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ESTIMATION OF THE BIOLOGICAL VALUE OF WINTER GARLIC LEAVES FROM EARLY CULTIVATION ON BUNCH CROP PART I. PLANTS GROWN FROM CLOVE PLANTING

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ABSTRACT

The purpose of the studies was to determine the quantity and quality of the yield of aboveground parts (false stem and leaves) of winter garlic in the cultivation for bunch yield. The content of dry weight (10.37-12.10%), total carbohydrates (21.64-24.19%), L-ascorbic acid (7.32-9.17 mg %), chlorophyll (0.025-1.532 mg per one kilo) and raw fibre (0.86-1.10%) was determined. In both years of the studies the plants were gathered 30 and 60 days after emergence.

Key words: garlic, *Allium sativum* L., leaves, chemical composition

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INTRODUCTION

The most popular way of utilizing garlic is using the heads, which are valuable in their chemical composition [3, 7, 11], both for fresh consumption and in a form of spice [1].

There are a number of studies concerning the agrotechnics of garlic, that is the establishment of optimum dates of planting, plant density on an area unit or evaluation of cultivars and cultivation lines [4, 8, 9, 10].

A relatively little popular form of using garlic is consumption of fresh leaves in the early stage of growth as an addition to salads, ready-to-serve dishes, cottage cheese, butter, etc (photo 1, 2).

Photo 1. Garlic from early cultivation for bunch yield (during the harvest)

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Photo 2. Garlic leaves 60 days after planting the cloves in a form of a 50-gram-bunch

A growing demand for fresh vegetables with valuable taste and medicinal values made the authors undertake the studies on the utilization of aboveground parts (false stem and leaves) in the early stage of growth (like chive in other onion vegetables). A practical use of this form could result in a richer assortment of fresh vegetables available in spring [5]. In order to estimate the chemical composition of garlic leaves they were gathered 30 and 60 days after the emergence in the field, and they were submitted to phytochemical evaluation, which was the purpose of the present paper.

MATERIALS AND METHODS

The agrotechnical experiment was carried out in the years 1998 and 1999. Garlic cloves were planted in the second 10 days' period of October in the spacing of 30×15 cm, on the depth of 5-6 cm, in five repetitions. The area of one plot in the experiment was 3 m^2. The cultivation treatments, fertilization and plant protection were performed according to the recommendations for garlic. The experimental material were the leaves and false stems of winter garlic of the local ecotype R. In both years of the studies the plants were gathered in two dates, namely

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30 and 60 days after the emergencies (I – May 5, 1999 and May 5, 2000, while II – June 5, 1999 and June 5, 2000). Immediately after the harvest, an estimation of biometric features was performed on a hundred of plants selected at random. Laboratory studies analyzed the content of dry weight (using a dryer at the temperature of 105°C), total carbohydrates (using the method of Schoorl–Luff), L-ascorbic acid (using the method of J. H. Roe modified by Ewelin), chlorophyll (using the method of Mac Kinney), and raw fibre (using the method of Hennenberg and Stokman modified by Hennenberg) [2, 6].

The significance of differences of the results was statistically worked out by means of T-Tukey's test, $\alpha = 0.05\%$.

RESULTS AND DISCUSSION

The yield of the fresh weight of aboveground parts (false stem and leaves) was in a significant way related to the date of the harvest (tab. 1). Plants gathered 60 days after emergencies were characterized by biomass greater by 67% in 1999, and by about 70% in 2000. The highest yield of fresh weight of plants was obtained in 2000 (318.97 g/m^2) from the second date, while the lowest (183.15 g/m^2) in 1999 from the first date of harvest.

Table 1. Chemical components in green garlic leaves obtained from the cloves harvested in two dates (in years 1999-2000)

Yield of fresh mass (above ground part) g/m^2		Measured factor		Dry matter %		Total sugars % fresh mass		L-ascorbic acid mg % fresh mass		Chlorophyl mg/kg fresh mass						Crude fibre % fresh mass	
I*	II*	Years	Part of plant	I	II	I	II	I	II	I A	II A	I B	II B	I Σ AB	II Σ AB	I	II
183.15	273.06	1999	Steams	11.60	12.10	24.19	23.68	8.39	8.98	0.059	0.041	0.025	0.036	0.084	0.077	1.05	1.10
			Leaves	10.48	10.88	22.13	21.95	7.32	8.11	0.952	1.104	0.378	0.407	1.330	1.511	0.95	1.02
			Mean	11.04	11.49	23.16	22.81	7.85	8.54	0.505	0.572	0.201	0.221	0.707	0.794	1.00	1.06
221.46	318.97	2000	Steams	11.52	12.02	23.95	23.35	8.57	9.17	0.072	0.055	0.037	0.040	0.109	0.095	0.99	1.10
			Leaves	10.37	10.72	21.94	21.64	7.44	8.37	0.977	1.115	0.391	0.417	1.368	1.532	0.86	0.91
			Mean	10.94	11.37	22.94	22.49	8.00	8.77	0.524	0.585	0.214	0.228	0.738	0.813	0.92	1.00
6.69		LSD (years) A		n.s.		0.16		0.07		0.003		0.004		0.006		0.04	
-		LSD (part of plant) B		0.30		0.16		0.07		0.003		0.004		0.006		0.04	
6.69		LSD (times of harvest) C		0.30		0.16		0.07		0.003		0.004		0.006		0.04	
n.s.**		LSD (A×B)		n.s.		n.i.		n.s.		n.s.		n.s.		n.s.		n.s.	
n.s.		LSD (A×C)		n.s.		n.i.		n.s.		n.s.		n.s.		n.s.		n.s.	
n.s.		LSD (B×C)		n.s.		n.i.		0.14		0.007		0.007		0.012		n.s.	

***I - 30 days after emergence, II - 60 days after emergence;**
****n.s. – not significant.**

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The content of dry weight during the vegetation of garlic aboveground parts ranged from 11.52 to 12.10% in false stems, and from 10.37 to 10.88% in the leaves.

The highest content of total carbohydrates, independently of the date of harvest, was observed in false stems and it ranged from 23.35 to 24.19% of the fresh weight, while being significantly lower in the leaves, where it ranged from 21.64 to 22.13% of the fresh weight.

Two-year-long laboratory studies found out that the content of L-ascorbic acid and raw fibre was significantly higher in false stems as compared to the leaf blades. The situation was different with the content of chlorophyll (A, B and sums), which was found in the highest quantity in the leaf blades.

The plants gathered after 60 days were characterized by a significantly higher biological value. There is a need to work out agrotechnical methods which would make it possible to achieve a higher yield of biomass both in field cultivation and under covers (unheated glasshouses, foil tunnels, agro-fibre), the purpose of which would be to have chive leaves already in winter and early spring months.

CONCLUSIONS

1. Garlic cultivated from cloves can be successfully used for the cultivation for leaf yield and for consumption in a fresh form.
2. Plants can be gathered at different stages of their growth, and the highest yield and biological value were characterised of older plants (picked about 60 days after emergencies).
3. In the period of winter–early spring garlic used for the leaf yield constitutes a rich source of biologically active substances, which have nutritious and medicinal values.
4. There is an urgent need to work out a technology of garlic cultivation for leaf yield in the period of winter–early spring using rooms and thermal covers.

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