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Gauno is a good fertilizer from Cynopterus sphinx Frugivorous Bat (MEGACHIROPTERA: PTEROPODIDAE) in Ahmednagar, Maharashtra

Shaikh Tabbunisha R.*[1], Doke Dnyaneshwar V.[2], Bhosale Rahul S.[3]
[1*]Department of Zoology, Annasaheb Awate College Manchar, Pune, Maharashtra, India
[2]Department of Zoology, Annasaheb Awate College Manchar, Pune, Maharashtra, India
[3]Arts, Commerce and Science College, Narayangaon, Junnar, Pune, Maharashtra, India

ABSTRACT

Cynopterus sphinx is a frugivorous bat also known as greater short-nosed fruit bat or short-nosed Indian fruit bat known for fruit eating habit. Apart for which its feces called as guano is thought to be rich in nutrient and microbes. Recent research was carried out to study its positive implementation as manure for plants. Results of present study indicate that bat guano is an efficient source of manure which helps to increase plant productivity and improve soil texture.

Key words: Cynopterus sphinx, Guano, Manure.

I. INTRODUCTION

Cynopterus sphinx is a frugivorous bat also known as greater short-nosed fruit bat or short-nosed Indian fruit bat and this species found in Bangladesh, Bhutan, Cambodia, China, India, Indonesia, Malaysia, Myanmar, Pakistan, Sri Lanka, Thailand, and Vietnam (Fujitta and Turtle 1991). Ahmednagar is found to be reach spot of diversity of frugivorus btas. Some distinct species present in Ahmednagar are well known for their fruit consumption. Thses speies are identified as Cynopterus sphinx, Taphozous longimanus, Pteropus giganteus (Kardile V. U. 2009). The use of Bat guano in the improvement of the nutritive value of poor quality roughage fed to ruminants (M. lay, P. M. 2008). Application of farmyard manure (FYM), compost, Green manure and bioinoculants are the most important management practices in farming (Thampan,1993). Improvement of soil fertility through the application of vermicompost is becoming more popular. Guano was somewhat forgotten once chemical fertilizers became the plant food of choice, but it has always been prized by organic growers. Now that the risks of synthetic gardening products are becoming widely known, more and more farmers are realizing that this dark, rich manure is indeed one of nature's treasures. It is an alternative to a shelf full of chemical products, ably serving as plant fertilizer, soil builder, soil cleanser, fungicide, nematocide, and compost activator. Most chemical fertilizers leach out of the soil soon after being bat guano can be safely used as a fertilizer, both indoors and outdoors. Its primary ingredients are roughly 10% nitrogen, 3% phosphorous, and 1% potassium. Besides these three major nutrients, guano contains all of the minor and trace elements necessary for a plant's overall health. Unlike artificial gardening products, guano applied. Guano remains much longer, enhancing the soil and slowly continuing to feed the plant.

Guano "works wonders" as a soil builder and says it can be used year-round to improve soil texture and richness, helping to bind loose soil and lighten heavy soil. Homeowners have reported that the benefits of a single treatment on the lawn can still be seen three or four years later. Because guano is rich in bioremediation microbes, which clean up toxic substances, it is a purifying addition for gardens in transition from chemical to organic practices. These microbes will combat fungus when sprayed directly on a plant's leaves. Bat guano contains powerful decomposing microbes, which help control soil-borne diseases and harmful nematodes and which serve as ideal compost activators, significantly speeding the decomposition process (Keleher, S., 1996).

II. METHODS AND MATERIAL

Selection of Site

Location of Ahmednagar and India coordinates 19.08°N 74.73°E at an elevated about 615m above sea level .The study site selected for present investigation is Botanical garden in New Arts, Commerce and Science College, Ahmednagar (See Fig No-1). We are selected five stations on selected site for collection of guano. These stations are Station I – tree species like Delonix regia (Gulmohar) ,Station II- Samanea saman (Rain tree),Station-III- Eucalyptus alba (Nilgiri) ,Station IV- Albizia libbeck (Shirish),Station V- Ficus racemosa (Umbar) (Ingalhalikar, S And S .Barvr) are the roosting sites for a large number of Cynopterus sphinx (about 840) over the past years(See Figure 2) .

Collection and Preservation of sample

Polythene sheets were hanged horizontally to spread collect bat excrement during November 2015 to February 2016(See Fig No 3). Sample is daily collect at afternoon by wearing handglose and mask in paper boxes. Sample is preserved in boxes by sun drying process (See Fig No 4). Amount of sample is crush with the help of mortar and pestle.

Analysis of Guano

Preserved guano at different time intervals the following parameters was used to analysis of guano as follows-

1. P^H

P^H was estimated using P^H meter after preparation of saturated solution by 1:20 dilution w/v with distilled water (Behera, P.K.)

2. Total organic matter

Total organic matter was estimated by weighing 10 Gms sample initially and completely incinerating in furnace above 250°C and final weight was taken by weighing residue. Organic content was recorded from difference of initial and final weight. Similarly inorganic salts were recorded (Harbone, J. B.)

1. 3. NPK estimation

Sample was given for detection of **N**, **P** and **K** to Shrushtipriya laboratory and environment consultants, Ahmednagar . Following methods was used-

Nitrogen (N): from Kjeldahl method

Phosphorus (P): from Colorimetric method

Potassium (K**):** Atomic Absorption Spectroscopy.

a) b)

a) Preparation of different treatment selected

Seven treatments (T1-T7) consisting of loamy soil, bat guano and farm yard manure(FYM)(w/w) were assessed .Red loamy soil (150g) was mixed with bat guano and farm yard manure in different proportion in plastic trays. Sets made for treatment were as follows (See Fig 5: T1 to T7) (Ashwini, KM.et al 2006)-

T1= Soil (Control)

T2 = Soil +Bat Guano (20:10)

T3 = Soil +Bat Guano (20: 5)

T4 = Soil +Bat Guano (20: 2.5)

T5 = Soil +Bat Guano (20: 1)

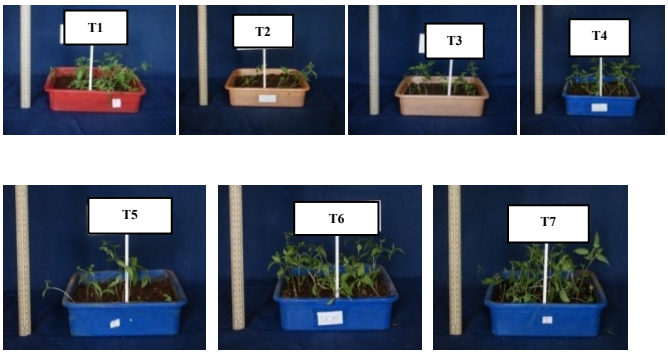
T6 = Soil +Bat Guano + FYM (20: 2.5:10)

T7 = Soil +FYM (20: 10)

Figure 1. Collection Site

Figure 2. Polythene sheets

Figure 3. Sun Dry sample



(T1: Soil (Control), T2 = Soil +Bat Guano (20:10), T3 = Soil +Bat Guano (20: 5), T4 = Soil +Bat Guano (20: 2.5), T5 = Soil +Bat Guano (20: 1), T6 = Soil +Bat Guano + FYM (20: 2.5:10), T7 = Soil +FYM (20: 10).

b) Selection of seed material and Cultivation

The healthy 100 seeds of Phaseolus aconitifolius (Mataki) were selected per treatment. Plastic trays were sterilized with 0.1% $HgCl_2$ for different sets. Trays were filled with selected ratios of Soil, FYM, and Bat Guano.100 seeds per tray were sown at equidistance and covered by moist filter paper to maintain humidity and avoid water loss.

c) Analysis of plant growth parameter

1. Percentage of germination

After one week of sowing the percentage of germination was determined and recorded (Cook,T).

2. Seedling height

The plastic tray contains the various proportions of soil and guano. After one week of sowing 10 seedlings from each tray was taken and measure the root and shoot length separately and record it. The total of each root and shoot length is seedling height (Cook,T) .

3. Survival of plants

Survival of plants was recorded after four week of germination by counting healthy plants in each tray (Cook,T).

4. Fresh weight and dry weight

The fresh weight was recorded after removing plants from each tray and dry weight was recorded after drying plants at 25°C in hot air oven (Cook,T).

1. **5. NPK uptake**

For NPK uptake, dried powder of plant was gives to Shrushtipriya laboratory and environment consultants, Ahmednagar. Following methods was used-

Nitrogen (N): from Kjeldahl method

Phosphorus (P): from Colorimetric method

Potassium (K) Absorption Spectroscopy.

6. Statistical Analysis

From recorded data of germination and plant height, Plant Dry Biomass and Nutrient Uptake was statistically analyse.

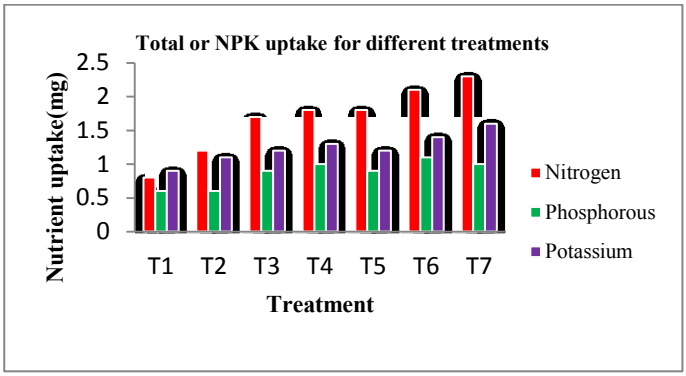
III. RESULTS

Physicochemical feature

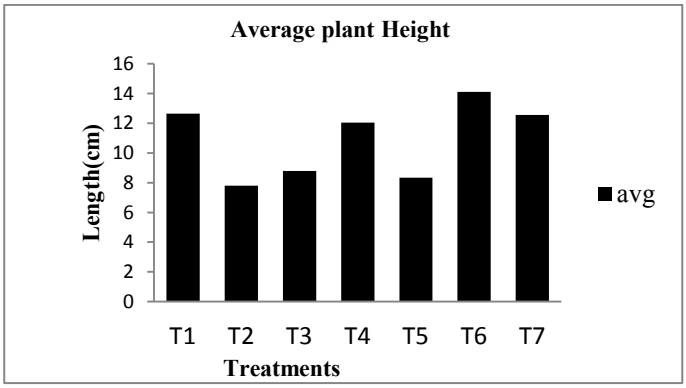
Physicochemical feature of guano is presented in following table. Throughout study it was observe that bolus was acidic in nature (P^H-6.12). Conductivity, Organic matter, Nitrogen, Potassium, Phosphorus, Fungi, was substantially higher than other animal manure.

Table 1. Physicochemical features of guano

Characteristic	Values
P^H	6.12
Total Organic matter (gm)	0.611
Total Nitrogen (mg/lit)	4.1
Phosphorus (mg/lit)	2.3
Potassium (mg/lit)	3.6



Graph: 1. NPK uptake for different treatments



Graph 2. Plant height

Crop growth was better in T1, T6 than T2-T5 and T7. The crop in T6 (soil+guano+FYM) showed the highest growth shoot length, NPK uptake (graph 1). T-test revealed the significant difference ($P<0.05$) between T6 (20:2.5:10) and T1 (Control) as like as T6 and T7 (20:10) in Highest growth, NPK uptake compare to other treatments. The crop in T2 (Soil+ guano) concentration guano is high resulted in wilting of seedling possibly due to high concentration of nutrients. In T6 successfully use as mixing of soil, FYM and guano to increased the growth and nutrient uptake of crop. Manure partially meets the NPK requirement of plantation crop, guano in appropriate ratio may help overcome the deficiencies to improve plant quality.

IV. DISCUSSION

Nitrogenous guano is known to be enhancing crop growth, while phosphorus guano induced root development, shoot budding, multiple branches and flowering. In this study, the uptake of P in treatment T6 indicating the presence of P in available form and importance of bat guano in crop growth. The high P uptake in T6 treatment resulted in increased quality of crops. This indicates the soil amendment with guano at 20:2.5:10 ratios supplied adequate nutrients. Amending soil with high quantities of guano (in T2, T3, T4) resulted in the wilting of seedling possibly due to high concentration of nutrients (Sridhar, K.R et al., 2006).

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