BIOLOGICAL UTILIZATION OF VISCERA SLAUGHTER WASTE FROM RABBITS AS COMPOST

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ABSTRACT

The aim of the trial was to study composting as a bioconversion technique for the treatment and processing of rabbit viscera, considered as a slaughter waste. Nine compost cribs (0.60 m x 1 m x 0.40 m high) were made and contained one of the following mixtures (3 cribs /treatment): Control - 60% wood chips and 40% rabbit faeces; Viscera - 60% wood chips and 40% viscera, and VF - 60% wood chips, 20%faeces and 20% rabbit viscera. The cribs were located on the grounds of a penitentiary located in Entre Ríos, Argentina, that included a rabbit production unit, a rabbit slaughter house, a vegetable garden, and a carpentry unit. Prior to turning the compost, temperature and pH readings were determined weekly and samples were sent to the laboratory for soils of the Faculty of Agronomy (Univ. Buenos Aires) to determine humidity, electrical conductivity, and nutrient content. Treatment data were tested using statistical analyses procedures for time repeated measures. The pH of the 3 treatments complied with standard values set for organic fertilizers (pH 4-9) with no differences (P>0.05) among treatments. Viscera and Control treatments showed a moisture content level close to the recommended value (<20%). All treatments produced compost with values below the threshold for ash (<60% set by the EPA). The contents of K and P were acceptable for all treatments, being higher in Control and Viscera groups compared to the VF treatment. The organic carbon content was lower than the recommended level (> 15% set by the EPA) after 15 days of composting, although treatments Viscera and Control had higher values than VF, being close to recommended levels. In conclusion, the composting process offers a technically relevant solution to the negative environmental impact caused by the improper handling of the viscera of rabbits. The physical and chemical data results from the three treatments suggest the recommendation of using composting mixtures from the sawdust-faeces and sawdust-viscera.

Key words: Composting, rabbit viscera, faeces, penitentiary unit.

INTRODUCTION

The generation of organic wastes as pollutants is a global environmental problem. The proper use of these wastes will benefit not only agricultural production but also help to improve environmental protection, which would prevent the wastes *(e.g.,* blood and viscera) from being disposed into the environment without previous chemical treatment (Uicab Brito and Sandoval-Castro, 2003). The 'composting' method would be an alternative use of meat by-product wastes.

The low number of rabbits slaughtered in Argentina (200,000 rabbits /year in 8 slaughter houses with national authorization to export; MINAGRI data 2011) determined that the wastes that are not used directly were discarded in the trash, burned, buried or disposed into rivers or streams.

Composting is the result of a natural process in which certain beneficial organisms reduce and transform organic wastes into a useful product. The viscera of rabbits have a large amount of microbial flora that may be beneficial to the soil if it is used as fertilizer. There are no studies to date on the use of

domestic rabbit viscera to obtain compost for use as soil fertilizers. The objective of this work was to study the composting method as a bioconversion technique for the treatment and processing of the viscera from rabbit slaughter.

MATERIALS AND METHODS

The study was carried out on the grounds of the Criminal Unit N◦ 1 (Entre Ríos, Argentina) using the wastes (faeces) from the production unit of rabbits, the slaughter room, and a carpentry unit. Nine compost cribs (0.60 m x 1 m x 0.40 m high) were made from the following mixtures (3 compost cribs / treatment): Control - 60% wood chips-40% rabbit faeces; Viscera - 60% wood chips and 40% viscera, and VF: 60% wood chips, 20% faeces, and 20% rabbit viscera. The faeces or viscera were deposited at the bottom of each crib, and then was piled with wood chips, repeating the process until a desired height was achieved, but always taking care that all cribs were covered with the wood chips.

The compost cribs were located on the ground, being kept under natural conditions but was covered by a plastic sheet in the case of rain. Water irrigation levels were applied at a rate that corresponded to maintaining a humidity level of 85%. Compost was thoroughly stirred weekly.

Prior to turning compost, temperature (multi-voltmeter with thermocouple), humidity (manual), and pH (reactive strips, MERK) were measured weekly at three points in each compost crib (2 measurements in the corners and 1 in the center). Samples were sent to the laboratory for soils of the Faculty of Agronomy (University of Buenos Aires) to determine electrical conductivity and pH (potentiometer) in all samples. Organic carbon (Walkley Black methodology), phosphorus (Kurtz and Bray1 methodology), potassium (Ac NH4-1N-pH 7 methodology) and ash (AOAC, 1984) samples were taken in the second and last week.

Treatment data were tested using Proc Mixed of SAS (2004) for time repeated measures. Estimates of the fixed week and treatment effects were obtained and the covariance structure was computed using REML estimates.

RESULTS AND DISCUSSION

From the physical point of view, after 4 weeks, the compost obtained for each of the treatments presented odor ‘similar to the ground’, dark brown color and good consistency, presenting it as a product with good physical properties, which is in agreement with that described by Dickerson (2000). Table 1 shows the temperature determinations and results of chemical analyzes of compost samples.

In general, the temperatures from day 7 were below the range that favors the growth of microorganisms (55-75 ◦C) with the center measured higher than the temperatures measured at the corners of the cribs. The temperatures varied depending on the week of study, but decreased with composting time, hence resulting week x treatment interaction ($P < 0.0001$) with the Control treatment cribs having the lowest temperatures. The lowest values at week 3 were due to adverse weather conditions in the days before measurements were taken.

The pH results obtained in all treatments complied with the standard values set for organic fertilizers (pH 4-9) with no differences ($P > 0.05$) among treatments. The pH values measured in the field (reactive strips) were higher and more variable compared to laboratory determinations. Viscera and Control treatments showed a moisture content closer to the recommended value of <20%) established by the Environmental Protection Agency (EPA, 1995), although the highest value of moisture found in the mixed treatment viscera-faeces (VF) could have been due to a flooding problem in one of their cribs after the third week.

Table 1: Temperature, pH and compost chemical determinations by per week and treatment

Item	Week				Treatments			Probability			SE
	1	2	3	4	Control	Viscera	VF	week	Treat.	WkxTr	
Temperature Corner 1 (◦C)	35.2	30.6	27.4	31.6	29.4	32.0	32.2	<.0001	.0118	.0050	0.76
Temperature Center (◦C)	36.6	35.1	27.9	32.3	30.9	33.5	34.6	<.0001	.0438	.0089	0.99
Temperature Corner 2 (◦C)	35.3	31.8	27.9	32.3	30.6	32.0	32.9	<.0001	.1485	.0023	0.72
pH (field)	8.33a	8.00a	7.56ab	6.56b	7.67	7.83	7.33	<.0001	.2577	.6619	0.43
pH (laboratory)	7.59	7.90	7.82	7.71	7.72	7.70	7.83	.0391	.2937	.0002	0.17
Electrical conduct.(ds/m)	6.86	6.84	5.80	6.53	5.73	7.59	6.25	.9148	.5851	.2518	2.20
Humidity (%)	nd[1]	20.5	nd	27.2	22.2a	22.1a	27.3b	.0023	.0367	.5851	1.67
O. Carbon (%)	nd	16.4	nd	6.43	12.7	11.6	9.95	<.0001	.1012	.0084	1.61
Ash (%)	nd	8.96	nd	13.3	11.4	14.0	7.93	.0381	.0073	.0323	0.99
P (ppm)	nd	252.6	nd	277.6	315.3	257.4	222.8	.4363	.1110	.5186	21.2
K (ppm)	nd	509.5	nd	593.5	591.5	576.5	486.6	.0451	.1292	.6053	25.3

[1]nd: not determined

With respect to ash content, all treatments produced compost with values below the threshold (<60%, EPA, 1995) but without significant differences between Control and Viscera treatments. The contents of K and P were acceptable for all treatments and higher in Control and Viscera compared to VF treatments. The organic carbon content was lower than recommended (> 15% EPA, 1995) from 15 days of composting, although treatments, Viscera and Control, had values that were higher than the VF treatment, being similar to recommended levels.

CONCLUSIONS

The composting process offers a technically relevant solution to the negative environmental impact caused by the improper handling and disposal of the viscera of rabbits generated in slaughter houses. In the case of the Criminal Unit, composting allows the combined treatment of 2 sub-products (of animal origin: faeces and viscera and from plants and sawdust from the carpentry unit) to produce 'compost' that can be used in the organic garden of the prison unit. The physical and chemical data results from the three treatments suggest the recommendation of using composting mixtures from the sawdust-faeces and sawdust-viscera.

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