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Domestic composting of food waste using small-scale composter

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Brazil

Population: 207 million people in 2014

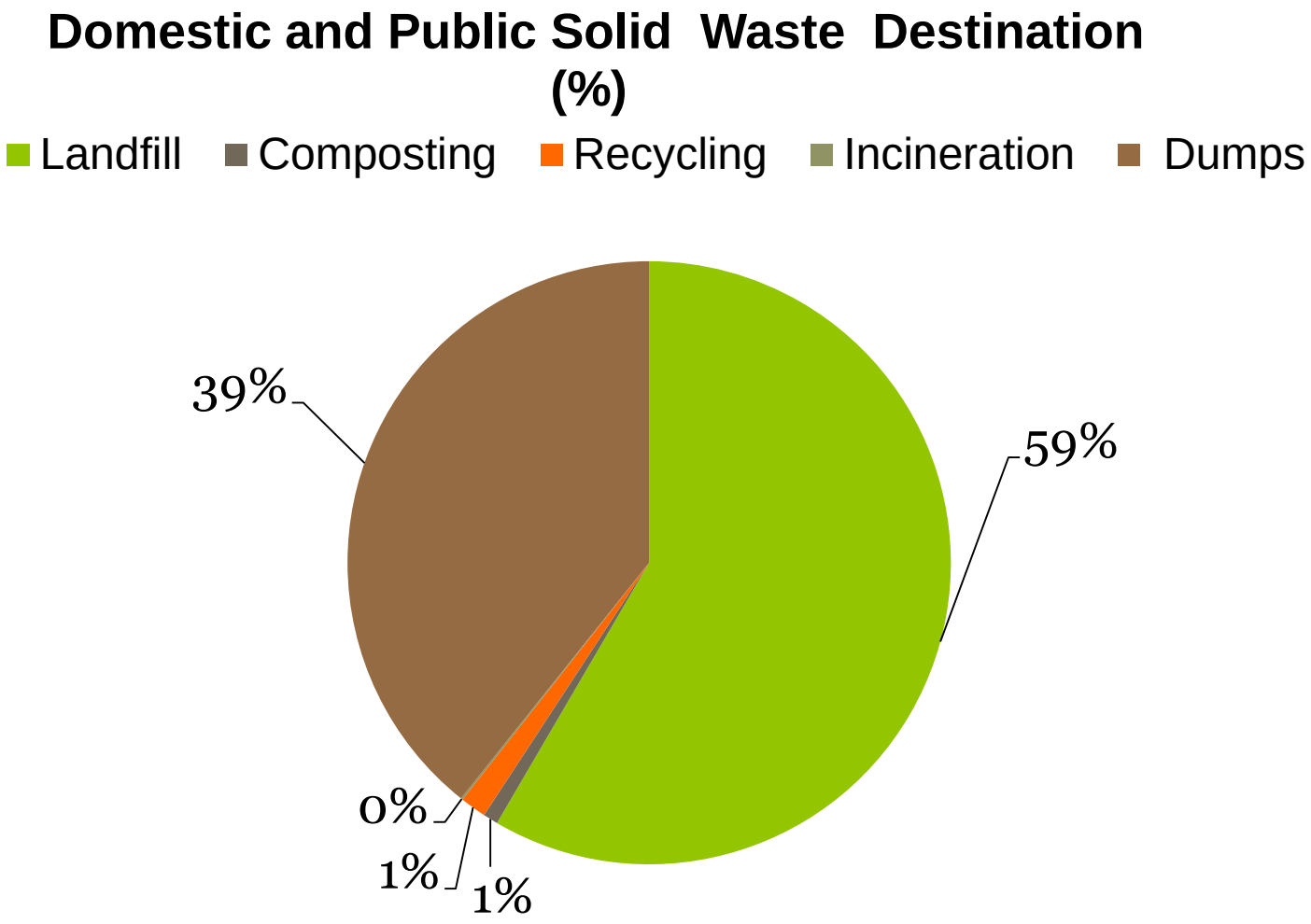
Per Capita: 1.1 kg domestic and commercial waste

Collected Wastes: 185,000 tons/day

51.4%

Organic Wastes : 94,335 tons/day

Destination

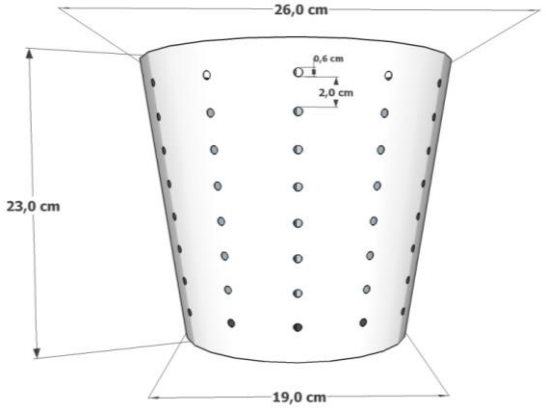


Source : Brazilian Geographic and Statistics Institute, 2010

Objective

- **Investigate the performance of food waste composting using a small-scale domestic composter**

Methods : Composter



Experiment

Trial 1:

- Food waste + new wood chips
- Duration 63 days
- With feeding once a week

Trial 2:

- Food waste + reused wood chips
- Duration 42 days
- No feeding

Trial 3:

- Food waste + (new wood chips + reused wood chips)
- Duration 40 days
- No feeding

Table 1 Food Waste Characteristics

Parameters	Trial 1 (Feeding 1 to 4)	Trial 2	Trial 3
Moisture (%)	85.3- 90.2	82.6	84.1
VS (%)	71.2 -84,8	94.7	88.1
Carbon (%)	28.8-38.5	30.7	34.4
Nitrogen (%)	1.5-2.3	1.4	1.0
C:N ratio	14-21	22	34
pH	5.0-5.6	3.6	4.9

Table 2 Bulking Agent Characteristics (new wood chips (NWC) or reused wood chips (RWC)

Parameters	Trial 1	Trial 2	Trial 3	
	Feeding 1 to 4 (NWC)	RWC	NWC	RWC
Moisture (%)	10.0	42.2	10.0	15.9
VS (%)	99.1	86.5	99.1	85.3
Carbon (%)	28.6	35.8	28.6	37.1
Nitrogen (%)	0.2	0.9	0.2	1.4
C:N ratio	145	39	145	26
pH	4.4	6.7	4.4	6.9

Procedure

Trial 1

- Start with food waste and new wood chips
- Mixing daily
- Feeding once a week with wood chips and food waste

Trial 2

- Mixed daily in the first week and after this three times a week
- Start with food waste and Reused wood chips

Trial 3

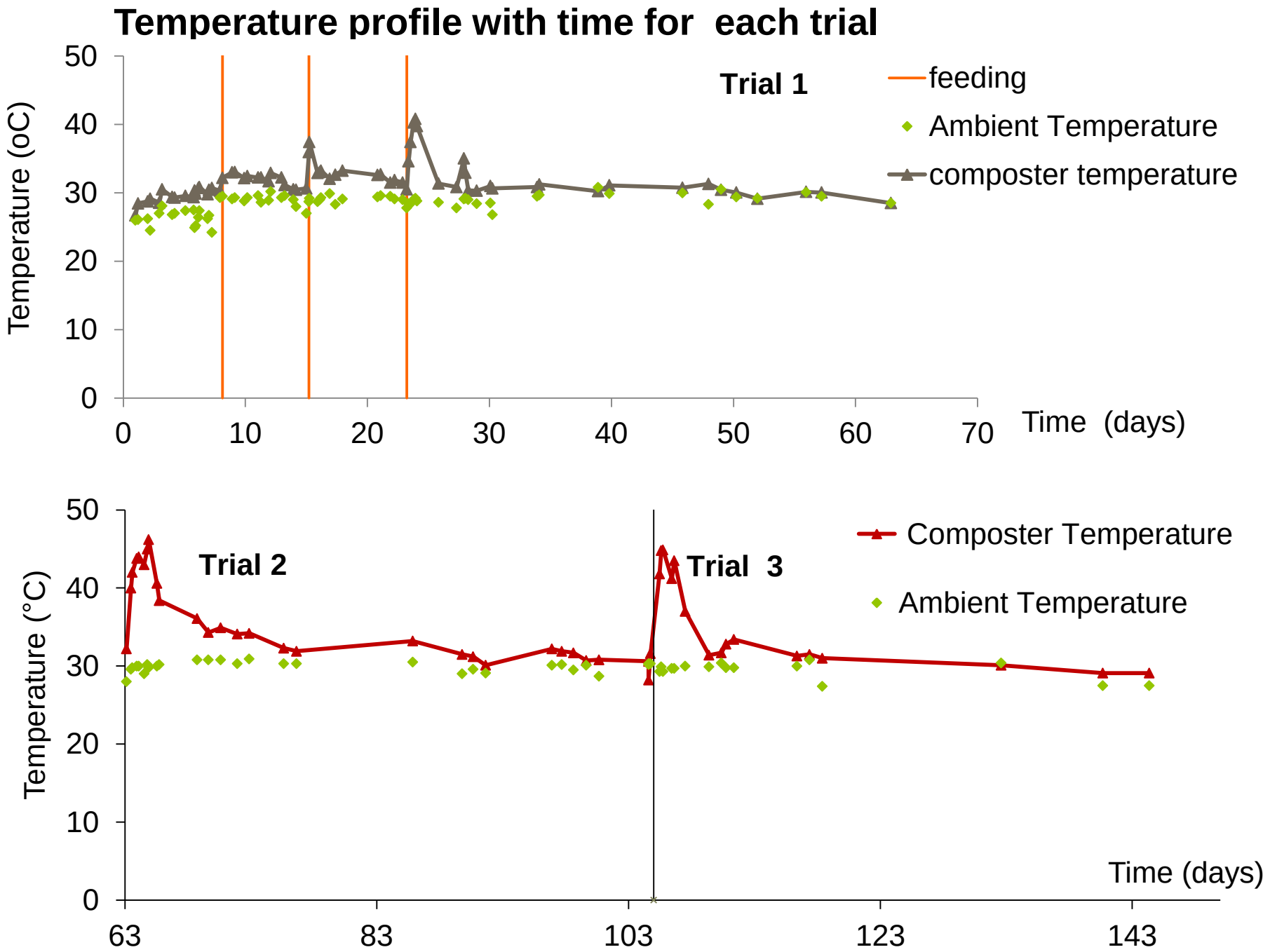
- Mixed daily in the first week and after this once a week
- Start with food waste and reused and new wood chips

Segregation

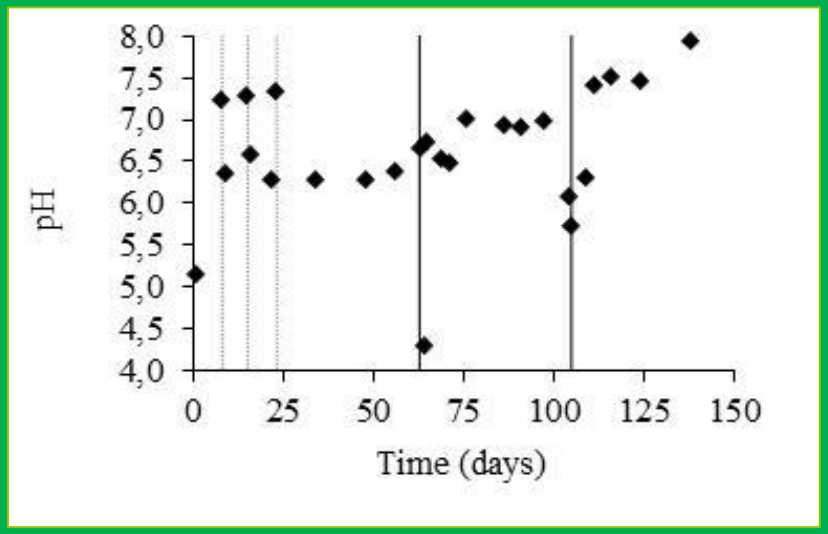
Compost

Table 3 Initial conditions of the mixture for each trial

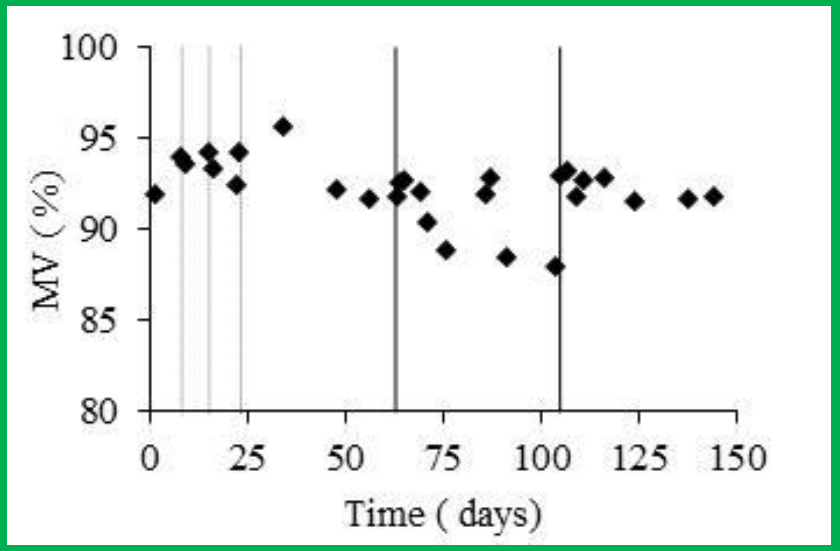
Parameters	Trial 1				Trial 2	Trial 3
	Feeding 1	Feeding 2	Feeding 3	Feeding 4		
Wet weight (g)	1178.0	1126.0	1641.0	1753.0	3000	3045
Dry matter (g)	420.8	405.5	654.8	690.1	885.6	1112.2
VM (g)	388.3	380.8	611.6	661.7	865.6	1009.8
M (%)	67.6	56.5	61.6	58.2	68.8	67.6
VM (%)	92.0	93.6	93.4	90.3	92.5	93.0
C:N ratio	55	39	42	38	31	39
pH	5.2	6.4	6.6	7.3	4.3	5.7


Temperature profile with time for each trial
Trial 1
feeding
Ambient Temperature
composter temperature
Temperature (oC)
Time (days)
0
10
20
30
40
50
60
70
Trial 2
Trial 3
Composter Temperature
Ambient Temperature
Temperature (°C)
Time (days)
63
83
103
123
143

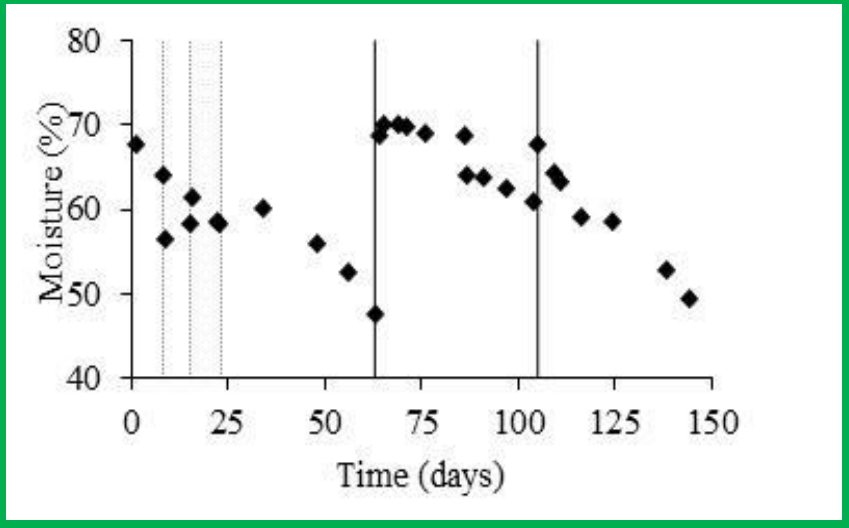
(a) Trial 1 Trial 2 Trial 3



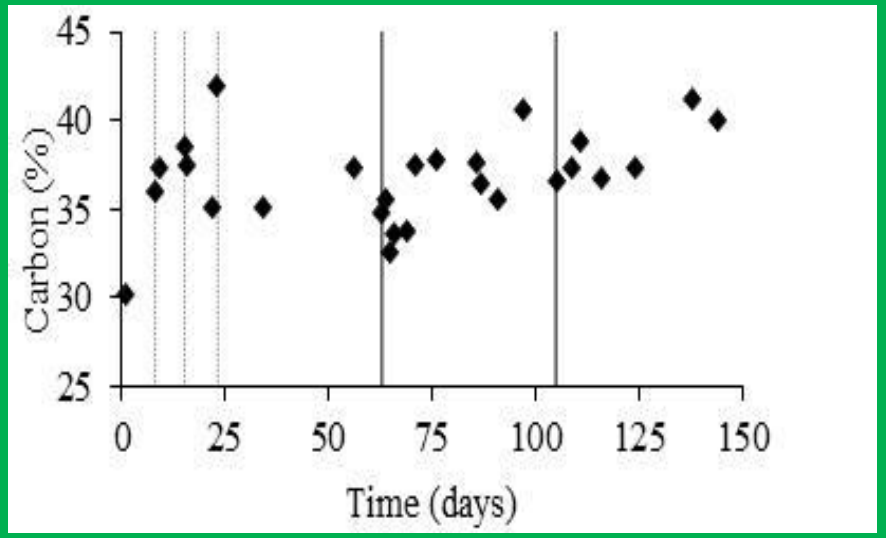
(b) Trial 1 Trial 2 Trial 3



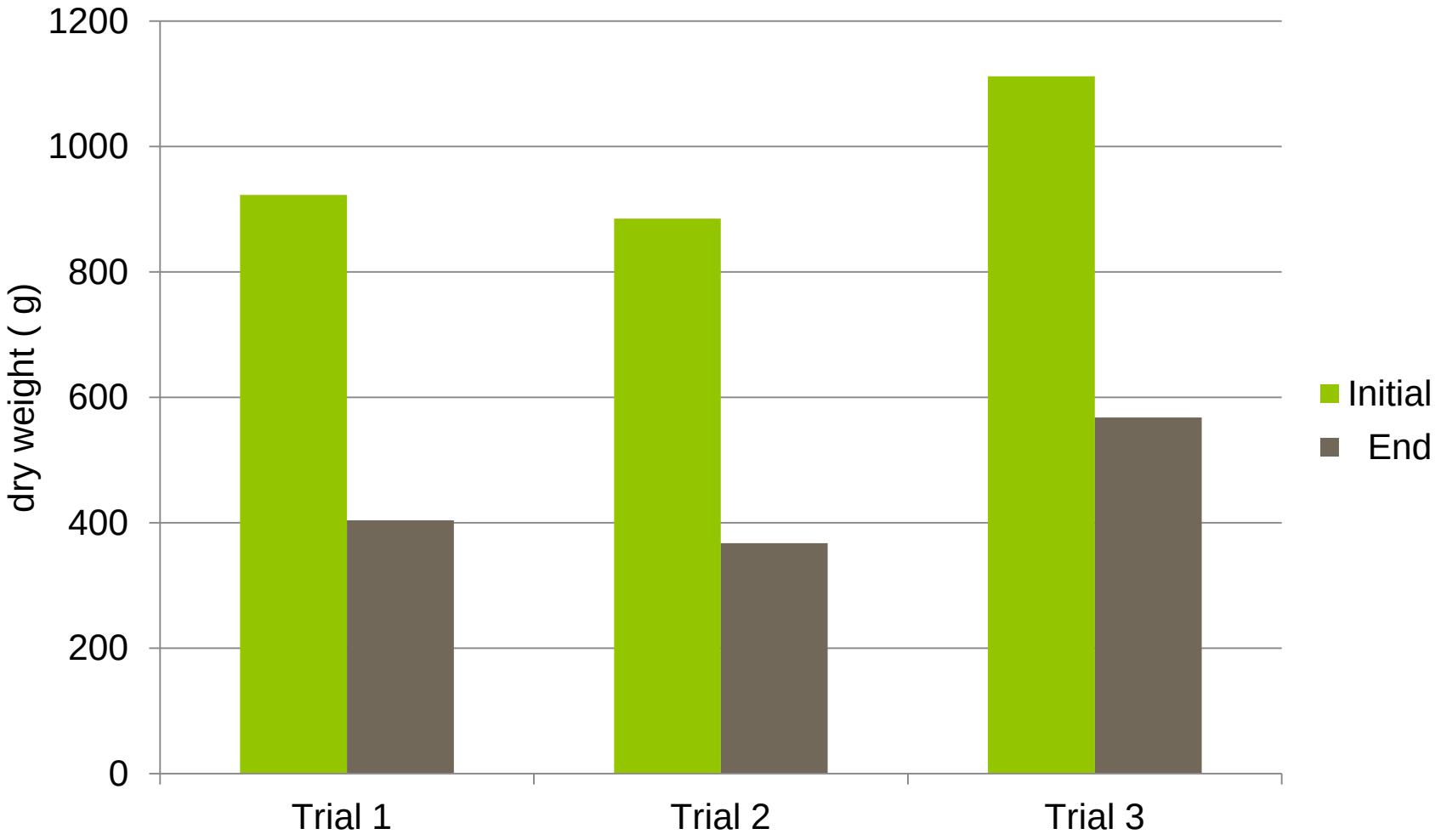
(c) Trial 1 Trial 2 Trial 3

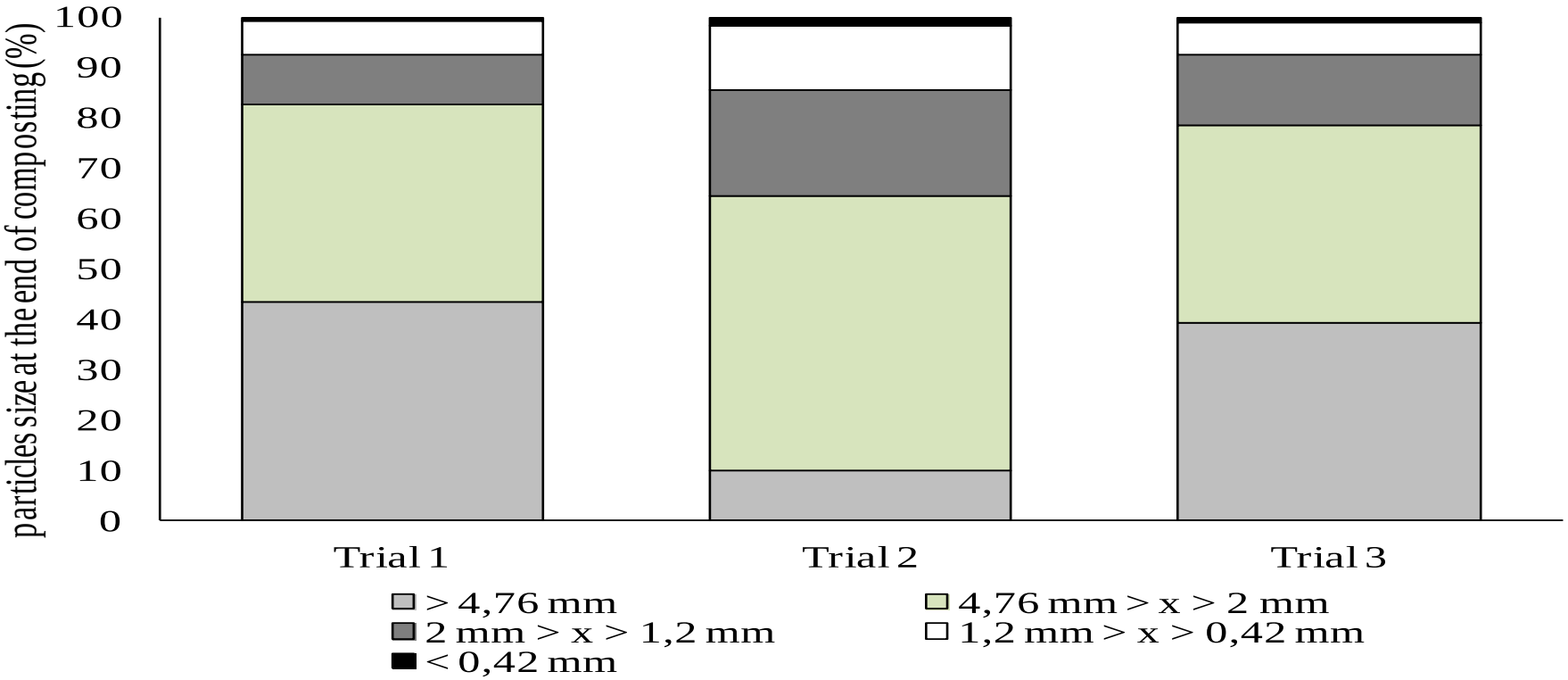


(d) Trial 1 Trial 2 Trial 3



Dry weight at beginning and the end of the trials





Particles size at the end of composting (%)			
	Trial 1	Trial 2	Trial 3
> 4,76 mm	43.4	9.9	39.3
4,76 mm > x > 2 mm	39.2	54.5	39.4
2 mm > x > 1,2 mm	10.0	21.2	13.9
1,2 mm > x > 0,42 mm	6.5	12.6	6.3
< 0,42 mm	0.8	1.7	1.1

Compost Characterization in the trials

Parameters	Trial 1	Trial 2	Trial 3
Dry weigt	8.9	4.2	6.3
Moisture 65°C (%)	28.0	50.7	50.3
VS (%)	66.5	80.9	82.3
Carbon (%)	31.8	40.8	37.3
Nitrogen (%)	1.6	2.5	2.9
C:N ratio	19.9	16.4	13.1
pH ($CaCl_2$)	6.7	7.6	8.0
Total Coliforms (MPN/g)	7.6×10^2	2.9×10^3	3.8×10^3
E. coli (MPN/g)	4,1	1.9×10^3	2.5×10^2

Conclusion

- Composting for 63 days was necessary to reach compost which conforms to Brazilian standards which specify Total Coliforms

- The production of compost was very small (particles smaller than 0.42 mm).

- The reused wood chips reduced the quantities of bulking agents required and improve the decomposition .

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THANK YOU FOR YOUR ATTENTION!!

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