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GRANULATION OF VERMICOMPOST USING VERMIWASH AS BINDING MEDIA

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ABSTRACT

Vermicompost is a bio-fertiliser that is obtained from the bio-conversion of organic waste using earthworms. However, this vermicompost exist in paste form thereby the need for granulation to make it easier to store and transport. Vermicompost was granulated using vermiwash as the binding agent. Vermiwash was chosen as an alternative over water due to the presence of fertiliser macro and micro nutrients in the vermiwash. The vermicompost nutritional composition was tested before and after granulation. The granulated vermicompost indicated a 48.9%, 55.4%, 75% increase in nitrogen (N), phosphorous (P) and potassium (K) content upon granulating using vermiwash. The vermicompost ash content increased by 71.2% upon granulation whilst the moisture content decreased by 84%. Granulation of vermicompost using vermiwash enhances the vermicompost NPK composition at the same time making large scale production easier.

Keywords: Granulation, NPK Composition, Vermicompost, Vermiwash

I. INTRODUCTION

Vermicomposting has been widely used as an organic waste management technique and results in two bio-fertilisers vermicompost and vermiwash1-15. Vermicompost is an odourless dark brown solid bio-fertiliser obtained from vermicomposting1-15 whereas vermiwash is a brownish leachate that is obtained during vermicomposting from the micro-organisms and earthworms excreta [5, 9, 11, and 13]. Vermiwash can be used as a liquid bio-fertiliser as it is rich in fertilizer macro and micro-nutrients [5, 9, 11, and 13].

Although, this technology has been proven beyond doubt, vermicompost exist in paste form and that makes it difficult to package as well as store. This study therefore focused on the possibility of granulating wet vermicompost into granules using vermiwash for easier storage and packaging. Granulation is essential if we consider large production of vermicompost and the recent trends in granulation. Wet granulation is ideal as a granulating technique since it's environmentally friendly due to less emission of dust particles to the atmosphere.

II. MATERIALS AND METHODS

Materials

Vermicompost and vermiwash were obtained from the Institute vermicomposting project [14-15]. Eisenia Fetida earthworms were used for vermicomposting over a 30 day period. 1-15

Methods

Moisture content and volatile matter analyses were done using an AND moisture analyser. The %Moisture content (M) was determined by heating 5g of sample at 105◦C for 30 minutes and then recording the difference in weight. The %Volatile Matter (VM) was determined by heating 5g of sample at 105◦C for 3 minutes and then recording the difference in weight. The %Ash Content (AC) was determined by completely incinerating the 5g sample of wet vermicompost using a burner. The total %Fixed Carbon was determined as: 100% - %(M + VM + AC).

The nitrogen and phosphorous content were determined using an ultra violet visible spectrophotometer. The potassium content was determined using a flame atomization absorption spectrophotometer.

III. RESULTS AND DISCUSSIONS

Vermicompost Granulation Process Description

The raw materials required in the process are vermicompost in paste form and vermiwash which was used as a granulating fluid. The vermicompost process is clearly shown in Fig. 1. The vermicompost was firstly fed into the mixer where it was mixed before being sent to the granulator. The vermicompost was fed into the mixers by using hoppers. Air was blown through a bed of particles to fluidize the particles. The air was delivered by a

compressor at a pressure of 1 atm under perforated plates to induce mixing of the vermicompost. Vermiwash was pumped from the reservoir or storage tank through a spray nozzle positioned over the bed of particles causing the particle to adhere. The composition of vermiwash which was used as a binding media during the vermicompost granulation process is indicated in Table 1. Vermiwash was added in the ratio 2.1 in comparison to vermicompost.

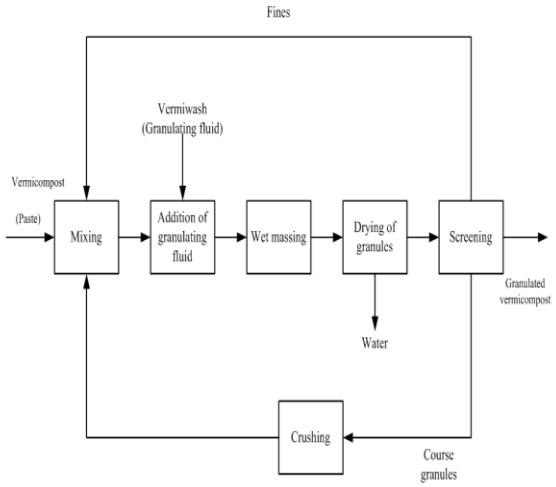

Fig. 1: Vermicomposting granulation process description

Escape of the material from the granulating chamber was prevented by exhaust filters. When sufficient vermiwash was sprayed to produce granules of required sizes, the vermiwash supply was turned off but the fluidizing air continued and this process was known as wet massing. The wet granules were then dried at a temperature of 110°C. The granules were lifted to a screening section using a bucket elevator. The fines were recycled back directly to the mixing section whilst the course particles were firstly crushed before being sent to the mixing section. The required vermicompost sizes were then moved to the storage vessel.

Table 1: Composition of vermiwash which was used as binding media during vermicompost granulation

Parameter	% Composition
N	**2**
P	**1.69**
K	**1.5**
Ash content	**3**

The granulated vermicompost particles that were obtained after using vermicompost as the wet media had an average particle size of 0.6 mm and are shown in Fig. 2. The particle size distribution obtained was the recommended for fertilizer granules.

Fig 2: Vermicompost granules obtained from using vermiwash as binder

Impact of using vermiwash as the binding media

The wet vermicompost was successfully granulated using vermiwash as a binder. The nutrient composition of the vermicompost also showed a marked increase upon addition of vermicompost (see Table 2). The vermicompost NPK content increased by 48.9%, 55.4% and 75% respectively upon granulation using vermicompost as a binder. This was attributed to the additional fertilizer macronutrients nutrients that were supplied by the vermiwash (see Table 1). The use of vermiwash as a binder therefore becomes attractive as it improves the vermicompost nutrient quality. The granulated vermicompost also had an ash content which was 71.2% higher as compared to the wet vermicompost (see Table 2). This was attributed to the increase in dry matter as the vermicompost was dried resulting in decreased moisture content by 84% (see Table 2). The moisture content obtained for the vermicompost was ideal for granules.

Table 2: Composition of vermicompost before and after granulation using vermiwash as binder

Parameter	% Composition (Raw Vermicompost)	% Composition (Dry Vermicompost Using Vermiwash)
N	0.89	1.74
P	0.45	1.01
K	0.25	1.00
Ash	12.96	45.01
Moisture	25	3.98
Dry matter	37.95	95.76

IV. CONCLUSION

Vermicompost can be granulated using vermiwash as a binding media for easier packaging and storage. Vermiwash is an attractive binder during the granulation process as it increases the vermicompost nutritional composition.

V. ACKNOWLEDGEMENT

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