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ESTIMATION OF THE BIOLOGICAL VALUE OF WINTER GARLIC LEAVES FROM EARLY CULTIVATION ON BUNCH CROP. PART II. PLANTS GROWN FROM PLANTING AIR BULBS

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ABSTRACT

The studies were aimed to determine the biological value of young garlic plants and a possibility of using them for consumption purposes. The experimental material were the aboveground parts (false stem and leaves) of winter garlic cultivated for bunch crop from planting air bulbs. The quantity and quality of the yield were established. The content of total carbohydrates (18.82-21.52%), L-ascorbic acid (7.16-8.51%), chlorophyll (0.024-1.044 mg in 1 kg of fresh weight) and crude fibre (1.37-1.60%) was determined in the fresh weight. The

studies also provided the content of dry weight. In both examined years the picking of the plants was performed 30 and 60 days after the emergencies.

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

INTRODUCTION

A growing demand for fresh vegetables with good nutritive and medicinal values made the author of the present paper undertake the studies on garlic cultivation for fresh consumption of aboveground parts (false stem and leaves) in the early phase of growth (like chive in other bulbous vegetables). Practical use of this form of utilization could bring about richer assortment of fresh vegetables available in spring [3, 4]. Garlic cloves are a rich source of biologically active substances that have a multi-directional effect [5, 6]. On the other hand, the chemical content of fresh leaves is not well known as yet. In order to estimate the chemical composition of garlic leaves, they were picked 30 and 60 days after emergence in the field and next they were submitted to phytochemical analysis, which was the purpose of the present paper.

MATERIALS AND METHODS

The present paper is a continuation of the studies discussed in part I. The conditions and the experimental scheme were analogous to the previous ones, however, the multiplication material was changed.

The agricultural experiment concerning an estimation of the biological value of the aboveground parts of winter garlic grown for bunch crop from planting the inflorescence bulbs was conducted in the years 1998 and 1999. The studied material were the leaves and the false stems of garlic of the local ecotype 'R'. The inflorescence bulbs of garlic were planted in the second ten days' period of October in the spacing of 30×10 cm, on the depth of 5-6 cm, in five replications. The area of one plot was 3 m^2. Fertilization, treatment and protection of plants were according to the recommendations for garlic. In both studied years the plants were gathered at two dates: I – May 5, 1999 and 2000, II – June 5, 1999 and 2000 (which is 30 and 60 days after the emergencies). Immediately after the harvest an estimation of biometric properties was performed on a hundred randomly chosen plants. Laboratory studies examined the dynamics of the accumulation of the dry matter (by means of a dryer method at 105°C), the total amount to carbohydrates (the method of Schoorl – Luff), L-ascorbic acid (the method of J. H. Roe modified by Ewelin), chlorophyll (the method of Mac Kinney), and crude fibre (the method of Hennenberg and Stokman modified by Hennenberg) [1, 6].

The results were statistically analysed using variance analysis of a three-factor experiment, determining the significance of differences by means of T-Tukey's test, $\alpha = 0.05\%$.

RESULTS AND DISCUSSION

The studies discussed here make it possible to state that in both examined years the yield of the fresh weight of the aboveground parts of plants (false stems and leaves) was in a significant way related to the date of the harvest (table 1). After 30 days of vegetation the average yield ranged from 126.5 g to 147.2 g from 1 m^2 of the green mass, then after 60 days from 186.5 to 210.6 g from 1 m^2 of the green mass of plants. The plants growing in the year 2000 formed a greater biomass (by 16% and 13%, respectively) as compared to the plants gathered in 1999.

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

Yield of fresh mass (above ground part) g/m^2		Measuring 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	II	I	II	I	II	I	II
										A	A	B	B	ΣAB	ΣAB		
126.54	186.46	1999	Steams	17.26	17.93	21.52	20.40	8.01	8.42	0.073	0.050	0.095	0.024	0.108	0.074	1.58	1.60
			Leaves	15.59	16.04	20.01	19.34	7.16	7.74	0.616	0.648	0.300	0.332	0.916	0.970	1.41	1.46
			Mean	16.43	16.95	20.77	19.89	7.58	8.08	0.344	0.349	0.167	0.178	0.512	0.522	1.49	1.53
147.16	210.59	2000	Steams	17.23	17.60	21.35	20.10	8.16	8.51	0.084	0.066	0.042	0.033	0.123	0.095	1.53	1.58
			Leaves	15.42	15.94	19.86	18.82	7.26	7.97	0.636	0.688	0.325	0.356	0.960	1.044	1.37	1.41
			Mean	16.32	16.77	20.60	19.46	7.71	8.24	0.360	0.377	0.183	0.194	0.541	0.569	1.45	1.49
10.321		LSD (years – A) ***		n.s.		0.16		0.061		0.0045		0.0045		0.005		0.020	
n.s.**		LSD (part of plant – B)		0.31		0.16		0.061		0.0045		0.0045		0.005		0.020	
10.321		LSD (times of harvest – C)		0.31		0.16		0.061		0.0045		0.0045		0.005		0.020	
n.s.		LSD (A×B)		n.s.		n.s.		n.s.		0.085		0.085		0.010		n.s.	
n.s.		LSD (A×C)		n.s.		n.s.		n.s.		0.085		n.s.		0.010		n.s.	
n.s.		LSD (B×C)		n.s.		0.12		n.s.		0.085		0.085		0.010		n.s.	

***I – 30 days after emergence, II – 60 days after emergence,**
****n.s. – not significant,**
*****$LSD_{0.05}$**
A – chlorophyl A,
B – chlorophyl B.

Two-year-long laboratory studies found out that the content of the dry matter during the vegetation of the aboveground parts of garlic ranged from 17.23 to 17.93% in false stems and from 15.42 to 16.95% in the leaves.

Independently of the date of harvest, a significantly higher total content of carbohydrates was observed in false stems ranging from 20.10 to 21.52% of the fresh matter, and lower in the leaves ranging from 18.82 to 20.01% of the fresh matter.

Statistically, a higher content of L-ascorbic acid and raw fibre was found out in false stems as compared to the content of these substances in the leaves. The content of chlorophyll (A, B, and the sum) shows a different picture; in both examined years its greatest amount was found in leaf blades.

The studies make it possible to sate that plants gathered after 60 days are characterized by significantly higher dietetic value. Further studies should concern working out the agricultural methods of achieving a higher yield of biomass, both in field cultivation and under covers (non-heated greenhouses, foil tunnels), which could result in getting chive already in winter and early spring months, both from planting cloves and air bulbs.

Both the cloves and the air bulbs are equally useful in the production of *"garlic chive"*, also abundant in the substances of dietetic and pharmacological importance.

CONCLUSIONS

1. Garlic cultivated from air bulbs can be successfully grown for bunch crop of leaves consumed fresh.
2. Both garlic cloves and air bulb can be used as multiplication material.
3. Garlic cultivated for leaves constitutes a valuable source of dietetic and medicinal substances.
4. Further studies should focus on working out technologies of garlic cultivation for leaves in winter and spring, using non-heated rooms and covers in field cultivation.

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