VOLATILE FATTY ACID CONCENTRATION AND INHIBITORY EFFECT UPON SOME PATHOGEN STRAINS OF SEVERAL COMPOST EXTRACTS

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ABSTRACT

It is well known that compost could be used as soil enhancers, in this way compost could has effect not only in nutrients availability but also in the inhibition of some plant pathogens. The aim of this work was to analyse and determine the volatile fatty acid profile of different compost. Experimental compost (onion compost, green waste compost, spent mushroom compost: SMC and grape mark and olive press cake compost: GMOP) were elaborated under UE fifth framework Recoveg proyect (Recycling Horticultural wastes to produce pathogen supressant compost for sustainable vegetal crop production QLRT-01458). The volatile fatty acids (VFA) were extracted in acid media. VFA content was determined by gas chromatography (flame-ionization detector). The acid extracts were added to a PDA growth media to test its possible inhibitory effect over *Sclerotinia cepivorum, Aspergillus niger, Aspergillus flavus, Fusarium oxysporum, Phythopthora nicotineae,* and *Phytium ultimun*. The results showed that onion compost is the only sample that has the main VFA content (acetic, propionic and butryric acid), and valeric acid was not detected in any sample. Higher concentration on butyric acid only was found in spent mushroom compost. In green waste compost and grape mark wastes and in olive press cake compost, only trace of this compound were detected. This extract did not show any inhibitory effect on growth of the microbial strains analysed.
Keywords: *Volatile fatty acids, onion grape mark, spent mushroom composts.*

INTRODUCTION

Phytopathogenic agents have been a source of agricultural damage throughout the ages. Plant diseases have caused alterations in roots, stems, leaves, flowers, fruit and many plant-derived food products. Most plant diseases are of the infectious type, that is, they arise from the action of other living things, such as fungi, bacteria and viruses, which adopt a parasitic relationship with the plant, causing disease in the process. To combat plant diseases man has developed pesticides and fungicides, without which there would have been no increase in food production to feed an ever-expanding population. At moment, there is not enought information about antifungal activity of food by-products compost. The aim of this work was to analyse and determine the volatile fatty acid profile of different compost and if these compost have antifungal activity upon several mould strains.

MATERIALS AND METHODS

Experimental compost (onion compost, green waste compost, spent mushroom compost and grape mark and olive press cake compost) were elaborated under UE fifth framework Recoveg proyect (Recycling Horticultural wastes to produce pathogen supressant compost for sustainable vegetal crop production QLRT-01458). The volatile fatty acids (VFA) were extracted in acid

media (Water pH:2, pH was adjusted with H_3PO_4). VFA content was determined by gas chromatography (flame-ionization detector, Innowax 19091N-133 Narrowbore column 30 m length, 0.25 mm i.d.; film of 0.5 μm, flow rate: 0.7 mL/min, carrier gas: Helium; oven temperature: 50 to 220ºC the increase of temperture were: 10ºC each minute, temperature detector and injector: 260ºC and 150ºC respectively, splitless: 5 μL). The acid extracts were added to a PDA growth media to test its possible inhibitory effect over *Sclerotinia cepivorum, Aspergillus niger, Aspergillus flavus, Fusarium oxysporum, Phythopthora nicotineae,* and *Phytium ultimun* (mould strains are from Spanish Type Culture Collection of the University of Valencia). ANOVA and Duncan's multiple range test ($p<0.05$) were applied.

RESULTS AND DISCUSSION

The results showed that onion compost is the only sample that has the main VFA content (acetic, propionic and butryric acid), and valeric acid was not detected in any sample (table 1). Higher concentration on butyric acid only was found in spent mushroom compost. In green waste compost and grape mark wastes and in olive press cake compost, only trace of this compound were detected.

In table 1 are represeted de volatile fatty acid identified in onion compost.

Table 1. *Volatile fatty acids compositions of several food by-products compost .*

CONCENTRATION μg/g (wet basis)				
Compost	Acetic acid	Propionic acid	Butyric acid	Valeric acid
Green waste	200,82 ± 29,68	N.D.	1359,90 ± 232,64	N.D.
GMOP	Traces	N.D.	Traces	N.D.
Onion compost	3454,07 ± 122,21	Traces	4663,07 ± 480,05	N.D.
SMC	595,69 ± 47,61	Traces	1033,20 ± 159,88	N.D.
Test ANOVA				
	***‡	***	***	***
Multiple Duncan Range test				
Green waste	200,82 c$^{\Psi}$	N.D.	1359,90 b	N.D.
GMOP	Traces	N.D.	Traces	N.D.
Onion compost	3454,07 a	Traces	4663,07 a	N.D.
SMC	595,69 b	Traces	1033,20 b	N.D.

, **, *, significance p<0.05, 0.01, 0.001, respectively. a-c values followed by the same letter within the same column are not significantly different (p>0.05) according to Duncan's Multiple Range Test. N.D., not detected.*

Studies carried out by Yamada et al. (1989); Elwell et al. (2001) confirmed that quantitative and qualitative differences exist between different composts mainly as a result of the initial mixtures of organic material. The VFA content also depends on the moment samples are taken during composting. Lee-InBog et al. (2002) demonstrated that the highest VFA concentration corresponded to acetic acid and that the content decreased with time. Other authors, including Ozores-Hampton et al. (2001) and Wiles et al. (2000) also found acetic acid to be the major VFA, followed by butyric, valeric, isovaleric and isbutyric acids, but that the concentration of butyric acid increased with time to become the most concentrated followed by acetic acid and the other acids mentioned above in the same order. The findings contrast in part with those of

this study in which acetic acid remained the prevalent acid, while Wiles et al. (2000) found that propionic acid occurred in higher concentrations than butyric acid, while no valeric, isovaleric or isobutyric acids were found.

This extract did not show any inhibitory effect on growth of the microbial strains analysed (table 2). In recent years many authors have suggested that by varying the conditions in which composting is carried out, a series of compounds might be obtained that may show a suppressive activity over certain vegetal pathogens. For example, Widmer et al., (1998) showed that in soils treated with composted food residues the attack of several fungi was inhibited. Analysis of the same food residues showed high VFA levels, with acetic acid being the most concentrated.

***Table 2**. Inhibition effect of food by-products compost upon several mould strains*

	Sclerotinia cepivorum	*Aspergillus niger*	*Aspergillus flavus*	*Fusarium oxysporum*	*Phythopthora nicotineae*	*Phytium ultimun*
Green waste	Negative	Negative	Negative	Negative	Negative	Negative
GMOP	Negative	Negative	Negative	Negative	Negative	Negative
Onion compost	Negative	Negative	Negative	Negative	Negative	Negative
SMC	Negative	Negative	Negative	Negative	Negative	Negative

CONCLUSIONS

The VFA present in food by-product compost have not any antifungal effect upon mould strains under study.

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