Effect of Different NADEP Compost on Growth Performance of Berseem (*Trifolium alexandrinum*) Fodder

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ABSTRACT

Background: The present study was conducted on NADEP compost prepared from cow, goat and poultry manure to determine its effect on growth performance of berseem (*Trifolium alexandrinum*) fodder.

Methods: A sample of compost from different NADEP tanks will be taken at 15th, 30th and 45th day for plant length (cm), number of branches, number of leaves and production yield per plot first cutting (quintal/acre).

Result: Applications of 4.5 quintal/acre cow, goat and poultry NADEP compost have a positive effect on the entire fodder growth under the experiment. The significant effect on plant length 60.26 cm at 45 days and number of leaves 24.78 at 30 days revealed that berseem (*Trifolium alexandrinum*) responded significantly well to the application of poultry compost as compared to cow and goat compost. Based on the findings of the study, it may be recommended that 4.5 quintal/acre of poultry compost is adequate to maximise the growth and yield of berseem fodder.

Key words: Berseem fodder, Fertilizer, Growth performance, NADEP, Production yield.

INTRODUCTION

Composting is the biological degradation process of heterogenous solid organic material under controlled moist, self-heating and aerobic conditions to obtain a stable material that can be used as organic fertilizer. Organic fertilizer improves the physical, chemical and biological properties of soil. It also improves water holding capacity. The NADEP method of organic composting was developed by an old Gandhian worker of Maharashtra named narayan deorao pandharipande and therefore, derives its name abbreviated as NADEP method of composting. This compost uses a wide range of organic materials such as crop residues, weeds, forest litter, kitchen and farm waste with an end product of a fertilizer that serves as a good alternative to farmyard manure. India having largest population which are the key source of milk, meat and eggs beside this produces huge amount of manure daily from these large number of livestock. These manures create serious environmental problems by releasing nitrate and phosphate to the surface and ground water as well as release ammonia, carbon di-oxide, hydrogen sulphide gas in the air (Won *et al.,* 2016). Manure biomass is also a potential source of greenhouse gases that are responsible for global warning.

NADEP method is a simple to process and operate which is nuisance free, environmentally friendly and socially acceptable, as the end product have good fertilizer value. NADEP method permits conversion of approximately 1 kg of animal dung into 40 kg of rich compost. Cows produces an average of 20 to 25 kilograms of dung every day. Cow dung contains 0.5% Nitrogen, 0.2% Phosphorus and 0.5% Potassium. The typical daily dung production of a goat is 1.0 to 1.5 kilograms. Goat manure contains 3% Nitrogen, 1% Phosphorus and 2% Potassium. Poultry generates an average of 2.5 to 3.0 kg of manure every day per 100 chickens. Chicken manure contains 3.03% Nitrogen, 2.63% phosphorus and 1.4% Potassium. Compost is the most significant resource for soil fertility that supplies macro and micro- nutrients for crop growth (Sarker *et al.,* 2019). These livestock manures could be a valuable resource if a proper recycling method is adopted otherwise, they are a burden to the environment (Rana *et al.,* 2020). Worldwide, sustainable crop production focused due to reduction in production resources and increased population in current and imminent farming systems. Fodder crops played a dynamic role in agriculture for increasing demand of fodder

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as it required for livestock to fulfil the increasing milk demand for human beings (Roy *et al*., 2015). The Berseem *(Trifolium alexandrinum* L.) is one of the most important forage legumes in India. Berseem was introduced in India in 1903 domesticated in Egypt and later introduced in other parts of the world. It was first introduced in North and Western India. Now, it is a major fodder crop in irrigated areas of the country (Beena *et al*., 2011). Berseem has been used in recent decades and is popular among farmers because of its fast growth, high number of harvests and fresh forage production with good quality and quantity. The results of research showed that the rate of berseem production depends on sowing date, climatic conditions, soil fertility, shrub height, the number of harvests and variety (Seyede *et al*., 2015). Berseem is known as the king of fodder crops due to its palatability and high forage nutritive value. It has become very popular rabi fodder in irrigated areas of the country (Roy *et al*., 2009).

Keeping the above in view, the present study has been planned to determine the effect of different NADEP compost on growth performance of Berseem (*Trifolium alexandrinum*) fodder.

MATERIALS AND METHODS

Location of work

The present research work was carried out at Livestock Farm Complex, Department of Livestock Production Management, College of Veterinary Science and Animal Husbandry, NDVSU, Mhow (M.P.).

Duration of the experiment

The experimental work was carried out in the year 2023 for a duration of six months, during which the composting process was monitored until completion.

Research methodology and experimental design

The experiment was conducted following a randomized block design (RBD). The study consisted of one main treatment namely the method of composting and three sub-treatments which were based on different composting materials. The NADEP composting method was adopted for the preparation of compost. Composting pits of uniform size measuring 1.5 m × 1.0 m × 0.5 m were used for all treatments to maintain consistency in experimental conditions. The composting materials constituted the sub-treatments were as follows:

T1 - Cow manure, farm waste and soil.
T2 - Goat manure, farm waste and soil.
T3 - Poultry manure, farm waste and soil.

The materials used for compost preparation included: Cow manure, goat manure, poultry manure, farm waste and soil.

Construction of NADEP compost tank

NADEP pit technology envisages the above ground construction of rectangular tank of bricks having dimension 1.5 m length 1 m width 0.5 m height with a thickness of side wall 8 inches. The top most layer of the brick being fixed with cement for the sake of its durability. The numbers of rectangular hole are made during construction by removing alternate bricks. This enables natural aeration of composting material after the completion of construction work the inside walls and floor of the tank are plastered with cow dung and water mixture and allow to dry before filling.

Collection of manure and farm biowaste

Manure of cow, goat and poultry was collected from dairy, goat and poultry unit, respectively, College of Veterinary Science and Animal Husbandry, NDVSU, Mhow (Indore). Soil was collected from locally available sources.

Material required for composting (each layer)

Farm waste 45 kg (wheat straw + green fodder) Cow/goat/poultry manure 5 kg mixed with 20 litres of water Fine dried soil 50 kg was uniformly spread and water was added to sufficiently moistened it.

Procedure

As per the original recommendation of NADEP Technology, materials required for filling the pit, compost was placed layers in following order. The first layer is spread uniformly which include dairy farm waste (Wheat straw + green waste) nearly about 45 Kg (First Layer) then followed by spread of manure slurry, prepared from 5 kg cow/goat/poultry manure is mixed with 100 litres of water is sprinkled (Second Layer) and 50 kg fine dried soil was uniformly spread (Third Layers). When layer reaches to 1.5 feet above the pit a dome shaped covering is made by plastering it with soil and cow dung slurry. 60 to 70 per cent moisture is maintained throughout the composting process up to three months from the filling date (Table 1).

Evaluation of the growth performance of berseem fodder in experimental plots

Randomized block design (RBD) field experiment was conducted during rabi season (2022-2023) at cultivation farm, Department of Livestock Production Management, College of Veterinary Science and Animal Husbandry, NDVSU, Mhow (M.P.). One acre (4047 Sq. Meter) of selected rectangular plane cultivable land was divided into three equal plots (1350 Sq. meters each) and sowing of Berseem

Table 1: Different ingredients of NADEP composting.

NADEP compost tank	Raw material 5 Kg	Farm waste (Wheat straw + green waste) (Kg)	Fine dried soil(Kg)	Water (Lit.)
Tank 1	Cow manure	45	50	100
Tank 2	Goat manure	45	50	100
Tank 3	Poultry manure	45	50	100

(*Trifolium alexandrinum*) seed was done @ 3 kg in each plot. Berseem was purchased from Foragen Seeds Private Limited company and was applied according to scientific practices. The size of each plot was 1350 sq. meter. After making water channels and thorough preparation of the field, the seeds were broadcasted uniformly in their respective plots. All the three plots were manured with the experimental NADEP compost, namely T1 (cow), T2 (goat) and T3 (Poultry) @ 1.5 quintal in each plot according to the design and mixed with the soil before the time of sowing. Sowing was done on 20 December, 2022 and first irrigation was applied at the time of sowing, while a second irrigation was applied about 12 days after sowing for the best establishment of seedlings. Nine (9) Berseem plants were randomly selected from each of the 3 plots and data of stem length (cm), number of branches, number of leaves and production yield/ plots (First cutting) were recorded.

Observation recorded

The growth and yield parameters including plant length, number of branches, number of leaves and fodder production yield (quintal/acre) of Berseem (*Trifolium alexandrinum) fodder* were observed at 15-day intervals (15^{th}, 30^{th} and 45^{th} day after sowing).

Statistical analysis

The statistical analysis was done according to One Way Analysis of Variance (ANOVA) as stated by Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

Berseem (*Trifolium alexandrinum*) is one of the most important leguminous forages in the Middle east and the Mediterranean region. It is a important winter forage because of its nutritional value and contains more than 20% and 70% crude protein and dry matter digestibility respectively (Pal *et al.,* 2004). In India, it is also cultivated as rabi (winter) fodder crop in irrigated areas.

It is clear from the Table 2, before berseem sowing all three plot was treated with NADEP compost prepared from various types of manure NADEP compost and measurement of plant length (in cm) 30.34, 31.00 and 31.68 at 15^{th} day. Similarly, 42.33, 42.89 and 43.34 for 30^{th} day, 59.34, 60.23 and 60.78 for 45^{th} day, respectively from cow, goat and poultry. The poultry compost treated plot has significant effect on plant length (cm) at 45^{th} day than cow and goat NADEP compost treated plot in our study, because poultry manure NADEP compost has high nitrogen content. Similar effect range of plant length (cm) was observed from cow compost *i.e*. 40.9 cm and poultry compost *i.e*. 42.1 cm by Nand *et al*. (2018). However, Jaiswal *et al.* (2023) reported higher plant length (68.69 cm) due to treated with chemical fertilizers. Berseem has phosphate solubilizing bacteria (PSB) causing significantly higher plant length (51.60 cm) was reported by Roy *et al.* (2015).

Evaluation of number of branches in cow, goat and poultry NADEP compost treated plots

All three plots were treated with NADEP compost prepared from various types of manure compost and number of branches were counted (Table 3). On 15^{th} day of experiment, the average of total no. of branches were calculated to be 7.0, 7.2 and 7.4 respectively for cow, goat and poultry NADEP compost. In the same manner, the means were found as 7.7, 7.8 and 8.0 for 30^{th} day growth of berseem. 8.4, 8.3 and 8.5 for 45^{th} day, respectively from cow, goat and poultry NADEP compost treated plots. The all three NADEP compost treated plot has no significant effect on number of branches in present study because before the first cutting, the branching did not progress much. Comparatively higher number of branches in Berseem was reported Roy *et al.* (2015) and Usman *et al.* (2015) who found higher

Table 2: Plant length (cm) of berseem, treated with cow, goat and poultry NADEP compost.

Day	Plant length (cm) of berseem treated with various compost		
	Cow compost	Goat compost	Poultry compost
15^{th}	30.34±0.33	31.00±0.70	31.68±0.52
30^{th}	42.33±0.28	42.89±0.35	43.34±0.44
45^{th}	59.34^{b}±0.28	60.23^{ab}±0.36	60.78^{a}±0.40
Overall mean± SE	44.00±0.29	44.70±0.47	45.26±0.45

Similar superscript indicates non-significant; Different superscript indicates significant difference ($p<0.05$).

Table 3: Numbers of branches of berseem, treated with cow, goat and poultry NADEP compost.

Day	Number of branches of berseem treated with various compost		
	Cow compost	Goat compost	Poultry compost
15^{th}	7.0±0.23	7.2±0.22	7.4±0.24
30^{th}	7.7±0.22	7.8±0.26	8.0±0.23
45^{th}	8.4±0.17	8.3±0.23	8.5±0.17
Overall mean±SE	7.7±0.20	7.7±0.23	7.9±0.21

Similar superscript indicates non-significant; Different superscript indicates significant difference ($p<0.05$).

Table 4: Number of leaves of Berseem, treated with cow, goat and poultry NADEP compost.

Day	Numbers of leaves of berseem treated with various compost		
	Cow compost	Goat compost	Poultry compost
15th	19.88±0.45	20.23±0.72	20.89±0.84
30th	22.67^{b}±0.64	23.22^{ab}±0.70	24.78^{a}±0.32
45th	24.66±0.89	25.45±0.72	26.11±0.35
Overall mean ± SE	22.40±0.66	22.96±0.71	23.92±0.50

Similar superscript indicates non-significant; Different superscript indicates significant difference ($p<0.05$).

Table 5: Production yield of berseem (First cutting), treated with cow, goat and poultry NADEP compost.

NADEP compost	Average yield (Quintal)
Cow compost	17.9
Goat compost	19.4
Poultry compost	22.3
Total production yield	59.6 Quintal/acre

number of branches. The different results reported by these workers might be due to fact that they treated their crop with rhizobium inoculation and phosphate solubilizing bacteria (PSB) inoculation respectively.

Evaluation of number of leaves in cow, goat and poultry NADEP compost treated plots

It is clearly shown in Table 4 that the berseem plot under study were treated with NADEP compost prepared from various types of manure compost and record the number of leaves 19.88 in cow compost, 20.23 in goat compost and 20.89 in poultry compost at 15 days. Similarly, 22.67, 23.22 and 24.78 for 30 days, 24.66, 25.45 and 26.11 for 45 days, respectively from cow, goat and poultry NADEP compost treated plot. The poultry compost treated plot has significant effect on number of leaves at 30 days than the plots treated by cow and goat NADEP compost. Since, the poultry manure NADEP compost had high Nitrogen and Phosphorus content, the no. of leaves was found significantly higher. However, Jaiswal *et al.* (2023) reported higher (49.54) number of leaves as it was treated with inorganic fertilizers. Usman *et al.* (2015) also found higher number of leaves, *i.e.* 36, 50 and 55, respectively in cow, goat and poultry NADEP compost in tomato crop. Interestingly, lower number of leaves were found in vegetable (10.50) and agriculture (10.25) waste NADEP compost (Naikwade *et al.*, 2012). Organic nutrient management helps to build healthy soil that is rich in organic matter and provide all the nutrients that the plants need besides improving the quality and taste of the final produce (Mahima *et al.*, 2025).

Evaluation of fodder production yield (quintal/acre)

Berseem fodder average production yield has been showed in Table 5. The average yield of berseem (Q) was found as 17.9 Q per plot which was treated by cow compost, whereas for that of goat compost and poultry manure NADEP compost were obtained to be 19.4 Q and 22.3 Q per plot, respectively. The total production (quintal/plot) of berseem at first cutting was obtained as 59.6 quintal/acre at 45 days. The higher yield might be due to the more positive effect of organic manure in the form of vermicompost or NADEP. This is in agreement with the findings of Shah *et al.* (2025) who studied the application of 10 kg nitrogen through NADEP mixed with Bio NP (*Rhizobium* and PSB) 1.0 per hactre as soil application or 10 kg nitrogen through vermicompost mixed with Bio NP (*Rhizobium* and PSB) 1.0 per hactre as soil application produced significantly higher seed yield and better economic return. Kharte *et al.* (2022) studied the positive effect of organic manures and inorganic fertilizers on yield attributes, yield and economics of pigeon pea and revealed that the number of pods/plant, seeds/pod, pod length and seed yield/plant were statistically similar in all tested organic manures but the application of vermicompost @ 5 t/ha, significantly improved the 100-seed weight. It also produced a significantly maximum seed yield of 1337 kg/ha, stover yield of 6220 kg/ha and net returns of Rs. 51727/ha. In another study, the production root yield of sweet potatoes increases by combined application of vermicompost and mineral K fertilizer (Degwale *et al.*, 2025). Similarly, Kumawat *et al.* (2009) showed that use of organic manures, PSB and phosphorus, have markedly influenced the yield and monetary return of kharif mungbean crop, which might be due to greater absorption of nutrients as a result of increased cation exchange capacity enhanced with organic manure application.

CONCLUSION

Based on the findings of the study, it may be recommended that 4.5 quintal/acre of poultry compost is adequate to maximise the growth and yield of berseem fodder. However goat compost, which is common in the area may be applied in the absence of poultry compost for greater growth performance of Berseem (*Trifolium alexandrinum*) fodder. Moreover, the study may be performed on bigger NADEP Tank and larger crop fields and on different crops to get more accurate results. As oversized or undersized tanks reduce compost efficiency and nutrient quality because it balances air, moisture, heat and microbial activity. The presence of a relatively large microbial population under aerobic heap formation eliminates the possibility of methane generation and enhances humification post soil application, leading to increased organic carbon sequestration.

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Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this article. No funding or sponsorship influenced the design, interpretation or preparation of this manuscript.

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