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"Can agroecological farming feed the world?
Farmers' and academia's views"

Comparative characterization of humic substances obtained from anaerobic digestate of horticultural residues

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INTRODUCTION

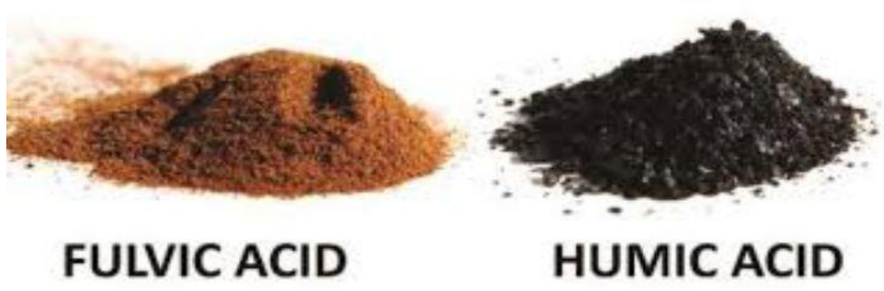
Among the products that have been used to increase crop yields are biostimulant products.

One of the ways to obtain humic substances (HS) is from the anaerobic digestate produced by anaerobic digestion (AD).

The HS, including the humic acids (HA) and fulvic acids (FA), are the main components of the organic substances of the anaerobic digestate.

Objective: to characterize the HS extracted from the anaerobic digestate of horticultural residues.

Horticultural residues



Humic substances

MATERIAL AND METHODS

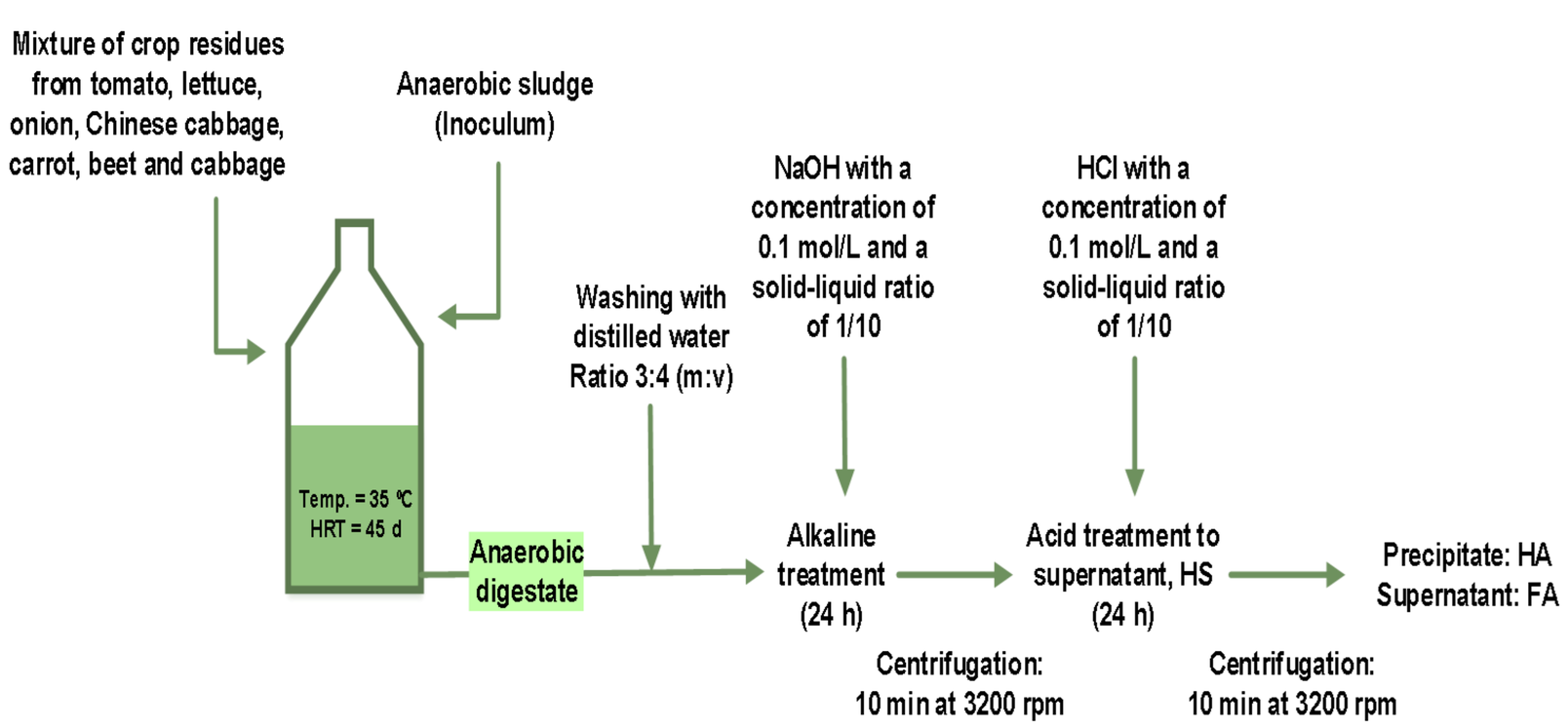
Completely mixed anaerobic bioreactors of 500 mL total volume were used in three times.

As inoculum for the batch reactors was used an anaerobic sludge from a biodigester that treat pig manure located in a near farm.

After the working time of the bioreactors, the settled sludge obtained was considered as the anaerobic digestate.

Total elemental concentrations of HA and FA were determined by microwave-assisted digestion in hydrochloric acid using inductively coupled plasma optical emission spectroscopy

Figure 1. Schematic performance of the experiment. Source: own elaboration..



RESULTS

Table 1. Chemical characterization of humic and fulvic acids from anaerobic digestate of horticultural residues.

Element	Unit	Humic acid	Fulvic acid
N	% DM	0,309	0,031
Pb	mg/kg DM	0,35	0,10
Bo	mg/kg DM	1,7	1,1
Cd	mg/kg DM	0,020	0,016
Ca	mg/kg DM	67	140
Cr	mg/kg DM	0,66	0,24
Fe	mg/kg DM	320	27
K	mg/kg DM	580	510
Cu	mg/kg DM	20	0,42
Mg	mg/kg DM	96	29
Mn	mg/kg DM	2,4	1,3
Mo	mg/kg DM	2,8	0,020
Ni	mg/kg DM	0,71	0,31
P	mg/kg DM	200	72
Hg	mg/kg DM	0,015	<0,002
S	mg/kg DM	1.000	250

The total contents of the chemical elements in the HA were higher than those observed in the FA, except for Ca. However, similar values were obtained for the content of K.

The amounts of N present are slightly higher than those found in some types of soils used for intensive agriculture in Cuba.

Both compounds showed low contents of heavy metals, which is advantageous because it reduces the risk of contamination and allows the recycling of the organic material.

CONCLUSIONS AND OUTLOOK

High concentration of chemical elements in both humic substances in the anaerobic digestate of horticultural waste.

Significant increases of macronutrients in humic acid were found.

The content of micronutrients in both compounds exceeds that required by several tropical crops.

The humic substances of the anaerobic digestate of horticultural residues have a low content of heavy metals.

The content of secondary macronutrients is considered significant in both samples analyzed.

These amounts are higher than those found in various natural fertilizers traditionally used in vegetable production in tropical conditions.

The proportion in which the micronutrients were found in both acids exceeds the requirements of several crops of economic importance