



The biochemical activity in the apple-trees orchard soil after replantation

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It is well-known that the monoculture of crops leads to the phenomenon of soil sickness [1]. A long-term application of monoculture can lead to quantitative and qualitative changes in the populations of soil microorganisms, activity of enzymes, soil respiration, and to other processes of the biological activity of soil which affect soil fertility [1].

Investigations were carried out during 2003-2005 years in an apple orchard after replantation which is situated in the Agricultural-Orchard Experimental Station in Przybroda belonging to the Agricultural University in Poznań. The experiment was established on the true grey-brown podzolic soil with the topsoil (0-50 cm) made up of light loamy to strong loamy sands. The following three levels of irrigation were applied: W_0 — maintenance moisture on the level rainfall and W_1 —maintenance moisture on the level -0.003 MPA potential water soil as well as W_2 — maintenance moisture on the level -0.001 MPA potential water soil. Besides, within irrigation three combination of fertilization were also applied: 65 kg N/ha; 65 kg N/ha, 95 kg/ha K_2O as well as 130 kg N/ha, 190 kg/ha K_2O and control combination (Virgin soil). Soil samples for analyses were taken from the depth of 0-20 cm at three different dates, depending on the stage of development of trees in the orchard: intensive growth (June), fruiting/ripening (August) and fruit harvesting and leaf-dropping (October). Within the framework of the performed biochemical studies, the following enzymes were made: dehydrogenase [Thalman 1968.], protease [Ladd, Butler 1972], urease [Hoffmann, Teicher 1961] and respiration activity [Golebiowska, Pędzwiłk 1984].

The effect of fertilization and irrigation on the biochemical activity of the apple-trees orchard soil after replantation was investigated. The performed experiments showed significant variations only in the dehydrogenase and protease activity depending on the applied level of fertilization. Dehydrogenase and urease activity was high in combination of 130 kg N/ha and 190 kg/ha K₂O, and protease activity in combination of 65 kg N/ha and 95 kg N/ha K₂O. Their lowest activity were in combination of 65 kg N/ha. The highest enzyme activity and soil respiration were found also in the control.

The experiments showed significant variations only in the dehydrogenase and protease activity depending on the applied level of irrigation. The highest enzyme activity (dehydrogenase and protease) were noted in combination of irrigation: -0.03MPa and -0.01MPa. Urease activity was high in combination of W₀.

High level of fertilization and irrigation always increased the enzyme activity. Significant correlation was observed only between the enzyme activity, soil respiration and the content of soil organic carbon, dissolved organic carbon, pH_{H₂O} in the apple orchard after replanted.

References

1. Gawrońska A., Kulińska D., Lenart S., Jaškowska H. 1992. The effect of the maize monoculture on the biological properties of soil and on the yields of plants. Polish J. Soil Sci. 25: 89-94.