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# Performance and economics of feeding soviet chinchilla rabbits with hydroponic maize fodder

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**Abstract**
The "hydroponic fodder production" is the alternative technology to increase green fodder production with optimal utilization of land water and manpower. A study was conducted to assess the performance of Soviet Chinchilla rabbits under different feeding regimes. Sixteen Soviet Chinchilla-weaned bunnies were divided into two groups *viz* control - C: (Concentrate diet + Guinea grass) and treatment - T: (Concentrate diet + Hydroponic maize). Data on microclimatic variables, body weight, average daily body weight gain, average dry matter intake, cost of fodder production, cost of rabbit production/kg live weight, cost of feeding and reproductive performance were collected. There is no significant ($p$<0.01) difference in overall weight gain (g) between Control (1.0225 ± 0.04 kg) and Treatment (1.15 ± 0.04 kg) respectively. The overall average daily gain in C and T were 6.09 ± 0.24 and 6.83 ± 0.29 which showed no significance between the control and treatment. The overall dry matter intake from concentrate feed and green forage (g) in C and T were 100.25 ± 2.39 and 79.61 ± 1.27 which differed significantly between the treatment groups. The overall feed conversion ratio in C and T were 9.64 and 6.12. Reproductive performance *viz* age at age at first mating (days), age at first kindling (days) and litter size at birth was better in treatment when compared to control. The total cost incurred towards feeding of rabbits during the experimental period was Rs.151.05 per Kg live weight in control whereas it was Rs.208.03 per Kg live weight in treatment. Hydroponic fodder production technology can be recommended for broiler rabbit production in urban, peri-urban and areas where land availability for fodder production is a constraint.

**Keywords:** Guinea grass, growth, hydroponics fodder maize, reproductive performance soviet chinchilla rabbits

## 1. Introduction
Ever-increasing trends in the human population warrant to have nutritional security, economic sustainability and food adequacy. Rabbit rearing is one of the avenues that can give livelihood and food security to people. Among various categories of meat animals that are augmenting the per capita availability of meat, the main emphasis has been made to the chicken, sheep, goat, cattle and pigs. In this direction, broiler rabbit farming is gaining momentum and becoming popular as a meat animal. Rabbits are the only micro livestock suitable for rearing by small farmers and landless agricultural labourers with simple housing and management. Rabbits have short generation intervals, high prolificacy, good mothering ability, easy management, ability to utilize waste and other unconventional feed sources and thrive well on forage. Rabbit meat is high in protein (22%) low in fat (4%) and cholesterol (5%) and thus possesses health-promoting properties (Aduku and Olukosi, 2000) [1]. The rabbit production suits to a range of production systems from backyard to commercial multi-tier cage rearing systems. Rabbit production would boost the income of the farmer and could improve human nutrition. Broiler rabbit production with appropriate technologies can play an important role in scaling up the production traits and thereby economic benefits to the farmers. Quality green fodder is an important input for rabbit production. It is inevitable to produce green fodder by alternative method for feeding livestock including rabbits.
Nowadays, hydroponics is used in harsh climates such as deserts, areas with poor soil or in urban areas where high land costs have driven out traditional agriculture. Hydroponic fodder production is probably best suited to semi-arid, arid, and drought-prone regions of the world, suffering from chronic water shortages or in areas where irrigation infrastructure does not exist. Hydroponic fodder production is a boon for farmers whose soil is rocky and infertile.

It is viable farmer-friendly alternative technology for landless farmers for fodder production (Bakshi *et al*., 2017) [3]. This technology might be very important in regions with limited forage production (Fazaeli *et al*., 2012) [4]. Al-Karaki and Al-Momani (2011) [2] reported that hydroponic production requires only about 2-3 per cent of water used under field conditions to produce the same amount of fodder. For the production one kg of maize fodder, about 1.50 litres (if water is recycled) to 3.0 litres (if water is not recycled and drained out) of water is required (Naik *et al*., 2013) [8]. To optimize the fodder production for rabbits, hydroponic cultivation is an eco-friendly method of growing fodder and hydroponically grown cereals grow upto 50% more and produce higher yields of better-quality fodder (kide *et al*. 2015) [6].

With this background the present study was formulated to understand the benefits of hydroponic fodder and the growth performance of Soviet Chinchilla rabbits and to evaluate the effect of partial replacement of concentrate feed with hydroponic maize fodder on growth performance in soviet chinchilla rabbits. Also, it was formulated to assess the economic feasibility of integrated farming system of rabbit with hydroponic maize fodder.

## 2. Materials and Methods

All experiment protocols were approved by the Tamil Nadu Veterinary and Animal Sciences University. A twenty-four weeks' study was carried out at Livestock Farm Complex, Madhavaram Milk Colony, TANUVAS, Chennai-51, located between latitudes 12° 9′ and 13° 9′ N and longitudes 80° 12′ 80° 19′ E with an altitude of 22 m above MSL. Sixteen numbers of Soviet chinchilla-weaned bunnies (comprising of both sex *viz* 3 males and 5 females) were selected and divided into two experimental groups. The first group (control) was fed with a concentrate diet and guinea grass and the second group (Treatment) was fed with a concentrated diet and hydroponic maize fodder. The experimental animals were fed *ad libidum.* All the animals were reared in three-tier cages made up of galvanized iron weld mesh under similar management conditions. The concentrate diet was procured from the University feed mill and guinea grass were harvested from the farm. Hydroponic green fodder was produced using the TANUVAS-UIIC- Low-cost hydroponic green fodder machine fabricated at University Innovation and Instrumentation Centre (UIIC), TANUVAS. Good quality yellow maize seeds with less than 12% moisture were selected for hydroponic fodder production. Seeds were washed in tap water to remove chaff and dirt. The seeds were then soaked in tap water for 20 hours. Later water was drained, and the seeds were kept in gunny bags for 24 hours for germination. After germination, seeds were placed onto different trays and kept on the sprout section of the hydroponic green fodder machine. Each tray in the sprout section is provided with two drippers and one sprinkler which sprinkle water in every 1 hour for about 1 minute. The trays were shifted to the next rack daily. On the 5$^{th}$ day the tray enters the growth cycle in which each tray is supplied with two sprinklers. After 8 days of total growth period, the fodder was ready to feed, which was weighed and then fed to rabbits. An adaptation period of 15 days was provided to the rabbits and Ivermectin as prophylaxis against ecto and endo parasites was given during the start of the trial. Parameters such as weekly body gain and daily feed intake, age at first mating, age at first kindling and litter size at birth were recorded. Accumulated data were analyzed for statistical significance by unpaired 't-test using SPSS software.

## 3. Results and Discussion

The proximate composition of guinea grass is moisture – 78.06%, CP – 14.92%, EE – 3.51%, TA – 11.89%, CF – 26.36% and NFE – 43.32% and proximate composition of hydroponic green fodder is moisture – 82.27%, CP – 10.93%, EE – 4.38%, TA – 2.98%, CF – 9.00% and NFE – 72.71%. Kide *et al*. (2015) [6] and Naik *et al*. (2015) have observed the nutritional composition of hydroponic maize fodder in the ranges as follows; CP 13.57 -14.56%, CF 10.00 - 10.67%, EE 3.49 - 4.67%, TA 2.83 - 3.84% and NFE 66.72 - 68.47%. The proximate composition of hydroponic fodder observed in the current study was slightly lower with respect to CP and CF but higher in NFE. The variation may be due to difference in variety, geographical location, storage duration, irrigation and days to harvest (Jemimah *et al*., 2018) [5].

Even though the hydroponic fed group consumed less feed it could perform on par with conventional green fodder due to the enhanced nutritional value of sprouted grain and increase in quantity and quality of protein, sugars, minerals and vitamin during sprouting (Lorenz, 1980) [7]. The overall daily concentrate feed intake (g) in C and T were 56.60 ± 2.10 and 52.00 ± 1.11 respectively and the corresponding value for green fodder intake (g) in C and T were 223.67 ± 5.82 and 183.95 ± 2.16 respectively. The overall dry matter intake from concentrate feed and green forage (g) in C and T were 100.25 ± 2.39 and 79.61 ± 1.27 which differed significantly between the treatment groups.

The overall average daily gain in C and T were 6.09 ± 0.24 and 6.83 ± 0.29 which showed no significance between the control and treatment. The treatment group though had a comparatively better mean value, there was no significant difference ($p \geq 0.01$) with respect to body weight at weaning (g), body weight at end of trial (g), total body weight gain (g) and daily body weight gain (g) in the control and treatment groups. At the start of the trial, the body weight (kg) of rabbits in C and T were 1.16±0.03 and 1.12±0.04 respectively and at the end of the trial (24 weeks), were 2.18±0.03 and 2.27±0.04 respectively. There is no significance difference in overall weight gain (kg) between Control and Treatment were 1.0225 ± 0.04 and 1.15 ± 0.04 respectively.

Mean ± S.E of Age at first mating (days) was 212.80 ± 3.55 and 208.60 ± 1.66; age at first kindling (days) 243.40 ± 3.62 and 238.20 ± 1.78; and number of young ones per kindling 2.80 ± 0.22 and 4.00 ± 0.14; in the control and treatment groups, respectively. Statistical analysis revealed highly significant difference ($p \leq 0.01$) in litter size at birth between treatment and control groups. There was no significant difference observed between treatment groups for other reproductive performance parameters like age at first mating and age at first kindling.

The cost of production of guinea grass fodder was the least (Rs. 0.30) and high for hydroponic maize production (Rs. 3.30). The total cost incurred towards feeding each rabbit during the experiment period was least in C (Rs. 151.05) and that of T (Rs. 208.03). Similarly, cost of production per kg live weight in C and T were Rs. 113.57 and Rs. 124.57 respectively. Even though the cost of production was higher by feeding hydroponic fodder maize, the litter size was almost double in treatment fed with hydroponic when compared to the control fed with guinea grass alone.

**Table 1:** Growth and reproductive parameters of the soviet chinchilla rabbits (Mean ± S.E)

| Parameters | Control | Treatment |
|---|---|---|
| | Guinea grass + Concentrate feed | Hydroponic fodder maize + Concentrate feed |
| Average daily dry matter intake (g)** | 100.25 ± 2.39 | 79.61 ± 1.27 |
| Body weight at start of trial (kg) NS | 1.16±0.03 | 1.12±0.04 |
| Body weight at end of trial (kg) NS | 2.18±0.03 | 2.27±0.04 |
| Total Body weight gain (kg) NS | 1.0225 ± 0.04 | 1.15 ± 0.04 |
| Daily body weight gain (g) NS | 6.09 ± 0.24 | 6.83 ± 0.29 |
| Age at first mating (days)NS | 212.80 ± 3.55 | 208.60 ± 1.66 |
| Age at first kindling (days)NS | 243.40 ± 3.62 | 238.20 ± 1.78 |
| Number of young ones per kindling* | 2.80 ± 0.22 | 4.00 ± 0.14 |

Mean of eight observations
Means bearing different superscript in the same row differ significantly
NS- Non significant, *$p$<0.05 **$p$<0.01

Soviet Chinchilla rabbit in multi-tier cages


Feeding – guinea grass

Feeding – hydroponic fodder maize

Hydroponic fodder production

**Fig 1:** Housing of Soviet chinchilla rabbit in multi-tier cages and automatic device fabricated for the hydroponic maize fodder production

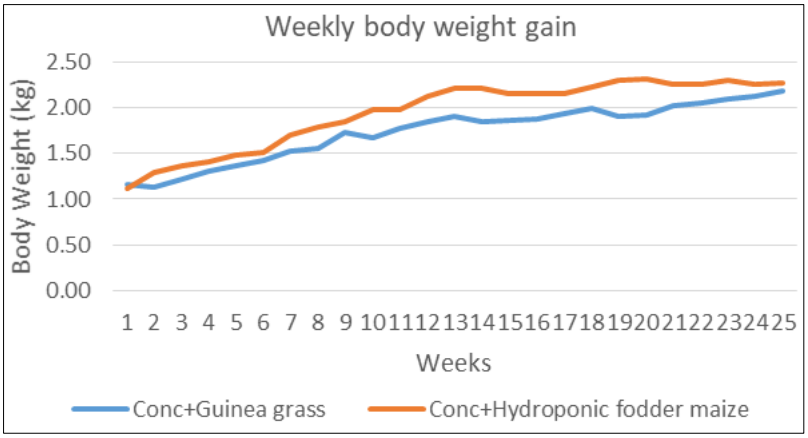


**Fig 2:** Weekly body weight (kg) gain of soviet chinchilla rabbit in control and treatment groups

## 4. Conclusion

This experiment clearly demonstrated that feeding hydroponic maize was on par with guinea grass feeding in Soviet Chinchilla rabbits. The hydroponic maize-fed rabbits showed similar body weight gain and better reproductive performance compared with the Guinea grass group. Thus, this study suggests that the hydroponic yellow maize fodder can be suggested as a replacement for conventional fodder in the diet of Soviet chinchilla rabbits without any deleterious effect on their growth and reproduction. Considering the economy of feeding, the cost of production is least in the guinea grass-fed group followed by hydroponic maize and hydroponic cowpea. A conventional system of fodder production is ideal if the land is available. Hydroponic fodder may increase the reproductive performance in broiler rabbits compared to conventional green fodder. A good scope is there in future for vertical expansion of both rabbit productions in combination with hydroponic fodder production technology.

## 5. Acknowledgement

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