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ON THE DYNAMICS OF THE REDOX CHARACTER OF A VITICULTURAL PLANTATION'S SOIL

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INTRODUCTION

The organism belonging to a biocenosis may be considered – no matter which is the function they perform in the ecosystem – as either autotrophic (primary producers) or heterotrophic (consumers and decomposers) ones. The organisms known as developing direct relations with the environment – i.e., plants, fungi, microorganisms, protozoa and metazoa in the larvar stage – are influenced and, equally, do influence the environment in a redox way.

More exactly, the autotrophic organisms are stimulated by the oxidating media and inhibited by the reducing ones, while the heterotrophes, on the contrary, are stimulated by the reducing media and inhibited by the oxidating ones. By their activity, the autotrophes impart to the medium a reducing character, while the heterotrophes – an oxidating one.

It gres without saying that, under such circumstances, the two categories of organisms could not coexist in the absence of an alternative taking over of the biocenosis' "hegemony". In this respect, Figure 1 plots graphically, for each category, the position of the optimum and, respectively, the inhibition zone.

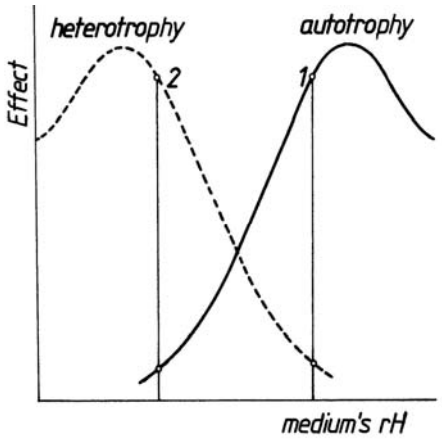

Fig. 1.

If assuming that, at a certain moment (1), the medium's rH is an oxidating one, the autotrophes will be stimulated and, respectively, the heterotrophes will be inhibited; consequently, the hegemonistic autotrophes will impart to the medium an increasingly reducing character, up to the attainment of moment (2), in which the autotrophes are inhibited, while the heterotrophes are stimulated; once having become hegemonistic, the latter ones impart to the medium an oxidating character, specific to moment (1), a.s.o. Consequently, alternative oscillations in the rH of the biotope will be recorded.

The above-described situation has been demonstrated by a long-time monitorization of an aquatic [2] and, respectively, a terrestrial [3, 4] biotope. În the latter case, on could observe a resultant mediating the primary ascillations, which records a minimum (i.e., reduction) in the summertime – a result of the vegetal supremacy – and, respectively, a maximum (oxidation) in winter, due to the supremacy of soil's heterotrophes.

As such a situation referred to a non a non-anthropized, lawn ecosystem, covered by vegetation even in winter, when its activity is only diminished, the authors suggested the monitorization of an anthropized, named viticultural ecosystem in which, as a result of the agrotechnical methods applied, vine is the only plant present, which means that, in the cold seasons, no autotrophic-type activity is to be recorded.

MATERIAL AND METHOD

Out of a strictly-marked space within a viticultural plantation, soil samples have been taken over weekly, at a 5 cm depth. Immediately after, the samples have been subjected to the procedure of rH determination, by means of a previously-described potentiometric method [1]. The data obtained are plotted graphically in Fig. 2.

RESULTS AND DISCUSSIONS

As the character of the rH oscillations in the biotope had been discussed in detail in previous studies [2, 3], the graphical representation was much simplified, up to suggesting, over a narrow interval, the primary rH oscillations, stress being mainly laid on the representation of the resultant, obtained by the application of the least square rule to the experimental data.

The observation may be nevertheless made that, contrary the case of the lawn, the primary rH oscillations are much more ample in the winter than in summer, which suggests that the inactivity of the

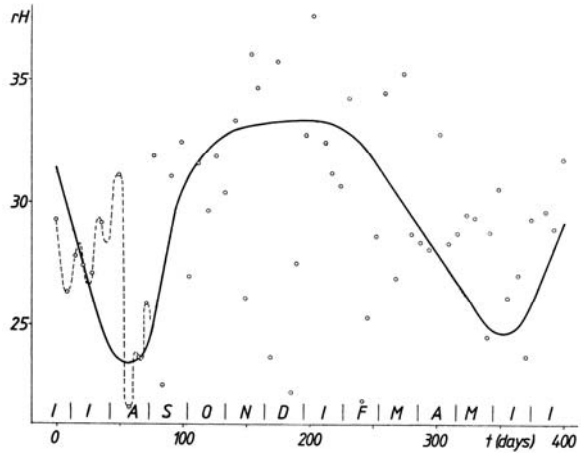

Fig. 2.

macrophyte – the vine – throws the charge of the redox homeostasis to soil's microflora, which has an inferior redox modulating power, similar to the of soil's heterotrophic organisms.

The global character of dynamics of soil's rH is similar to that noticed in the case of the lawn, with small differences as to the position of the minimum and, respectively, maximum; the situation may be explained by the influence of some climatic factors – different, however, in two experiments (in oenology, such a case known and exploited for quite a long time, and expressed by the French term "millésime" – i.e., year of harvesting – is that in which, from one year to another, the same kind of vine, in the same place, may produce absolutely different wines, ranging between high quality – "grand vin" – and ordinary wines).

As to the global dynamics of soil's worth mentioning are the following aspects. In the beginning of the monitorization phase, i.e., in the beginning of summer, a reduction process may be observed, coinciding – quite naturally – with the intense vegetation. The maximum rH value recorded, attaining 23, is nevertheless inhibiting for the plant (the optimum of which is of minimum 28) and, respectively, stimulating for the heterotrophes in the soil, seen as initiating an oxidation process which will continue until November-December. The rH value attained, of about 33, is nevertheless inhibiting for heterotrophes (requiring rH values below 25, which are the lower, the lower is their systematic position), so that, beginning with February, a reduction process will be manifested, promoted first by the soil's microflora and then by the initiation of vegetation in the vine.

CONCLUSIONS

A one-year monitorization, from a redox perspective, of a viticultural plantation soil's evidences two main aspects: 1. the short-term alternation of a reduction process, induced by the maximum activity of autotrophes, the wine preponderently, and of an oxidation process, induced by heterotrophes; 2. the long-term alternation of a reduction process in spring and summer, caused exclusively by vine's vegetation, with an oxidation process – induced by soil's heterotrophes, but depending on vine's inactivity, in autumn and winter.

REZUMAT

Datele prezentate monitorizează caracterul redox al solului aferent/suport al unei plantații viticole pe parcursul unui an. Se reliefează efectul reductiv al vieţuirii plantei, care se manifestă de la începutul primăverii şi atinge maximul în lunile iulie-august, ca şi efectul heterotrofelor solului care, după (auto)inhibiţia plantei şi obligarea ei la repaus prin extrema reducere la nivelul solului, oxidează solul până la un maxim, atins în perioada februarie-martie. Aici intervine inhibiţia acelor heterotrofe, dar stimularea autotrofei vițe.

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