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ECOLOGICAL VEGETABLES BIOCHEMICAL PROPERTIES

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Abstract

In an experiment carried out on a 15 years ecologically certified land, at SCDL Bacau, and at ICDLF Vidra, in a solarium, in organic agriculture conditions, the fact was noticed that the nutritional state of the vegetables grown here, described by the mineral elements content in the leaves, is normal, comparable to the vegetables grown in conventional agriculture conditions. Nutritional elements contents in the vegetables are not significantly different from the ones grown under conventional agriculture regime.

Under these conditions, the biochemical properties of the yield obtained at SCDL Bacau, on ecologically certified land, and at ICDLF Vidra, in solarium, under organic agriculture regime, describe mature full-grown vegetables, with good nutritional properties. A slight immaturity was noticed with tomatoes and capsicum, at SCDL Bacau, due to the early sampling, before the complete fruit maturation.

INTRODUCTION

Ecological vegetal products have intrinsic value, given by the obtaining technology and the adequate certification. However, taking into account the fact that the fertilizer inputs are lower than in the conventional agriculture, it's interesting to study their mineral nutrition and biochemical properties, as compared to those of the conventional products. Such researches were carried out wihtin the frame of a research project, at SCDL Bacau, on ecologically certified land, and at ICDLF Vidra, in solarium, comparing products obtained in a conventional manner, in organic regime (without chemical inputs), and an unfertilized control.

MATERIAL AND METHODS

Experiments were carried out at SCDL Bacau, on ecologically certified land, and at ICDLF Vidra, in solarium. The soils don't have a very good fertility. However, the exclusively organic fertilization, with compost, green manure and combinations, on

ecologically certified land, at SCDL Bacau, for over 15 years, maintained the soil fertility properties at such a level that insures ecological vegetables yields. Fertilization with manure, in ICDLF Vidra solarium, insures adequate nitrates soil contents for the vegetables nutritional necesities and quality organic matter contents. The nutritional elements contents ensure a minimum supply for plants nutrition. The experiments were carried out on a very slightly and slightly alkaline soil, with a relatively high organic matter contents, the carbon/nitrogen ratio values are specific for a low and very low fertility [7, 8].

Tomatoes and green pepper were grown at ICDLF Vidra, in solarium, in three variants: a control to wich no fertilizers nore pest control products were applied, a conventional agriculture variant, and an organic one, namely without chemical inputs (fertilizers, pest control products).

At SCDL Bacau the experiments aimed to compare the effect of green manure to that of organically fertilized variants with compost, when growing tomatoes, capsicum, and egg plants. The following variants were experimented, for tomatoes: V_1 = unfertilized control; V_2 = green „winter" manure; V_3 = compost 40 t/ha on the whole surface; V_4 = compost 10 t/ha localized on rows; V_5 = „winter" green manure + compost 40 t/ha; V_6 = „winter" green manure + compost 10 t/ha. Capsicum were grown in four variants: V_1, control; V_2, fertilized with 10 t/ha compost; V_3, fertilized with 20 t/ha compost; V_4, fertilized with 40 t/ha compost. The variants for egg plants were the control (V_1) and fertilization with green manure (V_2).

RESULTS AND DISCUSSION

From the biochemical point of view, the tomatoes grown at ICDLF Vidra in solarium, in ecological system, have a dry content lower than the control by 11%, higher sugar content, and lower acidity (table 1).

The jus nitrates contents are much lower in the conventional and organic solariums, as compared to the control. So is the potassium level, while sodium contents are comparable, a bit higher. Nitrites are missing. The conclusion could be drawn that organically grown tomatoes have a higher quality than the control and the conventionally grown ones.

The green peppers grown in organic system don't significantly differ from those grown in conventional system (table 2).

The tomatoes grown at SCDL Bacau, on ecologically certified land, have a 92-95% water content (table 3), placed at the upper limit of the normal content interval [2, 10, 12], which indicates technological immaturity. It is possible that these vegetables have been harvested before they reached complete maturation.

Table 1

The main biochemical quality parameters of the tomatoes grown in solarium, at ICDLF Vidra

(a three determinations average)

Variant	Average weight, g/fruit	Total dry matter (%)	Total sugar (%)	Acidity (%)	Ascorbic acid (mg/100 g)	Sugar/ acidity ratio	Pigments (Licopene) (mg/100 g)
Control	110.57	4.80	2.93	0.34	9.61	8.62	4.04
Conventional agriculture	129.43	4.44	2.58	0.30	10.22	8.60	4.04
Organic agriculture	107.50	4.79	2.98	0.32	9.61	9.31	5.05

Variant	NO_3 (mg/l jus)	NO_2 (mg/l jus)	K (mg/l jus)	Na (mg/l jus)
Control	13	missing	138	2,5
Conventional agriculture	3	missing	101	3
Organic agriculture	4	missing	100	4

Table 2

The main biochemical quality parameters of the green peppers grown in solarium, at ICDLF Vidra

(a three determinations average)

Variant	Average weight (g/fruit)	Total dry matter (%)	Total sugar (%)	Acidity (%)	Ascorbic acid (mg/100 g)
Control	73.21	5.44	2.19	0.10	24.02
Conventional agriculture	118.57	4.90	1.92	0.10	28.83
Organic agriculture	112.86	5.04	1.92	0.09	28.83

Sugar/ acidity ratio	Pigments (Chlorophyll) (mg/100 g)	NO_3 (mg/kg)
21.90	2.53	3
19.20	2.05	16
21.33	2.03	15

Table 3

The biochemical properties of the tomatoes grown at SCDL Bacau, on ecologically certified land

Variants	Ds (%)	U (%)	Glu (%)	Cel (%)	Pect (%)	Acid (%)	Vit C (mg-% g)	Non-red. glucides	Red. glucides	Licopene (mg%g)
V_1	5.45	94.55	1.69	0.175	0.05	0.95	13.04	1.8	1.18	2.32
V_2	6	94.00	4.66	0.28	0.12	0.87	14.7	2.53	2.13	2.12
V_3	4.91	95.09	3.27	0.16	0.054	1.03	14.37	1.8	1.47	1.99
V_4	5.5	94.5	3.98	0.31	0.11	0.84	15.27	2.19	1.79	3.19
V_5	5.7	94.3	4	0.44	0.165	0.95	12.3	2.2	1.8	2.5
V_6	6.67	93.33	3.63	0.32	0.083	1.06	17.02	1.74	1.89	2.92

Reductive glucides vary between 1.18 and 2.13%. as compared to a normal average of 2.30%, thus indicating a physiological insufficiency due to immaturity in the unfertilized variant. The total glucides are situated over the 3.46% limit cited in the literature, except for the unfertilized variant. The best variant is that fertilized with green winter manure. The cellulose content is lower than the 0.68% cited in the literature, which certifies a high cellulolitic activity. Pectines are insignificant as related to the dry substance, which means that the fruits can't be processed. As a matter of fact, the products are ment to be consumed fresh. The acidity shows, through its high values, technological immaturity as compared to the average of the literature data which is 0.3-0.5%. Also, as compared to a 22.42 mg/100 g ascorbic acid the variants are with 30-50%, on an average, lower, indicating once more technological immaturity. As compared to a carotenoids (expressed as Licopene) contents average of 4.4 mg/100 g, the studied variants vary between 1.99 and 3.19 mg/100g, indicating immaturity.

Water contents in capsicum is within normal data cited in literature, namely 91.79% (table 4). The chlorophyl content describes a light colored material, suitable for marketing. The glucides content is higher than the normal content interval [4], which means the genetic material is good from this

point of view. The acidity, 0.077-0.083% malic acid, designs physiological immaturity. The variant fertilized with the maximum compost dose (40 t/ha) reaches the average value cited in the literature for Vitamin C (192.1 mg/100 g). As compared to the literature data, the 24.3 mg/100 g capsatine content is very low, showing an obvious technological immaturity. The average chlorophyl contents is 4 mg/100 g or higher, in the compost fertilized variants, as comapred to a 0.75 mg/100 g average.

Table 4

The biochemical properties of the capsicum grown at SCDL Bacau, on ecologically certified land

Variant	Dry matter (%)	U (%)	Total glucides (%)	Reductive glucides (%)	Non-reductive glucides, (%)	Pectine (%)	Acidity (%)	Vit C (mg/100 g)	Chlorophyll (mg/100 g)	Capsantine (mg%g)
V_1	8.63	91.37	6.7	3.72	2.98	0.991	0.083	101	6.5	14.07
2	8.49	91.51	7.07	3.82	3.25	0.799	0.083	123.7	5.8	15.39
3	7.64	92.36	6.19	3.54	2.65	0.695	0.077	154.8	7.1	11.05
4	8.28	91.72	6.77	3.69	3.08	0.699	0.077	193	5.9	13.77

In the literature, water contents in egg plants is 91.64-93.60% [1, 3, 5]. The studied egg plants are in the lower part of this interval (table 5).

Table 5

The biochemical properties of the egg plants grown at SCDL Bacau, on ecologically certified land

Variant	Weight (g)	Su (%)	U (%)	Glu (%)	Cel (%)	Acid (%)	Pect (%)	Chl (%)
V_1	161.58	8.46	91.54	5.18	1.59	0.25	0.393	2.99
V_2	204.84	8.02	91.98	3.78	1.59	0.30	0.57	3.75

Regarding glucides, the normal sugars content, mentioned in the literature, is 2.13-4.00% and it consists of glucose, fructose, saccharose, and less galactose. The data obtained for the studied plants are in the upper part of this interval and describe a valuable edible material.

The normal soluble pectine contents vary between 0.38 nd 0.58% and the cellulose contents vary between 0.73 and 1.51%. The data corresponding to the studied vegetables are within normal limits for pectine and at the upper limit for cellulose, and describe a physiologically mature material.

CONCLUSIONS

1. The biochemical properties of the vegetables grown at ICDLF Vidra, in solarium, in organic agriculture regime, and at SCDL Bacau, on ecologically certified land, describe full/grown vegetables, with good nutritional value. The slight immaturity noticed with tomatoes and capsicum grown at SCDL Bacau is due to sampling before full maturation.

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