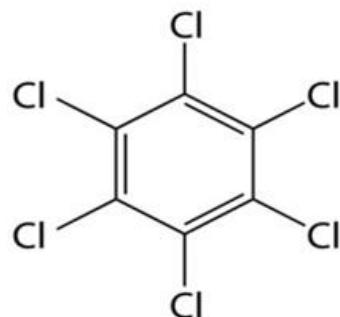
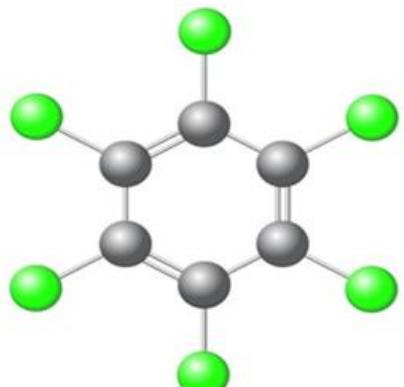


# SENSITIVITY OF MICROBIOCENOSIS TO HEXACHLOROBENZENE IN DIFFERENT SOIL TYPES

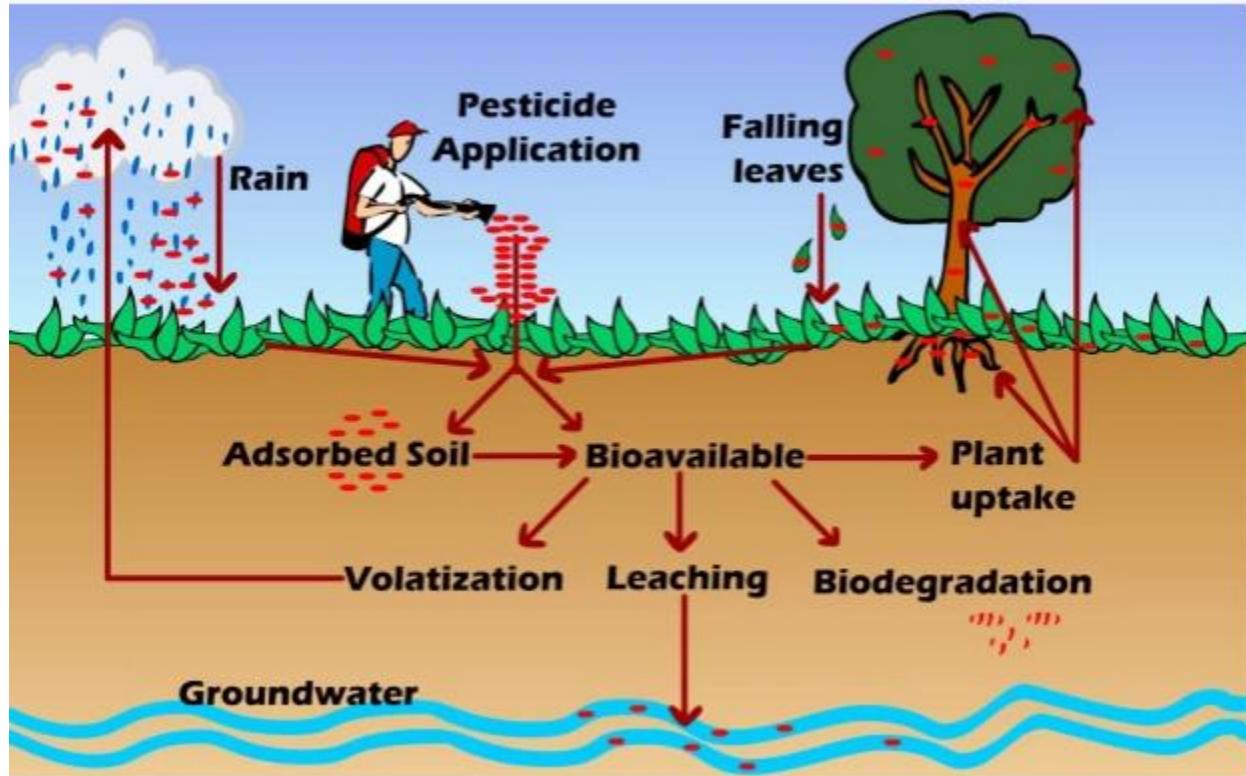
Hexachlorobenzene (insecticide)



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## RESEARCHING RELEVANCE

- Organochlorine pesticides (OCP) using for agriculture accumulates in the soil
- Hexachlorobenzene (HCB) is one of the most common OCP
- HCB is part of industrial waste
- HCB applying leads to the disturbance in soil ecosystem



<https://www.dawsoncreekmirror.ca/dawson-creek-news/pesticide-application-class-is-coming-1.23807353>

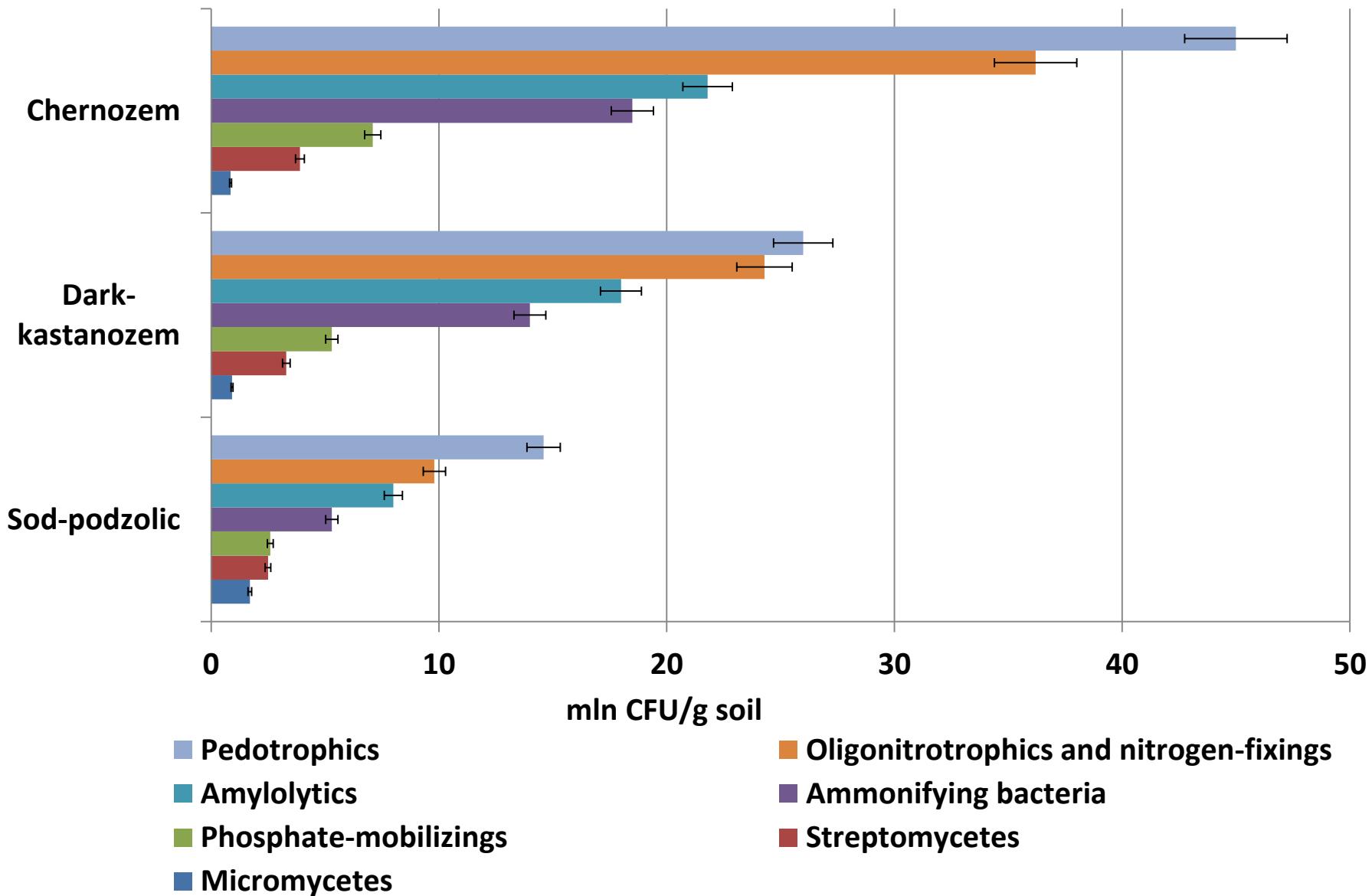
# *The aim of this study*

To investigate the effects of hexachlorobenzene (HCB) on soil microbiota of chernozem, dark-kastanozem and sod-podzolic soils.

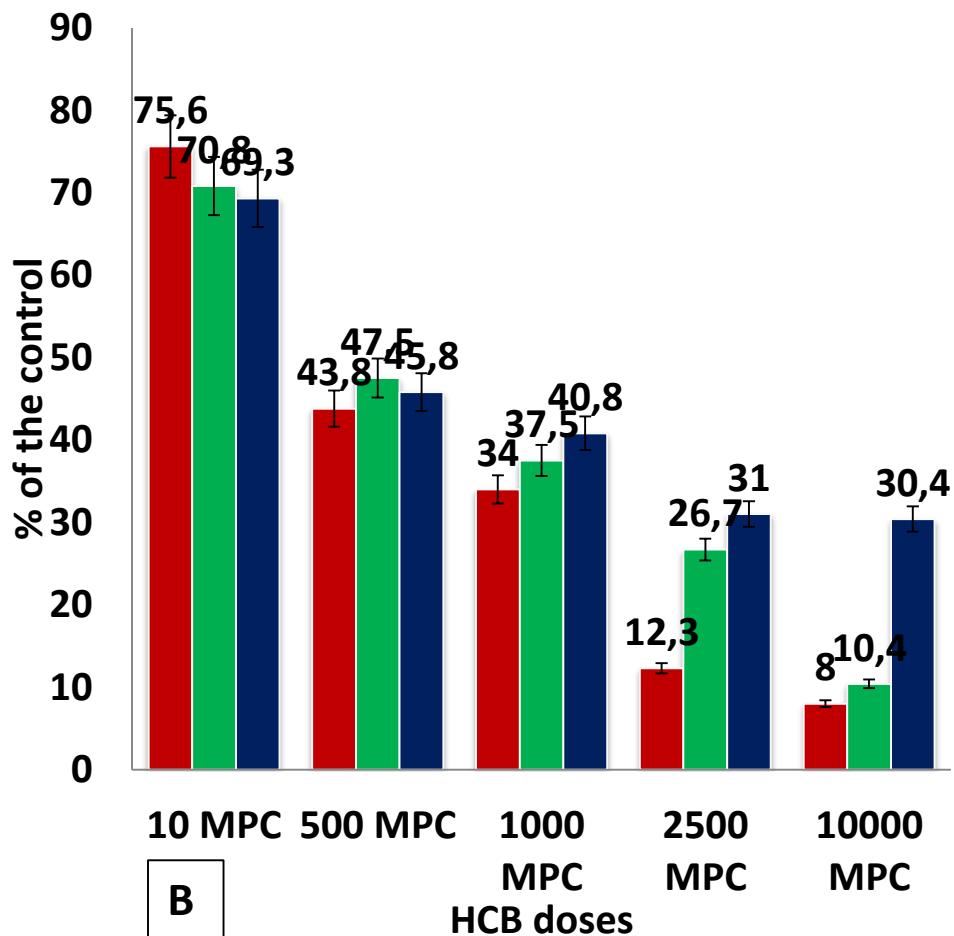
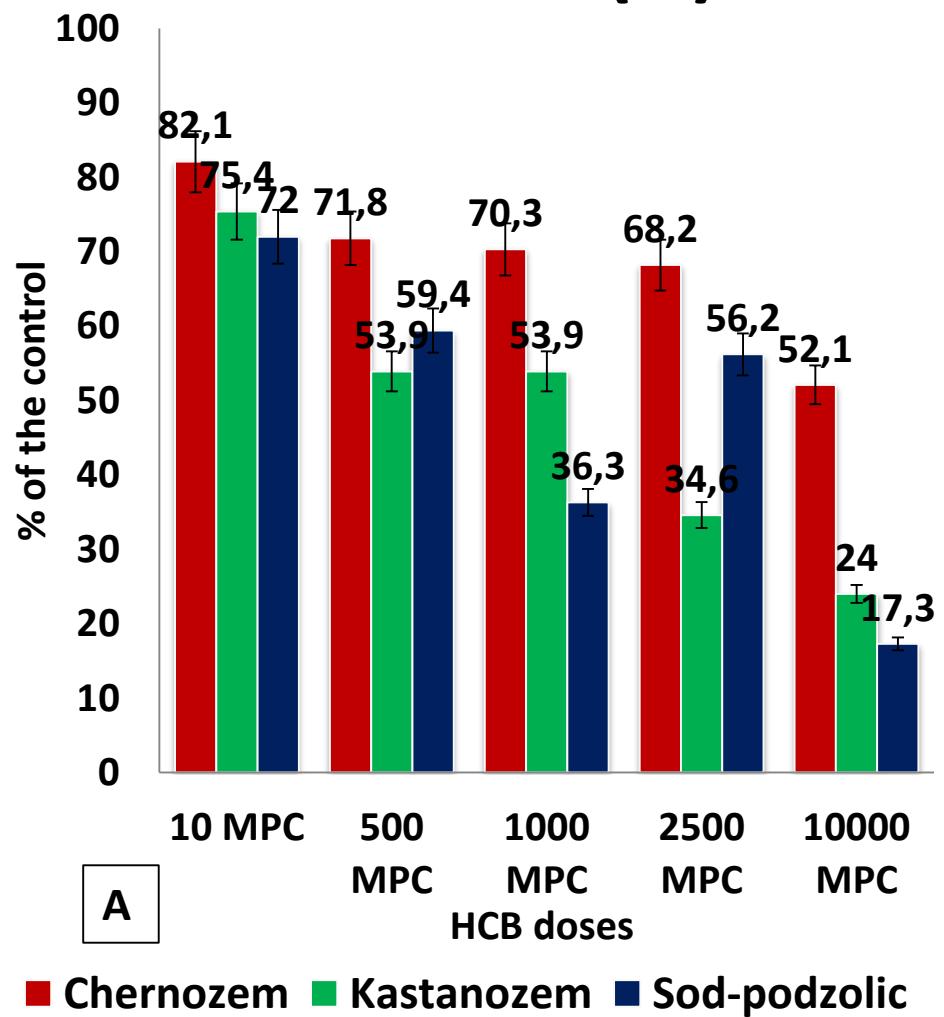
# Scheme of the experiment

HCB doses, MPC (maximum permissible concentration)	Soil types	Microbial groups	General indicators
10	Chernozem	Pedotrophicics	Soil respiration
500		Oligonitrotrophic and nitrogen-fixing bacteria	
1000	Dark-kastanozem	Phosphate- mobilizing bacteria	
2500		Amyloytics	
5000	Sod-podzolic soil	Ammonifying bacteria	Total microbial biomass
10 000		Streptomyces	
		Soil micromycetes	

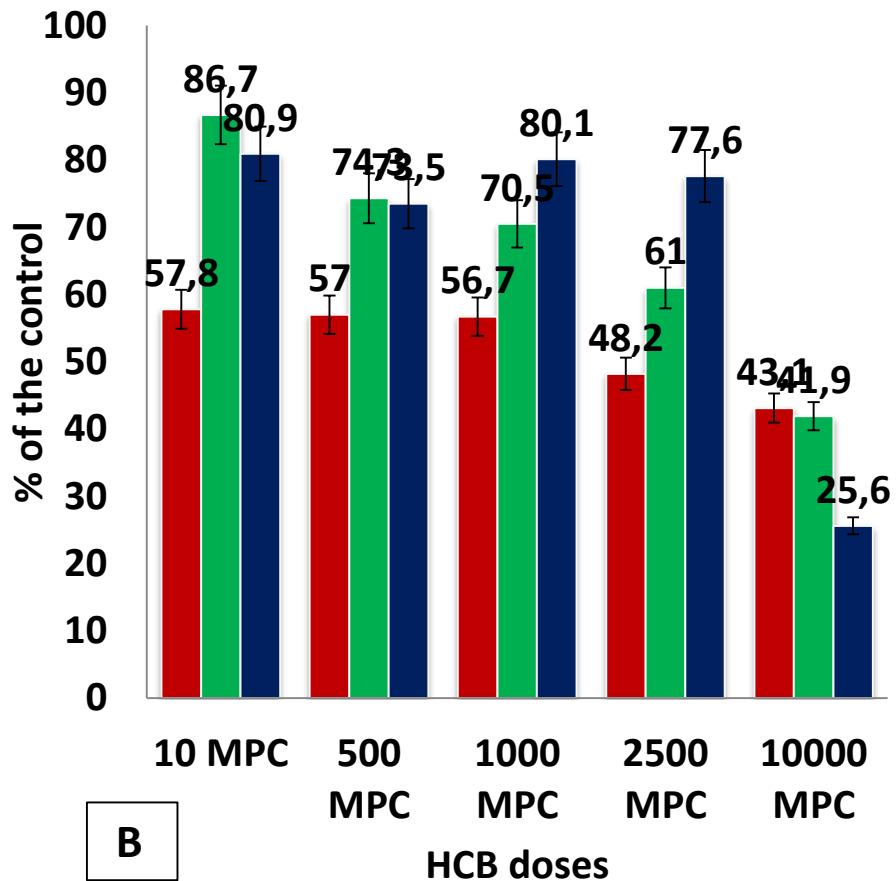
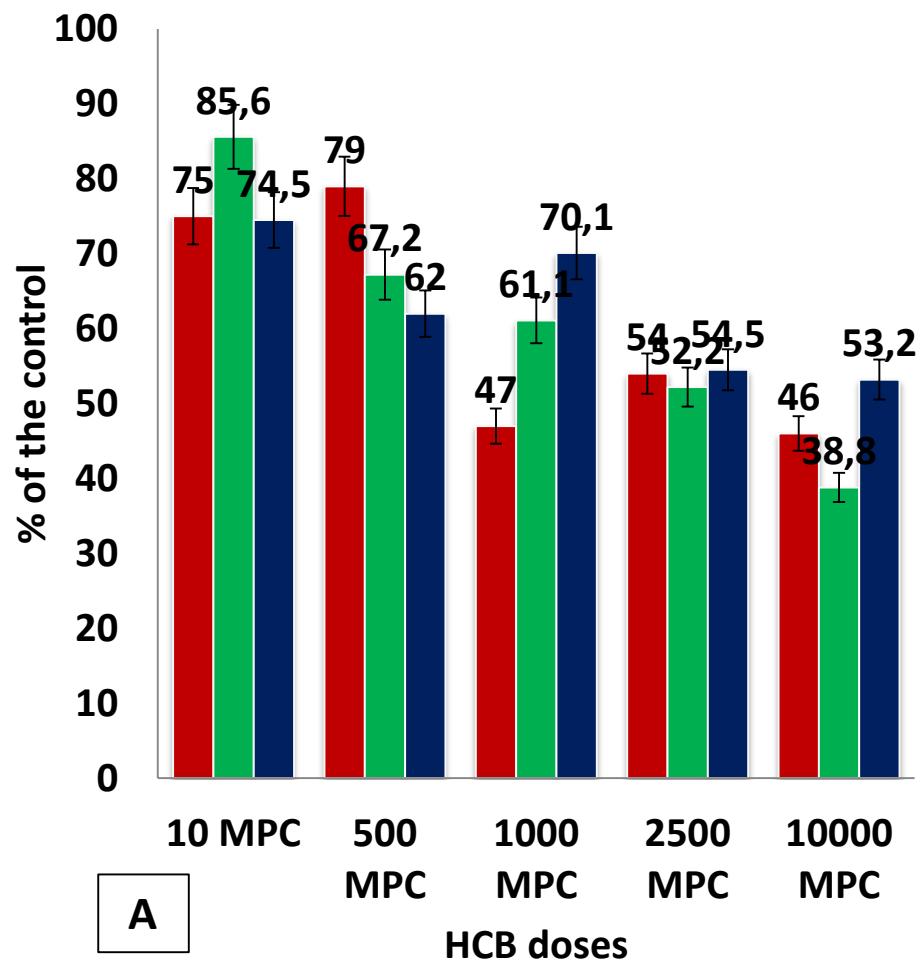
# Quantity of soil microorganisms of ecology-trophic groups



# The HCB influence to phosphate-mobilizing bacteria (A) and streptomycetes (B)

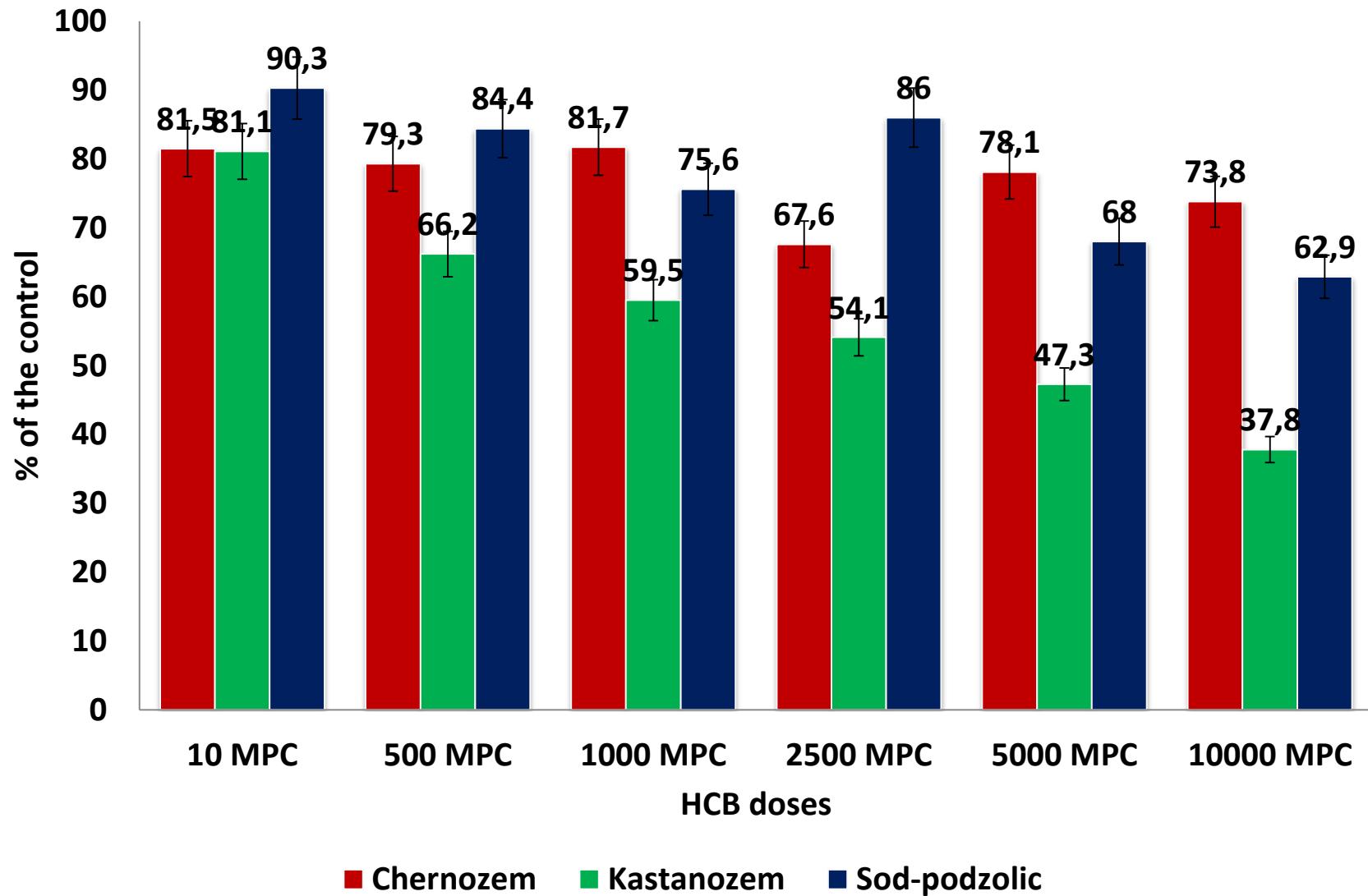


# The HCB influence to amyloytic (A) and oligonitrotrophic and nitrogen-fixing (B) bacteria

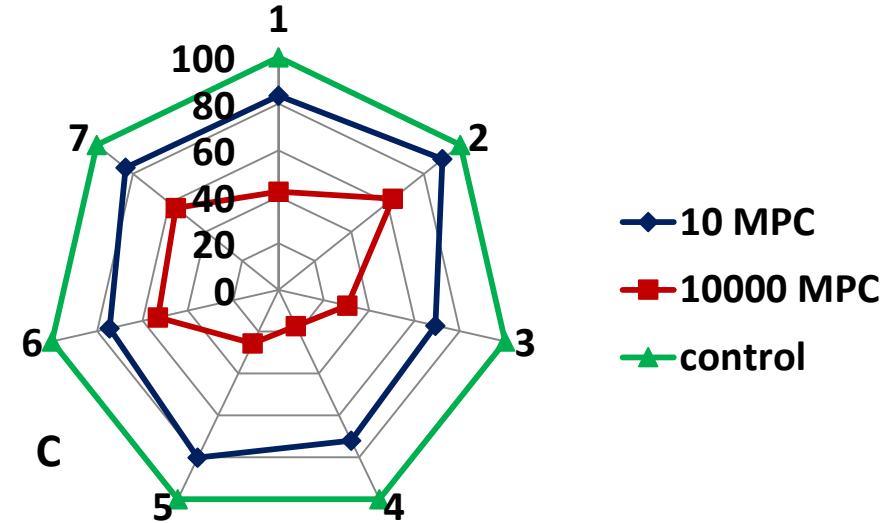
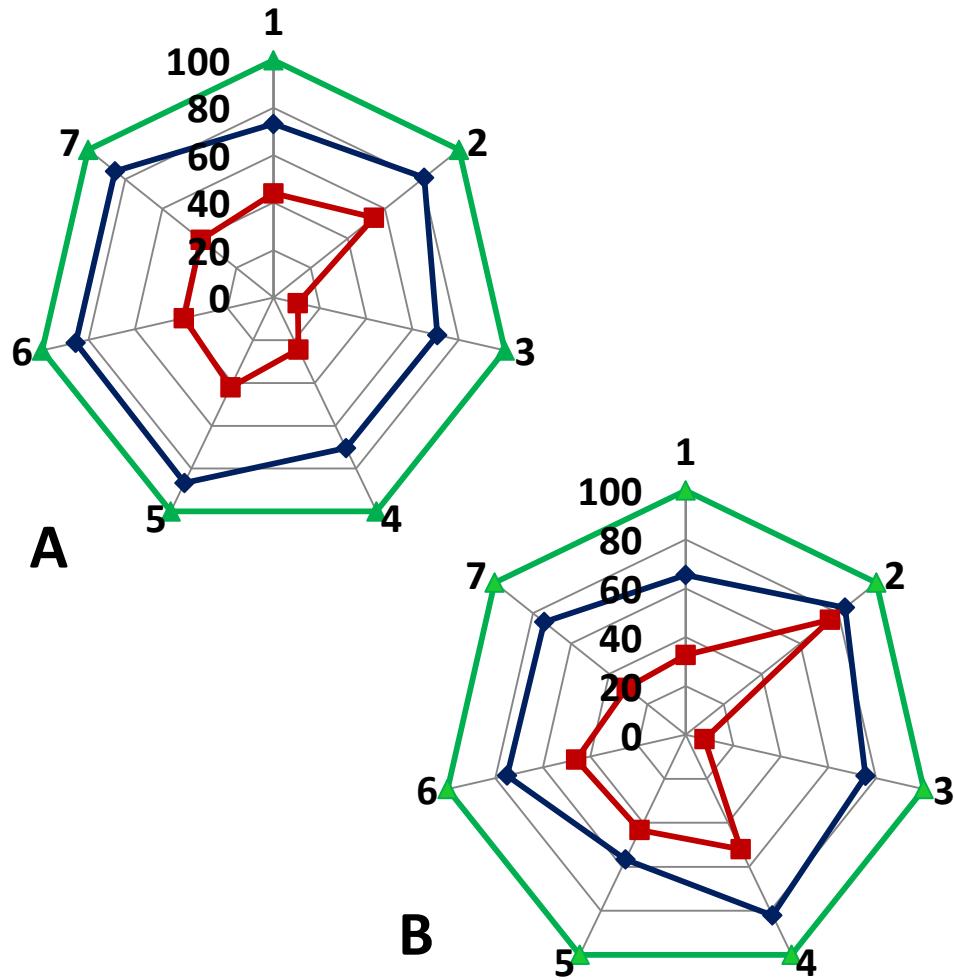


■ Chernozem ■ Kastanozem ■ Sod-podzolic

# The effect of HCB on the of micromycetes in different soils



# The effect of HCB on soil microbiocenoses of dark-kastanozem (A), chernozem (B), sod-podzolic (C) soil types (% to the control)



- 1-Pedotrophic
- 2-Micromycetes
- 3-Streptomyces
- 4-Phosphate-mobilizing
- 5-Oligonitrotrophic and nitrogen-fixing
- 6-Amylolytic
- 7-Ammonifying bacteria

# Rate of basal (BR) and substrate induced soil respiration (SIR)

Soil types	Chernozem	Sod-Podzolic	Kastanozem	Chernozem	Sod-Podzolic	Kastanozem
HCB doses	Rate BR, mg CO <sub>2</sub> /g·h			Rate of SIR, mg CO <sub>2</sub> /g·h		
control	49,4 ± 2,3	42,4 ± 2,1	50,1 ± 2,5	100,7 ± 5,0	52,6 ± 2,6	106,5 ± 5,3
500 MPC	34,8 ± 1,7	19,6 ± 1,0	63,1 ± 3,1	94,5 ± 4,7	73,7 ± 3,7	70,0 ± 3,5
2500 MPC	26,7 ± 1,3	41,5 ± 2,1	24,9 ± 1,3	50,9 ± 2,5	48,2 ± 2,4	34,2 ± 1,7
10 000 MPC	18,4 ± 0,9	30,3 ± 1,5	6,7 ± 0,3	36,7 ± 1,8	36,0 ± 1,8	31,3 ± 1,6

# The effect of HCB to microbial biomass in different soils

Soil types	Chernozem	Sod-Podzolic	Kastanozem
HCB doses	Biomass , g/kg		
control	$47,3 \pm 2,4$	$27,2 \pm 1,4$	$52,0 \pm 2,6$
500 MPC	$55,0 \pm 2,8$	$21,6 \pm 1,1$	$6,3 \pm 0,3$
2500 MPC	$22,2 \pm 1,1$	$5,1 \pm 0,3$	$8,6 \pm 0,4$
10 000 MPC	$17,0 \pm 0,9$	$4,0 \pm 0,2$	$23,1 \pm 1,2$

# Spearman correlation coefficient of depending the microorganisms quantity from the contamination dose

Microbial groups	Soil types		
	Chernozem	Sod-Podzolic	Kastanozem
	Spearman correlation coefficient		
Pedotrophic	-0,75 ± 0,04	-0,64 ± 0,03	-0,96 ± 0,05
Oligonitrotrophic and nitrogen-fixing bacteria	-0,75 ± 0,04	-0,7 ± 0,04	-0,96 ± 0,05
Phosphate- mobilizing bacteria	-0,96 ± 0,05	-1 ± 0,05	-1 ± 0,05
Amyloytics	-0,96 ± 0,05	- 0,96 ± 0,05	-0,96 ± 0,05
Ammonifying bacteria	-0,7 ± 0,04	-0,67 ± 0,03	-0,75 ± 0,04
Streptomyces	-1 ± 0,05	-0,96 ± 0,05	-0,96 ± 0,05
Soil micromycetes	-1 ± 0,05	-0,96 ± 0,05	-1 ± 0,05

# Conclusions

1. Microbiocenoses of chernozem, dark - kastanozem, sod-podzolic soils in intensive agrocenoses are sensitive to contamination of HCB in doses from 10 -10 000 MPC. The most sensitive were phosphate mobilizing bacteria and streptomycetes, and the most resistant were soil micromycetes.
2. The stability of soil microorganisms under conditions of HCB loading is irreversibly violated, since, the ability to recovery of the quantity was not detected in any of the studied soil types.
3. A clear inverse dependence of the microbial quantity on the dose of HCB contamination was revealed; the highest negative correlation (-0,96 – -1) was characterized by streptomycetes, phosphate-mobilizing bacteria and micromycetes.
4. The negative reaction of microbial groups on HCB indicates the necessity to perform the rehabilitation activities.

**Thanks for your attention!**