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Titel
Soil and Phyllosphere Microorganisms of the Rapeseed (Brassica napus L.) Holobiont Involved in Chloromethane Emissions

Abstract
Brassica napus, or rapeseed, is one major oilseed crop in Europe and Germany and is used for food, feed, and Biodiesel production. Chloromethane (CH_3Cl) is the most abundant halogenated organic compound in the atmosphere and triggers the chlorine-mediated destruction of the ozone layer. Anthropogenic sources became negligible because of taken measures according to the Montreal Protocol (1987) and therefore natural sources such as plants became more relevant for the global chloromethane budget. The actual global budget is imbalanced through missing sinks, which may be activities of soil and phyllosphere microbiomes which together with the plant is considered as the holobiont. The amount of CH_3Cl from crops has not been addressed and might even increase under stresses such as elevated soil salinization and temperature. We proved that B. napus (rapeseed) plants emit CH_3Cl. Certain methylotrophs (microorganisms that utilize one-carbon compounds) degrade CH_3Cl and can gain a selective advantage while colonizing plants. Moreover, methylotrophs thrive in the rhizosphere of grassland plants. The rapeseed associated microbiome likely harbours methylotrophs that degrade CH_3Cl. Therefore, we addressed in this study the rapeseed holobiont to resolve its response to stressors such as salt and temperature in regard to CH_3Cl emission. We addressed in our project the following objectives: (i) To measure CH_3Cl emission rates from single B. napus holobionts under different NaCl and temperature stress levels in pot experiments, (ii) to assess the B. napus microbiome and its CH_3Cl degradation ability through amplicon sequencing of bacterial 16S rRNA genes and functional gene markers. The summer cultivar MAKRO was used as a model organism. We identified methylotrophs that responded to salt and temperature stress conditions in the phyllo- and rhizosphere of rapeseed and correlated those to the observed net emission rates.