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# ABUNDANCE AND DIVERSITY OF SOIL MESOFAUNA UNDER TILLAGE SYSTEM IN MAIZE PLANTATION AT ULTISOLS SOIL

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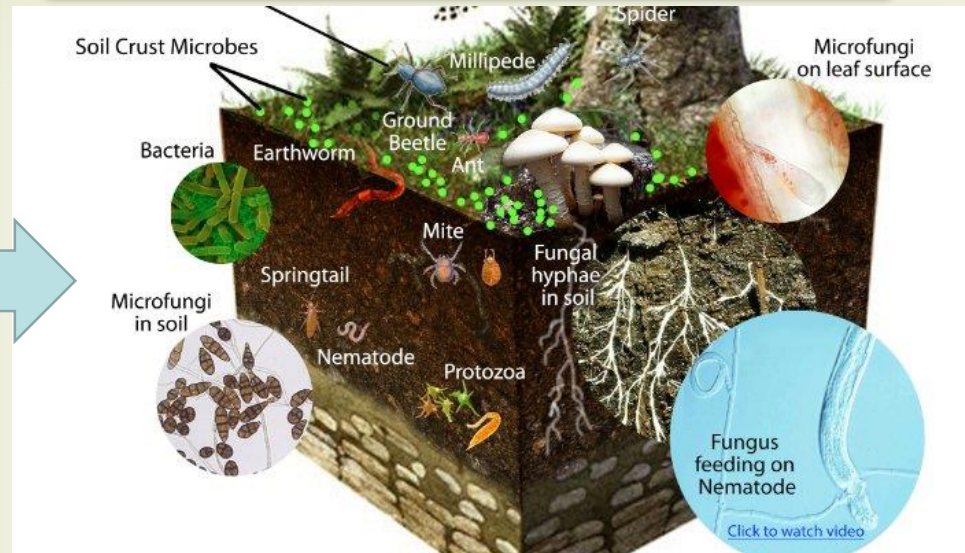
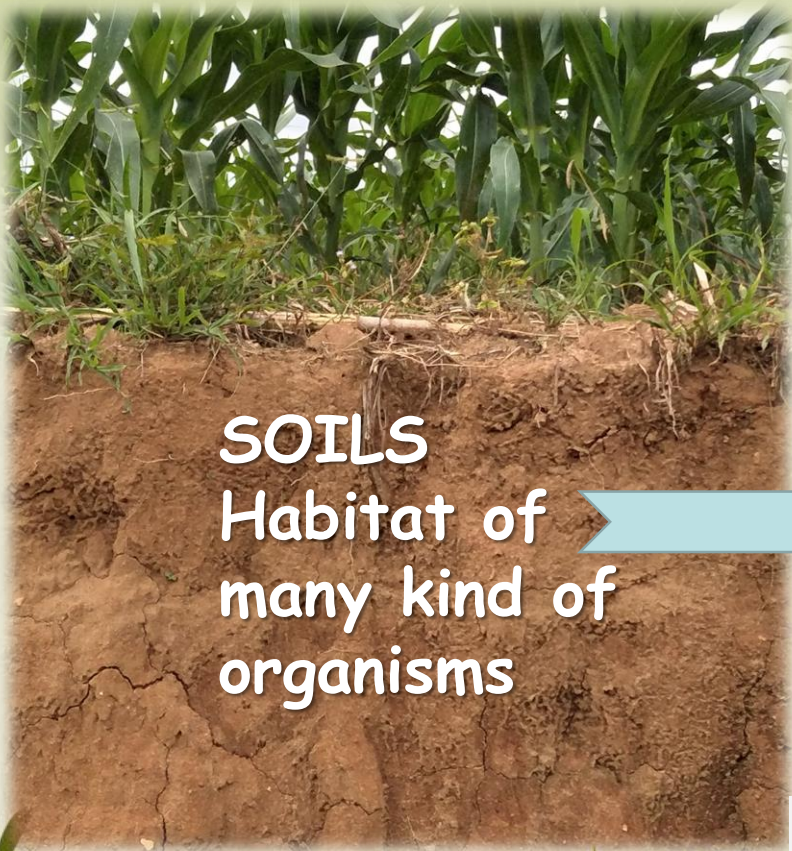


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# Introduction

5% is Organic matter

Organism (macro-, meso-, microorganism)



✓ High biological diversity is an indicator of soil quality.

# Agriculture Practice for increasing productivity

**Tillage**, fertilizer, irrigation, **pesticides**, etc

Organic matter as a food suplay

Bacteria, fungi,  
actinomycetes,  
namatodes, acarina,  
collembola,  
earthworm, etc

Factory of life

Sensitive organisms??

Soil Mesofauna

# Purpose

- to study the change of abundance and diversity of soil mesofauna because of tillage and herbicides application in maize plantation at ultisol soils



# Materials and Methods

## Treatments to the soil; preparation for maize

- ✓ MT: minimum tillage (manual weeding, weed covered soil);
  - ✓ MT+H: minimum tillage + herbicide with active ingredient Glyphosate 2,4 - D (application on 2 days before weed cleaning and 2 days after second fertilization);
  - ✓ FT: full tillage (weed remove from plot),
  - ✓ FT+H: full tillage + herbicide.
- Field design: completely randomized block design
  - 4 blocks
  - Plot size: 3 m x 4 m

# Enumeration of Soil Mesofauna

- Sampling: twice, at vegetative maximum and harvest time
- Composite five point per plot, depth 10 cm, and 100 g soils
- Extracted by Berlese-Tullgren apparatus
- Ethanol 70% for keep a while
- Observed with microscope



# Data Analysis

- Abundance of soil meso fauna (individuals per dm<sup>3</sup>)
- Shannon-Wiener diversity index

$$H' = - \sum_{n=1}^n (p_i \cdot \ln p_i)$$

- Simpson dominance index

$$D = \sum p_i^2$$

$$D = \sum [n_i(n_i-1)/N(N-1)]$$

Analysis of Variance and LSD test at 5% level



# Results and Discussion



# Selected soil characteristics of after maize harvest

Soil properties	Treatments			
	MT	MT+H	FT	FT+H
Temperature (°C)	25.9	25.8	25.9	25.8
Water content (%)	32.3	28.1	32.5	28.8
pH (H <sub>2</sub> O)	6.4	6.4	6.9	6.6
Organic-C (%)	1.5	1.5	1.8	1.8
Total-N (%)	0.1	0.1	0.1	0.1
C/N ratio	12.5	11.8	17.5	14.9

# Abundance of soil mesofauna at vegetative maximum and harvest phase of sampling in maize plantation

Treatments	Abundance of soil mesofauna	
	Vegetative maximum	Harvest time
	..... individuals dm <sup>-3</sup> .....	
MT	35 ± 12 a	315 ± 131
MT+H	136 ± 65 ab	226 ± 64
FT	262 ± 142 b	339 ± 187
FT+H	213 ± 102 b	258 ± 293
LSD 5%	138	ns

# Diversity of soil mesofauna orders that were found in each treatment

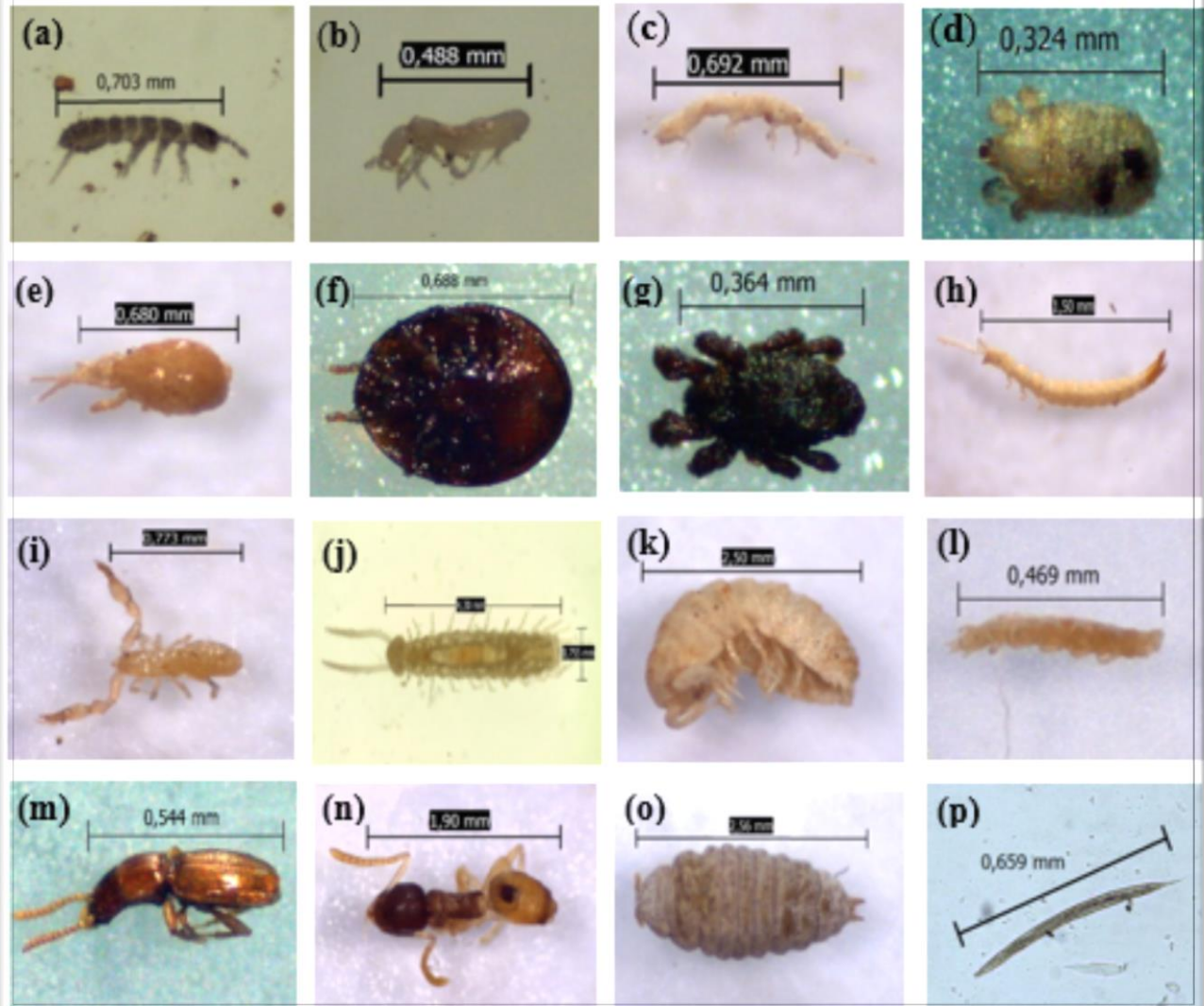
No	Treatments	Order and the abundance			
		Vegetative maximum		Harvest time	
		individuals dm <sup>-3</sup>		individuals dm <sup>-3</sup>	
1	Minimum Tillage	1. Collembola	3	1. Collembola	39
		2. Acarina	22	2. Acarina	226
		3. Diplura	3	3. Diplura	6
		4. Diplopod	4	4. Symphyla	6
		5. Unidentified	3	5. Nematodes	6
				6. Diplopod	29
		7. Unidentified	3		
	Total		35		315
2	Minimum Tillage + herbicide	1. Collembola	25	1. Collembola	33
		2. Acarina	97	2. Acarina	133
		3. Symphyla	3	3. Diplura	13
		4. Diplopod	7	4. Symphyla	10
		5. Unidentified	3	5. Pauropod	3
				6. Nematodes	3
				7. Diplopod	9
				8. Coleoptera	10
				9. Unidentified	12
	Total		136		226

# Diversity of soil mesofauna orders that were found in each treatment (countinous)

No	Treatments	Order and the abundance			
		Vegetative maximum		Harvest time	
			individuals dm <sup>-3</sup>		individuals dm <sup>-3</sup>
3	Full tillage	1. Collembola	66	1. Collembola	41
		2. Acarina	98	2. Acarina	185
		3. Diplura	3	3. Diplura	6
		4. Symphyla	3	4. Pseudoscorpiones	6
		5. Diplopod	61	5. Symphyla	9
		6. Coleoptera	19	6. Diplopod	47
		7. Unidentified	12	7. Coleoptera	9
				8. Hymenoptera	3
				9. Unidentified	33
	Total		262		339
4	Full tillage + herbicide	1. Collembola	36	1. Collembola	37
		2. Acarina	95	2. Acarina	162
		3. Diplura	5	3. Diplura	3
		4. Diplopod	38	4. Diplopod	39
		5. Coleoptera	25	5. Unidentified	6
		6. Hymenoptera	8	6. Coleoptera	11
		7. Unidentified	6		
	Total		213		258

# Order of soil mesofauna that founded at the each treatment

- (a) order *Collembola* suborder *Entomobryomorpha*;
- (b) order *Collembola* suborder *Symphyleona*;
- (c) (order *Collembola* suborder *Poduromorpha*;
- (d) order *Acarina* suborder *Oribatida*;
- (e) order *Acarina* suborder *Mesostigmata*;
- (f) order *Acarina* suborder *Prostigmata*;
- (g) order *Acarina* suborder *Astigmata*;
- (h) order *Diplura*;
- (i) (order *Pseudoscorpiones*;
- (j) order *Symphyla*;
- (k) order *Diplopod*;
- (l) order *Pauropod*;
- (m) order *Coleoptera*;
- (n) order *Hymenoptera*;
- (o) unidentified;
- (p) order *Nematodes*



# Diversity index

Treatments	Diversity index of soil mesofauna	
	Vegetative maximum	Harvest time
	..... H <sup>1</sup> .....	
MT	0.4 a	1.0
MT+H	0.5 ab	1.2
FT	<b>1.2 c</b>	1.1
FT+H	<b>1.2 c</b>	1.0
LSD 5%	0.3	ns

more divers

# Dominance index

Treatments	Dominancy index of soil mesofauna	
	Vegetative maximum	Harvest time
	..... D .....	
T0	0.6 ± 0.3	0.5 ± 0.1
T0+H	<b>0.7 ± 0.1</b>	0.4 ± 0.1
T1	0.4 ± 0.1	0.4 ± 0.3
T1+H	0.4 ± 0.2	0.4 ± 0.1
LSD 5%	ns	ns

Soil pH and abundance of soil mesofauna have significantly relation with the equation of  $y = 301,5x - 1704$  with the coefficient correlatin was 0,6 (n=16).

# Conclusions

- Application of minimum tillage was lowest abundance of soil mesofauna at vegetative phase, but no differences at generative phase
- Diversity index in full tillage were significantly higher than that in minimum tillage, on the contrary, the dominance index of soil mesofauna were not significantly different between tillage system.
- There were three dominant mesofauna orders namely Acarina, Collembola, and Diplopod.





**Thank  
You!**

**for your attention**