

## THE DOSAGE OF THE ASSIMILATORY PIGMENTS IN THE APPLE LEAVES OF VARIOUS SPECIES WITH A PALMETA CROWN

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**Key words:** *apple specie, "palmeta" crown, carotenoid pigments, chlorophyll a, chlorophyll b*

### INTRODUCTION

In 1977, Burnea and his team, defined the *a* and *b* chlorophyll as being metalloporphyrin, complex combinations of some porphyrins with magnesium (Mg) and iron.

The carotenoid pigments, together with the chlorophyll, function as a shield against the UV radiations for all the chlorophyll types and for the enzymes

The proportion between chlorophyll *a* and chlorophyll *b* is in general constant  $a/b = 3/1$ , (with slight variations depending on degree of lighting; in the case of the plants growing in the sun light the proportion is greater than in the case of those cultivated in the shade, as for the alpine plants it can reach 5, 5/1 (RATI I.V, 2009)

*Malus* type is from the Maloideae branch of the Rosaceae family. The trees and the arbuscles this species are small or of medium height, not more than 12-14 m, with big round falling leaves and type 5 rosy flowers. Their fruits are round eatable and rich in vitamins.

*Malus domestica* or the breeding apple is a natural hybrid obtained as a result of the spontaneous and consecutive crossing between several species, one of them being *Malus silvestris*, which had a very important role.

According to FAO statistics, the apple is cultivated in 84 countries, and the fruit consumption is on the second place after oranges and bananas. In Romania the apple is cultivated in districts such as: Argeș, Suceava, Mureș, Maramureș, Dâmbovița, Iași, Bihor, Bistrița, Năsăud, Bacău, Sălaj, Vâlcea, on approximately 75.000 ha (in the year 2000), producing around 600 thousand tones of fruits.

The purpose of this paper is to determine dosage of the *a*, *b* chlorophyll quantity and carotenoid pigments in the case of three apple species (Golden, Jonathan, Idared) in two vegetative phases: during and after the blooming period.

### MATERIAL AND METHODS

The vegetal material biochemically examined consisted of apple leaves gathered during (29.04-03.05.2010) and after the blooming period (03.05 - 10.05.2010). The apple leaves were gathered at random from three different species cultivated by S.C. Fructex S.A. Bacău. The crowns of these trees, from which the leaves had been taken, are the "Palmeta" type with oblique branches, one of the most frequent in most apple orchards. The main features of this crown type are: a central axis on which grow 2 or 4 levels of branches, each with two "arms" growing in opposite direction and with 8-12 cm distance between them. The method used in the dosage of the chlorophyll pigments is that of Mayer-Bertenrath, modified by Stirban și Farcus (HAGER și MEYER BERTENRATH, 1966); The chlorophyll pigments extraction was made in acetone and the extract was dosed using the spectrophotometer (Libra S 22) with different wavelength for each pigment.

### RESULTS AND DISCUSSIONS

We have observed a progressive increase of *a* and *b* chlorophyll quantity and carotenoid pigments in the case of the "Palmeta" crown tree type of the three apple species, during the two main vegetative phases. The Idared specie (0,0008 mg/g) had the highest quantity of carotenoid pigments during the blooming phase, while the Jonathan type had the lowest one. After the shedding of the leaves we observed a significant increase of the carotenoid pigments level in the chloroplasts, reaching up to 0,0009 mg/g in the case of the Golden and Jonathan species, except the third one, the Idared, which had 0,0001 mg/g, representing a much lower level than during the blooming phase. We supposed that the tree from which the samples had been taken had been exposed to a high level of UV radiations, reducing the capacity of biosynthesis of these pigments (fig. 1-6).

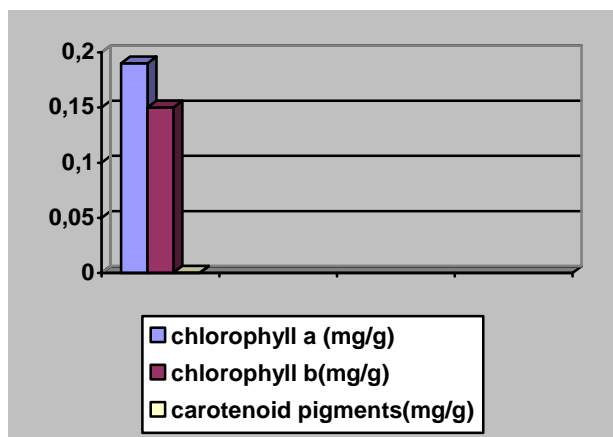


Fig. 1. The amount of assimilating pigments at the variety Golden during flowering

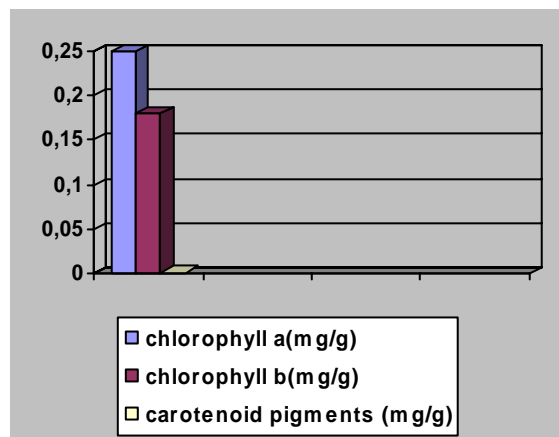


Fig. 2. The amount of assimilating pigments after shaking flowers at the variety Golden

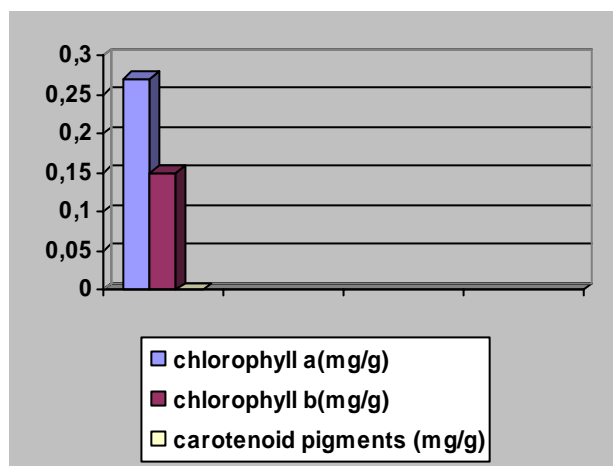


Fig. 3. The amount of assimilating pigments at the variety Idared during flowering

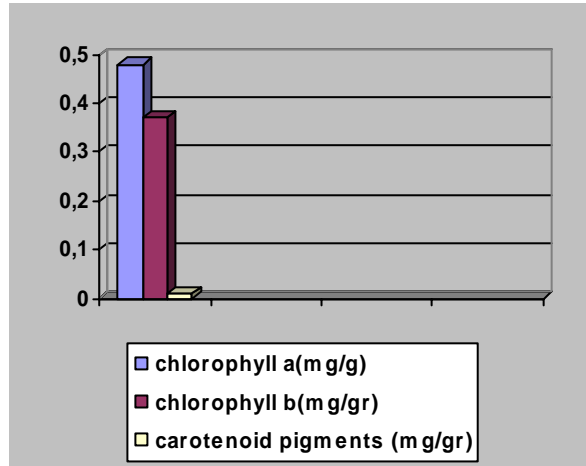


Fig. 4. The amount of assimilating pigments after shaking flowers at the variety Idared

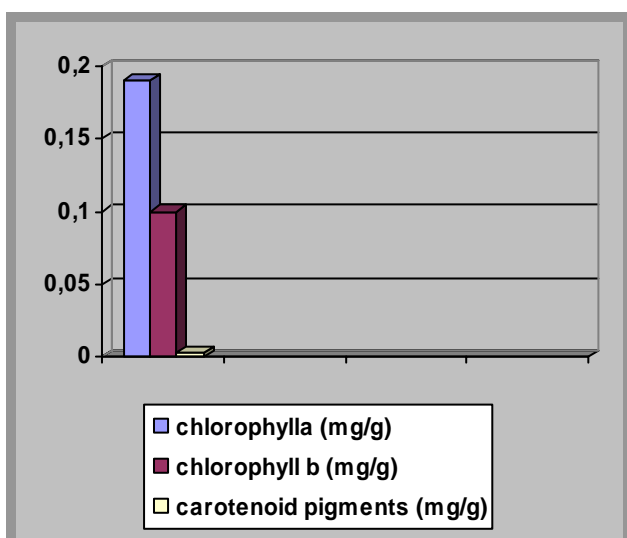


Fig. 5. The amount of assimilating pigments at the variety Jonathan during flowering

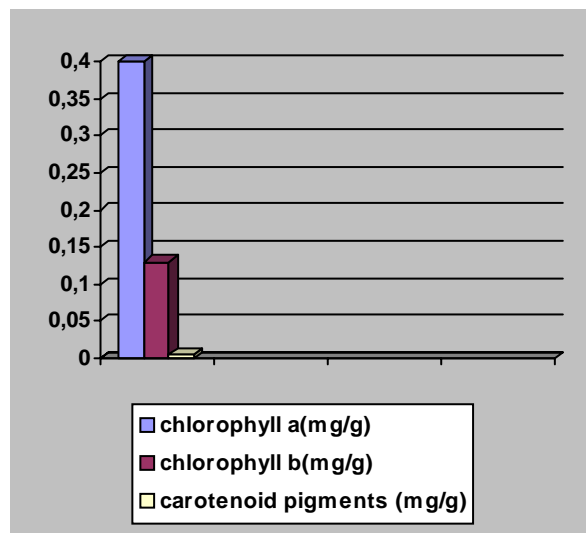


Fig. 6. The amount of assimilating pigments after shaking flowers at the variety Jonathan

During the blooming phase the Idared type had the highest level of *chlorophyll a*, 0,27mg/g, while the lowest was observed in the case of the other two species, 0,19 mg/g.

*Chlorophyll b* reached the maximum value of 0,15 mg/g in the case of the Golden and Jonathan species, while the minimum was of 0,10 mg/g for Jonathan

After the shedding of the leaves there has been recorded a growth of the *A chlorophyll* quantity in all the studied species. Nevertheless the Idared species had the greatest quantity of *chlorophyll a*, 0,48 mg/g

There is a higher level of *chlorophyll b* during the shedding of the leaves phase, as compared to the blooming phase. Such a significant increase has been noticed in the case of the Idared species (0,37mg/g).

By comparing the two vegetative phases it can be observed the intensifying of the photosynthesis process after the shedding of the leaves with approximately 50 % more than during the blooming period.

Image 7 is the graphical representation of the results obtained after the analysis of the *a* and *b chlorophyl* levels.

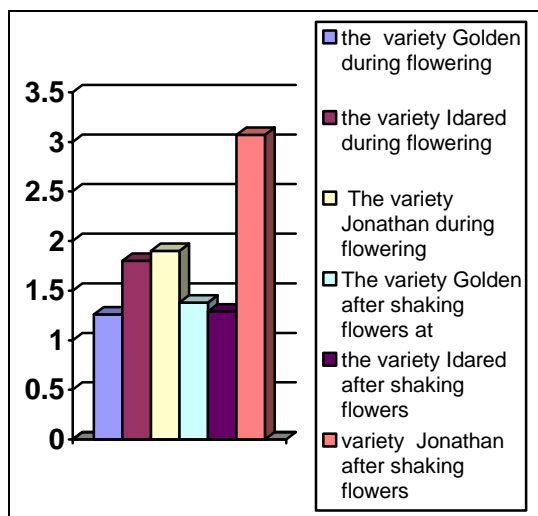


Fig. 7. The ratio of chlorophyll a / chlorophyll b to the three varieties of apple

### CONCLUSIONS

In the case of the “Palmeta” crown tree type, the largest amount of assimilating pigments (chlorophyll a,b and carotenoids) during flowering was recorded at the Idared variety.

After shaking flowers period carotenoid pigments were dosed in large amounts at Jonathan and Golden varieties of 0.0009 mg / g plant material;

During the shaking flowers period we notice an increase of the photosynthetic metabolism, with approximately 50% compared with the flowering period;

**The ratio** of chlorophyll a /chlorophyll b is in the range 1-3, in favor of chlorophyll a, so the trees wherefrom we collected the samples analyzed presented a good solar exhibition due to the “Palmeta” shape of crown.

### ABSTRACT

The aim of this paper is to present the research results of the dosage of the assimilatory pigments in the apple leaves in the case of various species such as Golden, Idared and Jonathan, which have a “Palmeta” crown with oblique branches during and after the blooming period.

After analyzing the results, we noticed an increase of the *a , b chlorophylls* quantity and carotenoid pigments in the two phases.

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