

RESEARCH ON THE PIGMENT CONTENT IN VARIOUS APPLE TREE VARIETIES, TREATED WITH CAPSICOSIDE

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ABSTRACT - Furostanol glycoside represents a natural substance belonging to the class of saponines. Capsicoside, one of them, is found in *Capsicum annuum* seeds and it was obtained by the alcoholic extraction from pepper seeds. It is a bioactive substance of vegetal origin, having a wide range of biological activities, especially antiviral and antifungal properties. The goal of the present paper was to promote this bioactive compound and to evaluate its biological activity. The influence of the plant compound with steroidal glycoside structure was studied on the plantation of apple trees. The treatments consisted in spraying the aqueous solution of Capsicoside, at different doses and ways of using. The results of the experiments pointed out the positive effects of the influence of steroidal glycosides on the growth and quality development of apple trees.

Key words: furostanol glycosides, pepper seeds, apple tree

REZUMAT - Studii asupra conținutului de pigmenți la diferite soiuri de măr tratate cu Capsicozid. Glicozida furostanolică este o substanță naturală, care aparține clasei saponine. Capsicozidul, unul dintre acestea, se găsește în semințele de *Capsicum annuum*, și a fost obținut prin extracție alcoolică din semințele de piper. Este o substanță bioactivă de origine vegetală, cu numeroase activități biologice, în special proprietăți antivirale și antifungice. Scopul acestei lucrări îl reprezintă promovarea acestui compus bioactiv și evaluarea activității sale biologice. S-a studiat influența compusului vegetal cu structura unei glicozide steroidice asupra unei plantații de meri. Tratamentele au constatat în pulverizarea cu

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soluție apoasă de Capsicozid, în diferite doze și moduri de folosire. Rezultatele au subliniat efectele pozitive ale glicozidelor steroidice asupra creșterii și dezvoltării merilor.

Cuvinte cheie: glicozidă furostanolică, semințe de piper, măr

INTRODUCTION

The importance of biologically active substances (BAS) is well known (Croitoru et al., 1988), but their use is conditioned by their synthetic or natural origin. Knowing that the substances of synthetic origin are limited within the system of conventional growing or even forbidden in the systems of sustainable agriculture (organic, biological or ecological), it is necessary to carry out studies on discovering and applying bioactive substances of natural origin (Tschesche and Wulff, 1972; Kofler, 1972).

The investigations conducted at earlier stages (Бобейко, Кинтя, 1991; Tschesche and Gudwinski, 1975) pointed out some bioactive substances of natural origin, extracted from different plant organs (fruits, seeds, etc.). The goal of the present investigations is to introduce into study some bioactive substances, for optimizing their way of application.

MATERIALS AND METHODS

Investigations have been conducted in the experimental field of the Faculty of Horticulture from the University of Agricultural Sciences and Veterinary Medicine of Iași, Centre of Horticultural Research.

As biological material, we have used the apple tree (*Malus domestica*), varieties Golden delicious, Idared, Jonathan and Ionagold, grafted on the MM 106 rootstock. At setting up of the plantation (1996), they used the planting distance of 4 x 3 m, and the fruit trees were trained under the shape of tiered palmette with oblique branches. The system of soil conservation was ploughed field.

The plantation was set up on a uniform slope field, well drained and having a humus content of 2.36. In the first part of the vegetation period, they carried out in the plantation maintenance and fructification pruning, phytosanitary treatments for controlling diseases and pests and soil conservation works.

The product that belongs to BAS is Capsicoside - furostanolic steroidal glycoside of vegetal origin – in the concentration variants and application mode, established according to the experimental protocol (*Table 1*). The treatment was done after two weeks since flowering (May 21).

In order to emphasize the efficiency of Capsicoside on the growth and fructification of fruit trees, observations and determinations were carried out on vegetative growth, fruit yield and quality, resistance to diseases and pests.

For achieving the experimental variants, works for plant preparation were carried out. In order to emphasize the effect of treatment, observations and biometrical determinations were carried out against the control.

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Table 1 – Treatment variants in apple trees

Variants Specification	Mode of application (500-600 l solution/ha)
Control – treated with distilled water	Two weeks after flowering, flower-bearing shoots
BAS–C- concentration = 0.00001%	Two weeks after flowering, flower-bearing shoots
BAS – C- concentration = 0.0001%	Two weeks after flowering, flower-bearing shoots
BAS – C- concentration = 0.001%	Two weeks after flowering, flower-bearing shoots
BAS – C- concentration = 0.005%	Two weeks after flowering, flower-bearing shoots
BAS – C- concentration = 0.01%	Two weeks after flowering, flower-bearing shoots

RESULTS AND DISCUSSION

After processing the obtained data, we found out that the leaf application of Capsicoside has determined the increase in photosynthetic efficiency and stimulated the internal metabolism from apple tree leaves (*Table 2*). As concerns the content in chlorophyll *a*, it has increased from 0.608 mg/g fresh matter, by leaf application of Capsicoside, at a concentration of 0.001 %, to 0.891 mg/g in the Idared variety. The content in chlorophyll *b* has increased from 0.261 mg/g at the control to 0.431 mg/g fresh matter in Idared, and 0.384 mg/g fresh matter, respectively, in Jonagold.

The total content of carotenoid pigments has increased from 0.229 mg/g fresh leaves at the control to the value of 0.318 mg/g in Idared and 0.295 mg/g in Jonagold, respectively. The total content of assimilating pigments has increased from 1.098 mg/g leaves to 1.640 mg/g in Idared, as a result of applying Capsicoside.

Table 2 – Influence of the Capsicoside treatment (0.001 %) on the efficiency of photosynthesis in four apple tree varieties

Variants	Chlorophyll <i>a</i> (mg/g fresh matter)	Chlorophyll <i>b</i> (mg/g fresh matter)	Carotene (mg/g fresh matter)	Total pigments			
				mg/g fresh matter	Differences against the control	%	Signif.
Golden delicious	0.809	0.340	0.272	1.421	0.323	130	*
Idared	0.891	0.431	0.318	1.640	0.542	149	**
Jonathan	0.848	0.384	0.295	1.527	0.429	139	**
Jonagold	0.708	0.322	0.268	1.298	0.200	118	
Untreated control	0.608	0.261	0.229	1.098	0.0	100	
LSD 5% - 0.26 mg/g; LSD 1% - 0.48 mg/g; LSD 0.1% - 0.64 mg/g							

We noticed **the increase in the efficiency of photosynthesis**, as a result of a more rapid evacuation from chloroplasts of their primary products, of

stimulation of the synthesis of finished organic matters (proteins, sugars, pigments, flavours, etc.) and of their translocation in the stocking organs. By an increased efficiency of photosynthesis and a greater ratio between synthesized organic matters (anabolism) and those degraded by respiration (catabolism), assured in the leaf stimulation treatment, significant yield increases may be obtained, especially when the number of leaf treatments is higher.

In fruit tree species, which technology requires more treatments for preventing and controlling diseases and pests, as well as soil conservation works, more leaf fertilizers can be applied with fertilizers that are compatible with phytopharmaceutical and biologically active substances.

Table 3 presents data concerning the influence of Capsicoside leaf application on the productivity in apple tree varieties.

By using Capsicoside at a concentration of 0.001%, yield increases can be obtained, because it stimulates the efficient capitalization of the variety biological potential. The highest yield was found in Idared (23.7 t/ha), with a distinctively significant yield increase (5.0 t/ha) against the control. This variety was followed by Golden delicious with 21.8 t/ha, respectively, a significant yield increase of 3.1 t/ha. At the untreated control, the yield was of 18.7 t/ha.

Table 3 – Influence of the Capsicoside treatment (0.001 %) on the fruit yield in four apple tree varieties

Variants	Mean yield		Difference over the control (t/ha)	Significance
	t/ha	%		
Golden delicious	21.8	116	3.1	*
Idared	23.7	127	5.0	**
Jonathan	21.5	115	2.8	
Ionagold	21.1	113	2.4	
Untreated control	18.7	100	0.0	

LSD 5% - 3.0 t/ha.; LSD 1% - 4.8 t/ha; LSD 0.1% -6.4 t/ha

The other two varieties, Jonathan and Ionagold, have achieved yield increases of 13-15%, but these had no statistical significance, because their yields were found within the variation limits of the control.

CONCLUSIONS

The application of Capsicoside treatments (0.001%) has resulted in increasing the metabolic activity and yield.

The increases in pigments (chlorophyll and carotene) have significant and very significant values, between 0.323 mg/g and 0.542 mg/g fresh matter.

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The yield increases have varied according to the variety at which Capsicoside (0.001%) was applied, between 2.4 t/ha and 5.0 t/ha, respectively, as compared to the value of 18.71 t/ha, obtained by the untreated control.

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