



Improving vermicomposting of organic manures: effects of rate of manure application on carbon loss and microbial stabilization

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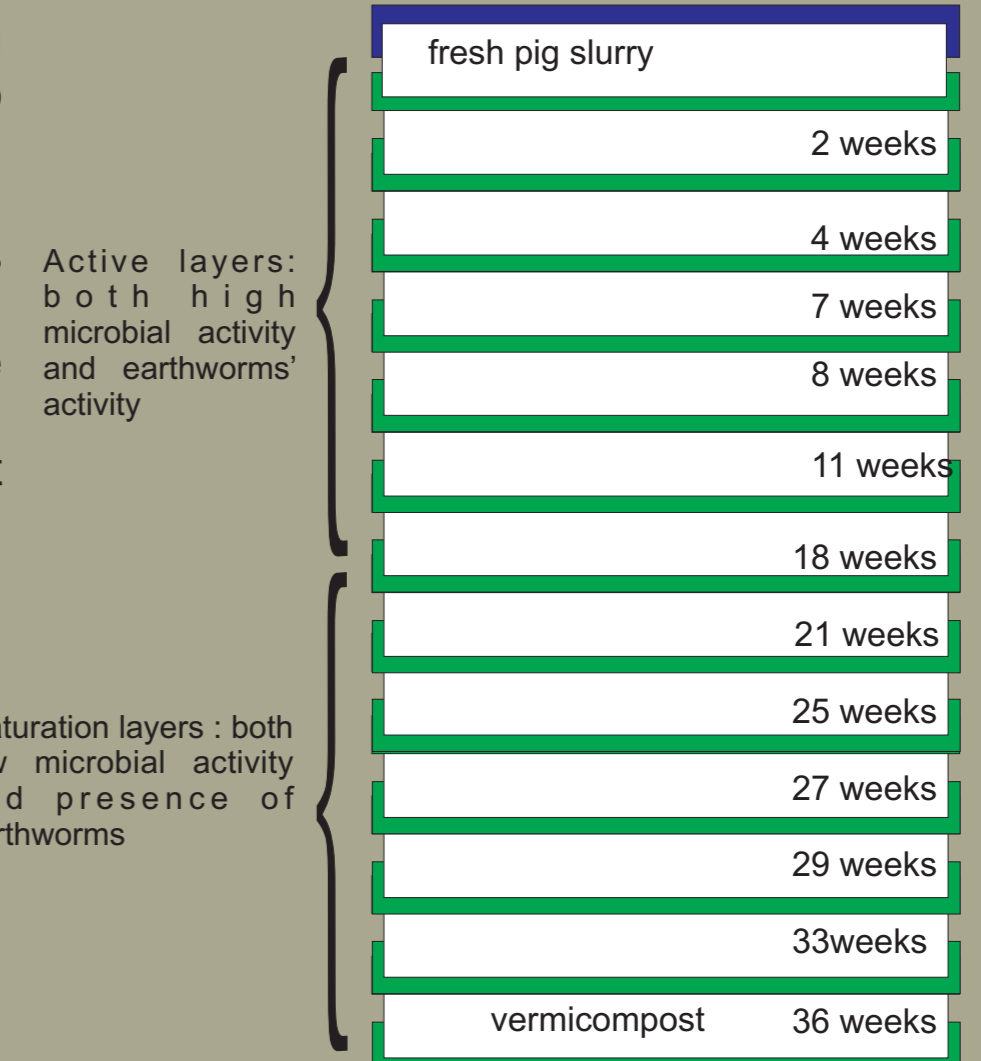
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RATIONALE

The decomposition systems depend on inputs of resources, that is, the components of the system do not have any control on their availability (regeneration). Vermicomposting is the process whereby organic residues are broken down by earthworms and microorganisms. Addition of manure has been shown to be of critical importance and determines most of the changes that take place during vermicomposting. Here we study how the rate of manure applied affects microbial biomass and activity and carbon losses.

EXPERIMENTAL DESIGN

We designed continuous feeding vermireactors with separated layers to date them. We set up six reactors with earthworm (500 mature initial population, ca. 85 g) and six reactors without (control). New layers with fresh pig slurry (1.5 and 3 kg fresh weight, we set up six reactors per rate of application of pig slurry) were added when the last ones were eaten by the earthworms and the experiment ended after 36 weeks.



Batch of reactors

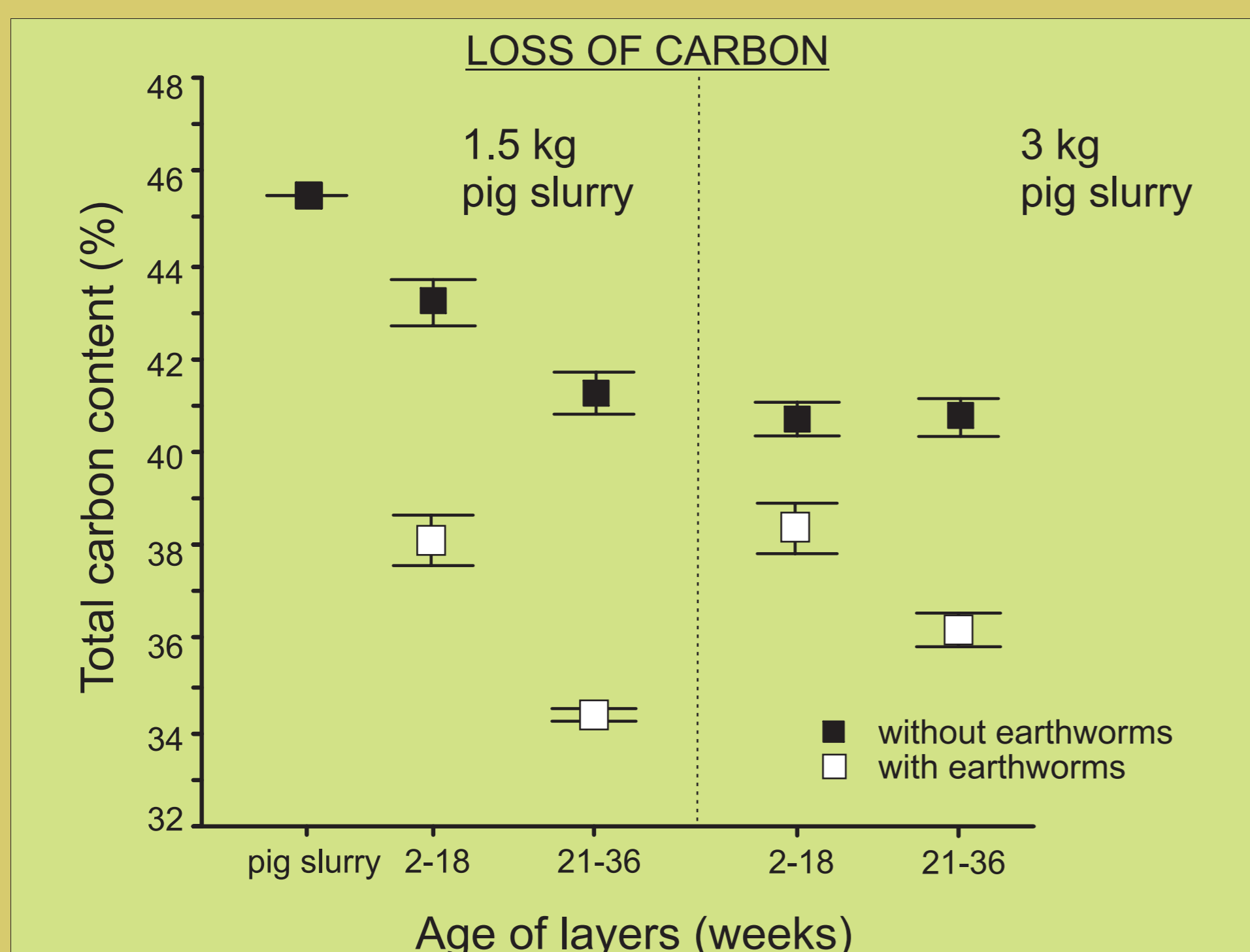
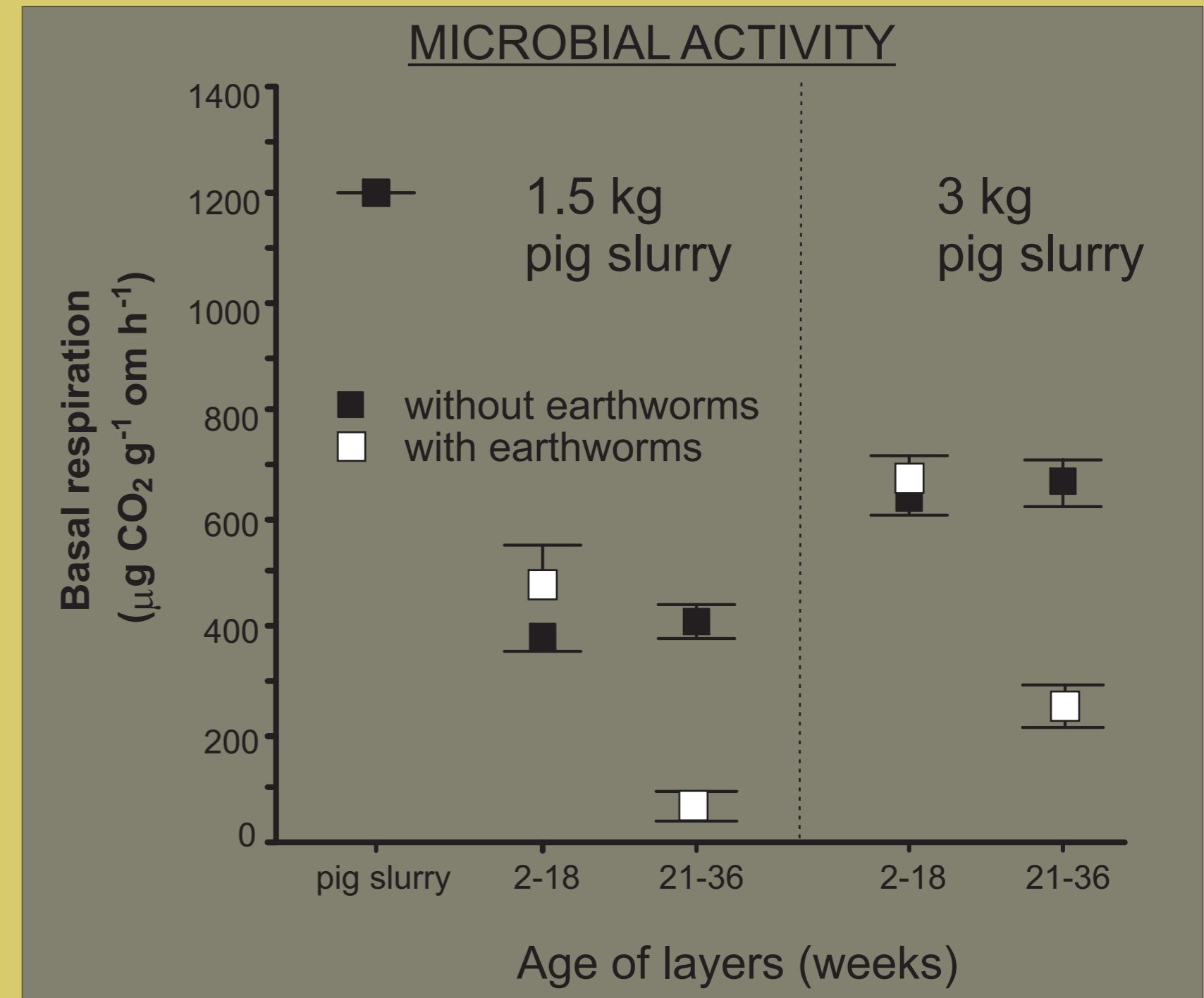
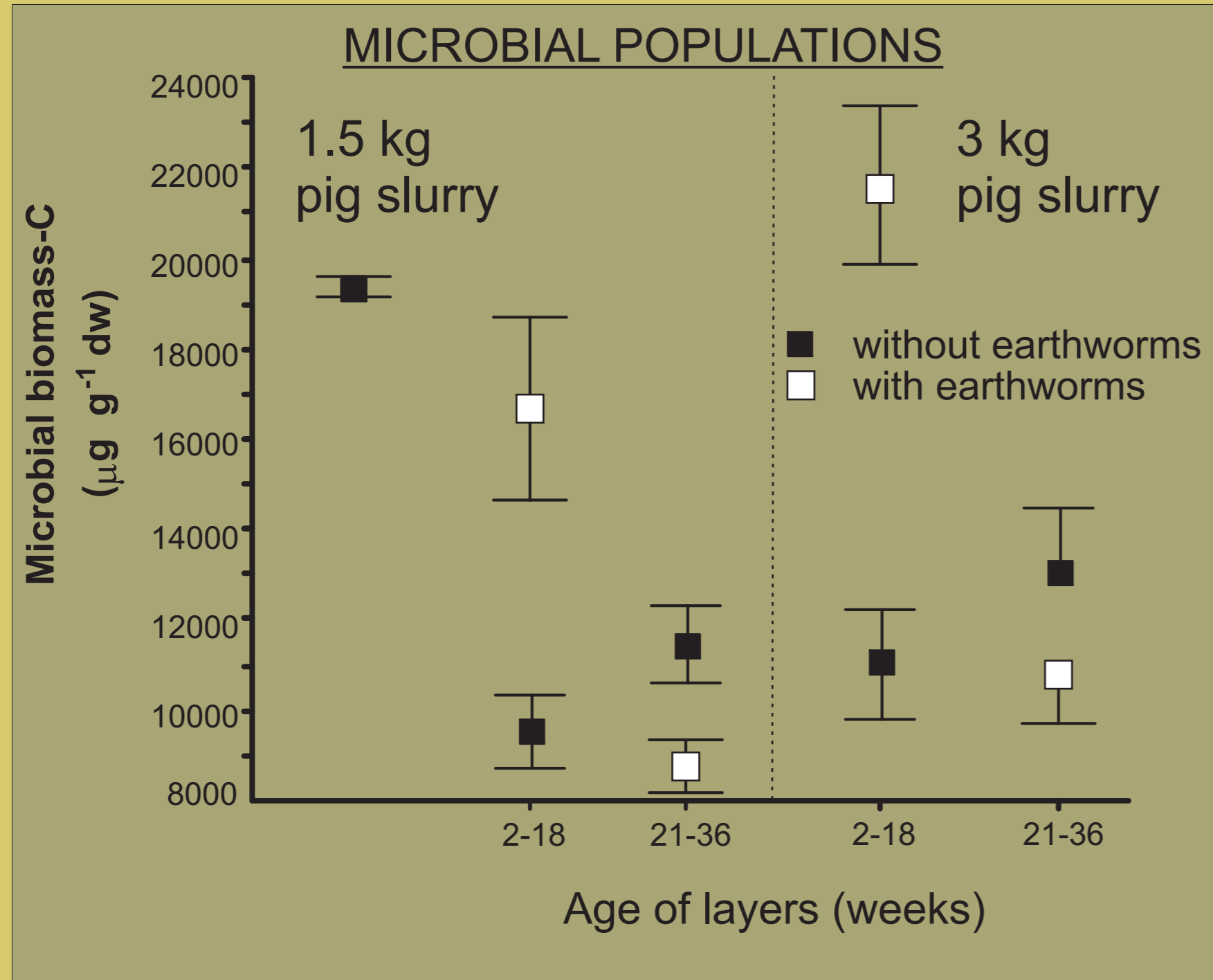


At the end there were nine layers with an age gradient of 0, 4, 8, 13, 21, 25, 27, 33 and 36

Material and methods

Experimental design

In order to better understand the effects of rate, earthworms and time on the decomposition of pig slurry, the figures represent the values of the initial or raw pig slurry, the mean of the values corresponding to 2-18 week-old layers (layers in which earthworms were present at sampling time) and the mean of values corresponding to 21-36 week-old layers (oldest layers without earthworms at sampling time). Five samples of substrate per module were taken at random and gently mixed for biochemical analyses, i.e. organic matter content, total C, microbial biomass C and basal respiration. Data were analyzed under a split plot repeated measures ANOVA design.



CONCLUSIONS

We found that earthworms increased microbial biomass and were more active in reactors fed with 3 kg of slurry. However the differential rates of respiration were not reflected in C losses. The results thus showed that loss of C was not affected by the rate of pig slurry applied. We conclude that despite the strong effect that the rate of manure has on microbe-earthworm relationships, it did not affect carbon losses. We therefore recommend the use of low application rates of manure when the objective is the microbial stabilization of the residue.