

Effect of petroleum-derived substances on plants after application of compost, bentonite and calcium oxide *

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Abstract

The aim of the study was to determine the effect of petrol and diesel oil soil contamination on the yield and content of some macroelements in spring barley (*Hordeum vulgare* L.), and investigate if soil amendment with of compost, bentonite and calcium oxide could reduce the impact of petroleum-derived products on the plants. The experiment was conducted in the greenhouse at the University of Warmia and Mazury in Olsztyn (Poland). It was realized in 9.5 kg polyethylene pots (with 4 replications). Soil material used for the trials was taken from the arable humus soil horizon. This material under natural conditions was typical Eutric Cambisols soil according to WRB formed from loamy sand. In this research, increasing doses of petrol and diesel oil were applied in the following amounts: 0; 2.5; 5 and 10 cm³ kg⁻¹ d.m. of soil. After that some objects were enriched with compost (3% in relation to the mass of the soil), bentonite (2% in relation to the mass of the soil) or calcium oxide (1.26 g Ca kg⁻¹ of soil). Additionally, macro- and microelements were added to all pots. Afterwards, spring barley (*Hordeum vulgare* L.) - 15 plants per pot Polish cv. Ortega was sown. The harvest of spring barley was carried in the full maturity (98 day of vegetation) and samples of grain, straw and roots were collected for chemical analyses. During the experiment, the humidity of soil was maintained at the level of 60% capillary water capacity.

The negative influence of petrol on yield of *Hordeum vulgare* L. was larger than diesel oil. Their effects on diesel oil were considerably smaller than on petrol, although in case of the highest dose of diesel oil also negative. Application calcium oxide and compost to soil (in the distinction from bentonite) contaminated by petroleum-derived products generally reduced the effects of the negative influence of diesel oil on growth and development of plants, in distinction from petrol. The best effects were got in objects contaminated by 10 cm³ of petrol per kg of soil. The contamination of the soil by petrol and diesel oil and the application of the compost, bentonite and calcium oxide in the soil were significant effect on the content of macroelements in grain, straw and roots of *Hordeum vulgare* L. In the series without application neutralizing substances to soil, the petrol and in a smaller degree diesel oil caused an increase in content of potassium in grain of *Hordeum vulgare* L. On the other hand, the lower oil-derived substances doses caused an increase in content of phosphorus, calcium and magnesium in grain of this plant (in comparison with control variant), meanwhile the higher doses were diminished of these elements. Petrol caused an enlargement the content of phosphorus in straw of *Hordeum vulgare* L., in reverse from potassium, sodium, calcium and magnesium. The lowest dose (2.5 cm³ kg⁻¹ of soil) of diesel oil increased the content of all macroelements in straw and the content of potassium, sodium and calcium in roots of spring barley, meanwhile its higher doses (5 and 10 cm³ kg⁻¹ of soil) had significant and negative effect. The content of phosphorus in *Hordeum vulgare* L. roots also increased under the influence of the oil-derived substances contamination.

Keywords: petrol; diesel oil; compost; bentonite; CaO; plants; yield; macroelements.

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