THE INFLUENCE OF THE ATTACK OF TAPHRINA DEFORMANS (BERK.) TUL. (PEACH LEAF CURL) ON THE ACTIVITY OF KREBS CYCLE DEHYDROGENASES IN DIFFERENT SORTS OF PEACH

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The fungus Taphrina deformans is the agent of peach leaf curl, a worldwide disease of peach potentially devastating to both crop yields and trees longevity. Generally, the pathogen agents produced structural, morphoanatomical, physiological and biochemical modifications in host plant. In this paper we present the influence of the attack of the fungus Taphrina deformans on the activity of Krebs cycle dehydrogenases: glucose-6-phosphate dehydrogenase, α-cetoglutarate dehydrogenase, isocitrate dehydrogenase, malate dehydrogenase, in Redhaven and Redskin sorts of peach from experimental field, Miroslava Station Pomiculture. The determinations was effectued from healthy and infected leaves, beeing to put in evidence the differentiation in connection with the presence or the absence of the attack. The activity of glucoso-6-phosphate dehydrogenase at Redhaven sort had the highest value in healthy leaves, excepting the activity registered in de 2. 06. 2007, when the enzyme had higher values in infected leaves. At Redskin sort the activity of glucoso-6-phosphate dehydrogenase was higher in infected leaves, excepting 14. 05. 2007 and 23. 06. 2007, when the activity was more intense in healthy leaves. The activity of isocitrate dehydrogenase at Redhaven sort had higher values in healthy leaves at 14. 05. 2007, 23. 05. 2007 and 2. 06. 2007, and at 11. 06. 2007, 19. 06. 2007 and 23. 06. 2007 the activity of this enzyme was increasing in infected leaves. At Redskin sort, in healthy leaves, the activity of isocitrate dehydrogenase had higher values at: 14. 05. 2007, 23. 05. 2007, 2. 06. 2007 and smaller values at: 11. 06. 2007, 19. 06. 2007, 23. 06. 2007, comparative with in infected leaves. The activity of α-cetoglutarate dehydrogenase at Redhaven sort was higher in infected leaves at 23. 05. 2007, 2. 06. 2007 and 11. 06. 2007, and in the healthy leaves at 14. 05. 2007, 19. 06. 2007, 23. 06. 2007. At Redskin sort, the activity of this enzyme had higher values in infected leaves excepting 14. 05. 2007 and 19.06.2007, when the values was higher in healthy leaves.The activity of malate dehydrogenase at Redhaven sort was higher in the infected leaves, excepting 14. 05. 2007, when the activity was highest in healthy leaves; at Redskin sort it was observed that the malate

dehydrogenase had a more intense activity in the infected leaves, excepting 14. 05. 2007 and 25. 05. 2007, when the activity was higher in healthy leaves.

Key words: *Taphrina deformans*, *peach, sorts, dehydrogenases.*

Peach leaf curl is a fungus disease, produced by *Taphrina deformans* that, under the right conditions, can cause severe early defoliation and crop loss on nearly all peach and nectarine sorts. The fungus attacks especially the leafs and in a smaller measure the sprouts, the flowers and the fruits. The leafs presents blotches or blisters on their superior face and dimples on the inferior one; in the beginning, these are red, and later they became brown and decay because of the necrosation of the tissues; because of the attack, leafs fall down massively, a fact that causes a quick decline of the plantation. The attacked sprouts remain shorter, are deformed and thickened, and the sick branches present fusiform thickenings. The infected leafs have yellowish-white or reddish-violet blurs right where the tissues became brown and crack. The pathogen agents produce structural, morphoanatomical, physiological and biochemical modifications in host plant, which were analysed by different authors. A monographic study, concerning the relationship between pathogen agent and host plant, was recently published [10]. In Romania were made a series of researches concerning the physiology and biochemistry of diseased plants. Valeria Barbu in her doctorat thesis presents the influence of rust (*Phragmidium mucronatum*) and of the black spot (*Diplocarpon rosae*) on some physiologically and biochemicaly process in host plant [3]. Alice Pisică - Donose & collab. made physiological and biochemical researches at some meadows plants, healthy and infected, attacked by different pathogen agents [7, 8]. Eugenia Eliade in the monography concerning the *Erysiphaceae* familly from Romania, presents the results of some Romanian and foreign authors, concerning the biochemical (the containt of water, carbon hydrates, chlorophyll, enzymes) and physiological modifications (perspiration, respiration, photosynthesis) produced by the attack of these fungi on different species of plants [5]. Antohe Anca & collab. made ecophysiological studies in some sorts of plum in the conditions of pesticides applications and of the attack of *Polystigma rubrum* [1]. Ştefania Surdu & collab., made complex researches on the relationship of the fungus *Claviceps purpurea* with the host plant [11], Craita Rosu studied the biochenical and physiological mecanisms of the resistence of sugar beat at some pathogenic fungi [9]. Lacrămioara Antohe & collab. [2] published some results concerning the dynamics of som biochemical indicators in the rye plants attacked by *Claviceps purpurea*. Al. Manoliu & collab. published the first results concerning the influence of the brown rust (Puccinia recondita) on the nutritious values in different sorts of weat [6].

In this paper we present the influence of the attack of the fungus *Taphrina deformans* on the activity of Krebs cycle dehydrogenases: glucose-6-phosphatedehydrogenase, α-cetoglutaratedehydrogenase, isocitratedehydrogenase, malatedehydrogenase, at different sorts of peach.

MATERIALS AND METHODS

The investigations have been performed at two sorts of peach, Redhaven and Redskin, cultivated in the experimental field of the Pomiculture Research Station Miroslava, Iaşi, on healthy and infected leaves by ***Taphrina deformans***.

The dehydrogenases activity was determinated by Sîsoev and Krasna method, modified by Artenie [4], in different fenological phases of the trees.

RESULTS AND DISCUSSIONS

The results of the investigation concerning the dehydrogenases activity at two sorts of peach: *Redhaven* and *Redskin*, in healthy and infected leaves, are presented in *figures 1- 4.*

In *figure 1* is presented the activity of glucose-6-phosphate dehydrogenase, concluding that the highest value of this enzyme - 0,5469 µg.formasan/g mat. - was registered at *Redhaven* sort, in healthy leaves at 14. 05. 2007, followed in decreasing order by the values determinated at: 11. 05. 2007 - 0,3421 µg.formasan/g mat., 19. 06. 2007 - 0,2558 µg.formasan/g mat., 23. 06. 2007 - 0,2557 µg.formasan/g mat., 23. 05. 2007 - 0,1967 µg.formasan/g mat., 2. 06. 2007 - 0,0629 µg.formasan/g mat. At the same sort of peach, in leaves infected by *Taphrina deformans*, were registered the following values of this enzyme: 0,2378 µg.formasan/g mat. at 19. 06. 2007, 0,1797 µg.formasan/g mat. - 2. 06. 2007, 0,1376 µg.formasan/g mat. - 23. 05. 2007, 0,1296 µg.formasan/g mat. - 23. 06. 2007, 0,1079 µg.formasan/g mat. - 14. 05. 2007, 0,0442 µg.formasan/g mat. - 11. 06. 2007.

At Redskin sort, in healthy leaves, the activity of glucose-6-phosphate dehydrogenase had the highest value in 14. 05. 2007 - 0,3155 µg.formasan/g mat., followed in decreasing order by the following values: 0,2558 µg.formasan/g mat. - 23. 06. 2007, 0,1193 µg.formasan/g mat. - 23. 05. 2007, 0,0979 µg.formasan/g mat. - 19. 06. 2007, 0,0695 µg.formasan/g mat. - 11. 06. 2007, 0,0380 µg.formasan/g mat. - 2. 06. 2007. The activity of this enzyme in the leaves parasited by *Taphrina deformans* had the smallest value - 0,1441 µg.formasan/g mat.- at 23. 05. 2007, followed in an increasing order by the next values: 0,1478 µg.formasan/g mat. - 2. 06. 2007, 0,1525 µg.formasan/g mat. - 23. 06. 2007, 0,1609 µg.formasan/g mat. - 14. 05. 2007, 0,2325 µg.formasan/g mat. - 19.06.2007, 0,2689 µg.formasan/g mat. - 11. 06. 2007.

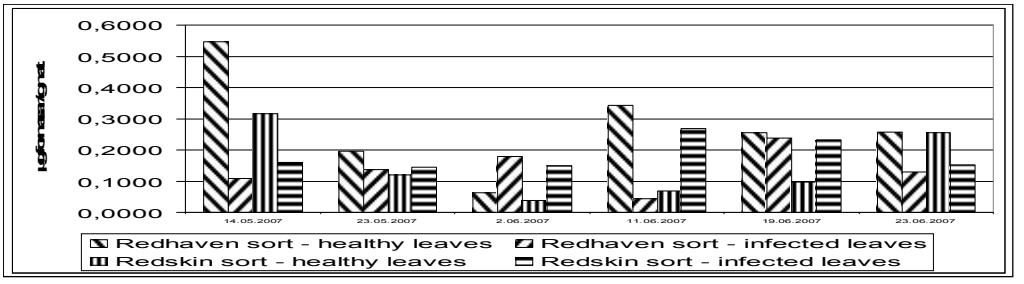

Figure 1 **The activity of glucose-6-phosphate dehydrogenase in healthy and infected leaves of peach**

The activity of isocitrate dehydrogenase at the *Redhaven* sort, in healthy leaves, is presented in figure 2, from which results that this enzyme had the following values: 0,9732 µg.formasan/g mat. - 14. 05. 2007, 0,4096 µg.formasan/g mat. - 23. 05. 2007, 0,2825 µg.formasan/g mat. - 19. 06. 2007, 0,2343 µg.formasan/g mat. - 23. 06. 2007, 0,0917 µg.formasan/g mat. - 2. 06. 2007, 0,0741 µg.formasan/g mat. - 11. 06. 2007.

In infected leaves, the activity of isocitrate dehydrogenase had the smallest value - 0,1660 µg.formasan/g mat. - 11. 06. 2007, followed in increasing order by the next values: 0,2119 µg.formasan/g mat. - 2. 06. 2007, 0,2184 µg.formasan/g mat. - 19. 06. 2007, 0,2479 µg.formasan/g mat. - 23. 06. 2007, 0,2852 µg.formasan/g mat. - 14. 05. 2007 and 0,0392 µg.formasan/g mat. - 23. 05. 2007.

The activity of isocitrate dehydrogenase in healthy leaves at *Redskin* sort had the highest value - 0,8681 µg.formasan/g mat. - 14.05.2007, followed in decreasing order by the next values: 0,2842 µg.formasan/g mat. - 23.06.2007, 0,2337 µg.formasan/g mat. - 23. 05. 2007, 0,1826 µg.formasan/g mat. - 19. 06. 2007, 0,1672 µg.formasan/g mat. - 2. 06. 2007, 0,0586 µg.formasan/g mat. -11.06.2007.

At the same sort, in diseased leaves, the activity of isocitrate dehydrogenase had the following values: 0,2728 µg.formasan/g mat. - 2. 06. 2007, 0,2556 µg.formasan/g mat. - 19. 06. 2007, 0,2540 µg.formasan/g mat. - 23.05.2007, 0,2339 µg.formasan/g mat. - 14. 05. 2007, 0,2303 µg.formasan/g mat. - 11. 06. 2007, 0,1734 µg.formasan/g mat. la 23.05.2007.

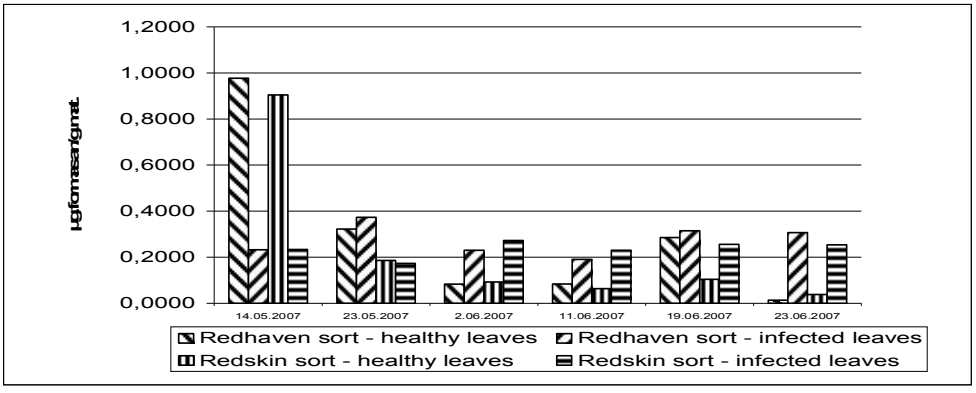

Figure 2 **The activity of isocitrate hydrogenase in healthy and infected leaves of peach**

The activity of α-cetoglutarate dehydrogenase is presented in figure 3, from which we can observe that in healthy leaves from Redhaven sort this enzyme had the highest value - 0,6097 µg.formasan/g mat. at 14. 05. 2007, beeing followed in decreasing order by tje next values: 0,3025 µg.formasan/g mat. - 19. 06. 2007, 0,2748 µg.formasan/g mat. - 23. 06. 2007, 0,1438 µg.formasan/g mat. - 23. 05. 2007, 0,1038 µg.formasan/g mat. - 2. 06. 2007, the lowest value beeing recorded/ registered in 11. 06. 2007 - 0,0301 µg.formasan/g mat. In infected leaves, the lowest value of α-cetoglutarate dehydrogenase activity was recordered at 11. 06. 2007, 0,1897 µg.formasan/g mat.,beeing followed in increasing order by the next

values : 0,2162 µg.formasan/g mat. - 19. 06. 2007, 0,2561 µg.formasan/g mat. - 2. 06. 2007, 0,2703 µg.formasan/g mat. - 23. 06. 2007, 0,2989 µg.formasan/g mat. - 23. 05. 2007, 0,3126 µg.formasan/g mat. - 14. 05. 2007.

At Redskin sort, in healthy leaves, the α-cetoglutarate dehydrogenase activity had the highest value - 0,5653 µg.formasan/g mat. - 14. 05. 2007, followed by next decreasing values: 0,2922 µg.formasan/g mat. - 23. 06. 2007, 0,1861 µg.formasan/g mat. - 19. 06. 2007, 0,1370 µg.formasan/g mat. - 23. 05. 2007, 0,0869 µg.formasan/g mat. - 11. 06. 2007, 0,0354 µg.formasan/g mat. - 2. 06. 2007. In infected leaves, the activity of α-cetoglutarate dehydrogenase, had the highest value - 0,3464 µg.formasan/g mat. - 14. 05. 2007, followed by decreasing values: 0,2931 µg.formasan/g mat. - 23. 06. 2007, 0,2551 µg.formasan/g mat. - 2. 06. 2007, 0,2177 µg.formasan/g mat. - 23. 05. 2007, 0,1779 µg.formasan/g mat. - 11. 06. 2007, 0,1589 µg.formasan/g mat. - 19. 06. 2007.

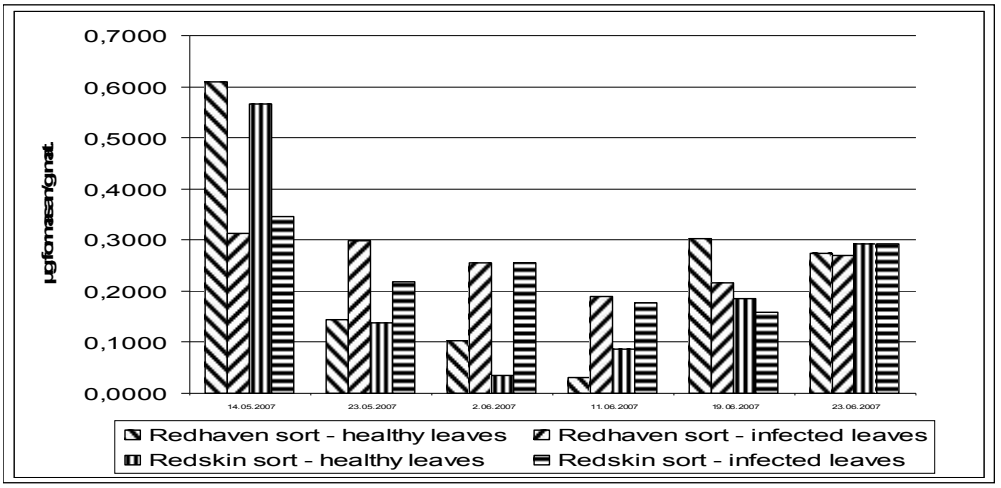

Figure 3 **The activity of α-cetoglutarate dehydrogenase in healthy and infected leaves of peach**

In figure 4 is presented the activity of malate dehydrogenase in healthy and infected leaves at the two sorts of peaches which were studied.

At *Redhaven* sort, in healthy leaves, were registered the following values of the dynamics of malate dehydrogenase activity, presented in decreasing order: 0,9770 µg.formasan/g mat. - 14. 05. 2007, 0,3222 µg.formasan/g mat. - 23. 05. 2007, 0,2857 µg.formasan/g mat. - 19. 06. 2007, 0,0842 µg.formasan/g mat. - 11. 06. 2007, 0,0831 µg. formasan/g mat. - 2. 06. 2007, 0,0134 µg.formasan/g mat. - 23. 06. 2007.

In the leaves attacked by *Taphrina deformans*, the activity of malate dehydrogenase had the most diminishing value 0,1907 µg.formasan/g mat. at 11. 06. 2007, followed in increasing order by the next values: 0,2304 µg. formasan/g mat. - 2. 06. 2007, 0,2325 µg. formasan/g mat. - 14. 05. 2007, 0,3071 µg.formasan/g mat. - 23. 06. 2007, 0,3149 µg.formasan/g mat. - 19. 06. 2007, 0,3736 µg.formasan/g mat. - 23. 05. 2007.

The activity of malate dehydrogenase in healthy leaves at peach sort *Redskin*, had the lowest value - 0,0381 µg.formasan/g mat. - at 23. 06. 2007, beeing followed by the next values of the activity of this dehydrogenase: 0,0639 µg.formasan/g mat. - 11. 06. 2007, 0,0927 µg.formasan/g mat. - 2. 06. 2007, 0,1039 µg. formasan/g mat. - 19. 06. 2007, 0,1858 µg.formasan/g mat. - 23. 05. 2007, the highest value- 0,9044 µg. formasan/g mat. was registered in 14. 05. 2007.

In the parasited leaves, the malate dehydrogenase activity, at the same sort of peach, had the highest value - 0,2728 µg.formasan/g mat. at 2. 06. 2007, beeing followed in decreasing order by the values: 0,2556 µg.formasan/g mat. - 19. 06. 2007, 0,2540 µg.formasan/g mat. - 23. 06. 2007, 0,2339 µg.formasan/g mat. - 14. 05. 2007, 0,2303 µg.formasan/g mat. - 11. 06. 2007, 0,1734 µg.formasan/g mat. - 23. 05. 2007.

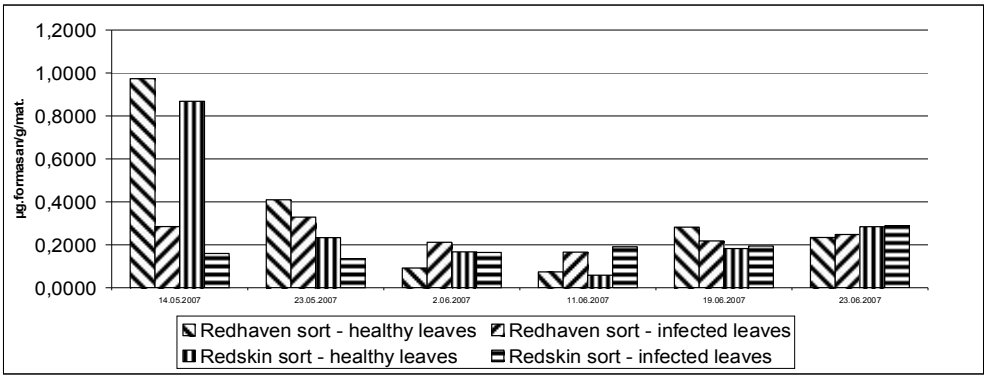

Figure 4 **The activity of malate dehydrogenase in healthy and infected leaves of peach**

CONCLUSIONS

The dinamics of dehydrogenases at the two sorts of peach which were studied, was influenced, by the sort and by the presence of the pathogen agent and by the period in which the determinations were made, in the following way:

The activity of glucoso-6-phosphate dehydrogenase at *Redhaven* sort had the highest value in healthy leaves, excepting the activity registered in de 2. 06. 2007, when the enzyme had higher values in parasited leaves by *Taphrina deformans*. At *Redskin* sort the activity of glucoso-6-phosphate dehydrogenase was higher in diseased leaves, excepting 14. 05. 2007 and 23. 06. 2007, when the activity was more intense in healthy leaves.

The activity of isocitrate dehydrogenase at *Redhaven* sort had higher values in healthy leaves at 14. 05. 2007, 23. 05. 2007 and 2. 06. 2007, and at 11. 06. 2007, 19. 06. 2007 and 23. 06. 2007 the activity of this enzyme was increasing in diseased leaves. At *Redskin* sort, in healthy leaves, the activity of isocitrate dehydrogenase had higher values at: 14. 05. 2007, 23. 05. 2007, 2. 06. 2007 and smaller values at: 11. 06. 2007, 19. 06. 2007, 23. 06. 2007, comparative with the activity of this enzyme in parasited leaves.

The activity of α-cetoglutarate dehydrogenase at *Redhaven* sort was higher in diseased leaves at 23. 05. 2007, 2. 06. 2007 and 11. 06. 2007, and in the healthy leaves at 14. 05. 2007, 19. 06. 2007, 23. 06. 2007. At *Redskin* sort, the activity of this enzyme had higher values in parasited leaves excepting 14. 05. 2007 and 19.06.2007, when the activity of this enzyme was higher in healthy leaves.

The activity of malate dehydrogenase at *Redhaven* sort was higher in the infected leaves, excepting 14. 05. 2007, when the activity of this enzyme was highest in healthy leaves; at *Redskin* sort it was observed that the malate dehydrogenase had a more intense activity in the infected leaves, excepting 14. 05. 2007 and 25. 05. 2007, when the activity of this enzyme was higher in healthy leaves.

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