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Sewage sludge and tree pruning residue use in the recovery of degraded area and their effects on epigeic invertebrates of Brazilian Savannah soil

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Reuse potential of organic residues

Degraded areas:

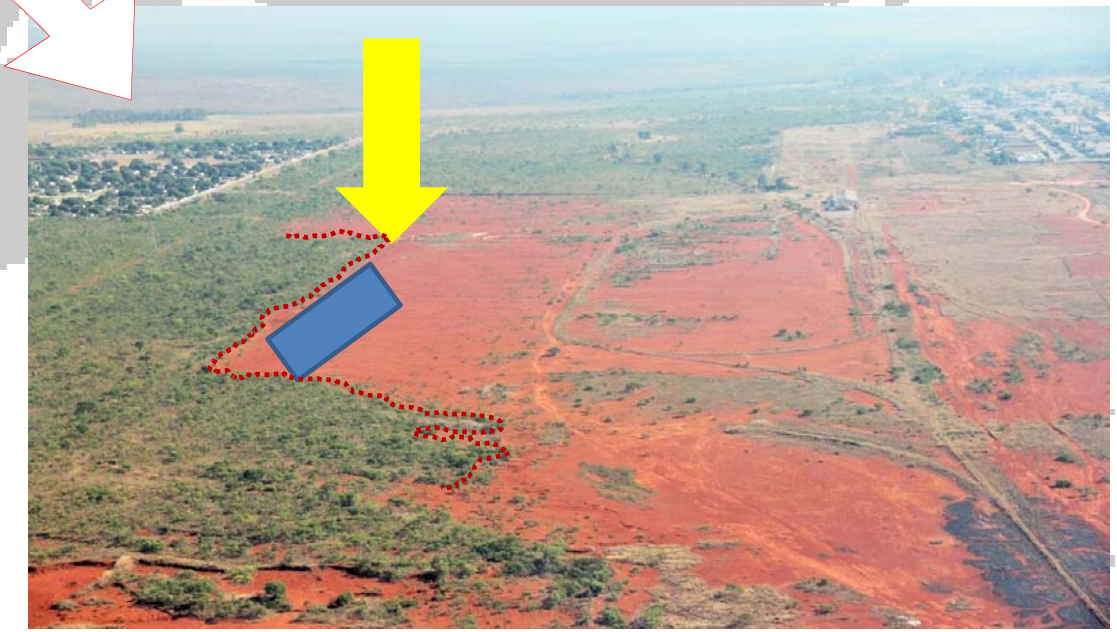
- Scarcity of organic matter and nutrients
- Exotic plants or no vegetation

Sewage sludge and tree pruning:

- Carbon and nutrients
- Constant-growing production

Photos: Terracap; Leonardo Fraga

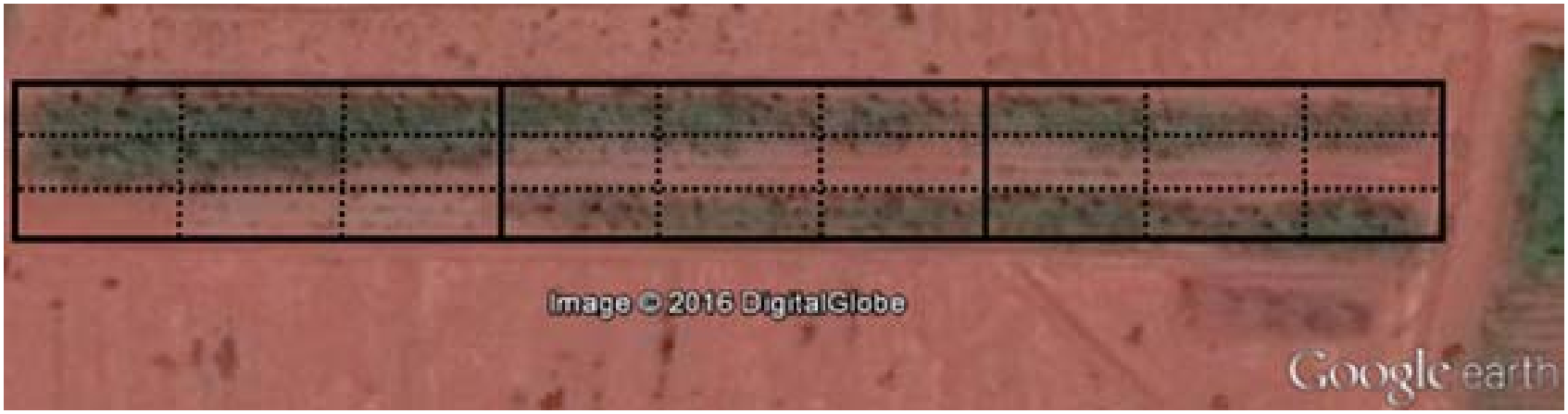
Location of experiment area



Map: Geology.com

Photo: Terracap

Experiment area



- Full Factorial experiment: 3 levels of 2 residues = 3^2 = 9 treatments

Treatments:

. Sewage sludge (SS) : (L0=0, L1 =270 and L2 =1080 m^3 ha^{-1})

. Tree pruning residue (TP): (P0=0, P1=122.5 and P2=245 Mg ha^{-1})

- 3 replicates (3 Blocks) and plots with 20 x 5 m

Experiment setup

- Sewage sludge: provided by municipal wastewater treatment plants (CAESB)

- Main characteristics:
  - 30% of TOC, 5% NTK and 1.5% P
  - fast decomposition rate (C:N ratio = 6:1)
  - pathogens and heavy metals

Experiment setup

- Tree pruning: provided by municipal urban development authority (NOVACAP)

- Main characteristics:
  - Crushed, green pruning, consisting of branches and leaves
  - 56% of TOC and 1% of N
  - Slow degradation rate (C:N ratio = 56:1)

Experiment setup

Photos: Leonardo Fraga

Experiment setup

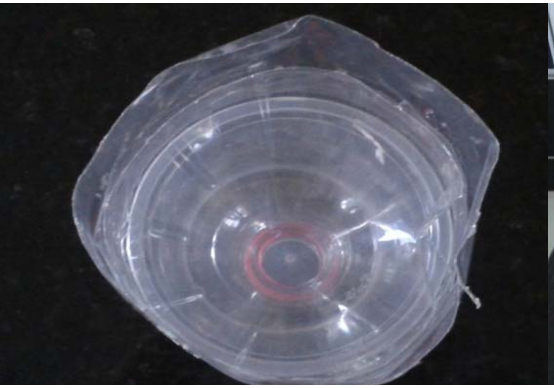
60 seedlings (with 2-8 months) of 10 different woody native Savannah species (6 seedlings/species) were planted in distances of 2m x 1m

Species	Ecological classification
Alibertia edulis	secundary
Alibertia sessilis	pioneering
Tabebuia aurea	pioneering
Copaifera langsdorffii	secundary
Anadenanthera colubrina	pioneering
Handoanthus impetiginosus	secundary
Peltrophorum dubium	pioneering
Senegalia polyphylla	pioneering
Sterculia striata	pioneering
Schinus terebinthifolius	pioneering

Photos: Leonardo Fraga

Evaluation

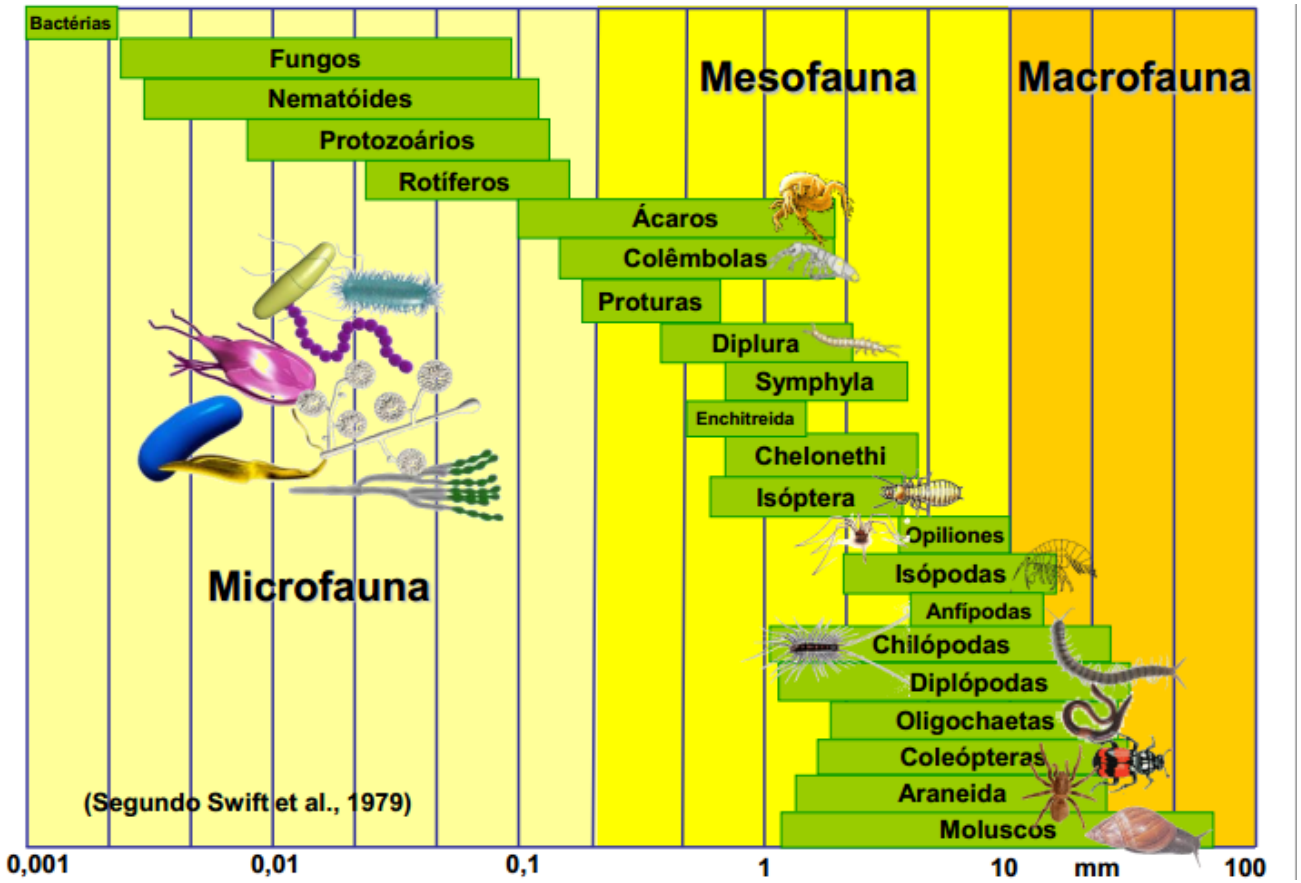
- Litter sampling: 25 x 25 cm frame
- Epigeic invertebrates sampling - pitfall traps
- Filled with 250 mL 0.5% (v/v) alcohol solution
- rainy season (March 2016) and dry season (August 2016)
- 4 traps/plot




Photos: Tatiana C. Amaral

Evaluation

Epigeic invertebrates



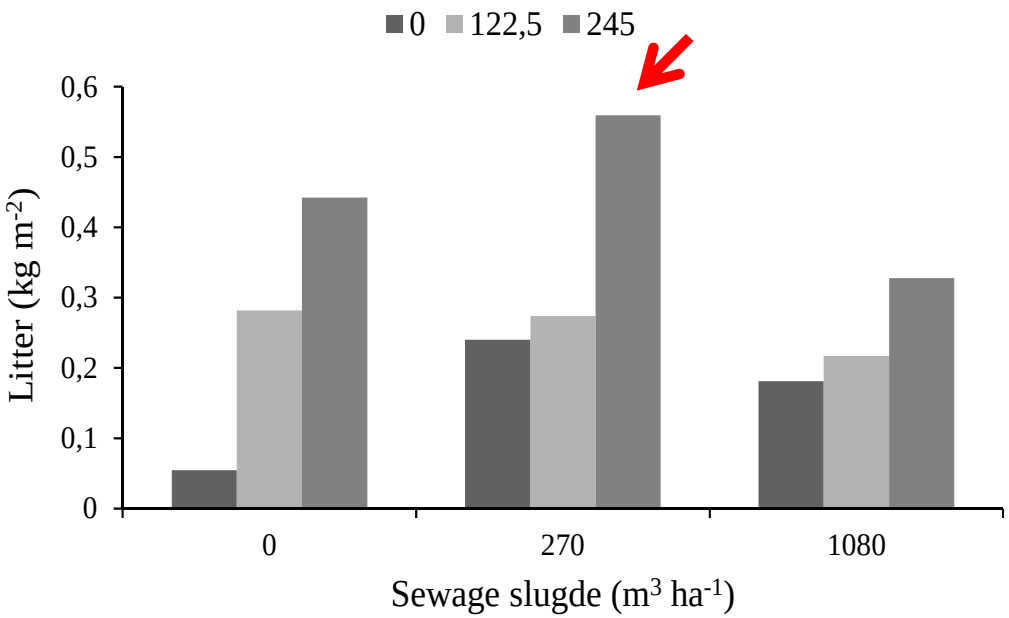
Evaluation

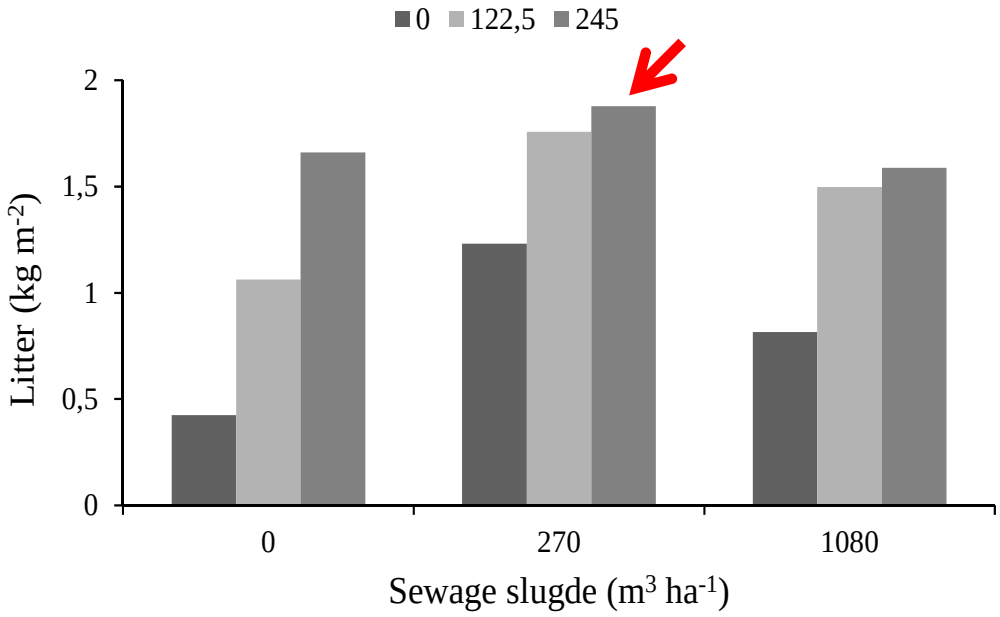
Data analysis:

- Litter deposition (Mg ha^{-1})

- Epigeic invertebrates:
  - taxonomic composition (grouped by order) (%)
  - total number of individuals in the experiment area
  - relative frequency in each treatment
  - density (number of individuals per treatment) and abundance (number of groups) in each treatment

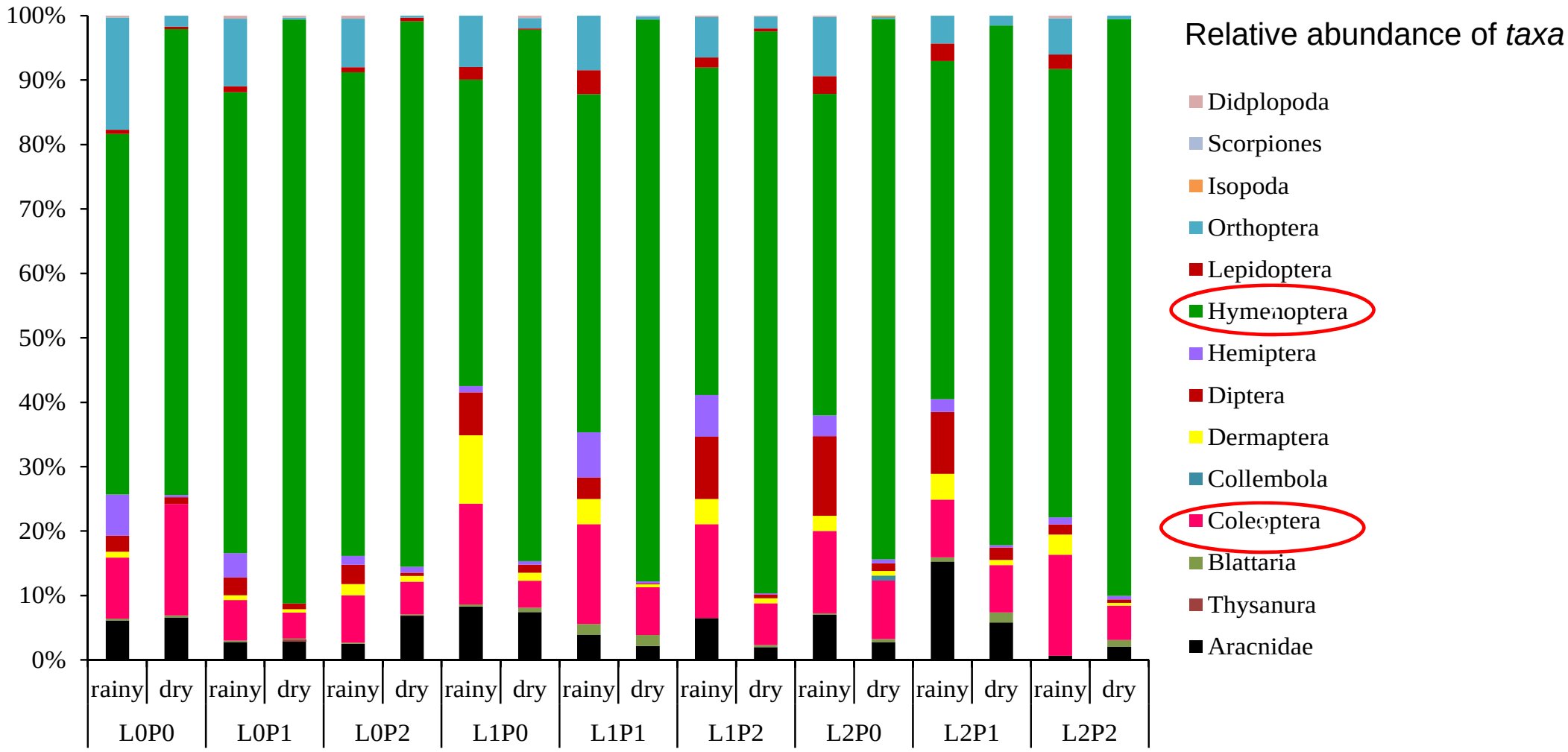
Results



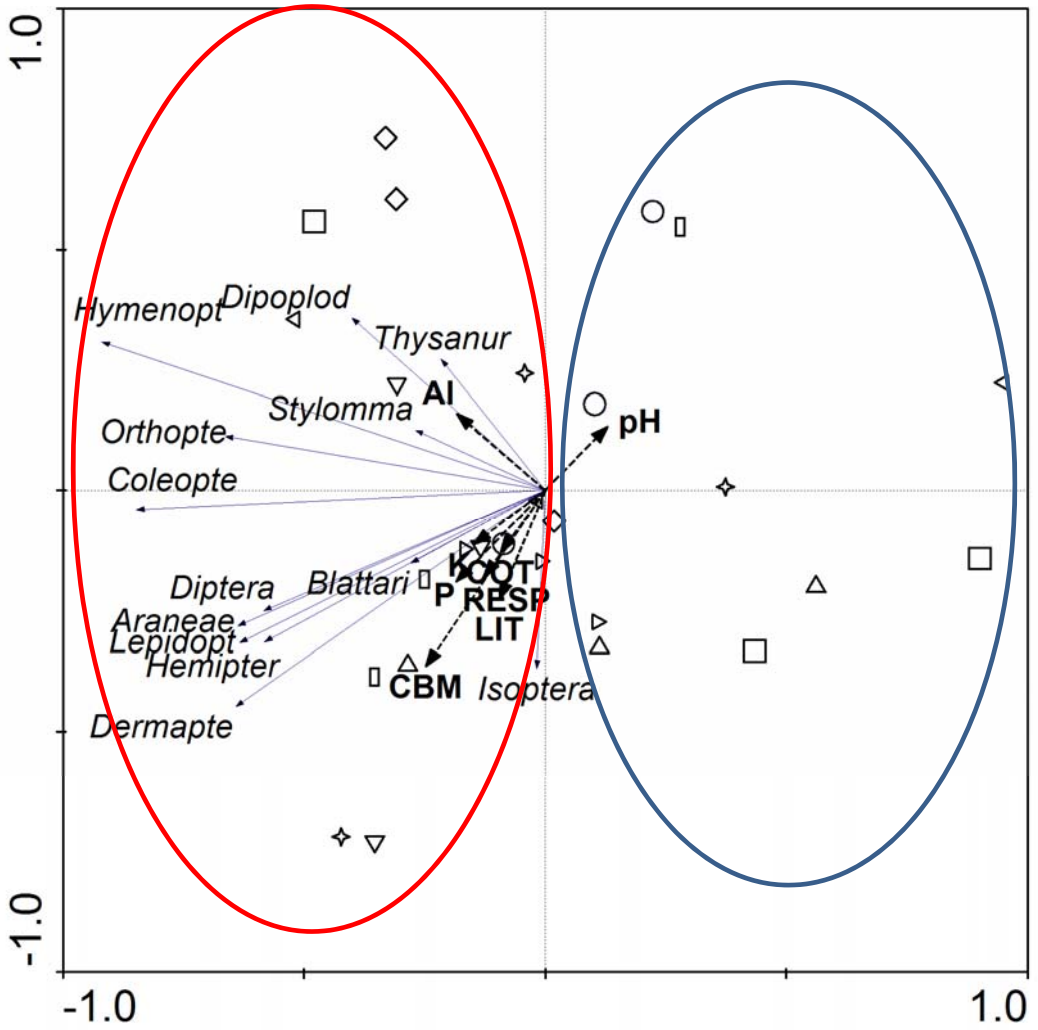


Litter Deposition after 24 and 30 months of recovery process

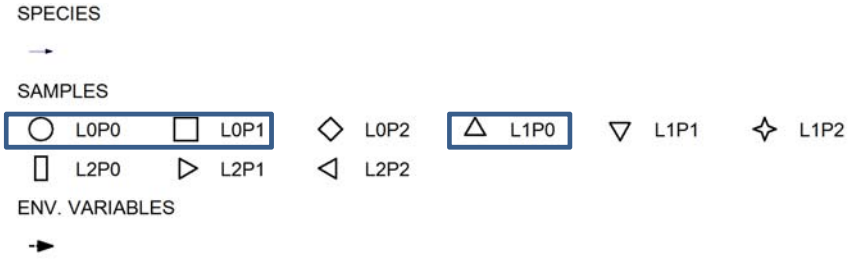
Results


100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
rainy
dry
L0P0
L0P1
L0P2
L1P0
L1P1
L1P2
L2P0
L2P1
L2P2
Relative abundance of *taxa*
Didplopoda
Scorpiones
Isopoda
Orthoptera
Lepidoptera
Hymenoptera
Hemiptera
Diptera
Dermaptera
Collembola
Coleoptera
Blattaria
Thysanura
Aracnidae

Results



Principal Component Analysis of epigeic invertebrates



<u>Environmental variables</u>:
COT – total organic carbon
CBM – microbial biomass carbon
RESP – microbial respiration
LIT – litter deposition
K – exchangeable potassium
P – available phosphorus
Al – exchangeable aluminum

Conclusion

- Recovery of degraded areas using organic matter from sewage sludge and tree pruning residue in the soil has stimulated litter deposition from the woody species introduced in the area.

- The major epigeic invertebrates groups found were: *Hymenoptera*, *Coleoptera,* *Orthoptera* and *Araneae*

Acknowledgements

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