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Compost in agriculture and their effect on the environment

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Introduction

Composting is considered to be a sustainable, economical, and simple technology for disposing of organic waste (Song et al., 2021). The transformation of organic materials into compost serves as a valuable soil amendment, playing a pivotal role in maintaining soil and plant health Al-Rumaihi et al., 2020). However, achieving effective decomposition hinges on various factors, encompassing the physical, chemical, and microbiological properties of the initial materials and the surrounding soil. These influential elements include the crucial carbon-to-nitrogen (C: N) ratio, nutrient composition, moisture content, temperature, pH balance, oxygen availability, porosity, grain size, and particle size (Hlava, 2015).

Objectifs

Our objectives were to investigate the physical, chemical, and biological properties of two samples of composts (A2, D2) prepared from a different organic matter and to determine their impact against two pathogenic fungi *F. solani* and *F. acuminatum* causing dapping off diseases and test the efficacy of composts in vitro and in vivo.

Materials and Methods

The compost Material

Two types of compost were prepared aerobically for six months. These composts were prepared at the experimental farm of Mascara University with different compositions.

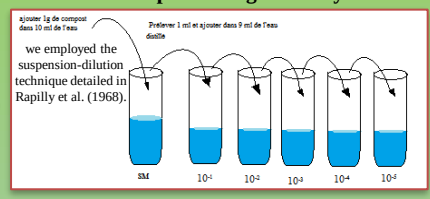
Com A-02	50% poultry droppings, 50% peeling vegetables with the addition of a quantity of sheep manure),
Com D-02	Compost A2 (50% green waste, 50% olive extract waste).

Physicochemical and biological characteristics of the composts

Compost physical and chemical analyses

- Measurement of aqueous pH
- Measurement of the organic matter content
- Measurement of the dry matter
- Quantification of compost fungal diversity

Compost biological analyses



To determine the fungal community composition in our compost, we employed the suspension-dilution technique detailed in Rapilly et al. (1968). study. Three replicates of 1ml from each concentration (10^{-2}) and (10^{-4}) were cultured into two different culture media (PDA and MEA). The cultured Petri dishes were then incubated at two different temperatures, 25˚C and 30˚C, for 7 days.

❑ **Effect of the compost extract on the biological character of *F. acuminatum and F. solani***

Mycelia growth | **spore production** | **spore viability**

❑ **Effects of compost and its extract on damping off diseases *in vivo***

Results and discussion

➢ Species diversity of fungal compost

Table 01: Fungal density (CFU/g MS) of compost A2 on PDA and MEA media at different temperatures.

Microbial population	Fungal density (x10⁴ CFU/g MS)			
	PDA		MEA	
	25ºC	30ºC	25ºC	30ºC
T.harzianum	1.50 ±0.01b	0.88 ±0.01de	0.44 ±0.01d	0.55 ±0.01g
C.Sphaerosper mum	0.68 ±0.01fg	0.79 ±0.01ef	0.43 ±0.01h	0.77 ±0.01efg
Penicillium sp.	1.43 ±0.01b	1.53 ±0.01b	0.44 ±0.01h	0.38 ±0.01h
F.oxysporum	2.12±0.01a	1.43 ±0.01b	1.10±0.01c	0.46 ±0.01h

Table 02: Fungal density (CFU/g MS) of compost D2 on PDA and MEA media at different temperatures.

Microbial population	Fungal density (x10⁴ CFU/g MS)			
	PDA		MEA	
	25ºC	30ºC	25ºC	30ºC
T.harzianum	1.65 ±0.01a	0.95 ±0.01d	0.45 ±0.01f	0.35 ±0.01ij
Aspergillus sp.	1.58 ±0.01a	1.34 ±0.01b	1.05 ±0.01c	1.35 ±0.01b
C.Sphaerosper mum	0.43 ±0.01l	0.67 ±0.01gh	0.29 ±0.01m	0.26 ±0.01mn
Rhizopus sp.	0.25 ±0.01mn	0.51 ±0.01jk	0.21 ±0.01no	0.42 ±0.01l
F.oxysporum	0.74 ±0.01fg	0.30 ±0.01m	0.14 ±0.01op	0.12 ±0.01p


A-02


D-02

➢ The physicochemical analysis

A-02

pH	**7.12**	**MS %**	**79.16 %**
CE	3.27 mS/cm	MO %	16.74 %

D-02

pH	**8.05**	**MS %**	**80.12 %**
CE	2.05 mS/cm	MO %	12.30 %

➢ Effect of compost extract on mycelial growth, sporulation, and spore germination

our results showed that the compost extract (A2 and D2) inhibited significantly **the mycelia growth sporulation, and spore germination** of the two isolates of *Fusarium* This inhibition was very important and it was recorded at 84% and 87%, 77% and 66%, 85% and 91% respectively for the isolates *F.solani* and *F.auminatum*

➢ Suppressive effect of the compost on damping off disease

The addition of both composts A2 and D2 to soils contaminated with isolates (*F. acuminatm* and *F. solani*) reduced significantly **the disease incidence of damping off on tomato plant** with 25% and 15%, 19% and 22%, respectively

Conclusion

Composting is an exciting global process to turn wastes into resources, but it should be locally adapted taking into consideration the cost, the nature of the waste and the environmental impact of the produced compost amended to the soil. The analysis of the physicochemical parameters of our composts (A2 and D2) has revealed a good organic matter biodegradation, an alkaline pH, and a high concentration of humic and fulvic acids. The biological test in *vitro* and *vivo* confirm also that our compost inhibited and reduced the mycelia growth, sporulation, and spore germination of the two pathogenic fungi (*F. solani, F. acuminatum).* In perspective the acceptance by local farmers of the benefits of compost to the soil and crops would be a significant incentive to reduce the expensive mineral fertilizers and optimize their use.