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Effect of shelterbelt on two kinds of soils on redox processes

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The investigations were carried out in soils under a 125-m-long shelterbelt, located in the Agroecological Landscape Park in Turew (40 km south of Poznań, West Polish Lowland). One part of this shelterbelt is allocated on mineral (63 m), whereas the second part is on mineral-organic soil (62 m). Samples were taken from five chosen sides marked as Nos. 1, 2, 3, 4 and 5 each month in 2007 from the depth of 0-20 cm. The activity of peroxidase in soils was determined by Bartha and Bordeleau method, iron (II) by phenanthroline and iron (III) by thiocyanate method. The dissolved organic carbon was estimated using analyzer TOC-5050A facilities, Solid Sample Module SSM-5000A, Shimadzu, Japan. The dissolved organic carbon concentration ranged from 0.97 to 3.58 g·kg^{-1} in mineral and mineral-organic soils.

The objective of this study was to compare the effect of shelterbelt on two kinds of soils on redox processes.

Depending on the environmental conditions, iron can form stable compounds in both the divalent and trivalent state. The redox change between Fe (II) and Fe (III) plays an important role in redox processes in soil. It was confirmed that the total iron content in all the sampling periods increased from 5 to 48 % similar to the flow of ground water in mineral soils. In mineral-organic soils, the decrease in the total iron concentration (from 8 to 23 %) was observed similar to the flow of ground water. Our research showed that the total iron content ranged from 6.50 (mg·kg^{-1}) to 19.53 (mg·kg^{-1}) in mineral soils and from 7.53 to 11.79 (mg·kg^{-1}) in mineral-organic soils.

Similar trend was shown for the activity of peroxidase. This enzyme catalysis the oxidation of phenols and aromatic amines in the presence of H_2O_2. These studes indicate that the flow of ground water was accompanied by an increase in activity of peroxidase from 5 to 59 % in most the sampling periods in mineral soils. It was observed that activity of peroxidase ranged from $1.67 \cdot 10^{-4}$ to $10.07 \cdot 10^{-4}$ (μmol·h^{-1}·g^{-1}) in mineral and mineral-organic soils.

The investigation has shown that the transformation of Fe (II) and Fe (III) ions and activity of peroxidase in the soils under shelterbelt is connected with the redox processes.