

YIELDING OF LEAF CELERY *APIUM GRAVEOLENS* L. VAR. *SECALINUM* ALEF. DEPENDING ON THE NUMBER OF HARVESTS AND IRRIGATION

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Abstract. Leaf celery (*Apium graveolens* var. *secalinum*) is a vegetable with medicinal and spicy properties. Its numerous intensely fragrant leaves can be cut several times during the plant growing period. The aim of this study was to evaluate the effect of irrigation and number of harvests on leaf celery yield of the cultivars 'Afina' and 'Gewone Snij'. Plant irrigation significantly increased leaf yield and plant height of leaf celery. Higher total yield was obtained from non-irrigated plants when leaves were harvested three times, whereas for irrigated plants yield was higher in the case of two leaf harvests. Irrespective of the experimental factors, higher yield was obtained from the cultivar 'Gewone Snij'

Key words: *Apium graveolens*, leaf celery, cultivar, harvest, yield, irrigation

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Introduction

Celery, *Apium graveolens* L., is a plant with high taste, dietetic, and medicinal values (SALEH *et al.* 1985; ZHENG *et al.* 1993; JABŁOŃSKA-RYŚ & ZALEWSKA-KORONA 2006; MANSI *et al.* 2009; NEHAL 2011). Three botanical varieties of this vegetable are important for cultivation: a) celeriac, *Apium graveolens* var. *rapaceum* (Mill.) Gaud. Beaup., which is widespread mainly in Central Europe; b) celery, *Apium graveolens* var. *dulce* (Mill.) DC., grown primarily in Western Europe and the USA; and the least known c) leaf celery, *Apium graveolens* L. var. *secalinum* Alef., which is mainly used as a spice plant. The decorative and medicinal properties of celery have been known for a long time and many authors confirm its use in folk medicine (SALEH *et al.* 1985; ATTA & ALKOFARI 1998). Compared to celery, leaf celery produces much more leaves and has thinner and more delicate petioles; hence it is better raw material for processing. The aim of this study was to evaluate the effect of plant irrigation and frequency of harvests on the growth and yield of 2 leaf celery cultivars.

Material and methods

The present experiment was conducted at the Felin Experimental Farm of the University of Life Sciences in Lublin in 2006. Two leaf celery cultivars: 'Afina' and 'Gewone Snij', were the subject of the study. Plants were grown from seedlings produced in a greenhouse. Seeds were sown in germination boxes in the first decade of March and subsequently, after the first true leaves were formed, seedlings were transplanted into seedling trays. Plants were planted in the field on 15 May, 20 plants per plot at a spacing of 20×25 cm. Before planting, the following fertilizers were applied: 100 kg · ha⁻¹ N in the form of ammonium nitrate, 120 kg · ha⁻¹ P₂O₅ as triple superphosphate, and 150 kg · ha⁻¹ K₂O as potassium sulphate. After the first harvest, nitrogen fertilization was applied at a rate of 50 kg · ha⁻¹.

Plants were first irrigated, using drip irrigation lines, immediately after planting seedlings at a rate corresponding to 15 mm of rainfall, and then irrigation was performed at a rate of 25 mm twice in June, three times in July, twice in September, and once in October. During harvest, leaves were cut off 3-5 cm above ground. In the first treatment, harvest was done on two dates – 14 August and 17 October, while

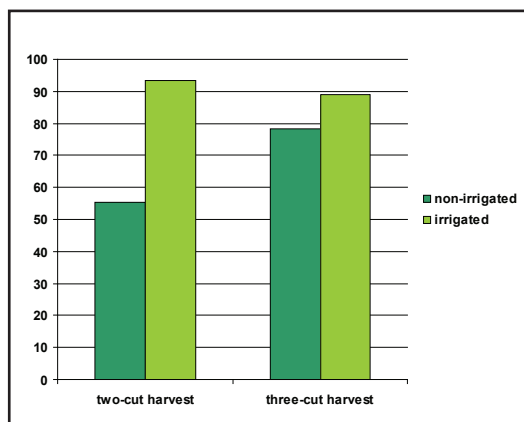


Fig. 1. Effect of the frequency of harvests and irrigation on yield of leaf celery (mean of cultivars, $t \cdot ha^{-1}$).

Table 1. Effect of two-cut harvest and irrigation on yield of two leaf celery cultivars ($t \cdot ha^{-1}$).

Cultivar	Harvest	Non-irrigated plants	Irrigated plants
<i>Afina</i>	14.08	16,3 c	50,1 a
	17.10	33,5 b	29,5 b
	Total	49,8 D	79,6 B
<i>Gewone Snij</i>	14.08	15,6 c	55,2 a
	17.10	45,2 b	52,1 a
	Total	60,8 C	107,3 A

Note: values signed with the same letters do not differ significantly.

Table 2. Effect of three-cut harvest and irrigation on yield of two leaf celery cultivars ($t \cdot ha^{-1}$).

Cultivar	Harvest	Non-irrigated plants	Irrigated plants
<i>Afina</i>	30.07	4,7 c	35,6 b
	18.09	63,3 a	35,2 b
	17.10	6,9 c	7,9 c
	Total	74,9 B	78,7 B
<i>Gewone Snij</i>	30.07	5,2 d	35,5 c
	18.09	69,8 a	45,7 b
	17.10	6,4 d	8,7 d
	Total	81,4 B	89,9 A

Note: values signed with the same letters do not differ significantly.

in the second treatment on three dates – 30 July, 18 September, and 17 October. The results were analysed using analysis of variance for two-way classification.

Results and discussion

Vegetables in which leaves are the yield show the greatest sensitivity to drought during the increase in leaf biomass (KANISZEWSKI 2005). An adequate amount of rainfall during plant growth is a condition for obtaining high and qualitatively good celery yield. In the present study, irrigation significantly increased leaf yield of leaf celery both in the treatment in which the harvest was done twice and in the one in which three harvests were taken. In the case of the triple harvest, the difference in yield obtained from non-irrigated and irrigated plants was lower than in the plots where the harvest was done twice (Fig. 1). Total yield of non-irrigated plants harvested twice was $49.8-60.8 t \cdot ha^{-1}$ (Tab. 1), while in those harvested three times it was $74.9-81.4 t \cdot ha^{-1}$ (Tab. 2). Yield of irrigated plants was, respectively, $79.6-107.3 t \cdot ha^{-1}$ (two harvests) and $78.7-89.9 t \cdot ha^{-1}$ (three harvests).

The date of the first leaf harvest in the middle of August was appropriate for irrigated plants. In harvesting plants at this time, we obtained even yield distribution and plant height that was similar during the first and second harvests (Tab. 3). On this date, non-irrigated plants were too low to harvest ($9.5-9.7 cm$), therefore twice lower yield was obtained from them compared to plants harvested in October.

Three harvests of leaves were taken, respectively, on 30 July, 18 September, and 17 October. The first date of harvest for non-irrigated plants proved to be too early, while the second one was too late (Tab. 2). A similar yield was obtained from irrigated plants during the harvests taken on 30 July and 18 September. During the third harvest, low yield was only obtained from both cultivars, ranging $6.4-8.7 t \cdot ha^{-1}$ (Tab. 2). On this harvest date, plant height was $12.2-15.0 cm$ (Tab. 4). An earlier study of the cultivars '*Afina*' and '*Safir*' (ROZEK 2007a, b) showed that increased frequency of harvests contributed to a decrease

in total leaf yield of leaf celery. During the study conducted in the period 2004-2005, the average yield of non-irrigated plants harvested twice was 7.49-7.78 kg · m⁻², while for those harvested three times it was 5.29-7.36 kg · m⁻². The average yield of irrigated plants harvested twice was also higher (11.62-13.58 kg · m⁻²) compared to the yield from plants harvested three times (7.70-11.97 kg · m⁻²). Irrespective of irrigation and the number of harvests, higher total leaf yield was obtained from the cultivar 'Gewone Snij'.

Conclusions

1. Irrigation of plants significantly increased leaf yield and plant height of leaf celery. Due to irrigation, a better distribution of celery yield was obtained.

2. In the case of non-irrigated plants, the date of harvest in the middle of August proved to be too early. At this time, the plants were still not fully grown and significantly lower yield was obtained compared to that from irrigated plants.

3. An increase in the number of harvests contributed to a distinct increase in yield only in the case of non-irrigated plants. Yield of irrigated plants harvested twice or three times was comparable.

4. Irrespective of the experimental factors, higher total leaf yield was obtained from the cultivar 'Gewone Snij'.

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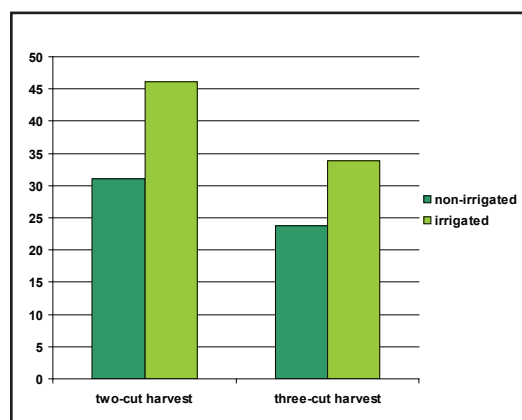


Fig. 2. Effect of frequency of harvests and irrigation on plant height of leaf celery (mean of cultivars, cm).

Table 3. Effect of two-cut harvest and irrigation on plant height of two leaf celery cultivars (cm).

Cultivar	Harvest	Non-irrigated plants	Irrigated plants
<i>Afina</i>	14.08	16,0 b	41,7 a
	17.10	37,7 a	37,2 a
	Total	26,9 D	41,0 B
<i>Gewone Snij</i>	14.08	23,5 c	52,5 a
	17.10	46,7 b	49,7 b
	Total	35,1 C	51,1 A

Note: values signed with the same letters do not differ significantly.

Table 4. Effect of three-cut harvest and irrigation on plant height of two leaf celery cultivars (cm).

Cultivar	Harvest	Non-irrigated plants	Irrigated plants
<i>Afina</i>	30.07	9,7 c	43,5 a
	18.09	44,2 a	36,7 b
	17.10	12,2 c	14,2 c
	Total	22,0 C	31,5 B
<i>Gewone Snij</i>	30.07	9,5 c	45,2 b
	18.09	53,5 a	48,2 ab
	17.10	13,2 c	15,0 c
	Total	25,4 C	36,1 A

Note: values signed with the same letters do not differ significantly.

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