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Effect of afforestation on urate oxidase activity in two kinds of soils

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Researches were carried out in soils under a 125-m-long the afforestation located in the Kościan Plain in Turew, which is a part of West Poland Lowland. Soil samples were taken from four chosen sites marked as Nos. 1, 2, 3 and 4 near wells. One part of this afforestation was allocated on mineral, whereas the second part was on mineral-organic soil. Times of sampling were from March to November in 2009 from the layer at 0-20 cm depth after removing leaf litter. Urate oxidase activity in soils was determined colorimetrically by measuring the absorbance at λ=293 nm.

Urate oxidase is a homotetrameric enzyme containing four identical active sites situated at the interfaces between its four subunits. This enzyme catalyzes the oxidation of uric acid, a final product of purine catabolism to 5-hydroxyisourate, which is non-enzymatically transformed into allantoin, carbon dioxide and hydrogen peroxide. Uricase is also an essential enzyme in the ureide pathway, where nitrogen fixation occurs in the root nodules of legumes. Nitrogen heterocyclic compounds such as allantoin may serve as nitrogen sources or nitrogen transport compounds in plants that are not able to fix nitrogen. It has been estimated that heterocyclic nitrogen compounds represent about 30% of the reduced nitrogen in soils.

These studies indicated that the flow of ground water was accompanied by an increase of uricase activity from 16 to 71% (from point 1 to point 2) in all periods of sampling in mineral soils. Similar trend was shown in mineral-organic soils. There was an increase of uricase activity from the point 3 to 4 and ranged from 13 to 37% similar to the direction of the flow of ground water. However, no significant differences of urate oxidase activity between two kinds of soils were observed. This study showed that the uricase activity ranged from 1.99 to 7.16 μmol·h^{-1}·g^{-1} in the mineral soils and from 1.79 to 8.36 μmol·h^{-1}·g^{-1}.

The study indicated an impact of the afforestation located on mineral and mineral-organic soils on the changes of uricase activity similar to the flow of ground water.

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