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The effect of mulching and soil compaction on fungi composition and microbial communities in the rhizosphere of soybean

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The soil environment is the habitat of pathogenic and saprotrophic microorganisms. The composition of the microbial community are related to biotic and abiotic factors, such as root exudates, crop residues, climate factors, mulching, mineral fertilization, pesticides introduction and soil compaction. The aim of the study was to determine the effect of the mulching and soil compaction on the microorganism communities in the rhizosphere soil of soybean.

The studies were carried out on silty loam soil (Orthic Luvisol) developed from loess (Lublin, Poland). The experiment area was 192m^2 divided into 3 sections consisted of 6 micro-plots (7m^2). Three levels of soil compaction low, medium and heavy obtained through tractor passes were compared. The soil was compacted and loosened within seedbed layer 2 weeks before sowing. Soybean "Aldana" seeds were inoculated with *Bradyrhizobium japonicum* and were sown with interrow spacing of 0.3m. Wheat straw (as mulch) was uniformly spread on the half of each micro-plot at an amount of 0.5kg m^{-1} after sowing. Rhizosphere was collected three times during growing season of soybean. Microbiological analyses were conducted in 3 replications and included the determination of: the total number of bacteria and fungi, the number of bacteria *Pseudomonas* sp. and *Bacillus* sp., the genus identification of fungi isolated from rhizosphere of soybean.

Results indicated a positive effect of mulching on the increase number of all groups of examined rhizosphere microorganisms (fungi, bacteria, *Pseudomonas* sp., *Bacillus* sp.). The highest number of the microorganisms was found in the low and medium compacted soil and markedly decreased in the most compacted soil. Relatively high number of antagonistic fungi (*Penicillium* sp., *Trichoderma* sp.) was recorded in the rhizosphere of low and medium compacted soil, particularly in mulched plots. The presence of these fungi can testify to considerable biological activity, which contributes to the improvement of the phytosanitary condition of the soil. However, the decrease of the antagonistic microorganism number in the heavy compacted soil can be responsible for appearance higher number of the potentially phytopathogenic fungi (*Fusarium* sp., *Phoma* sp.). Further research, with using molecular technique, will help better understanding interactions between plant and microorganisms in the soybean rhizosphere under different soil management conditions.