

YIELDING AS WELL AS BIOLOGICAL AND SENSORY QUALITY OF ENDIVE (*CICHORUM ENDIVIA* L.) CULTIVATED IN ROCKWOOL SLABS

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Introduction

Endive is a leaf vegetable with high taste and nutritious values. Botanically it is related to chicory, however, because of similar constitution and use it is compared with lettuce. Characteristic bitter taste of endive comes from glucosides which are contained in its leaves, mainly from inulin which stimulates digestion and appetite. For many consumers that trait is not desirable thus in order to enhance the taste, endive plants are subjected to the bleaching treatment or self-bleaching varieties are cultivated. Obtaining vegetables with high biological value includes many cultivation factors, such as varieties, microclimatic conditions, soil and rational fertilization.

Endive is an annual plant characterized by a relatively short vegetation period and small thermal requirements. It may be cultivated under covers for the whole year. Because of a short root system it is ideal for hydroponic systems and also in rockwool where the cultivation can be controlled and in consequence one may affect the crop and quality of cultivated plants.

The aim of the investigation was the assessment of yielding and quality of endive cultivated in rockwool slabs.

Materials and methods

The plants were cultivated in the spring cycle in the years 2008 and 2009. It was arranged in a one-factor split-plot design with three replications and 15 plants in each. On 15 March, the four week old endive seedlings were replanted on the rockwool growing slabs 5 plants on each. The plants were harvested on 7 May. The experiment was performed on endive cultivars obtained from Rijk Zwaan, three crispum leaf cultivars: 'Galanti', 'Perceval' and 'Barundi' and one latifolium leaf cultivar (escarole chicory) – 'Kethel'.



Fertilization for plants contained $140 \text{ mg} \times \text{dm}^{-3}$ of nitrogen in the form of ions NO_3^- . For the whole cultivation period pH of the nutrient solution in the rockwool slabs was kept at the level of 6.7 and $\text{EC } 2.8 \text{ mS} \times \text{cm}^{-1}$.

Statistical analysis was elaborated using one-way analysis of variance. Detailed comparison of means was performed by the Tukey's test at the significance level of $\alpha=0.05$.

Acknowledgments

This study is supported by the Polish Ministry of Agriculture N N310 089836

Results

The obtained results confirm the favourable effect of the cultivation in rockwool on the yielding and quality of endive. The highest weight of the entire rosette was reached by the cultivar of the escarole chicory type – Kethel (Table 1). Cultivars with curled leaves – Galanti and Perceval gave similar yield, while smaller rosettes were produced by Barundi cultivar. Similarly shaped were the differences in the yield of the bleached parts of plants. However, while analyzing the per cent share of the bleached part in the whole rosette, the best results were obtained in the case of Barundi (Table 1). The obtained contents of the investigated components in endive point to its high nutritive value (Table 2). However, some cultivar depended differences were observed. Leaves of the investigated cultivars contained similar amounts of dry matter with the exception of Perceval which showed the smallest content of dry matter. It also had the smallest content of chlorophyll, sugars and ascorbic acid. Kethel cultivar produced the greatest amount of sugars and accumulated small amounts of nitrates.

Sensory evaluation points to a better felt life crispness in Kethel cultivar than in cultivars of curly leaf margins (Fig. 1). Barundi cultivar proved in sensory evaluation to be the least juicy with also the highest mark for the grassy but sweet taste. Barundi was also assessed as the least bitter out of all the investigated cultivars.

The overall quality of all plants was similar (Fig. 1). However, the desirability of the taste, although not proved statistically points to Barundi as the most tasty out of all the investigated cultivars and Perceval as the least tasty. The total desirability was also the highest in the case of Barundi cultivar.

Table 1. Weight and number of leaves of entire rosette and bleached part of plant in dependent on endive cultivars

Cultivar	Weight of plant (g)		Per cent share of the bleached part in the whole rosette (%)	Number of leaves ($\text{No} \times \text{plant}^{-1}$)	
	Total rosette of plant	Bleached part of plant		Total rosette of plant	Bleached part of plant
Galanti	411.5 b	215.0 b	52.2	61.6 b	27.9 c
Perceval	433.2 b	225.0 ab	51.9	81.3 a	33.3 b
Barundi	305.5 c	182.5 b	59.7	66.3 ab	47.3 a
Kethel	514.2 a	263.5 a	51.2	54.4 b	33.8 b

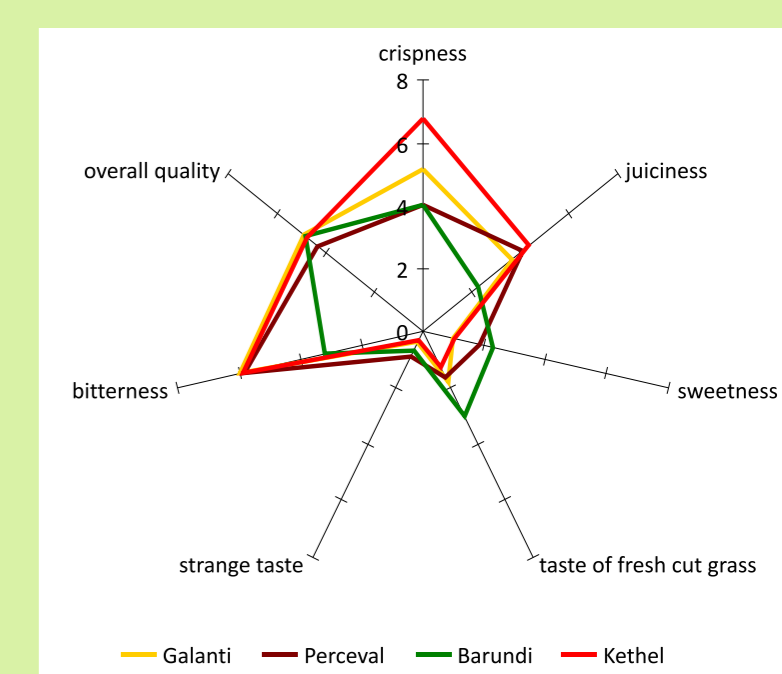
Mean values for factor which do not differ according to Tukey's HSD test at $\alpha=0.05$ are marked with the same letters

Table 2. Content of dry matter and studied chemicals components in different cultivars of endive

Cultivar	Dry matter (%)	Chlorophyll SPAD	Total sugars (%)	Ascorbic acid	NO_3^- , P, K, Ca ($\text{mg} \times 100^{-1} \text{ g FW}$)			
					NO_3^-	P	K	Ca
Galanti	6.18 a	29.3 b	1.01 b	26.5 a	260.8 a	26.7 a	364.4 a	40.4 a
Perceval	5.68 a	23.3 c	0.74 c	16.1 b	203.1 b	26.9 a	352.8 a	43.2 a
Barundi	6.15 a	33.3 a	0.93 b	21.9 a	197.3 b	25.2 a	319.1 a	32.1 ab
Kethel	6.08 a	28.7 b	1.25 a	22.0 a	160.4 b	19.0 b	360.1 a	27.1 b

Mean values for factor which do not differ according to Tukey's HSD test at $\alpha=0.05$ are marked with the same letters

Fig 1. Sensory analysis of endive in dependent on cultivar



Conclusions

1. Endive cultivated in rockwool reaches high and consumer accepted quality.
2. Endive cultivars differ in respect to yielding, the share of bleached part in the whole plant and quality.
3. In sensory evaluation all the investigated cultivars of endive reached the similar overall evaluation and the highest desirability obtained Barundi cultivar.