

## INFLUENCE OF THE ATTACK OF THE FUNGUS *POLYSTIGMA RUBRUM* (PERS.) DC (RED LEAF SPOT) ON NUTRITIONAL VALUE OF FRUITS IN DIFFERENT PLUM CULTIVARS

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**Keywords:** *Polystigma rubrum*, plum cultivars, glucide content

**Abstract:** This paper carried out of the influence of *Polystigma rubrum* attack on the soluble and insoluble glucides content in the plum cultivars, with different degrees of resistance to fungus attack: *Poroabe* and *Vinete românești* (sensitive cultivars), *Renclod violet* and *Grase românești* (middle-resistant cultivars) and *Renclod verde* (resistant cultivar), during the year 2008. Analyzing the results we observed that soluble glucides and insoluble glucides content with one exception was higher in healthy fruits comparatively with the attacked fruit. In generally, glucides was low in attacked fruit, but cannot establish a correlation between glucides content and the degree of resistance of the plum cultivars to attack of *Polystigma rubrum*.

### INTRODUCTION

The plum fruits are the fruits with the highest nutritional value comparatively with the other fruits. The phytopathogenic fungus infections are accompanied with structural changes and some changes in the metabolism of host plant. This is necessary for the coexistence of two partners involved, for a long time and given that for to grow and to reproduce, the parasite requires a constant supply with nutrients from the tissues of the host plant.

All these changes depend on the pathogen which is involved, the its mode of action on the host by enzymes and toxins that is secretes in the body of the host plant (Rosu, 2002). The physiological and biochemical changes and the influence on the production of plums, given of the attack of fungus are presented in different papers.

In Romania were made more researches on the physiology and biochemistry of the diseased plant, in this context we mention the researches made by Alice Pisciă – Donose & collab. which have performed physiological and biochemical researches on some species of plants from grassland, healthy and attacked by various phytopathogenic agents (Donose-Pisciă Alice și Manoliu Alexandru, 1988, Murariu A., 2008).

Valeria Barbu has realized a PhD thesis on the influence of rose of rust (*Phragmidium mucronatum*) and the stained blackof rose (*Diplocarpon rosae*) on physiological and biochemical processes in the host plant (Barbu, 2008). Valentina Jurcă & collab. have studied the peroxidases and isoperoxidases in the leaves of apple attacked by mildew – *Podosphaera leucotricha* under the effect of pesticide treatments (Jurcă et al., 1987).

Ștefania Surdu & collab., Zenovia Olteanu & collab. and Lăcrămioara Antohe & collab. have published some papers about the dynamics of biochemical parameters of rye plants parasitized by *Claviceps purpurea* (Antohe et al., 1993, Olteanu et al., 2000, Olteanu et al., 2000, Surdu et al., 1998, Vârtopeanu et Busuioc, 1998). Crăița Roșu made studies on the induced changes by the attack of phytopathogenic fungus of the sugar beet (Roșu, 2002, Roșu 2007).

Burzo & collab. have studied the content of proteins, lipids and fatty acids in soybean seeds in different conditions of fluid supply (Burzo et Săvulescu, 1999). Daniela Vârtopeanu & Gabriela Busuioc has studied the correlation between the activity of some oxidases and the respiration intensity of the respiration in the fruits of apple cultivars with genetic resistance to diseases, demonstrating their function in the increasing of the resistance of the plants at the attack of the phytopathogenic agents (Vârtopeanu et Busuioc, 1998).

Anca Antohe & collab. have presented a series of eco-physiological researches on some plum cultivars attacked by the fungus *Polystigma rubrum*, in the terms of the application with pesticides (Antohe, 1993).

Ileana Ene has studied a series of biochemical and physiological changes produced by the fungus *Sphaerotheca pannosa* a few varieties of rose including the total content in sugars (monosaccharides and disaccharides). The researches have regarded that in the infected leaves the content in total sugars is lower comparatively with the healthy leaves. In this case the degree of attack of the fungus is positively correlated with the content in sugar of the leaves, content with direct influence on the disease process of the plant (Ene et Vanca, 1972).

Glodeanu C. has studied the attack of fungus *Monilinia sp.* on some fruit trees cultivars. He made researches regarding on the content in glucides from the fruits which come from healthy and attacked plants. The researches showed a decrease of the content in glucides in the fruits from the diseased plants (Glodeanu et al., 1978, Glodeanu, 1974).

Băsu Felicia has studied the influence of the attack of the fungus *Puccinia recondite* on some varieties of wheat from the Moldovian area. The biochemical parameters which she studied refers to the content of the soluble and insoluble glucides from the attacked leaves wheat, comparatively with healthy leaves and showed that there aren't significant differences between the attacked cultivars in connection with content in glucides (Băsu, 2010).

In this paper we carried out the influence of the attack of fungus *Polystigma rubrum* (red leaf spot) of the content in total glucides of the fruits in the plum cultivars, with different degrees of resistance to fungus attack.

## MATERIALS AND METHODS

The researches were made in different plum cultivars: *Poroabe*, *Vinete românești*, *Renclod violet*, *Grase românești* and *Renclod verde*, cultivated in a private orchard from Dracșani-Sulița, the Botosani county.

The locality is situated on an uneven terrain consisting of hills and valleys, between the Dracșani lake, the Sitna river, the Dolina creek and the Gropi and Gornit forests, with a media altitude of 125 m.

The ground which is situated the village is varied, the orchard is located on a hill formed from various forms of chernozem soil type leachate and sometimes there is a light erosion, produced of run-off waters from the fast rains or the melting snows. The degree of resistance of the plum cultivars to attack of *Polystigma rubrum* was appreciated with notes from 1-6, system of scoring after the FAO scale, resulting the following classification of cultivars (Table 1).

After the chemical structure, the glucides are divided into three classes: monoglucides, oligoglucides and poliglucides. The hydrolysis reaction is characteristic for the all glucides and determines the cleavage of the glycosidic bonds and the releasing of monoglucides components. For total glucides determination was used the method with acid 3.5 di-nitro-salicylic (Miller, 1959). The reducing glucides reduce the acid 3.5 di-nitro-salicylic to acid 3-amino-5-nitro-salicylic, on the orange colour which is determined colorimetrically at  $\lambda=500$  nm.

Table 1. The degree of resistance of the plum cultivars to attack of *Polystigma rubrum*

	Cultivars	Classification of cultivars after the the degree of resistance at the <i>Polystigma rubrum</i>
1.	<i>Poroabe</i> ( <i>Porumbele</i> )	Sensitive cultivar - S
2.	<i>Vinete românești</i>	Sensitive cultivar - S
3.	<i>Renclod violet</i>	Middle-resistant cultivar - MR
4.	<i>Grase românești</i>	Middle-resistant cultivar - MR
5.	<i>Renclod verde</i>	Resistant cultivar - R

## RESULTS AND DISCUSSION

In figure 1 are shown the results on the variation of the content in monoglucides in healthy fruits and attacked fruits of *Polystigma rubrum* in the plum cultivars, during the year 2008.

The results obtained in the climatic conditions of the year 2008 illustrates that the content in monoglucides in healthy fruits reaches a maximum value of 4,62 g% to the *Poroabe* cultivar, than 4,46 g% in *Grase românești* cultivar and 4,34 g% in *Vinete românești* cultivar, in the initial phase of maturation of the fruits. In the intermediate stage of maturation, the maximum value of the content in moglucides was recorded in *Poroabe* cultivar - 3,73 g%, followed of the *Renclod violet* cultivar - 3,72 g% and the late phase of maturation , the maximum value of 3,72 g%, determining in *Poroabe* cultivar.

The highest content in monoglucides in attacked fruits - 3,82 g% - was recorded in *Vinete românești* cultivar in the initial attack phase of *Polystigma rubrum*. The dynamic of the content in monoglucides follows a regression curve from the initial phase of the attack of the pathogen to final. The values obtained shows that the content in monoglucides was higher in healthy fruits comparatively with the attacked fruits for all the plum cultivars.

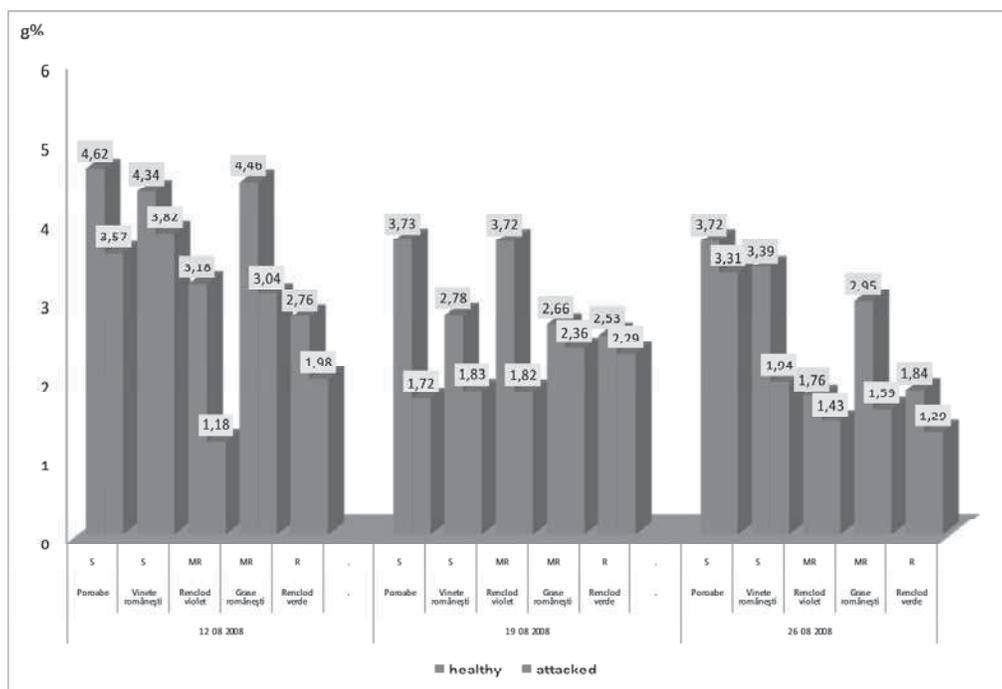


Figure 1. Variation of the content in monoglucides in healthy fruits and in the attacked fruits of *Polystigma rubrum* in the plum cultivars during the year 2008

Analyzing the results we observed that the monoglucides content in the plum cultivars during the year 2008 in the healthy fruits cannot established a clear correlation between monoglucides content and the degree of resistance of the plum cultivars to attack of *Polystigma rubrum*.

The most values of monoglucides content were determined in healthy fruits in *Poroabe* and *Vinete românești*, sensitive cultivars, followed by the middle-resistant cultivar *Renclod violet*. In the case of the attacked fruits, the highest values of the monoglucides content were recorded of the *Poroabe* sensitive cultivar and the middle-resistant cultivar *Grase românești*.

In figure 2 are shown the results on the variation of the content in diglucides in healthy fruits and attacked fruits of *Polystigma rubrum* in the plum cultivars, during the year 2008.

In the climatic conditions of the year 2008, the highest value of the diglucides content - 9,21 g% - was recorded in resistant cultivar *Renclod verde* in the early stage of the fruit maturation.

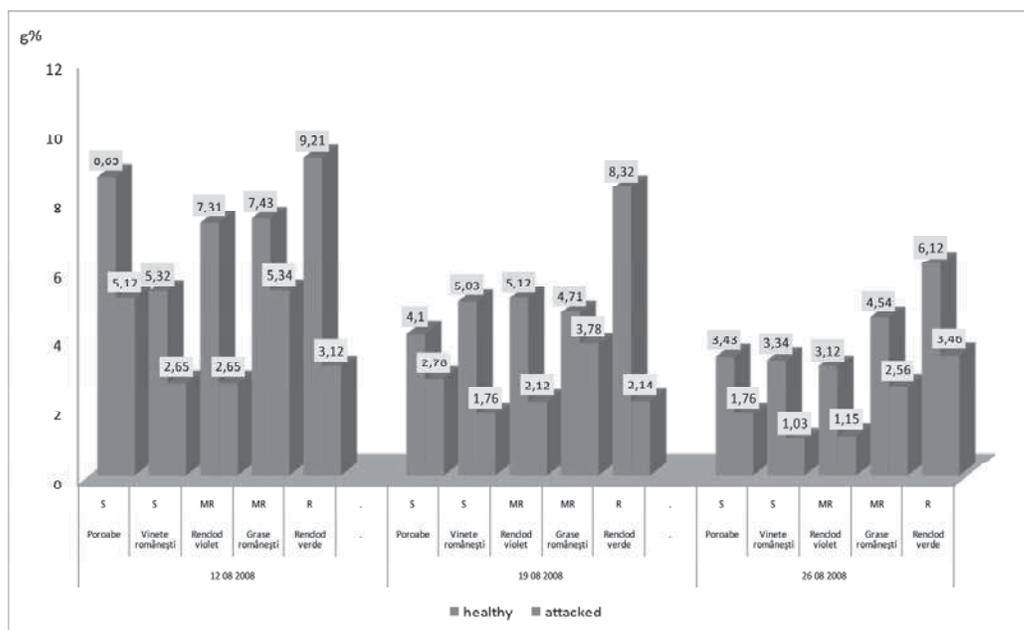


Figure 2. Variation of the content in diglucides in healthy fruits and in the attacked fruits of *Polystigma rubrum* to the plum cultivars during the year 2008

In the intermediate stage all this variety was recorded the maximum value of 8,32 g% diglucides in the healthy fruits, decreasing until 6,12 g% in the final phase of the ripening fruits. The results showed a high of diglucides content - 8,63 g% - in *Poroabe*, sensitive cultivar, in the initial phase of ripening in the healthy fruits. In the healthy fruits form all of the cultivars, the largest amount of diglucides recorded in the initial stage of fruits ripening.

The dates show that the lowest content of diglucides was recorded in the intermediate phase of the attack of the fungus, 1,76 g% of the *Vinete românești* cultivar and 1,03 g% in this cultivar, when the phytopathogenic attack grows in intensification.

The diglucides amount from the healthy fruits was higher than in the attacked fruits, which shows the influence of the attack of the fungus *Polystigma rubrum* on the metabolism of the glucides.

Analyzing the results we observed that the diglucides content in the plum cultivars during the year 2008 in the healthy fruits cannot established a correlation between diglucides content and the degree of resistance of the plum cultivars to attack of *Polystigma rubrum*.

The highest values of the amount of diglucides were determined in *Poroabe*, sensitive cultivar, and the *Renclod verde*, resistant cultivar. In the case of the attacked fruits the most increased values of the content of diglucides were determined in *Poroabe*, sensitive cultivar, and the *Grase românești*, middle-resistant cultivar.

In figure 3 we presented the results on the variation of the content in soluble glucides in healthy fruits and attacked fruits of *Polystigma rubrum* in the plum cultivars, during the year 2008.

From the results obtained in 2008 regarding the soluble glucides content of plum cultivars studied, the maximum amount of 12,51 g% determined in *Renclod verde* cultivar in the

early stage of ripening. Once with the increasing of the attack of the fungus, on this cultivar in the intermediate phase of ripeness of fruits the content in soluble glucides decreases until 11,56 g%, but on the final achieves 7,67 g%. The values obtained from the healthy fruits indicate a large amount of soluble glucides - 11,91 g% - in *Poroabe* cultivar and 11,52 g% in *Renclod violet* cultivar in the early phase of the ripening fruits process.

Variation of the content in soluble glucides in healthy fruits recorded the highest values, in the initial phase of the ripening fruits, decreasing towards the final stage of maturation.

The lowest soluble glucides content in the healthy fruits was recorded in *Vinete românești* cultivar (4,86 g%) and of the *Renclod violet* cultivar (4,84 g%) in the final phase of the fruits maturation.

The highest values of soluble glucides content of the attacked fruits by fungus were recorded in *Vinete românești* cultivar (11,49 g%), in the initial phase of the attack and 8,91 g% in *Renclod verde* cultivar, in the intermediate phase when the pathogen attack intensifies.

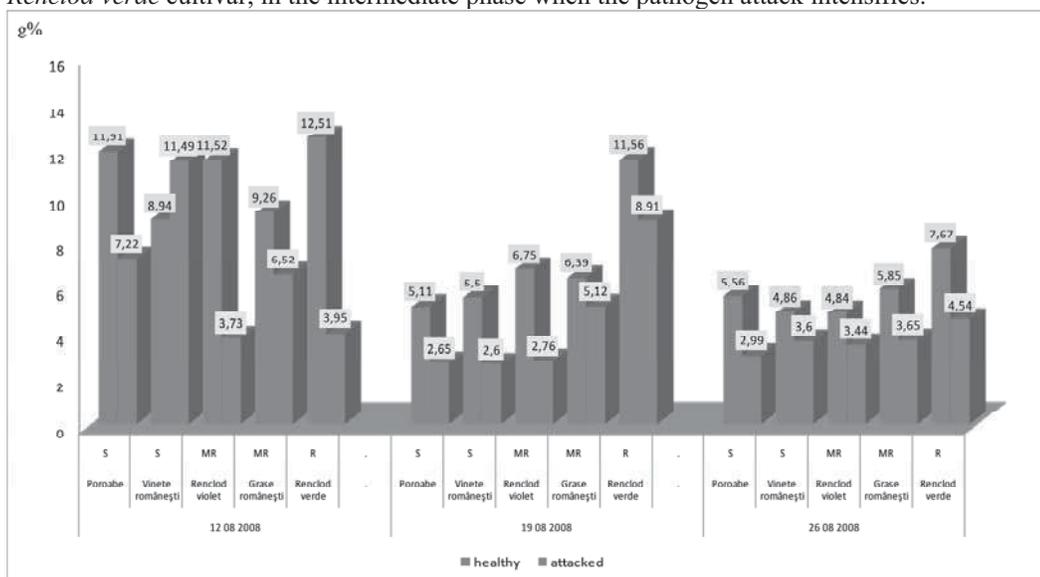


Figure 3. Variation of the content in soluble glucides in healthy fruits and in the attacked fruits of *Polystigma rubrum* to the plum cultivars during the year 2008

The lowest content of soluble glucides determined in the middle phase of the attack in the following cultivars: *Vinete românești* - 2,60 g%, *Poroabe* - 2,65 g% and *Renclod violet*- 2,76 g%. All these varieties with the increasing on the attack of fungus *Polystigma rubrum* to the terminal phase there was a slight increase in the soluble glucides content.

Analyzing the results can observe that the soluble glucides content of all cultivars was higher in the healthy fruits, recorded one exception of the *Vinete românești* cultivar, in the initial phase of the attack of the fungus when the amount of glucides was higher in the attacked fruits.

Analyzing the results in the soluble glucides content of the plum cultivars considered during the year 2008 in the healthy fruits can't establish a correlation between soluble glucides content and the degree of resistance of the plum cultivars to attack of *Polystigma rubrum*. The highest values of the soluble glucides were determined in *Poroabe*, sensitive cultivar, the

*Renclod violet*, middle-resistant cultivar and the *Renclod verde*, resistant cultivar. In the attacked fruits the highest values of the soluble glucides content were recorded in the following cultivars: *Vinete românești*, sensitive and *Renclod verde*, resistant.

In figure 4 are given the results on the variation of the content in insoluble glucides in healthy fruits and attacked fruits of *Polystigma rubrum* in the plum cultivars, during the year 2008.

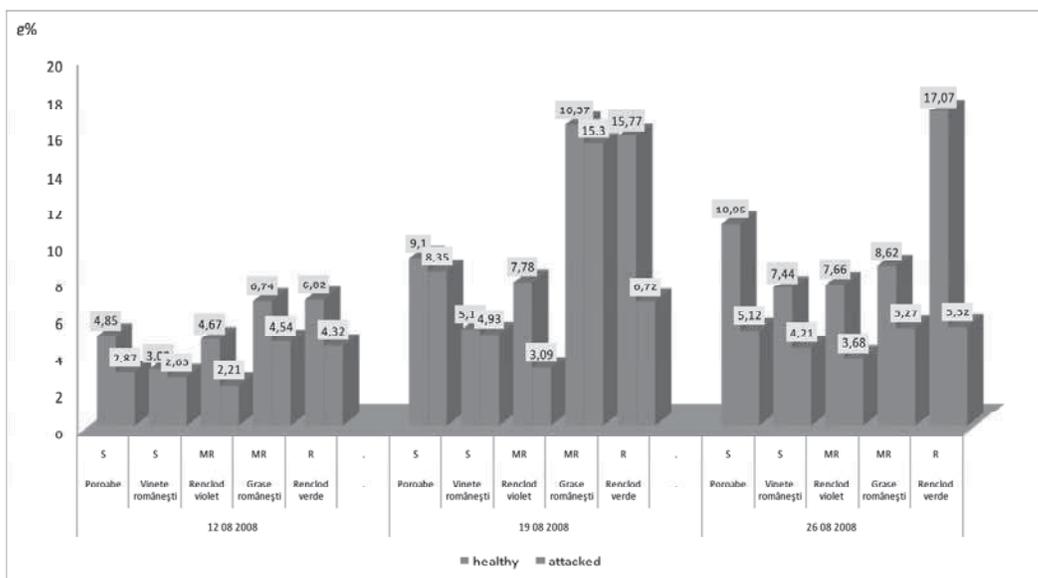


Figure 4. Variation of the content in insoluble glucides in healthy fruits and in the attacked fruits of *Polystigma rubrum* to the plum cultivars during the year 2008

The maximum quantity of the insoluble glucides in the healthy fruits was recorded in *Renclod verde* cultivar - 17,07 g% - in the final phase of maturation of the fruits, followed then of the *Grase românești* cultivar - 16,37 g% - in the intermediate phase. The lowest amount of insoluble glucides in the healthy fruits was determined to all cultivars in the initial phase of the fruits maturation.

Analyzing the results we observed that the diglucides content in the plum cultivars during the year 2008 in the healthy fruits can not established a correlation between insoluble glucides content and the degree of resistance of the plum cultivars to attack of *Polystigma rubrum*. The highest values of insoluble glucides content in the healthy fruits were recorded in *Grase românești*, middle-resistant cultivar and in *Renclod verde*, resistant cultivar. The highest content of the insoluble glucides was recorded in the attacked fruits in *Grase românești*, middle-resistant cultivar.

The values obtained shown a lower content of insoluble glucides in the attacked fruits in all cultivars in the initial phase of the attack of the fungus. The highest content of insoluble glucides in the attacked fruits - 15,3 g% - was recorded in *Grase românești* cultivar, in the intermediate stage of the attack of the pathogen *Polystigma rubrum*.

The insoluble glucides content in the healthy fruits was higher than in the attacked fruits. Comparing the insoluble glucides content with the soluble glucides content at all plum cultivars, can observe: higher values in soluble glucides in the initial phase of maturation of the healthy fruits and on the other hand, the insoluble glucides content in the healthy fruits is higher in the terminal phase of the maturation.

## CONCLUSIONS

The monoglucides, diglucides (soluble glucides and insoluble glucides) content with one exception was higher in healthy fruits comparatively with the attacked fruits. Variation of glucides content in all plum cultivars show a low content in the attacked fruits, illustrating the influence of the attack of the fungus *Polystigma rubrum* on nutritional value of fruits in different plum cultivars. In generally, glucides was low in attacked fruit, but cannot established a correlation between glucides content and the degree of resistance of the plum cultivars to attack of *Polystigma rubrum*.

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