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Abstract

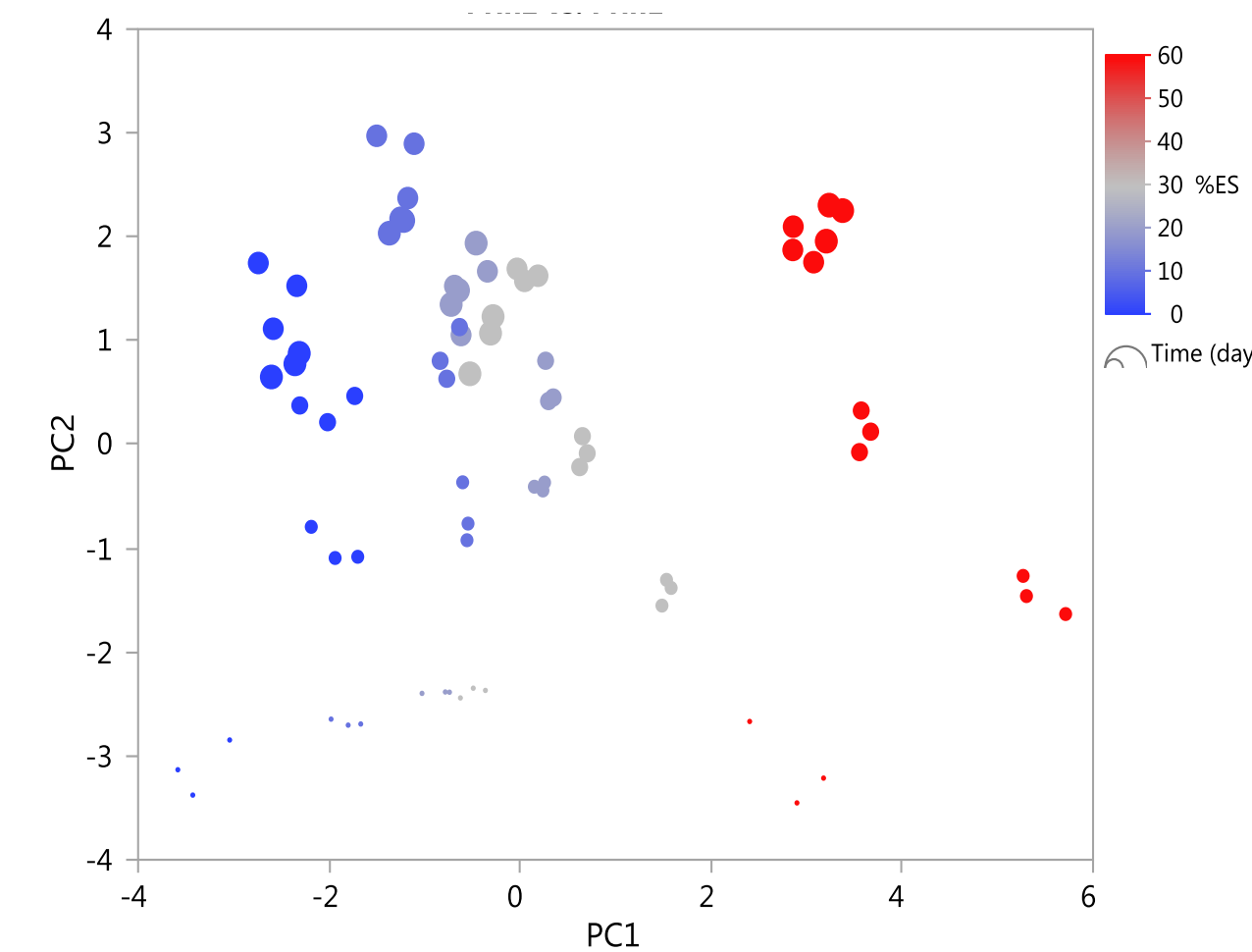
- Composting is a waste management process involving a variety of physical, chemical and biological parameters interacting in a complex way.
- Multivariate exploratory data analysis was implemented for unravelling the complex interactions among the design and operation variables of the process.
- As a case study, industrial eggshell (ES) co-composting with high levels of incorporation ($\leq 60\%$ w/w) was investigated.

Method

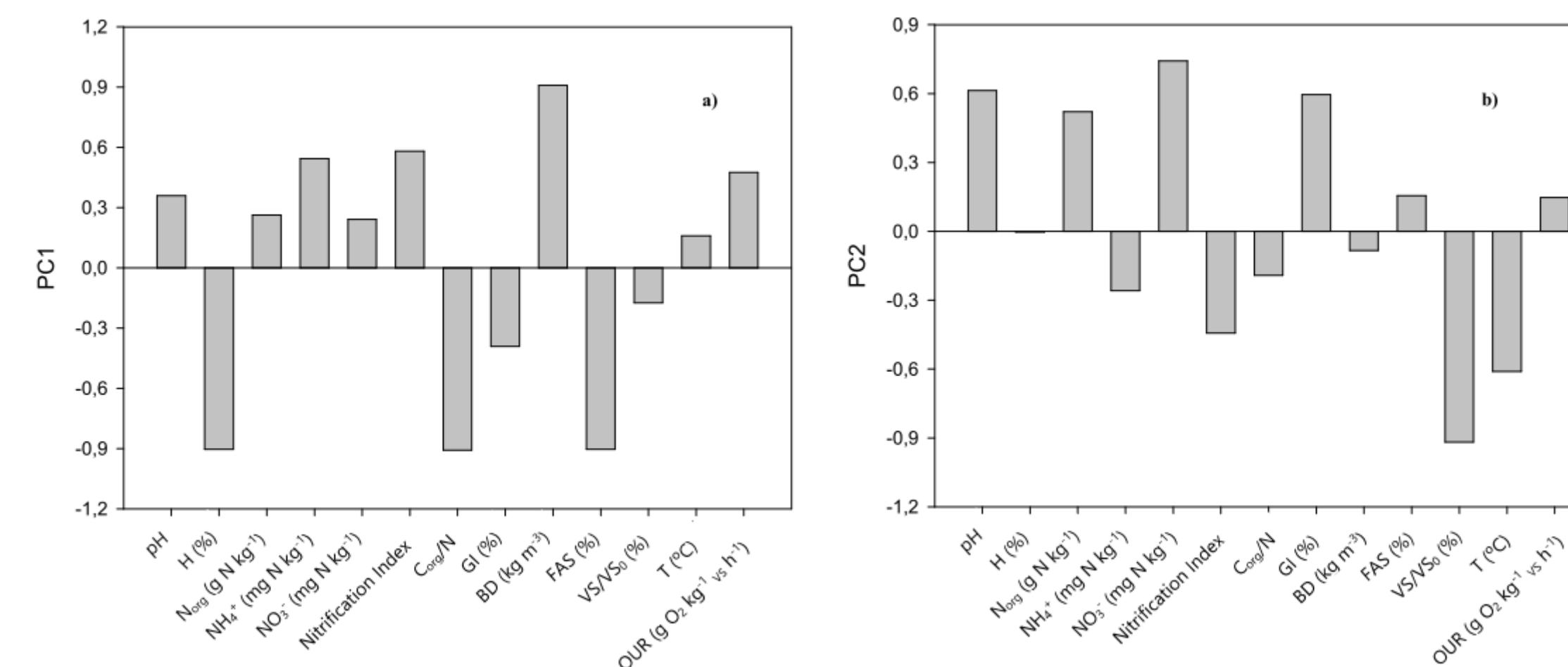
- Experiments were designed with increasing quantities of ES (0, 10, 20, 30 and 60% w/w) mixed with other industrial wastes (potato peel and rice husks).
- Co-composting tests lasted for 25 days.
- Measurements were recorded for thermal, physical, chemical and phytotoxicological parameters during the composting process. These were then evaluated using PCA.

Results

- PC1 and PC2 explain approximately 60% of the variability of the data set.
- PC1 captured the variability originated by %ES, while PC2 is related with the time dependency of the process (figure 1).



- Variables mostly involved in the definition of the dynamic patterns found for PC1 and PC2 are identified in the loadings (Figure 2).



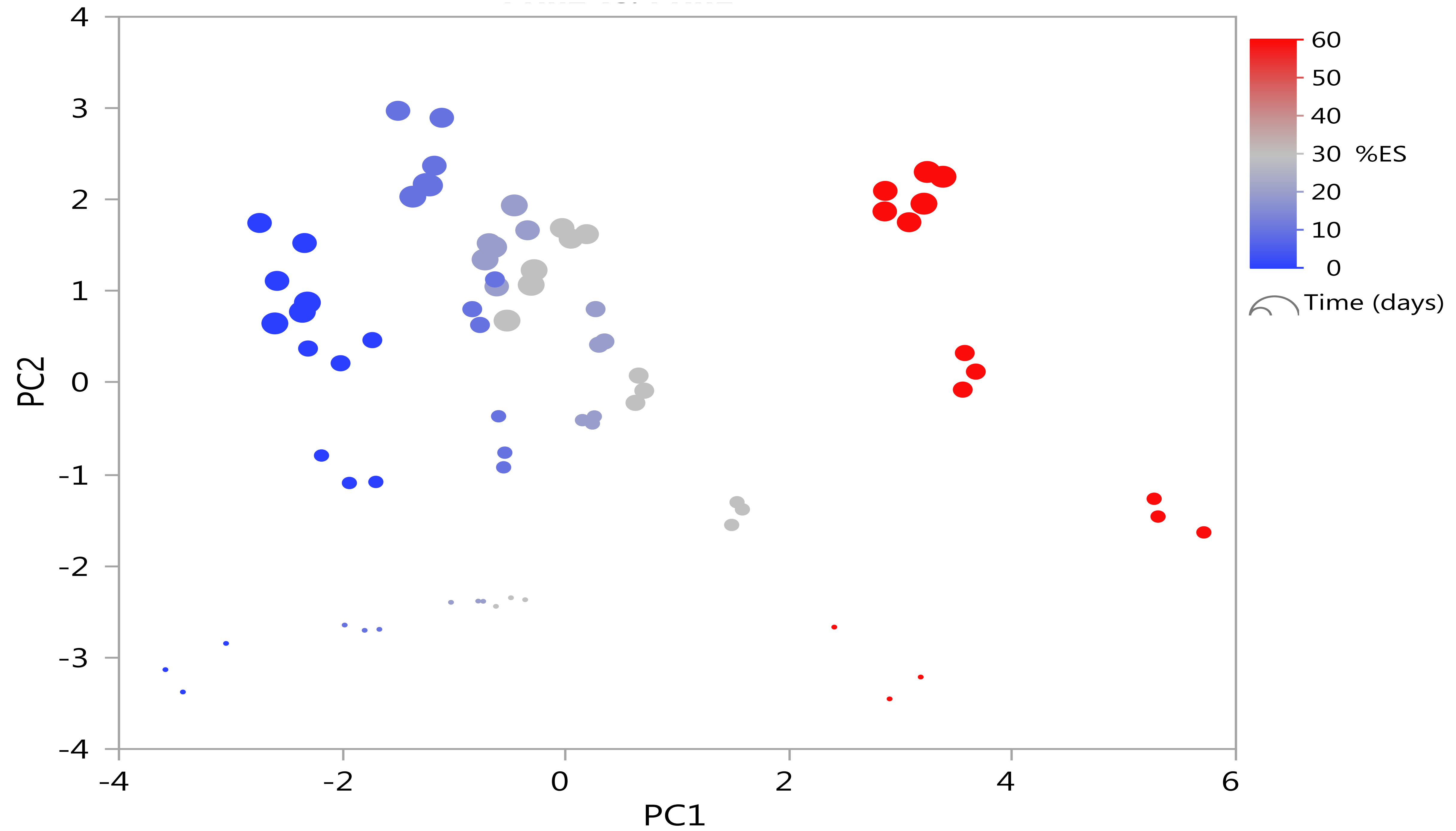
Conclusions

- ES co-composting was dependent on ES content and time.
- PC1 captured the variability originated by %ES, while PC2 is related with the time dependency of the process
- Physical properties capture the variability due to ES content. Also, Corg/N may play a role on PC1.
- VS/VS0, temperature, NO_3^- and pH are important for explaining the time dependency of the process.

References

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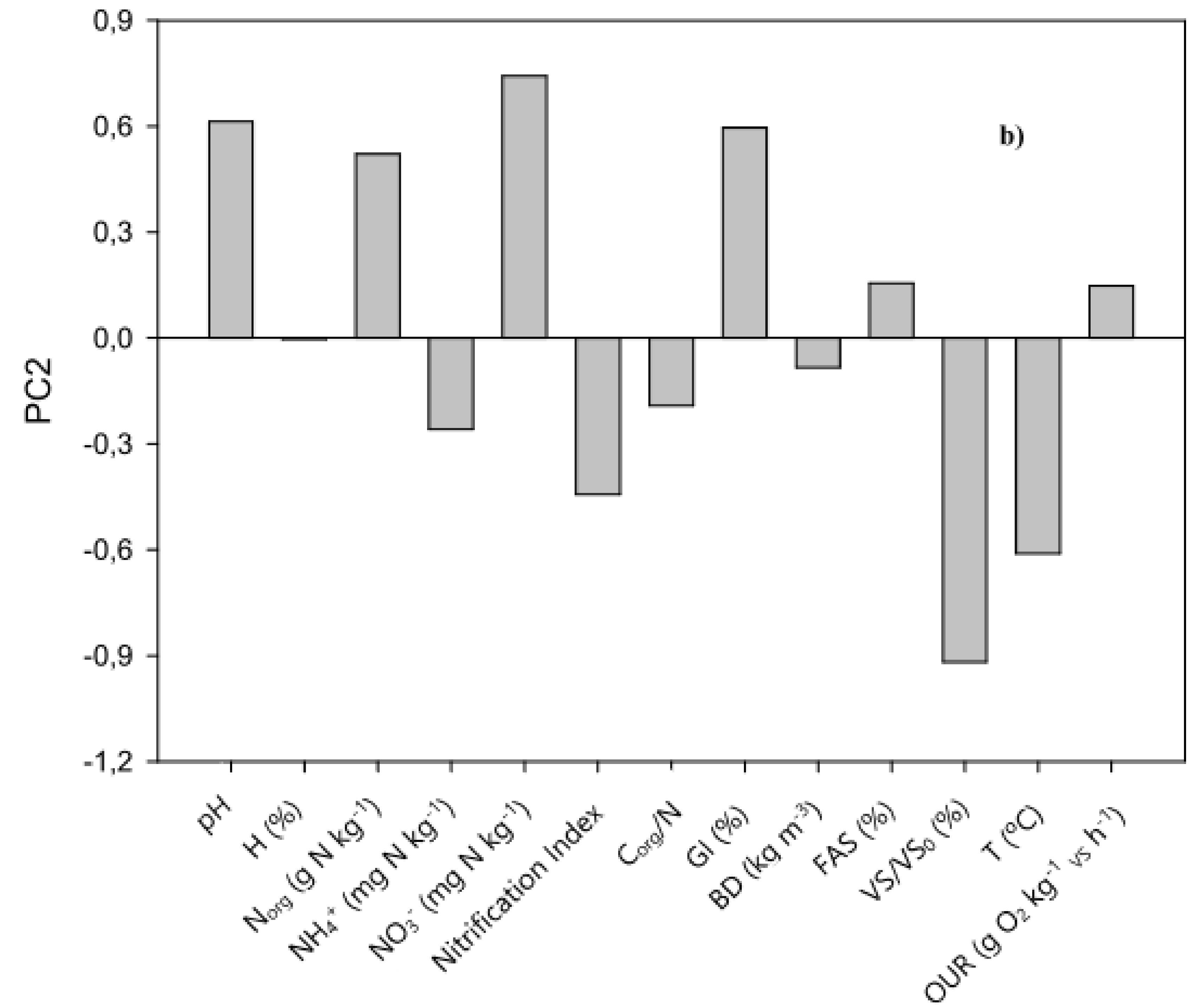
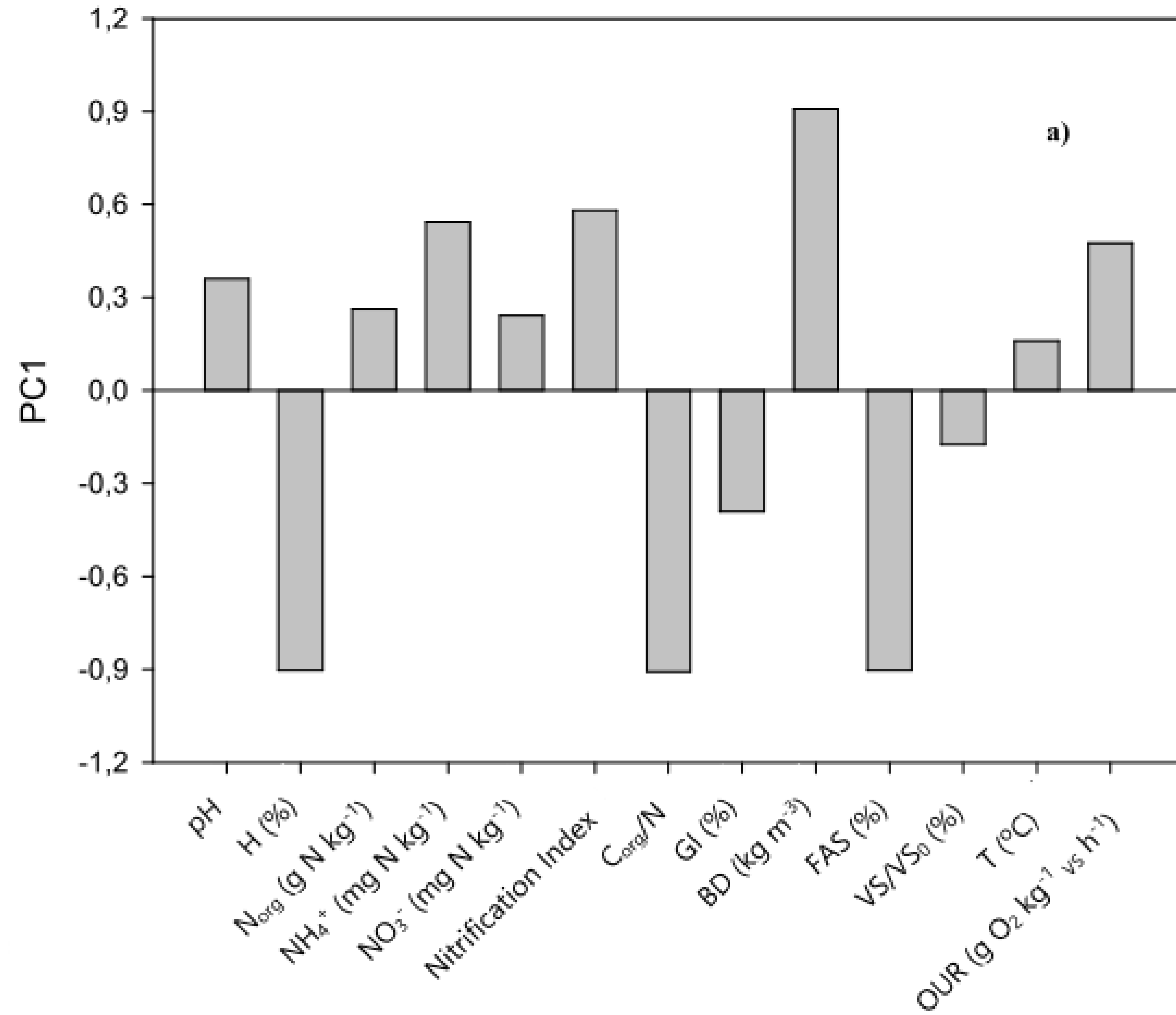
Figure 1



Scatter plot for the first two scores (PC1 vs PC2), stratified by %ES (color of the bubbles) and time (size of the bubbles).

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Figure 2



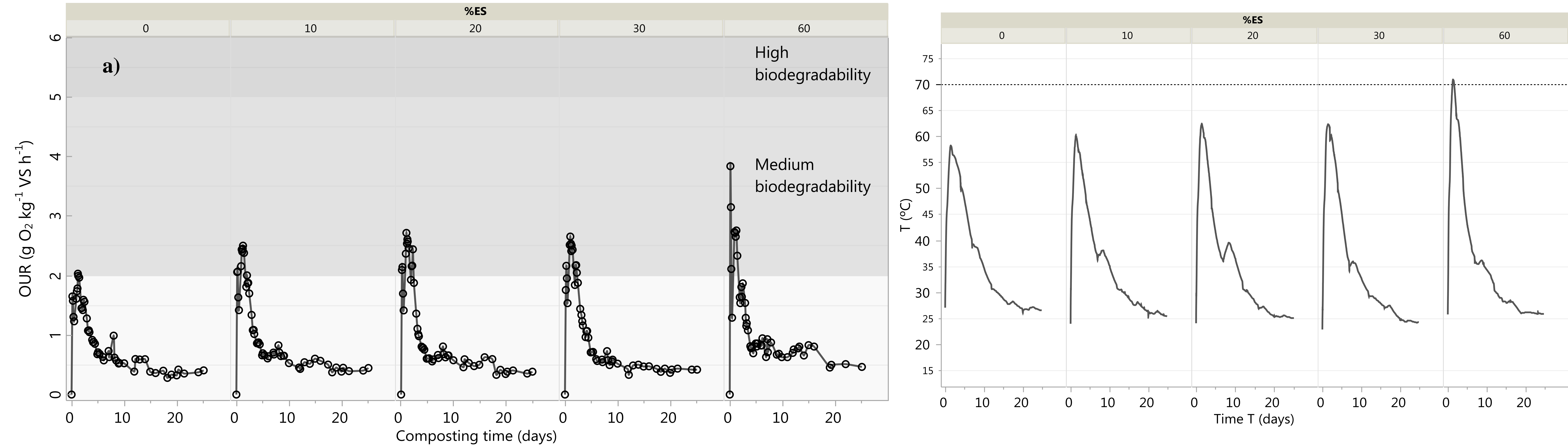
Loadings for the a) first principal component (PC1), b) second principal component (PC2).

Abbreviations: N_{org} - organic nitrogen; C_{org} - organic carbon; GI – germination index; BD - bulk density; dm - dry matter; FAS – free air space; VS/VS₀ – Volatile solids ratio; OUR – oxygen uptake rate

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Figure 3

Additional information



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