

# THE EFFECT OF SOME PRODUCTION FACTORS ON YIELD LEVEL OF CELERY (*APIUM GRAVEOLENS VAR. RAPACEUM*) IN TRANSYLVANIA'S CONDITIONS

Luca E.<sup>1)</sup>, Dorina Victoria Tamas<sup>1)</sup>, Laura Cristina Luca<sup>2)</sup>, Adela Hoble<sup>1)</sup>,  
Otilia Micu<sup>1)</sup>, Nineta Varga<sup>1)</sup>

<sup>1)</sup> University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Calea Manastur, 3-5, 400372 Cluj-Napoca, Romania; eluca@usamvcluj.ro

<sup>2)</sup> Research Institute for Analytical Instrumentation Cluj-Napoca, Romania, Donath Street, no. 67 CP 717, OP 5, 400293 Cluj-Napoca, Romania; lauraluca@yahoo.com

**Abstract.** This paper presents the results of investigations held between 2009 - 2011 in the conditions Nicula - Gherla, Cluj county, regarding the influence of factors of production (irrigation regime, fertilization, biological material) on the yield's level. The best result obtained the experimental variant  $a_2 \times b_2 \times c_3$  (80% AMI irrigation regime x basic fertilization + additional fertilization x Diamant variety).

**Keywords:** celery, yield, irrigation regime, fertilization, variety

## INTRODUCTION

Celery is an important plant used for food and for medicine (Butnariu, 1992; Bojor, 2005; Dorina Tamas, 2012). The celery has a complex composition: protides, carbohydrates, many minerals including sodium, magnesium, potassium, calcium, phosphorus, zinc, essential oil rich in triterpenic compounds, vitamins A, B<sub>1</sub>, B<sub>2</sub>, B<sub>3</sub>, B<sub>5</sub>, B<sub>6</sub>, B<sub>9</sub>, C, E, K, PP (Tamas Dorina, 2012).

The yield's level of celery is influenced by the production factors as irrigation regime, fertilization and biological material (Luca, Budiu, Ana Ciotlăuș, 2008; Tamas Dorina 2012).

## MATERIAL AND METHOD

The experiences were organized in Nicula village, located 3 km from the city of Gherla, 52 km from Cluj-Napoca and 17.6 km from Dej, Cluj county.

Characterization of thermal regime and, respectively, rainfall for the experimental field of Nicula, in 2009-2011, was performed using data recorded by the Meteorological Station Dej and Transilvania Nord Meteorological Center.

The experiments pursued the behavior of three varieties of celery: Giant Prague, Diamant and Anita, with two irrigation schemes and of two different fertilization schemes.

Experimental factors studied and their graduations were: A factor - irrigation regime, with graduations -  $a_1$  - irrigated at the minimum humidity threshold of 50% of active moisture interval (AMI),  $a_2$  - irrigated at the minimum threshold of 80% moisture of active moisture interval (AMI); B factor - fertilization with graduations -  $b_1$  - basic fertilization,  $b_2$  - basic fertilization plus additional fertilization; C factor - cultivated variety, with graduations -  $c_1$  - Giant Prague,  $c_2$  - Diamant,  $c_3$  - Anita.

The culture technology applied in the experimental field of Nicula during 2009 - 2011 was the vegetable recommended by researchers.

For each of the comparative cultures, three repetitions were ensured. For the irrigation scheme, the method that was chosen was irrigation through furrows, with isolation spaces that were made to eliminate possible influences that might have arisen, between the neighboring plants. The land used for this study was limited by a containment area, made in order to prevent the impact between plots (nutrients transport, moisture influence).

### RESULTS AND DISCUSSION

As a result of the research carried out in each of the experimental years 2009, 2010 and 2011, an evaluation of the average production during the entire period of time between 2009 and 2011 was made and thus, an analysis of the factors' influence was carried out as well, at individual level, but also at the level of these factors' interaction upon the production between 2009 and 2011, meaning *irrigation scheme x fertilization mode*, *irrigation scheme x variety*, *irrigation scheme x fertilization mode x variety*, in order to be able to observe the differences registered from one year to the other.

Figure 1 shows the graphic representation of the average productions registered under the influence of *irrigation scheme* factor between 2009 and 2011.

In the situation of analyzing the influence of irrigation scheme factor upon the average production obtained between 2009 and 2011, with the aim of comparing their evolution during this period of time, the average production obtained in 2009 was taken as blank for statistic interpretation, under the influence of applying the irrigation scheme maintained at the two thresholds of 50% of AMI and 80% of AMI respectively.

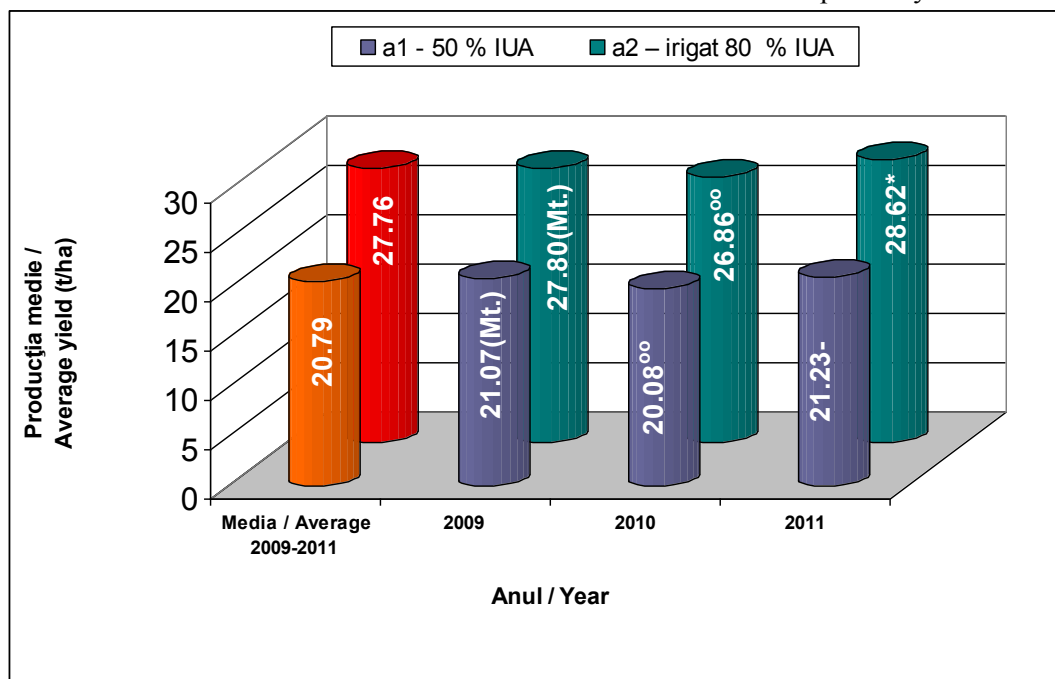


Fig. 1. Irrigation regime influence upon celeriac average yields, between 2009 and 2011, within the individual holding of Nicula Village, Cluj County

As shown in Figure 7.1., the average productions obtained in 2010 are significantly negative, having a 0.99 t/ha difference, respectively 0.94 t/ha, statistically

insured, as compared to the average production obtained in 2009 with an irrigation scheme and a maintained threshold of 50% of AMI and 80% of AMI respectively.

For 2011, the average production obtained with an irrigation scheme maintained at a threshold of 50% of AMI, it registers a 0.16 t/ha difference, which is not statistically assured and the average production obtained at an irrigation threshold of 80% of AMI registers a significant 0.83 t/ha difference, as compared to the average production of celery obtained in 2009, under the same cultivation conditions.

Figure 2, graphically shows the evolution of the average celery productions obtained after applying the fertilization treatment, between 2009 and 2011.

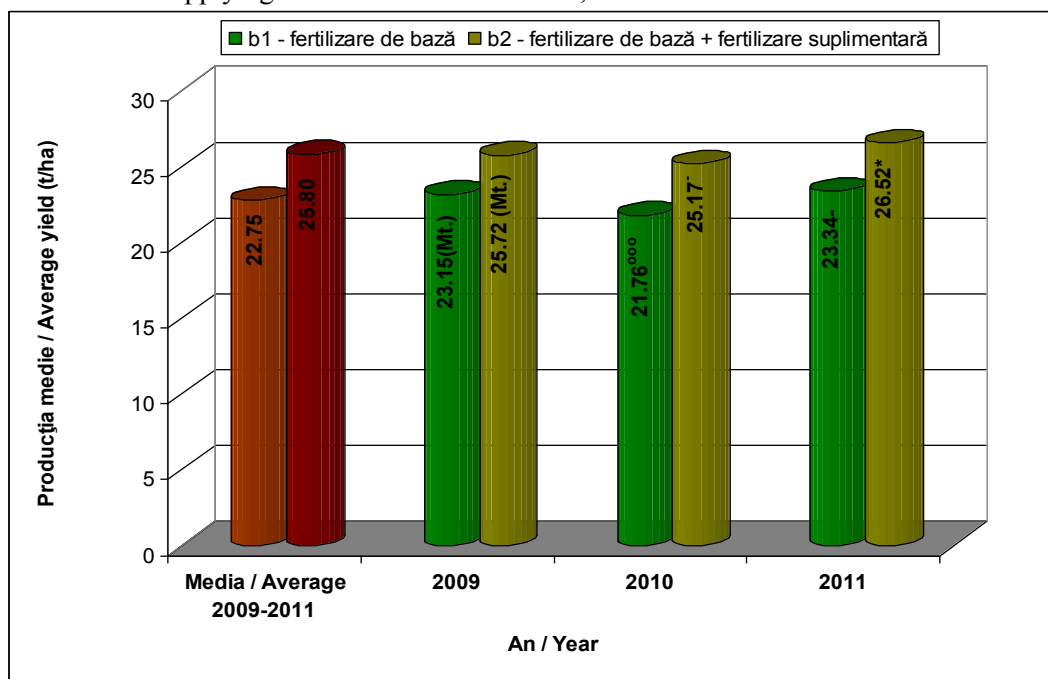


Fig. 2. Fertilization type influence upon celeriac average yields, between 2009 and 2011, within the individual holding of Nicula Village, Cluj County

By applying the basic fertilization, as compared to the average production of 2009, it has been obtained: a significantly negative difference of 1.39 t/ha in 2010 and a 0.19 t/ha statistically uninsured difference in 2011, in relative terms, the increased production being 6.0% lower and 0.8% higher, respectively.

By applying the basic fertilization, together with the supplementary fertilization, as compared to the average production of 2009, it has been obtained: a 0.55 t/ha negative difference, statistically uninsured, in 2010 and a 0.80 t/ha significant difference in 2011.

Figure 3 graphically shows the average productions obtained between 2009 and 2011, under the influence of the variety factor.

In 2010, Giant Prague variety registers a significantly negative difference of 1.49 t/ha and in 2011, a 0.17 t/ha difference, this being statistically uninsured, as compared to the production registered in 2009 of the same variety, in relative terms in 2010 the production has been by 6.0% lower as compared to the average production of 2009 and by 0.7% higher than the 2009 production, for the same Giant Prague variety.

The Diamant variety registers in 2010 the negative difference of 0.30 t/ha, statistically uninsured and in 2011, a distinctively significant difference of 1.25 t/ha, this

being statistically insured, as compared to the average production from the same variety under the conditions of 2009. In relative terms, in 2010, the production has been by 0.3% lower and in 2011, by 1.25% higher than the average production registered in 2009, from this celery variety.

In 2011, Anita variety registers a distinctively significant negative difference of 1.11 t/ha, statistically insured and in 2011, a 0.06 t/ha difference, statistically uninsured, as compared to the average production obtained under the conditions of 2009, from the same variety. In relative terms, in 2011, the production has been by 4.7% lower as compared to the production obtained from this variety in 2009 and in 2011, by 0.06% higher than the same production under the conditions of 2009.

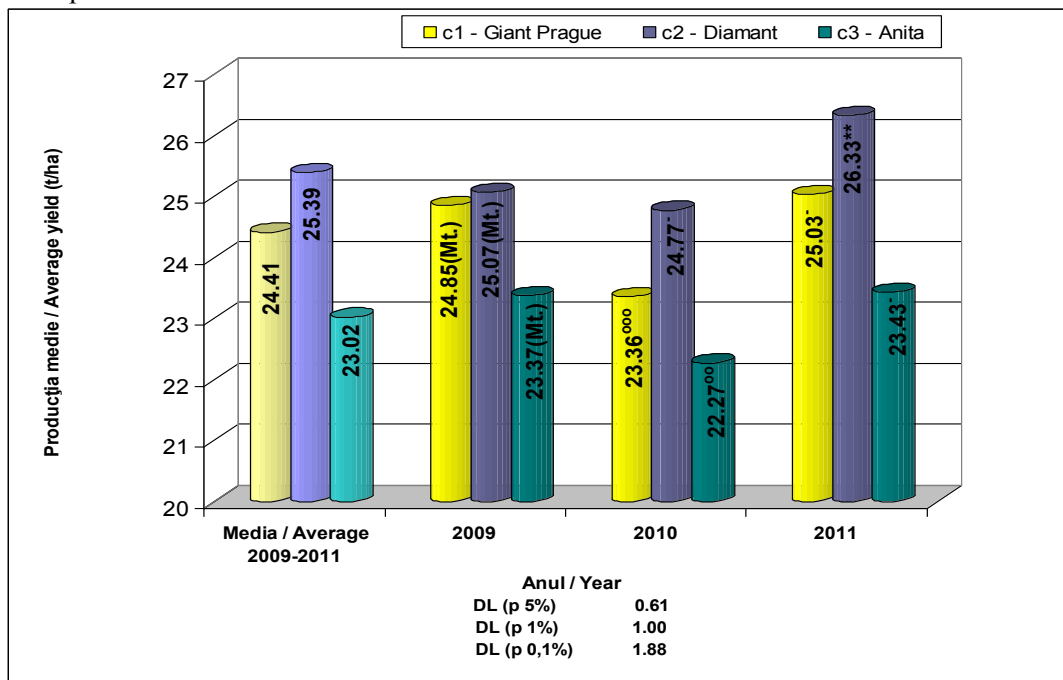


Fig. 3. Variety influence upon celeriac average yields, between 2009 and 2011, within the individual holding of Nicula Village, Cluj County

Figure 4 synthesizes the average productions of celery cultivated in the field, obtained after the influence of factors such as: *irrigation scheme x fertilization mode x variety* between 2009 and 2011, under the conditions of interpreting the influence upon production; *irrigation scheme* factor interaction, with two graduations; *fertilization mode* (two graduations: basic fertilization and basic fertilization combined with supplementary fertilization), with *variety* factor, with three graduations.

Within the blank version, the average production between 2009 and 2011, obtained after the interaction between *irrigation scheme with 50% threshold of IUA x basic fertilization x Giant Prague variety*, the following differences have been registered between the productions:

- significantly positive, statistically insured, of 1.36 t/ha (by 6.9% higher, in relative terms), following the interaction of *Diamant variety x irrigation scheme with a maintained threshold at 50% x basic fertilization*, as compared to the blank;

- significantly negative, statistically insured, of 1.12 t/ha (by 5.7% lower in relative terms), following the interaction of *Anita variety x irrigation scheme with a maintained threshold at 50% x basic fertilization*, as compared to the blank.

The production growth obtained after the interaction of *irrigation scheme with a threshold of 50% of IUA x basic fertilization + supplementary fertilization x Diamant variety*, in relative terms is by 4.5% higher, as compared to the blank (*irrigation scheme with a threshold of 50% of IUA x basic fertilization + supplementary fertilization x Giant Prague variety*), a difference being registered of 0.98 t/ha, statistically uninsured; following the interaction of *irrigation scheme with a threshold of 50% of IUA x basic fertilization + supplementary fertilization x Anita variety*, in relative terms is by 8.9% lower, as compared to the blank (*irrigation scheme with a threshold of 50% of IUA x basic fertilization + supplementary fertilization x Giant Prague variety*), a distinctively significant negative difference being registered of 1.97 t/ha, statistically insured.

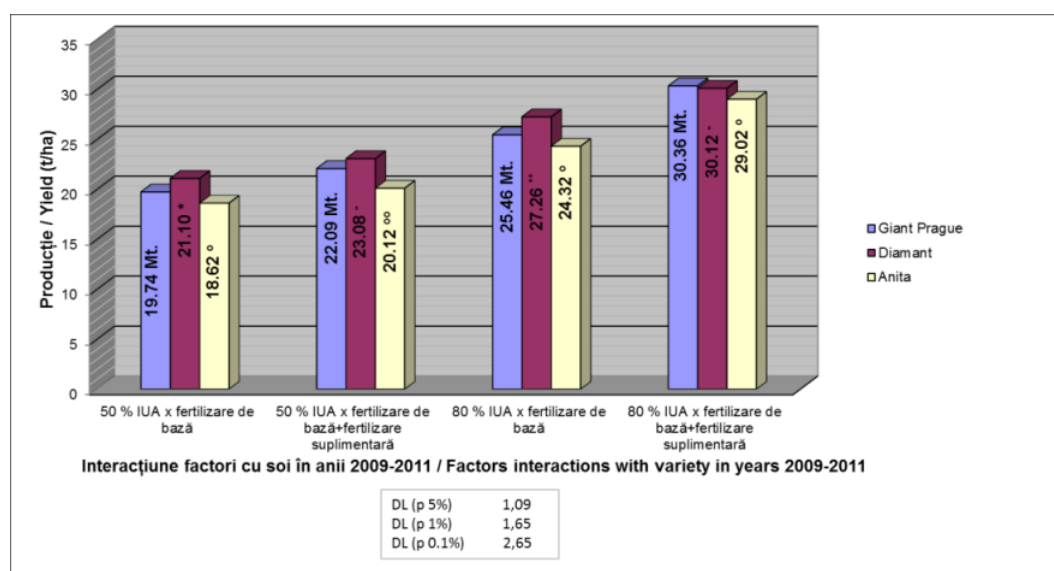


Fig. 4. The influence of interaction between irrigation scheme x fertilization type x variety factors (AxBxC) upon celeriac yield obtained between 2009 and 2011, within the individual holding of Nicula Village, Cluj County

Within the blank version, the average production between 2009 and 2011, obtained after the interaction of *irrigation scheme with a threshold of 80% of IUA x basic fertilization x Giant Prague variety*, the following differences are being registered between the productions:

- significantly positive, statistically insured, of 1.79 t/ha (by 7.0% higher in relative terms), following the interaction of *Diamant variety x irrigation scheme with a maintained threshold oat 80% x basic fertilization*, as compared to the blank;
- significant of 1,14 t/ha, statistically uninsured (by 4.5% lower in relative terms), following the interaction of *Anita variety x irrigation scheme with a maintained threshold at 80% x basic fertilization*, as compared to the blank.

Within the blank version, the production obtained following the interaction of *irrigation scheme with a threshold of 80% of IUA x basic fertilization + supplementary*

*fertilization x Giant Prague variety*, the following differences between the productions are being registered:

- a difference of 0,24 t/ha (by 0,8% lower in relative terms), following the interaction of *Diamant variety x irrigation scheme with a maintained threshold at 80% of IUA x basic fertilization combined with supplementary fertilization*, as compared to the blank;

- significantly negative difference of 1,34 t/ha (by 4,4 % lower in relative terms), following the interaction of *Anita variety x irrigation scheme with a maintained threshold at 80% of IUA x basic fertilization combined with supplementary fertilization*, as compared to the blank.

## CONCLUSIONS

The results of experiments carried out between 2009 and 2011 under the conditions in Nicula - Gherla, Cluj County, regarding the influence of production factors (irrigation scheme, fertilization, biological material) on the yield's level at the celery culture demonstrates the important role of all the three factors.

The highest yield was obtained by the experimental variant  $a_2 \times b_2 \times c_3$  (80% AMI irrigation scheme x basic fertilization + additional fertilization x Diamant variety).

## REFERENCES

1. BOJOR O., 2005, Pledoarie pentru viață lungă: sănătate prin seminte, legume și fructe, Editura Fiat Lux, București;
2. BUTNARIU H. și colab., 1992, Legumicultură, Editura Didactică și Pedagogică, București;
3. LUCA E., V., BUDIU, ANA CIOTLĂUȘ, 2008, Exploatarea sistemelor de îmbunătățiri funciare – Irigații, Editura Risoprint, Cluj-Napoca;
4. TĂMAS DORINA, 2012, Cercetări privind influența unor elemente de tehnologie asupra nivelului și calității producției la cultura de telină, *Apium graveolens* var. *rapaceum*, în condițiile din Transilvania, Teza de doctorat, USAMV Cluj-Napoca