Geophysical Research Abstracts, Vol. 7, 01478, 2005
SRef-ID: 1607-7962/gra/EGU05-A-01478
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Impact of genetically modified plants on the soil microflora

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Transgenic plants showing herbicide tolerance, resistance to viral, bacterial and fungal dieseases, insect resistance, improved product quality and superior agronomic properties are globally cultivated. However, the possible impact of genetically engineered plants on human health and ecosystem functioning is of increasing concern. Microorganisms contribute substantially to soil functions as they play an essential role in maintaining soil quality by being involved in nutrient turnover. Furthermore, plant-associated microbes may promote plant growth and health.

Plant diseases caused by phytopathogens acount worldwide for high production losses. Resistance traits are difficult to achieve through conventional breeding and chemical control of bacterial pathogens is not feasible. Therefore, plants including potato, tomato and tobacco have been developed, which carry genes encoding antimicrobial agents such as T4 lysozyme. As the release of such antimicrobial agents may alter the soil microflora, various studies have addressed plant-associated microorganisms of plants carrying genes with antimicrobial functions. Besides a potential direct effect, genetically modified plants may exhibit unintentional effects on the soil microflora, e.g. due to altered root exudation. Therefore, the potential impact of transgenic plants carrying traits such as herbicide tolerance or the production of the Bt Toxin has been investigated as well. Effects on the diversity and function of the soil and in particular the rhizosphere microflora due to the genetic modification of plants will be reviewed and discussed in regard to populations shifts caused by natural factors such as season, soil type, plant genotype, plant developmental changes or biotic and abiotic stresses.