*Biological Forum – An International Journal* **14(2a): 333-338(2022)**

**ISSN No. (Print): 0975-1130**
**ISSN No. (Online): 2249-3239**

# Effect of Rabbit Manure on Productive Performance of Flip of Fodder Grass - Cumbu Napier Hybrid

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*(Received 24 April 2022, Accepted 19 June, 2022)*
*(Published by Research Trend, Website: www.researchtrend.net)*

**ABSTRACT: Organic agriculture is expanding worldwide because synthetic fertilizers are paved the way for deterioration of soil health and in turn ill-effects on plants, human being and livestock. Rabbits are herbivores can extract energy and nutrients from feedstuffs rich in fibre. Finding out alternate manure in organic farming will help to increase the availability and decrease the over dependence of single manure. Hence, the present study was carried out to study the effect rabbit manure on Cumbu Napier hybrid grass in comparison with other livestock manure. Collection of rabbit manure is a big challenge. For that rabbit manure is collected along with crop residues and allowed it for composting. A filed experiments were conducted at PGRIAS, TANUVAS during 2019-20. The experiments were laid out in Randomised Block Design with three replication in main and ratoon crops. Treatments included were different doses of rabbit manure (150, 125, 100, 75, 50, 25 Percent : T1-T6 respectively) in comparison with FYM (T7), Pig manure (T8), Poultry manure(T9), Inorganic fertilizer (T10) and control (T11). From the above study it could be concluded that application of rabbit manure (100 percent) recorded the higher yield of 438.1 and 405.4 t/ha in main and ratoon crops respectively. This was followed by T4, T7, T8 and T9. However the higher doses of rabbit manure application increased the yield and it was on par with T3. Hence 100 percent application of rabbit manure is recommended and it is the best alternate for the other existing manure.**

**Keyword:** Rabbit manure, CN hybrid, Organic farming.

## INTRODUCTION

Organic agriculture is an ecologically intensive production system expanding worldwide as demand for sustainability increases (Eyhorn *et al.,* 2019; Willer *et al.,* 2019). organic farms produce lower yields than comparable conventional farms (Seufert *et al.,* 2012; Ponisio *et al.,* 2015), they are more profitable, more friendly to pollinators and the environment, and deliver equally or more nutritious foods with fewer pesticide residues (Kennedy *et al*., 2013; Tuck *et al.,* 2014; Reganold and Wachter 2016; Seufert and Ramankutty 2017). Organic farming relies on large-scale application of animal or farm yard manure (FYM), compost, crop rotation, residues, green manuring, vermicompost, bio-fertilizers and bio-pesticides (Muhammad Naeem *et al*., 2006).

Various studies proved that application of organic material improve the soil quality, fertility and even in soil reclamation. Assessment of physical, chemical, physico-chemical properties and functions of organic materials such as cow dung manure, sheep and goat manure, pig manure and rabbit manure compost would improve the soil quality and soil fertility (Rajendran *et al.,* 2019). Rabbits are herbivores mainly fed with high fibre diet for proper digestion along with concentrate feed. Rabbit farming now gaining its popularity in tropical condition state of India like Tamil Nadu. Globally, the demand of meat is projected to be 73% higher in 2050, and a major part of this increase will arise from the developing countries (FAO, 2011), because of the increasing income and fast population growth (Makkar *et al.,* 2014). Rabbits can extract energy and nutrients from feedstuffs that are rich in fibre (Finzi, 2008), and as such they can extract nutrients and energy for low-cost roughages and other organic wastes Rabbit compost contains the highest nitrogen content compared to other livestock manure (Irlbeck, 2001). Finding out alternate manure and its usage will help to increase the availability and decrease the over dependence of single manure. Hence, the present study was planned to study the effect of adult New Zealand white rabbit manure on growth

performance of Cumbu Napier Hybrid grass along with the other manures which is already in use.

## MATERIALS AND METHODS

A filed experiments were conducted to study the effect of different organic fertilizers on growth and yield of Cumbu Napier Hybrid grass at Post Graduate Research Institute in Animal Sciences, Tamil Nadu Veterinary and Animal Sciences University during the year 2019-20. The experiments were laid out in Randomised Block Design with three replication in main and ratoon crops. The soil was clay loam with available NPK of 28, 30 and 290 kg/ha respectively. The pH of the soil was 6.21 and EC of 0.08 at a depth of 0 - 20 cm.

The treatments were fixed with different manure as well as doses based on the recommended NPK for Cumbu Napier hybrid grass @150 - 50 - 40 kg $ha^{-1}$. For this study, composted rabbit manure (adult New Zealand White) along with cow dung, pig and poultry manures were used. The faces of livestock and rabbits were collected and composted. Nitrogen, phosphorus and potassium content was analysed by using following methods. For nitrogen AOAC (2010), phosphorus spectrophotometric molybdenum blue method (Fiske, 1925) and potassium using flame photometer 40 $m^2$ plots area were selected for each treatment. Rabbit manure from PGRIAS Kattupakkam has been analysed separately and based on the analysis, NPK equivalency of manure was worked out for cumbunapier hybrid grass.

**Statistical analysis:** The observations such as plan height , number of tillers per hill, cutting frequency, and biomass yield were tabulated. Statistical analysis was carried out by Gomez and Gomez method (Gomez and Gomez 1984).

**NPK equivalence.** In organic farming system, organic manure is the important component. PGRIAS is an organic farm, the organic manures such as Farm yard manure, Sheep and Goat manure, Poultry manure and rabbit manure are being applied to fodder crops regularly. The NPK requirement of important fodder crop like Cumbu Napier Hybrid grass is 150kg N, 50kg P and 50 kg K the equivalent manures are worked out hereunder.

**Table 1: Level of NPK in animal manure.**

| Animal | % Nitrogen | % Phosphorus | % Potash |
|---|---|---|---|
| **Dairy cow** | 0.57 | 0.2 | 0.62 |
| **Pig** | 0.49 | 0.34 | 0.47 |
| **Sheep /goat** | 1.44 | 0.50 | 1.27 |
| **Rabbit** | 4.4 | 0.17 | 0.57 |
| **Chicken** | 1.0 | 0.8 | 0.39 |

(Anon.,1998)

**Table 2: Comparison of nutrient for Cumbu Napier Hybrid grass (150:50:50 kg NPK/ha) through various manures and chemical fertilizers.**

| Manure | N:P:K (%) | Nitrogen equivalent Manure (kg/ha) for 100 percent recommendation |
|---|---|---|
| **Cattle manure** | 0.57:0.23:0.62 | 26,310 |
| **Sheep/Goat manure** | 1.44:0.50:1.27 | 10,410 |
| **Chicken manure** | 1.0:0.8:0.39 | 15,000 |
| **Rabbit manure from PGRIAS** | 4.40:0.17:0.57 | 3,408 |
| **Pig** | 0.49: 0.34: 0.47 | 30,612 |
| **NPK requirement is met out by fertilizers(UREA:SSP:MOP(kg))** | 46:16:60 | 325.5 |

**Table 3: Treatments.**

| | | |
|---|---|---|
| T1 | : | Recommended dose by 150 % rabbit manure |
| T2 | : | Recommended dose by 125 % rabbit manure |
| T3 | : | Recommended dose by 100 % rabbit manure |
| T4 | | Recommended dose by 75 % rabbit manure |
| T5 | : | Recommended dose by 50% rabbit manure |
| T6 | : | Recommended dose by 25 % rabbit manure |
| T7 | : | Recommended dose by 100 % FYM |
| T8 | : | Recommended dose by 100 % pig manure |
| T9 | : | Recommended dose by 100 % poultry manure |
| T10 | : | Recommended dose by 100 % as inorganic fertilizer |
| T11 | : | Control |

## RESULT AND DISCUSSION

The following observations were made to find the effect of rabbit manure application on cumbunapier hybrid grass application. Plant height, number of tillers, tiller weight and biomass yield were recorded, analysed and tabulated.

Significant variations in plant height were observed among the different treatments. The highest plant height (94.1 and 94.0cm) was observed with 100 percent rabbit manure application (T3) which is onpar with the treatments T1 and T2 in first and second crops respectively. The next best treatments are 100 % application of farmyard manure (T7), pig manure (T8) and poultry manure (T9) and inorganic fertiliser (T10). Plant height is verymuch reduced during the initial days of observation of both the crops (61.1 and 65.1) in control (T11) and it was continued during the later stages of observations also.

**Table 4: Effect of treatments on Plant height in main and ratoon crops.**

| Treatments | Plant height (cm) | | | |
|---|---|---|---|---|
| | First Crop (Main crop) | | Second Crop (Ratoon) | |
| | 45DAS | 90 DAP | 25DAS | 50 DAP |
| T1 | 94.4 | 212.1 | 96.8 | 204.3 |
| T2 | 94.0 | 212.2 | 96.7 | 204.1 |
| T3 | 94.1 | 212.5 | 96.4 | 204.4 |
| T4 | 88.2 | 209.0 | 95.8 | 202.5 |
| T5 | 88.0 | 202.6 | 92.7 | 200.9 |
| T6 | 85.5 | 200.0 | 88.3 | 192.1 |
| T7 | 90.5 | 210.2 | 94.7 | 203.7 |
| T8 | 90.2 | 210.7 | 94.8 | 204.0 |
| T9 | 90.3 | 210.6 | 94.3 | 203.7 |
| T10 | 89.4 | 209.4 | 94.0 | 198.5 |
| T11 | 61.1 | 139.6 | 60.1 | 132.2 |
| **CD (0.05)** | 0.46 | 0.74 | 0.50 | 1.02 |
| **SEd** | 0.96 | 1.52 | 1.02 | 2.02 |

**Table 5: Effect of treatments on Number of tillers per clump in main and ratoon crops.**

| Treatments | Number of tillers (tiller/ clump) | |
|---|---|---|
| | First Crop (Main crop) | Second Crop (Ratoon) |
| T1 | 16 | 21 |
| T2 | 15 | 20 |
| T3 | 17 | 21 |
| T4 | 16 | 21 |
| T5 | 14 | 20 |
| T6 | 12 | 17 |
| T7 | 16 | 18 |
| T8 | 15 | 17.33 |
| T9 | 16 | 19 |
| T10 | 16 | 19 |
| T11 | 15 | 17 |
| T12 | 8 | 11 |
| **CD (0.05)** | 0.88 | 0.77 |
| **SEd** | 1.08 | 1.58 |

Significant variations in number of tillers were observed among the different treatments. The highest tiller number was observed in the treatment T3 which was followed by T1, T2, T7, T8, T9 and T10. The other treatmens were next best treatments. The highest tiller number of 17 and 21 were observed in T3 of first and second crop respectively.This was is onpar with T1 and T2 which is the higher doses of rabbit manure. The same trend was also continues during the second crop observation. Number of tillers were reduced in control plot of treatmen T12 in both the crops.

**Table 6: Effect of treatments on tiller weight per tiller in main and ratoon crop.**

| Treatments | Tiller weight (gram/ tiller) | |
|---|---|---|
| | First Crop (Main crop) | Second Crop (Ratoon) |
| T1 | 0.452 | 0.440 |
| T2 | 0.454 | 0.439 |
| T3 | 0.464 | 0.445 |
| T4 | 0.429 | 0.408 |
| T5 | 0.432 | 0.413 |
| T6 | 0.340 | 0.303 |
| T7 | 0.442 | 0.440 |
| T8 | 0.441 | 0.440 |
| T9 | 0.440 | 0.441 |
| T10 | 0.439 | 0.428 |
| T11 | 0.185 | 0.177 |
| **CD (0.05)** | 0.020 | 0.202 |
| **SEd** | 0.050 | 0.030 |

**Table 7: Effect of treatments on biomass yield in main and ratoon crops.**

| Treatments | Biomass yield (t/ha) | |
|---|---|---|
| | First Crop (Main crop) | Second Crop (Ratoon) |
| T1 | 435.6 | 405.0 |
| T2 | 436.8 | 404.3 |
| T3 | 438.1 | 405.4 |
| T4 | 379.0 | 313.4 |
| T5 | 392.6 | 385.8 |
| T6 | 363.1 | 349.9 |
| T7 | 419.9 | 402.5 |
| T8 | 410.3 | 398.1 |
| T9 | 397.3 | 401.9 |
| T10 | 392.7 | 395.7 |
| T11 | 247.1 | 231.8 |
| **CD (0.05)** | **35.72** | **82.69** |
| **SEd** | **17.37** | **40.22** |

Tiller weight is significantly varied among the treatments which is the main criteria for yield assessment. Thetiller weight was higher in rabbit manure application. (T3). This was followed by application of rabbit manure at higher doses and other treatments *viz*., FYM application (T7), pig manure (T8) and poultry manure application (T9) which is onpar with the treatments T1 and T2 in first and second crops. Likewise other paramenters such as tiller weight was also reduced in control.

Among the treatments (T3) application of 100 percent rabbit manure performed significantly higher yield compared to all other treatments in both the crops. The highest yield of (438.1 and 405.4) were observed in first and second crops respectively. This is on par with the higher doses of rabbit manure application of T1 and T2. The next best treatments like application of FYM, pig manure, poultry manure were recorded significantly lower biomass yield compared to the treatments. Lower yields were recorded in lower doses of rabbit manure. Control plot recorded the lowest biomass yield of 247.1 and 231.8 tonnes respectively in the first and second crop.

The increased plant growth parameters such as plant height, tiller number and tiller weight is noticed in application of rabbit manure. This could be due top soil microflora nourishment and retention of soil moisture which enhance the soil fertility and improves the soil physical properties such as soil aeration and improves the organic carbon content. The same result was obtained in the study conducted by Dejene *et al*. (2011). Rajendran *et al*. (2019) reported that nitrogen, phosphorus and potassium content in the faces of rabbits increased the uptake and availability of nutrients. The highest plant height, number of tillers and tiller weight in turn increased vegetative growth of crops and biomass yield in the treatment T3. This could be attributed due to increased uptake of nutrients by the crop, as well as availability of nutrients and reduce the losses to the atmosphere as reported by Kirchmann (1985); Eghball *et al*. (1997). Build up of phosphorus through application of organic manure results in enhanced mineralization of organic phosphate and production of organic acids and increased nutrient availability (Virekanandan and Fixen 1990). Biomass yield could be increased by the addition of organic manure especially in rabbit manure applied plots (Rajendran *et. al.,* 2019). Application of rabbit manure

enhanced the nutrient availability especially nitrogen and phosphorus. Since the nitrogen content of rabbit manure was 4.2 percent, supply of enough quantity of nitrogen by minimum quantity of organic manure application. Enhanced N nutrition, which increased the photosynthetic capacity of the crop, thus resulting in more assimilates being partitioned to the various plant parts which consequently influenced the growth of the crop (Kling and Edmeades 1997). Application of rabbit manure would also result in higher plant growth due to enhanced nitrogen level and reduced level of leaching of phosphorus. During the second crop, best treatment performs still better due to long term soil fertility management and sustainable soil physical properties.

In other treatments the either in lower doses of rabbit manure application and other organic manure the biomass yield was reduced significantly due to lower availability of nutrients especially nitrogen and phosphorus. In inorganic fertilizer applied plots the yield were significantly reduced especially during second crop this might be due to continuous application of NPK fertilizer through in organic source experienced leaching of nutrients which can lead to deficiency of some micro nutrient elements, which results in poor quality of soil. Yield reduction is due to unavailability of nutrients in inorganic fertilizer applied plots. Further, this might be due to leaching losses, deterioration of soil chemical and physical properties, biological activities and total soil health. During both the crops control plots recorded reduced yield due to unavailability of nutrients and reduction of competitive nature of crops. Unavailability of nutrients reduced photosynthesis rate. Further due to reduction in competitive nature reduced the yield due to increased weed competition.

## CONCLUSION

From the above study, application of rabbit manure (100 percent) improved the soil quality and plant growth characters and yield of cumbunapier hybrid grass. This is followed by 75 percent application of rabbit manure, 100% FYM, sheep and goat manure, and poultry manure application. The yields were significantly reduced in inorganic manure applied field compared to the above treatments especially during second crop. Extremely reduced yields were observed in control plot due to nil manure application. It could be concluded that rabbit manure application is alternate source of manure in organic farming because of its high nitrogen content. Further in, organic farming nitrogen requirement can be met by the minimum quantity of rabbit manure and it is best alternate to all other manures.

## FUTURE SCOPE

This study will help to understand the constraint of rabbit farmers and will help to manage the rabbit manure. This study helps to pave way to improve the nutrient content of rabbit manure and further studies would focus on effective utilization of rabbit manure as a source of organic manure by scientific management practices.

**Acknowledgement.** Authors are thankful to the authors and support to conduct the study.
**Conflict of Interest**. None.

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**How to cite this article:** M. Suganthi, S. Usha and M. Murugan (2022). Effect of Rabbit Manure on Productive Performance of Flip of Fodder Grass - Cumbu Napier Hybrid. *Biological Forum – An International Journal*, *14*(2a): 333-338.