

The Effect of Composting Treatment on *Leucaena Leucocephala* (Weed Seed)

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Introduction

Compost is an organic matter that is widely applied to improve soil quality. Source separated from plant material is crucial on composting of yard waste, especially in large scale operations. Appropriate source separation of plants can prevent materials from mixing with seeds of invasive tree species, such as *Leucaena leucocephala*, otherwise, the resultant compost will become a source for dispersing invasive tree species. This can lead to massive quantities of weed growth in the compost applied to farmland and thus agricultural losses.

Objectives

1. To discover thermal duration treatment effect on *L. leucocephala* germination and growth performance
2. To discover different temperature thermal treatments effect on *L. leucocephala* germination and growth performance
3. To suggest a practical composting treatment methods to minimize livability of weed seeds *L. leucocephala*

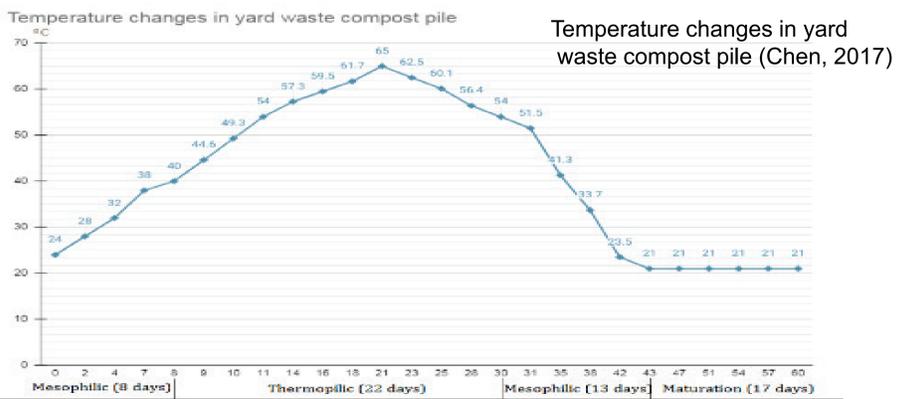
Methodology

A. Different temperature thermal treatments

- Simulated the thermophilic phase of compost treatment
- Temperature 20 °C, 30 °C, 40 °C, 50 °C, 60 °C and 70 °C
- Duration 5 days
- Divided into compost material(wood chips) applied group and non-applied group

B. Thermal duration treatments

- Simulated the composting heating process according to Chen (2017)
- Duration: 60 days
- Divided into compost material (wood chips) applied group & no applied group



After A & B treatments

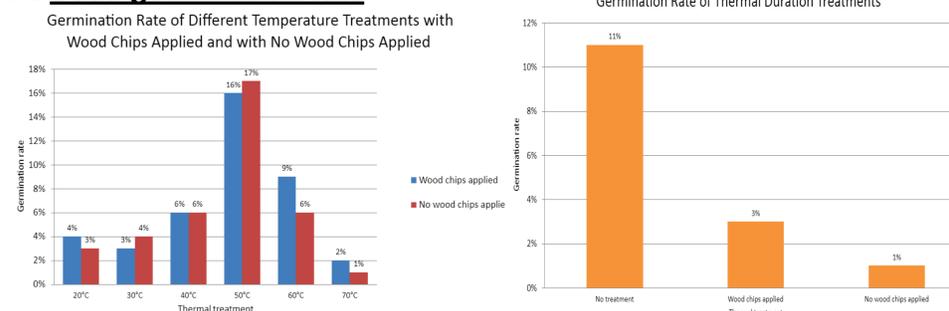
- 7 days seed germination test to observe:
 1. Seed germination rate
 2. Growth performances: seed root and shoot elongation & health conditions

C. Growing test after thermal duration treatment

- Duration: 2 months
- To observe : growing rate & health conditions

Findings

A. Seed germination rate



- 50 °C thermal treatments facilitate the germination
- Thermal duration treatment & 70 °C thermal treatments effectively inhibit the germination

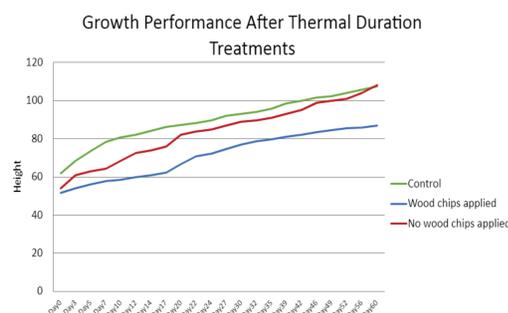
B. Seed root and shoot elongation

- Thermal duration treatments & Different temperature thermal treatments insignificantly inhibit the root & shoot elongation (P> 0.05)

C. Health conditions of seeds

- Most of the seeds were in healthy conditions
- Thermal duration treatments & Different temperature thermal treatments insignificantly inhibit seeds' health

D. Growth performance of seedlings



Thermal Duration treatment	N	Mean of original height (mm)	Mean of final height (mm)	Mean of increased height (mm)	Mean of growth Rate
No treatment	11	62.09	105.90	45.32	72.99%
Wood chips applied treatment	3	51.67	85.83	35.16	68.06%
No wood chips applied treatment	1	54	108	54	100%
Total	15	/	/	/	/

- Growing rate: No wood chips applied(100%) > No treatment (68.06%) > Wood chips applied treatment(72.99 %)
- Thermal duration treatment cannot effectively suppress *L. leucocephala* growth

Suggested Practical composting treatment method

- Refers to Chen's composting heating process (2017)
- 1. **Mesophilic phase**
 - Last for 8 days
 - Temperature gradually rise from 24 °C to 40 °C
 - Break down soluble and degrade compounds of composting material
- 2. **Thermophilic phase**
 - Last for twenty-two days & mixing compost pile for several times
 - Temperature rapidly increased from 40 °C to 54 °C & gradually reached 65 °C & gradually decrease to 54 °C
 - Eliminating most plant pathogens & weed seeds
- 3. **Cooling & maturation phase**
 - Last for thirty days
 - Temperature gradually decrease from 54 °C to 21 °C & lastly maintaining at 21 °C

Conclusion

- 5 days 70°C composting thermal treatments effectively inhibits *L. leucocephala* germination
- Higher temperatures and composting heating process (Chen 2017) can minimize *L. leucocephala* livability
- Chen's composting heating process in 2017 is a practical composting method to conduct for composting plant

References

Chen, L., 2017. Achieve maturity at the end of the manure composting process. [online] Progressive Dairy: Canada. Available at: <<https://www.progressivedairy.com/topics/manure/achieve-maturity-at-the-end-of-the-manure-composting-process>> [Accessed 27 June 2021].