns</sup> Statist. non significant

\* significant at level of 5%

\*\* significant at level of 1%

## Conclusion

Considering the research results for the influence of some agro – ecological factors, watering and type of soil, on celeriac root yield and data analysis, we could conclude:

Total and singular celeriac root yield was higher in using drip irrigation.

The fresh celeriac root yield varied from 14,625 kg/ha (in dry cultivation) to 25,204 kg/ha (irrigation).

The high productive type of soil at the locality of Kačarevo showed a greater ability for growing celeriac.

The year of study as a relevant factor was not of great importance in growing celeriac.

Modernization and new system of irrigation have effects on achieving better quality and higher, standardized yields.

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## UTICAJ AGROEKOLOŠKIH USLOVA NA PRINOS KORENA CELERA

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### R e z i m e

Analiziran je uticaj količine padavina, temperature, tipa zemljišta i zalivanja sistemom "kap po kap" na prinos korena celera.

Tip zemljišta imao je značajnog uticaja na prinos, tako da je u obe godine istraživanja i u obe varijante (suvo ratarenje i zalivanje), prinos korena celera bio veći na zemljištu tipa černozem.

Veća količina padavina i više temperature u toku vegetacionog perioda uslovile su veće prinose korena u prvoj godini istraživanja na oba lokaliteta u suvom ratarenju.

Zalivanje "kap po kap" značajno je uticalo na prinos korena celera tako da je prinos znatno veći u obe godine istraživanja i na oba lokaliteta u sistemu zalivanja "kap po kap" nego u suvom ratarenju.

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