# Composting of garden wastes in higher education institution

RHODES 2024

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## INTRODUCTION

In Europe, waste production is significant, with municipal solid wastes (MSW) representing around 9.4 % of total wastes produced, corresponding to 513 kg per capita in 2022, less 19 kg than in 2021, but more 46 kg than in 1995 (Eurostat, 2024). In Portugal, 5.323 million tons of MSW were produced, in 2022, represented an increase of around 0.24 % compared to the previous year. MSW have different compositions: plastic (10 %), paper/cardboard (9 %), sanitary textiles (9 %) and glass (7 %), with the largest fraction represented by biowaste (39 %) (APA, 2023). Due to the European legislation, until 2030 Portugal has the challenge to improve the treatment of biowaste, to achieve recycling targets and reducing the amount of bio-waste sent to landfill. To achieve the established goals, there must be a significant increase in the selective collection of biowaste and recycling at source, as is the case with domestic and/or community composting, together with the prevention of waste production. The present work issue is to study the process of composting of garden wastes produced in a Portuguese higher education institution campus.

## MATERIALS AND METHODS

The biowastes were grass, tree leaves and smalls trunks. The grass is usually cut once a month in November and December, and twice a month in the remaining months. The experimental tests were carried out in composter having a capacity of 1800 L, built with wood pallets and was built with wooden pallets (Figure 1). During the composting tests, the composter content was analysed, by the quantification of several parameters such as, temperature, pH, moisture, solids, etc. The compost produced will be applied in the campus gardens and a part will be distributed to campus users. The pH determination was made based on the method 9045 d (EPA, 2004), the ratio 1:10 (W/V) was used. The TS and VS were determined using the standard method 2540 G (APHA, 2017). A 10 g of the sample was weighed to determine TS, the sample were evaporated and dried in a oven at 103-105 ºC. Then it was placed in the muffle at 550 ºC in a muffle furnace for determination of VS. The compost temperature was checked using a thermometer, at three locations, at 40 cm of depth on the composter including the central point.

**Figure 1.** Experimental composter for garden waste: a) outside view and b) inside detail.

## RESULTS AND DISCUSSION

Before the composting tests, several wastes were characterized individually, in terms of pH (Figure 2) and solids (Figure 3), such as banana peel, watermelon, yellow plum, tomato, apple, courgette, cabbage, haystack needles, grass, rubber tree leaves, plantain leaves and bark. The results reveal that the pH range was from 3.3 (yellow plum) to 7.0 (cabbage, grass, and rubber tree leaves). The temperature range in the composter during the composting tests was from 19 to 55ºC (Figure 4) and the pH range was from 5,0 to 8,6. The highest temperature was in the middle of the composter. In the composting tests several contaminants were found, mainly plastics, because they appear in the middle of the grass.

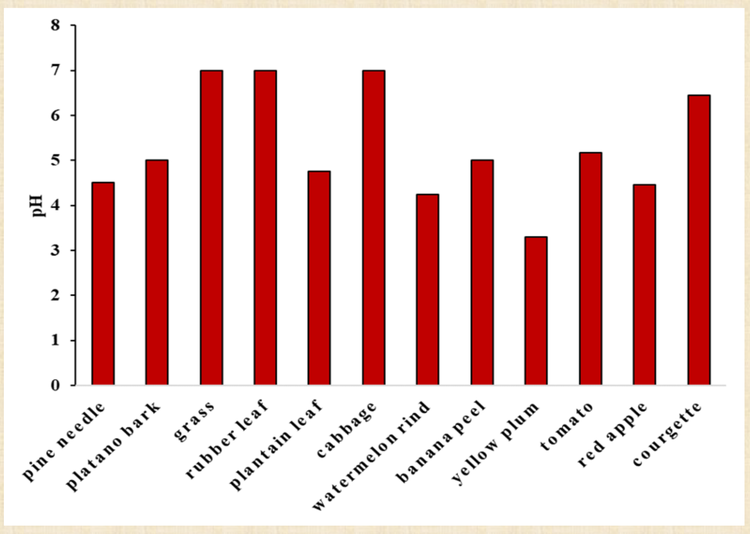


**Figure 2.** pH data of individual waste types

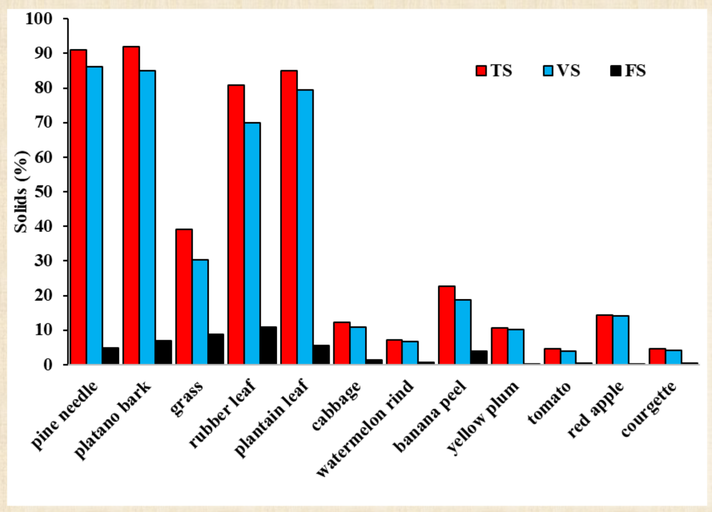


**Figure 3.** Solids data of individual waste types

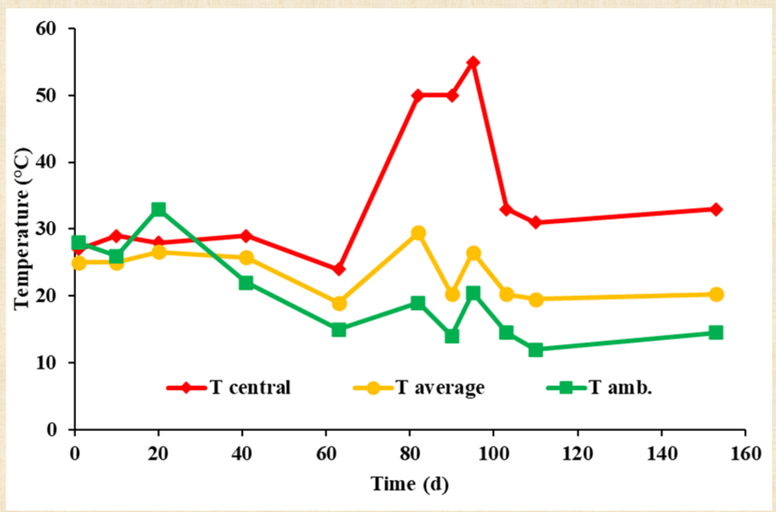


**Figure 4.** Time evolution of composter temperature

## CONCLUSIONS

The results revealed that is possible to do domestic composting in higher education institution, nevertheless, is a process that is dependent on participants and is a relatively slow process (5 to 6 months). It is difficult to collect green wastes without contaminants due to the presence of plastics in the gardens, and it is necessary to carry out frequent awareness campaigns in order to reach as many people as possible. In ISEL campus it was easier to compost garden waste because they are produced from only one source. The present work is still under development.

## REFERENCES

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## ACKNOLEDGMENTS

The authors thank:

- Instituto Superior de Engenharia de Lisboa for making wooden pallets available for the composter..
- Instituto Politécnico de Lisboa for the financial support through the project IPL/2022/BioCompost_ISEL