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12th International Symposium on Earthworm Ecology

ACTIVEsoil

Impact of different tillage systems and crop rotations on earthworm communities and soil characteristics

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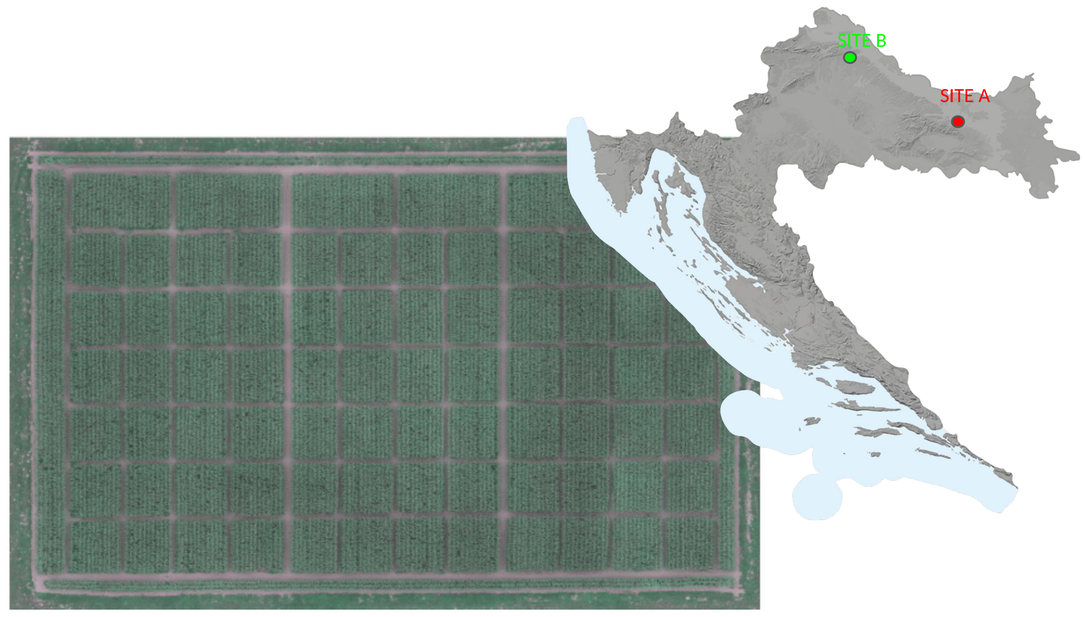
INTRODUCTION

Increasing degradation of agricultural soils urges the need for following the principles of sustainable soil management. The importance of soil organisms for soil health and, consequently, sustainable agriculture in the future became widely acknowledged. Conservation tillage has been associated with numerous soil quality parameters improvements including increased earthworm activity and biomass. Moreover, under conservation tillage earthworms can play a more important role by exploiting their abilities of bioturbation and impact on nutrient cycling.

EXPERIMENTAL SITES & SETUP

Within ACTIVEsoil project two experimental sites for a long-term field experiment were chosen.
At site A a field experiment was set before the project, while site B has not been cultivated 15 years prior to the project.
The experiment was set up on RCBD design with three repetitions.



SITE A (2021)

Tillage treatment	Depth (cm)	pH (Kcl)	pH (H2O)	Eh (mV)	ORP (mV)	AL-P2O5 (mg AL	K2O (mg/	SOC (%)	SOM (%)
ST	0-15	4,32	6,03	4,88	283,88	10,57	15,30	1,39	2,78
		0,10	0,10	0,56	2,84	1,43	2,51	0,11	0,22
CTD	0-15	4,89	6,44	6,64	282,31	12,57	13,84	1,47	2,94
		0,49	0,27	2,50	14,13	1,74	1,18	0,08	0,15
CTS	0-15	4,81	6,29	8,62	289,56	10,56	14,16	1,38	2,76
		1,06	0,66	7,08	8,12	3,86	3,03	0,16	0,32
ST	15-30	4,36	6,05	5,17	277,28	11,37	16,46	1,45	2,90
		0,11	0,09	0,44	3,08	2,04	3,87	0,07	0,15
CTD	15-30	4,81	6,45	5,70	292,56	12,76	12,89	1,41	2,83
		0,47	0,28	1,71	19,80	1,81	1,05	0,11	0,21
CTS	15-30	4,78	6,36	8,20	307,05	10,14	13,15	1,34	2,67
		1,02	0,64	7,19	5,39	3,38	2,18	0,14	0,28

SITE B (2021)

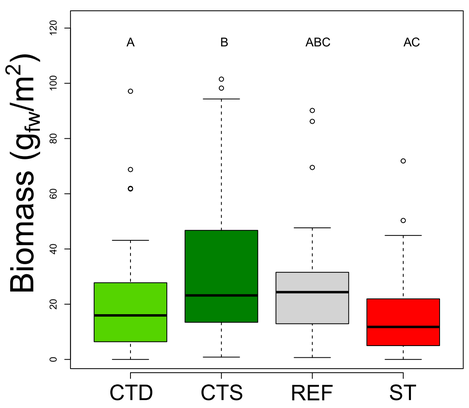
Tillage treatment	Depth (cm)	pH (Kcl)	pH (H2O)	Eh (mV)	ORP (mV)	AL-P2O5 (mg AL	K2O (mg/	SOC (%)	SOM (%)
ST	0-15	5,77	7,03	7,69	235,78	18,11	6,92	1,11	2,22
		0,40	0,48	1,12	16,64	3,42	0,57	0,10	0,20
CTD	0-15	5,43	6,39	7,47	253,71	22,21	6,46	1,17	2,34
		0,26	0,28	1,12	11,33	3,19	0,29	0,09	0,18
CTS	0-15	5,40	6,68	7,33	225,53	24,39	7,55	1,25	2,49
		0,32	0,25	0,64	14,58	4,56	0,64	0,12	0,24
ST	15-30	5,80	6,91	7,71	233,73	19,59	7,13	1,09	2,19
		0,43	0,45	1,26	21,07	4,60	0,54	0,09	0,18
CTD	15-30	5,27	6,56	7,03	282,63	17,33	9,66	1,29	2,59
		0,45	0,26	1,93	30,11	5,44	3,63	0,18	0,36
CTS	15-30	4,78	6,36	8,20	307,05	10,14	13,15	1,34	2,67
		1,02	0,64	7,19	5,39	3,38	2,18	0,14	0,28

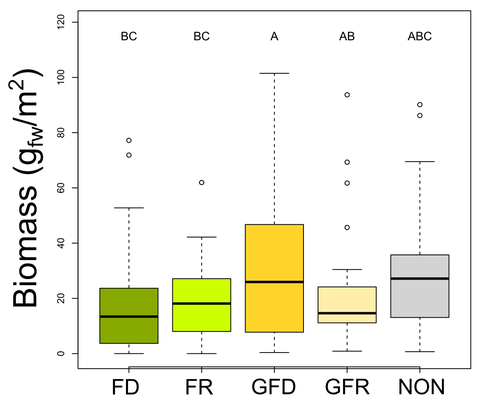
Three (3) different soil tillage treatments were applied as the main experimental factor, as follows:
ST - Conventional/standard tillage with ploughing up to 30 cm depth,
CTD - Conservation tillage deep– only chiseling with min. 30% crop residues
CTS - Conservation tillage shallow – shallow soil surface preparation by chisel plough up to 10 cm depth, crop residues cover 50%.

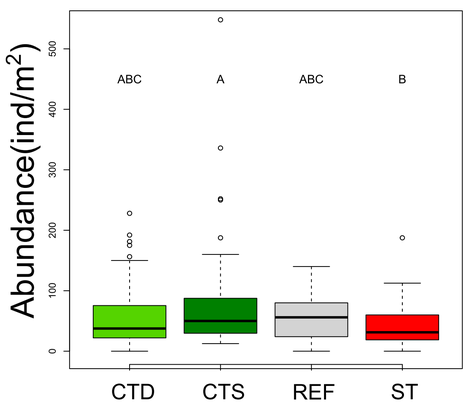
Fertilization treatments:
FR- recommended fertilization (NPK)
FD- recommended fertilization reduced by 50%;
GFR-recommended fertilization plus GeO 2 (biophysiological soil activator);
GFD- recommended fertilization reduced by 50% plus GeO 2.

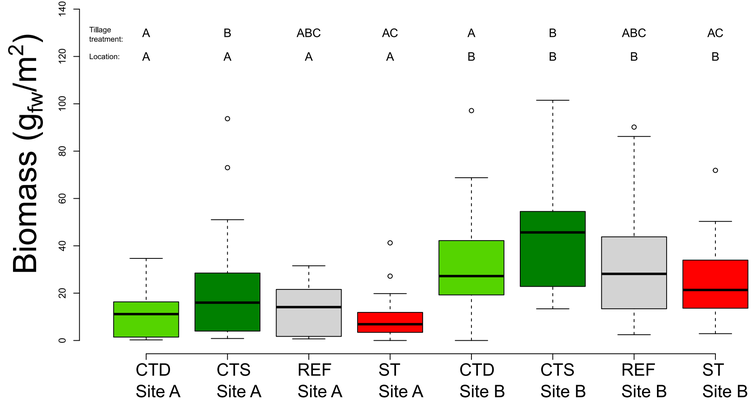
Liming:
CY- liming treatment according to recommendation
CN -without liming treatment

Earthworm sampling:
Earthworms are sampled twice a year (spring and autumn) with hand sorting 25 x 25 cm soil block.
Fresh weight, total abundance, abundance of juveniles and adults is recorded.
Adult specimens are identified to species level.









RESULTS

Regardless of the location both biomass and abundance were significantly higher in CTS tillage system). Additionally, recommended ferilization treatment with the addition of GeO 2 significantly affected biomass.
A significant difference in biomass between sites is observed. However, that difference is due to a difference in earthworm community.
Namely, the most abundant species at Site A is *Proctodrilus antipai* - a very small endogeic species, while at Site B the most abundant species in *Aporrectodea caliginosa*. The abundance is not significantly different between sites.
The number of species between treatment also did not differ.

Further sampling andadditional parameters will be done during project.

HRZZ Croatian Science Foundation

IP-2020-02-2647 Assessment of conservation soil tillage as advanced methods for crop production and prevention of soil degradation