

# Biodiversity of microbial communities in the rhizospheres of *Alnus glutinosa* contaminated by HCH isomers.

Aday Amirbekov [aday.amirbekov@tul.cz](mailto:aday.amirbekov@tul.cz), Alena Ševců.

## OBJECTIVE

In this exterior study, we aimed to determine the bioaccumulation potential of  $\alpha$ ,  $\beta$ , and  $\delta$  isomers of HCH by *Alnus glutinosa* (Alder tree) seedlings.

## Design of experiment

Each HCH isomer alone was mixed with soil to reach a final concentration of cca 5 mg/kg in one pot. Control was prepared with the same soil without HCH. All variants were set in triplicate and had instant access to water for three months.



**Fig. 1** Each triplicates was set on one tray. Control 1, control 2, control 3, alpha 1, alpha 2, alpha 3, beta 1, beta 2, beta 3, delta 1, delta 2, delta 3.

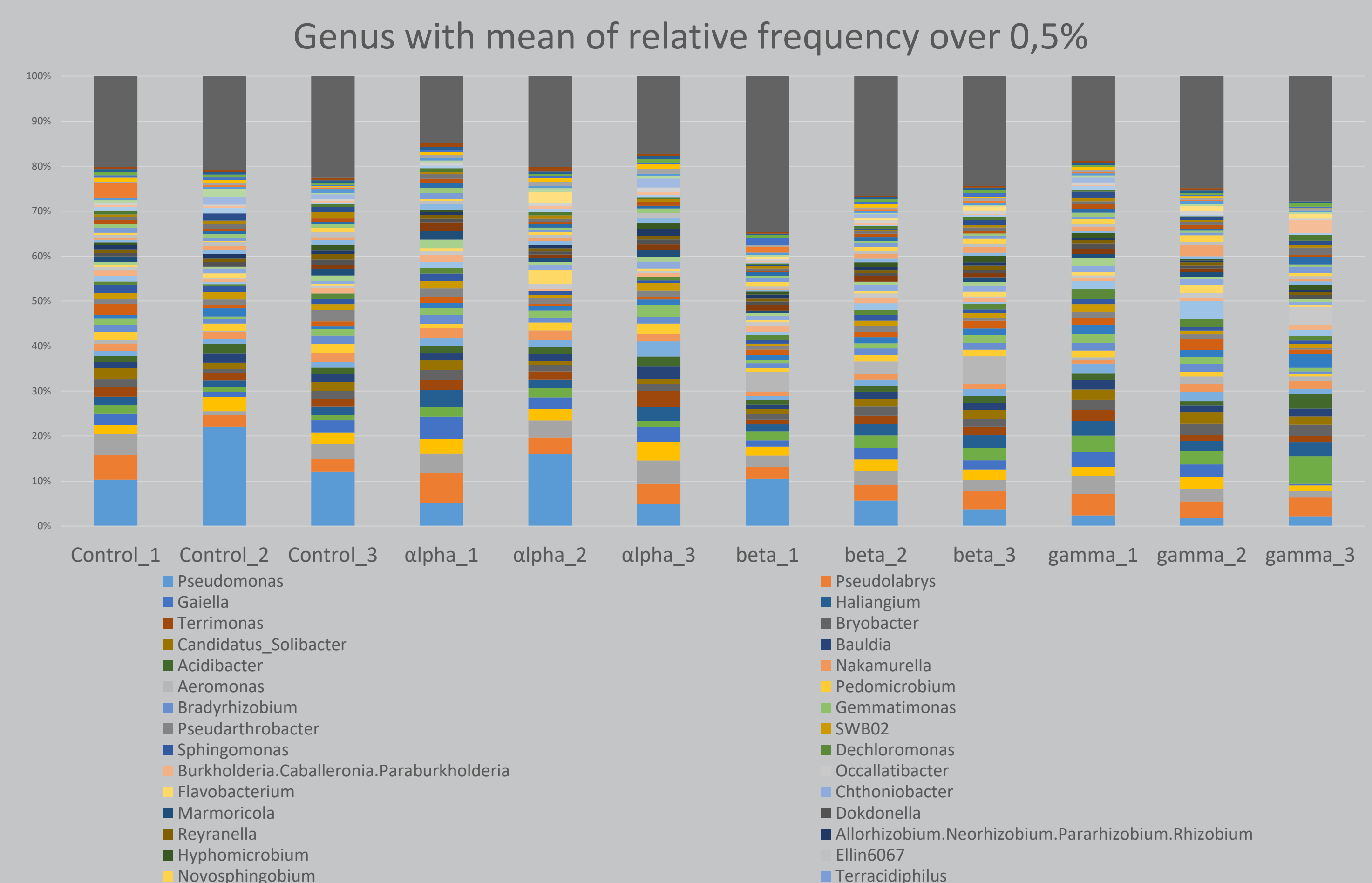
## Material and methods

HCH was analysed in soil and sections of seedlings (roots, trunks, branches, leaves) on GC/MS. Amplicon 16S rRNA sequencing was applied to study the microbial community in rhizosphere samples.

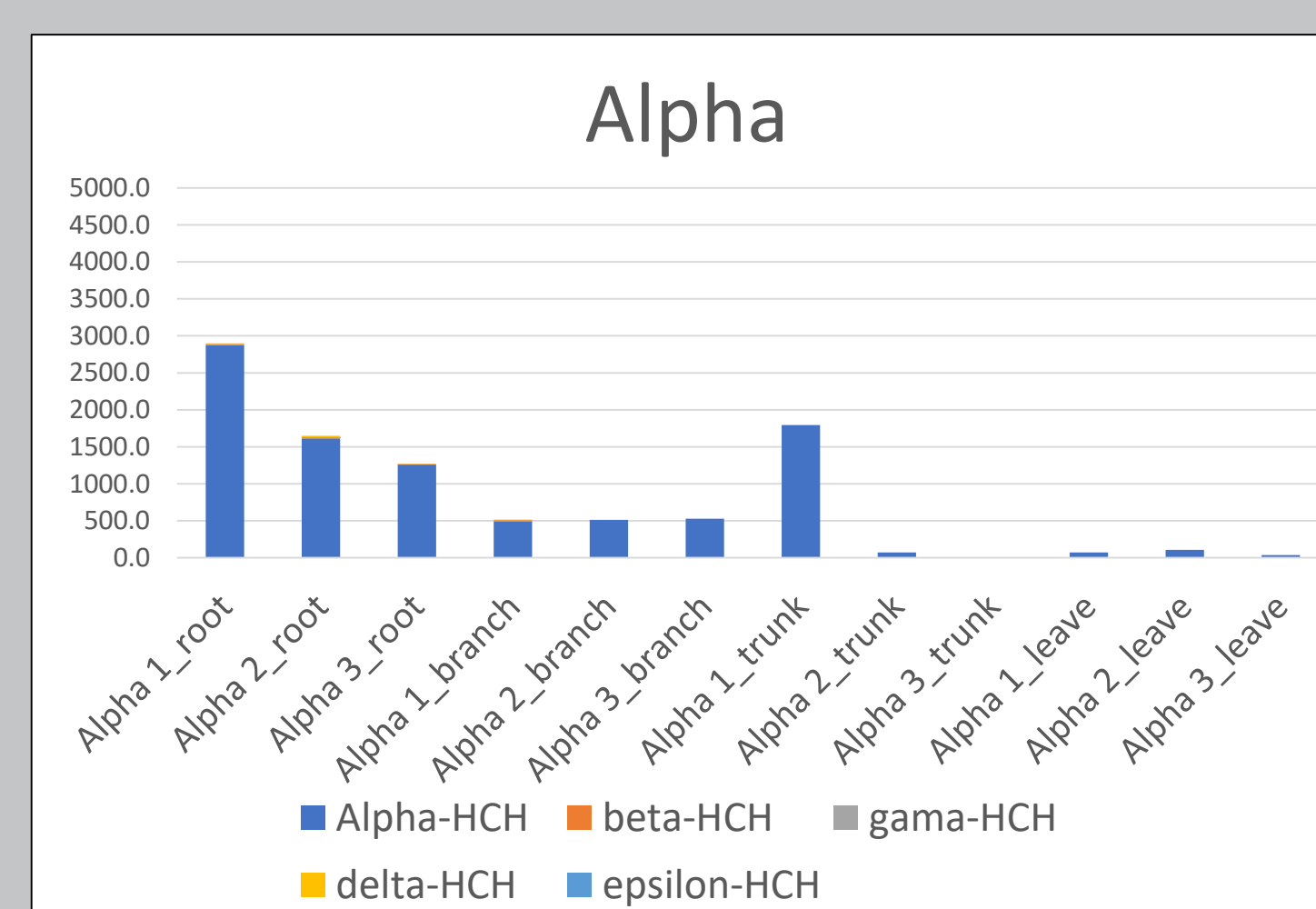
## Results

The highest concentrations of HCH isomers were detected in the roots with a decreasing trend towards the branches and the leaves. The  $\delta$ -HCH isomer was taken up in highest quantities (14.7  $\mu\text{g/g}$  in roots, 7.2  $\mu\text{g/g}$  in trunks, 1.53  $\mu\text{g/g}$  in branches and 1.88  $\mu\text{g/g}$  in leaves) while  $\alpha$ -HCH and  $\beta$ -HCH were found in much lower concentrations. Most interestingly, in the  $\beta$ -HCH treatment, we detected high concentrations of  $\alpha$ -HCH as well.

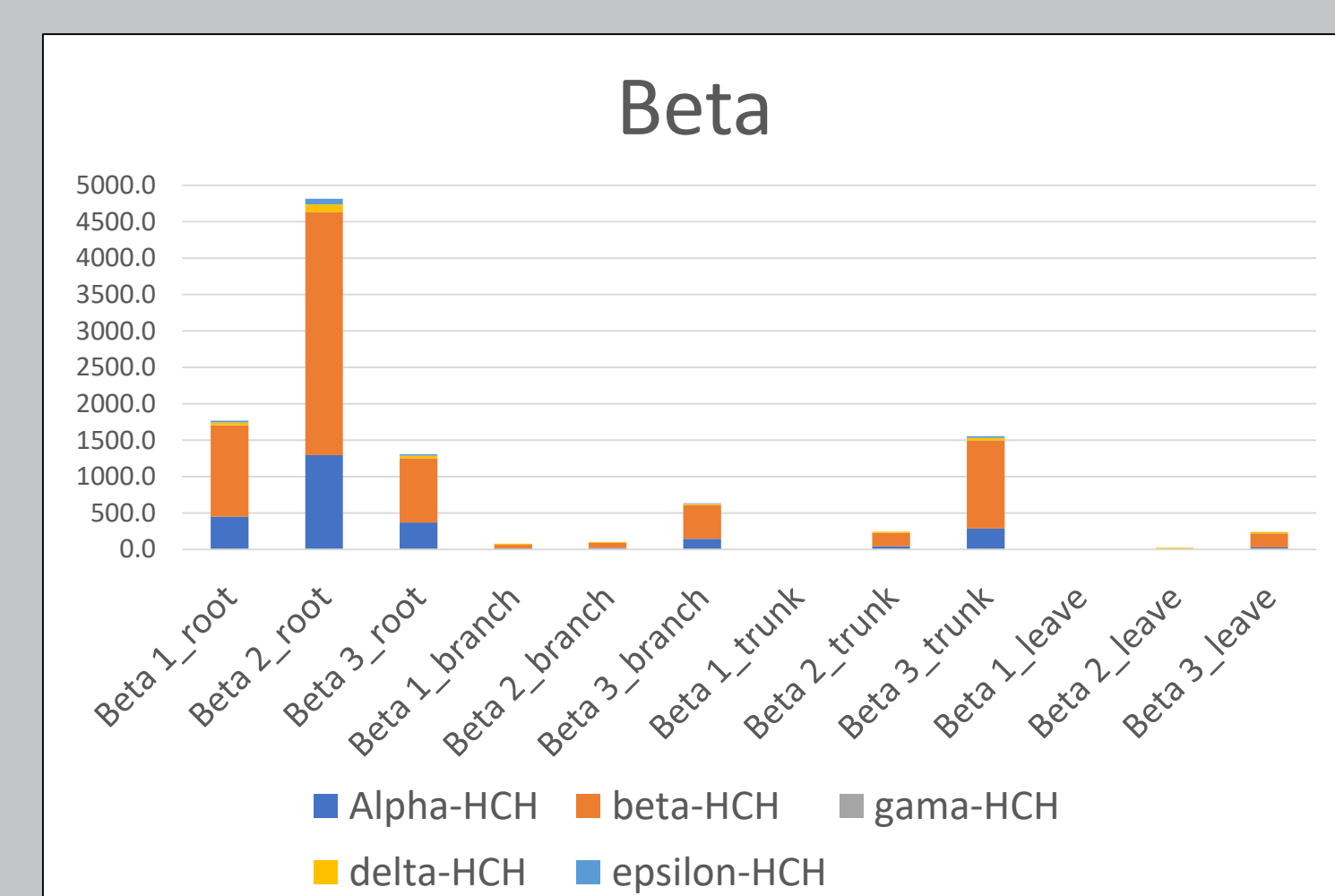
The abundance of rhizosphere populations was similar in all HCH isomer samples with some exceptions. For example, *Pseudomonas sp.* significantly decreased in all HCH-amended samples, the lowest abundance was found in the  $\delta$ -HCH – the isomer that was detected in highest quantities. In contrast to *Pseudomonas*, the abundance of an anaerobic *Opitutus sp.* was the highest. In samples treated with  $\beta$ - and  $\delta$ -HCH, *Rhizobacter sp.* appeared, while not present in control samples.



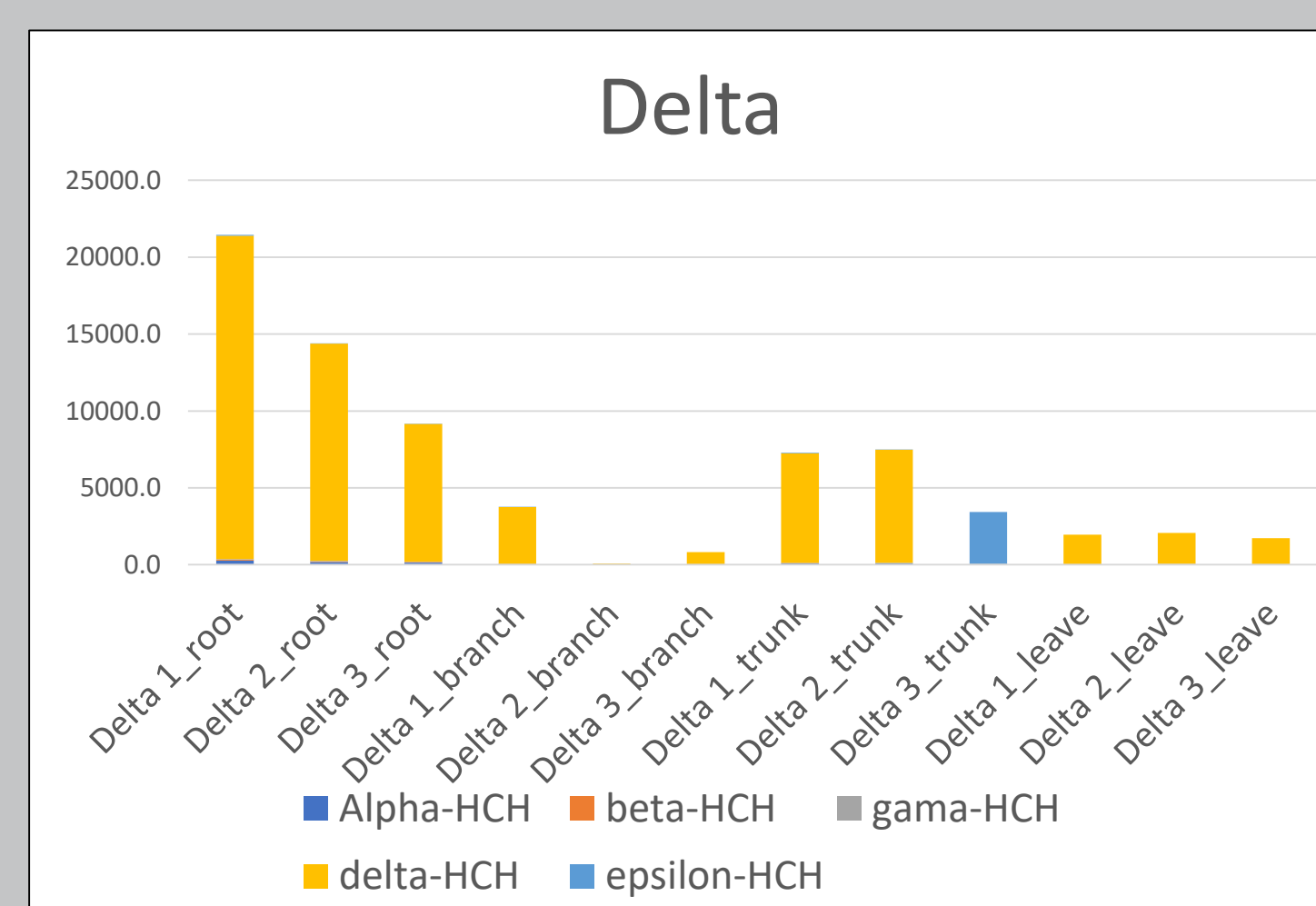
**Fig. 2:** Relative representation of microorganisms at family level (abundance > 0,5 %) in the rhizosphere samples.



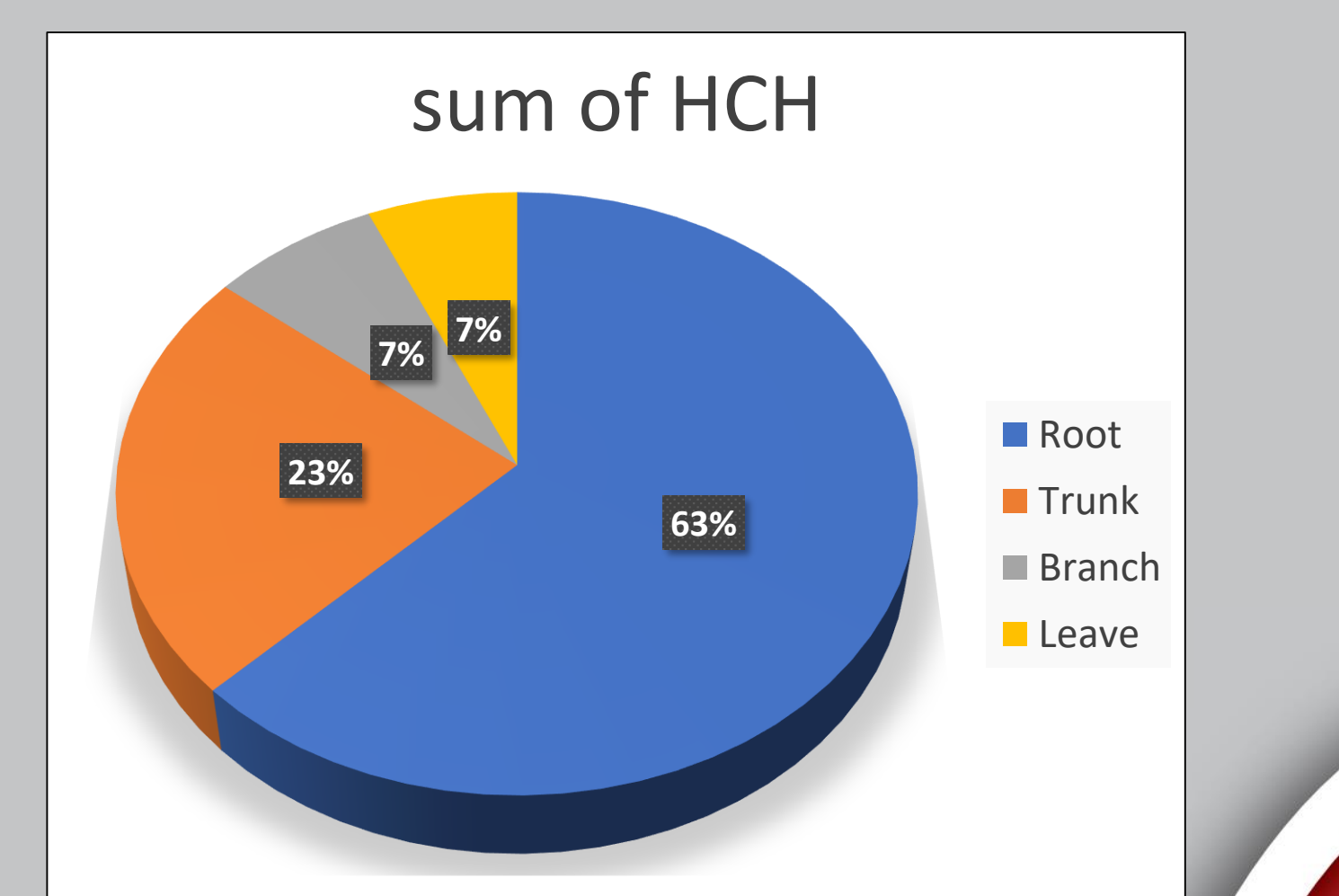
**Fig. 3:** Concentration of HCH isomers in samples treated with Alfa HCH [ $\mu\text{g-gr-1}$ ].



**Fig. 4:** Concentration of HCH isomers in samples treated with Beta HCH [ $\mu\text{g-gr-1}$ ].



**Fig. 5:** Concentration of HCH isomers in samples treated with Delta HCH [ $\mu\text{g-gr-1}$ ].



**Fig. 6:** Sum of HCH distributed by parts of *A. glutinosa*.

## Conclusions

To conclude, the *A. glutinosa* seedlings were able to accumulate all HCH isomers, thereby proving that it has high phytoremediation potential. The reason why was the  $\delta$ -HCH most easily bioaccumulated will be subjected to further study.