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Control of the spread of inorganic elements by shelterbelt in agricultural landscape

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A better understanding of the impact of shelterbelt on the decrease the quantities of chemical compounds in ground water should increase our ability to predict the improvement of the quality of ground water. The objective of this study was to evaluate the effect of shelterbelt on the decrease of calcium, magnesium and inorganic carbon in ground water passing through the shelterbelt from adjoining cultivated fields.

The investigations were carried out in Turew in Chlapowski's Agroecological Park situated 40 km South-West of Poznań (West Polish Lowland). This area is located on loamy soils, which contains 70% cultivated fields, 12% meadows and pastures and approximately 14% afforestations including well developed network of shelterbelts (mid-field rows of trees afforestation). The established network of shelterbelts in Turew is the unique in Europe.

Ground water under cultivated field and shelterbelt from the artificial wells ones a month during 7 years from 2000 to 2006 was sampled and investigated. Ground water under shelterbelt flows away from adjoining cultivated field and passing through the shelterbelt. The first distance of this shelterbelt 104 m long is located on mineral soils (division-autogenic soils, order-brown forest soils, type-hapludalfs, subtype-glossudalfs) next from 104 to 125 m on mineral organic soils (division-hydrogenic soils, order-post-bog, soils, type-mucky soils, subtype-muckous).

Calcium, magnesium and mineral carbon quantities have been investigated in the ground water of shelterbelts. The differences among the concentrations of calcium, magnesium and mineral carbon were attributed solely of width of the shelterbelt. Shelterbelt revealed the improvement in the quality of ground water. The biogeochemical barrier in the form of shelterbelt efficiently decreases the concentration of chemical substances calcium to 26%, magnesium to 25% and also mineral carbon 70,5%. Concerns over the environmental impacts of the elements of agricultural landscapes have focused attention on the study of calcium, magnesium, mineral carbon in ground water. These investigations have shown high contents of chemical compounds migrates ground water from cultivated fields. Ground water under cultivated field revealed high concentrations of calcium, which yearly mean contents are equaled from 81,9 to 179,2 mg/l. It was proved that biogeochemical barrier such as shelterbelt efficiency decrease the quantity of chemical compounds in ground water. The highest decrease of determined forms in the first distance of shelterbelt (62 m) and ranged for calcium from 26 to 34%, magnesium to 26% and mineral carbon to 71% was observed. On the basis of all aspects it seems that the first distance 62 m of shelterbelt is the most efficient for the function as biogeochemical barrier.