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Odour and fly score changes during vermicomposting of cattle dung, sheep manure and poultry litter

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Abstract
The present study was carried out in the Division of Livestock Production and Management, Faculty of Veterinary Sciences and Animal Husbandry (SKUAST-Kashmir) to analyze the odour and fly score changes due to vermicomposting of cattle dung, sheep manure and poultry litter under the agro climatic conditions of Kashmir Valley. Four groups were formulated for carrying out the vermin-composting process and assessing the fly and odour changes were: Group G1: Cattle dung (Control), Group G2: Cattle dung + Sheep manure, Group G3: Cattle dung + Poultry litter, Group G4: Cattle dung + Sheep manure + Poultry litter. Different waste ingredients were added in equal proportions in each group. Every group was provided with four replicates (sub groups). The duration of the trail was 5 months. The odour and fly score analysis was carried out after every 15 days interval. An eight-point hedonic scale format was provided for this work with a committee of 5 members. Score 1 was assigned with extremely undesirable and 7 with extremely desirable remarks in both the cases. The odour score of the vermicomposting process varied significantly ($p<0.05$) between 4.6±0.24 (at 15th day of vermin-composting) and 7.8±0.20 (150th day of vermicomposting). Similarly, the fly scorecard varied between 4.9±0.37 (15th day of vermicomposting) and 7.9±0.24 (150th of vermicomposting). It was concluded that odour and fly scores were improved significantly ($p<0.05$) as the vermicomposting process proceeded with the maturation and stabilization of the process.

Keywords: Scorecard, vermicomposting, cattle dung, sheep manure, poultry litter

Introduction
The livestock sector is pivotal in the development of the Indian economy due to its contribution of around 4.11% to the annual GDP and 25.6% to the agricultural GDP [1]. India has the largest population (536.76 million) of livestock in the world with 193.46 million cattle and 74.26 million sheep, besides a poultry population of 851.80 million [2]. Livestock and poultry primarily yield milk, meat and eggs for human consumption while also furnishing some important by-products like dung, sheep manure and poultry litter. The annual cattle dung production in India recorded was 562 million tons [3]. 60-80 lakh poultry birds are annually reared for slaughtering and generate about 4 lakh mortalities and 1.8 lakh tons of litter manure in Kashmir valley [4]. India has recorded around 370 million tons of sheep manure of which 17 million tons were generated in Jammu and Kashmir annually [5]. Improper disposal and handling of bio-wastes originating from agricultural industries in forests, rural and urban areas lead to nutrient loss and environmental pollution while posing significant health risks [6]. Additionally, it provides a breeding ground for the menace of unpleasant odor, flies, rodents, greenhouse gas emission and other forms of undesirable infestation and hence vermicomposting in this regard offers a best waste management methods which limits the menace in terms of smell and fly issues [7]. A number of earthworm species *Eisenia fetida* has been found to be the most suitable one [8] for eco-friendly managing the animal waste besides a valuable end product is attained in the end.

Materials and Methods
In the present study vermicomposting was conducted in the month of March during the year 2022 in the Division of Livestock Production and Management,

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Faculty of Veterinary Sciences and Animal Husbandry (SKUAST-Kashmir) under the agro climatic conditions of Kashmir Valley to analyze the odour and fly score changes while vermicomposting of farm waste. The Red Earthworms (*Eisenia fetida*) were utilized for carrying out the vermicomposting. The vermicomposting was carried out in plastic bins each having the capacity of 30 liters. The odour and fly score analysis was carried out after every 15 days interval. An eight-point hedonic scale format was provided for this work with a committee of 5 members [9]. The description of the scorecard is given in Table 1. The evaluation for the estimation of odour and fly scores were recorded after every 15 days interval (15th, 30th, 45th, 60th, 75th, 90th, 105th, 120th, 135th and 150th day). A 5 member committee was constituted for conducting the fly and odour scores at different intervals.

Statistical Analysis

The data was analyzed as per the method suggested by Snedecor and Cochran [10] using Chi Square Test. The SPSS software was used.

Table 1: Odour/fly scorecard

Attributes	Score	Marks
Extremely Undesirable	1	
Highly Undesirable	2	
Moderately Undesirable	3	
Undesirable	4	
Desirable	5	
Moderately Desirable	6	
Highly Desirable	7	

Table 2: Odour score card analysis of vermicomposting (Mean ± SE).

Interval	Odour score
15 days	$4.6^{a}\pm0.24$
30 days	$5.4^{ab}\pm0.40$
45 days	$6.2^{bc}\pm0.37$
60 days	$6.4^{bc}\pm0.40$
75 days	$6.6^{cd}\pm0.50$
90 days	$7.0^{cde}\pm0.31$
105 days	$7.2^{cde}\pm0.37$
120 days	$7.3^{cde}\pm0.37$
135 days	$7.6^{de}\pm0.24$
150 days	$7.8^{e}\pm0.20$

Means with different superscripts at different time intervals differ significantly ($p\leq0.05$)

Table 3: Fly score card analysis of vermicomposting (Mean ± SE)

Interval	Odour score
15 days	$4.9^{a}\pm0.37$
30 days	$5.4^{ab}\pm0.37$
45 days	$6.0^{bc}\pm0.24$
60 days	$6.3^{c}\pm0.37$
75 days	$6.5^{cd}\pm0.24$
90 days	$6.9^{de}\pm0.37$
105 days	$7.2^{de}\pm0.45$
120 days	$7.3^{de}\pm0.32$
135 days	$7.5^{de}\pm0.37$
150 days	$7.9^{e}\pm0.24$

Means with different superscripts at different time intervals differ significantly ($p\leq0.05$)

Results and Discussions: The odour score of the vermicomposting process varied significantly ($p<0.05$) between 4.6 (15th day) and 7.9 (150th day). Similarly, the fly scorecard varied between 4.9 (1^{5th} day) and 7.9 (150th). It was observed that both odour as well as fly scores were improved significantly ($p<0.05$) as the vermicomposting process proceeded. Odour score is an effective and simple indicator of an efficient vermicomposting [11]. The fly score card also has the same significance as flies are attracted by the odour if created during vermicomposting. The odour score recorded during vermicomposting varied between 4.6 (15th day) and 7.9 (150th day). Similarly, the fly score card varied between 4.9 (15th day) and 7.9 (150th day). In the present experiment there was improvement in the odour/fly scorecard with the passage of time. The results were in agreement with the findings of Fong and Hewitt, (2022) [12], who stated that the adding of sufficient carbon source or bulking agent act as a bio-filter which enhance the microbial activity by maintaining proper conditions of moisture, pH and temperature and deodorizes the gasses released at ground level from the carcass compost piles and also prevent access by insects and birds and this minimizes transmission of disease agents from mortalities to livestock or human [13].

Conclusion

It was concluded that by vermicomposting livestock farm waste and poultry farm waste the obnoxious gasses and smell vanishes as the process of vermicomposting proceeded. Hence vermi-composting is an eco-friendly and socially acceptable method of waste disposal.

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