

Original Research Article

Performance characteristics of male wistar rats fed graded levels of stored powdered *Corchorus olitorius*

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ABSTRACT

Background: This study was carried out to determine the growth performance of rats fed graded levels of *Corchorus olitorius* supplemented diet.

Methods: Twenty male wistar rats weighing between 70g and 90g were purchased and randomly allocated into four treatment groups with graded levels of *Corchorus olitorius* (2.5%, 5% and 10%) while the control had no *Corchorus olitorius*. The feed intakes as well as weight change of the experimental rats were monitored for eight weeks.

Results: The results obtained showed that the highest level of weekly feed intake and feed efficiency were recorded for animals in group fed 10% level of *Corchorus olitorius* supplementation when compared to other treatment groups. Similar result was observed for the weight change which can be attributed to the efficient utilization of feed consumption.

Conclusions: Therefore, it can be concluded that leaves of *Corchorus olitorius* are palatable and highly nutritious and can improve growth performance of rats when fed for eight weeks.

Keywords: *Corchorus olitorius*, Feed intake, Feed efficiency, Weight performance, Wistar rat

INTRODUCTION

Corchorus olitorius (Tiliaceae) is an annual herb whose leaves and roots are used as herbal medicine and eaten as vegetable by local people in East Malaysia, India, Egypt, and Philippines.¹ In West African countries particularly Ghana, Nigeria and Sierra Leone, where staple diets consist of starchy food-stuffs such as rice, cassava, maize and yams, leafy vegetables are used to complement such staple foods.² Traditionally, its leaves are used in the treatment of pain, fever, chronic cystitis and tumors.³ *Corchorus olitorius* leaf are rich in antioxidants, fatty

acids, minerals, vitamins and mucilaginous polysaccharides.⁴

The leaf of plant is used commonly by the people in food as a vegetable with the human body able to directly absorb the different compounds and due to the low concentration of these compounds, it has transpired that the plant particularly provides effective protection against infection. This protective property, either through the plant itself or by the compounds contained within, also has the effect of prolonging the shelf life of food. Several vegetable species such as *Amarantus cruentus*, *Basella*

allia in Nigeria are utilized either as condiments, supplements or spices in human diets and could be fed upon either in the fresh, processed or semi processed.⁵

Being a rich source of B-carotene, ascorbic acid, mineral dietary fibre, especially calcium, iron, magnesium they have become a part of daily diet improving the metabolic and physiological processes in the human body including in the weight performance. Among the numerous functions and role played by *Corchorus olitorius*, the impact of this plant on weight performance and its palatability is yet to be assessed. Thus, it is expedient to assess the feed intake and weight performance in male Wistar rats fed with different levels of *Corchorus olitorius* diet inclusion.

METHODS

Experimental animals

A total number of twenty (20) Wistar rats weighing between 70g and 90g were purchased. They were housed in properly sanitized cages at the faculty of pharmaceutical science animal house, Ahmadu Bello University, Zaria, Nigeria and allowed free access to water and rat grower mash for three weeks for acclimatization. The study was conducted in accordance with the US guideline as contained in the National Institute of Health guide for the care and use of laboratory animals NIH publication No. 18-23, 1985.⁶

Collection of plant materials

The fresh plants were collected from a local farm in Agwan Jeba, Zaria, Kaduna State, Nigeria. Identification and authentication were carried out in the herbarium section of the Department of Botany, Ahmadu Bello University, Zaria, Nigeria, where a voucher number 2649 was assumed.

Processing of plant materials

The fresh leaf of the *Corchorus olitorius* was air-dried at room temperature 25°C. They were grounded into fine powder using an electric blender and stored in a dried sample container.

Four experimental diets namely, the control diet (which contained 0% inclusion of *C. olitorius*) and three other diets containing *Corchorus olitorius* supplementation which was varied at 2.5%, 5%, and 10%.⁷ The analysis of proximate constituents of the varied supplementation levels were taken alongside the pure leaf of *C. olitorius*

Proximate analysis

The proximate analysis of the samples for moisture, ash, fibre and fat were performed using the method of AOAC.⁸ The nitrogen was determined by micro-Kjeldahl

method as described by Pearson.⁹ The percentage Nitrogen was converted to crude protein by multiplying 6.25. All determinations were performed in triplicates.

Determination of feed intake

The average feed intake (AFI) in the various supplemented groups and the control group for 8 weeks was calculated by summing up the Feed intake for the eight weeks divided by eight to (g/week)

$$\text{Feed intake (g/week)} = \frac{\text{Average feed intake of eight week (g)}}{2 \times 8}$$

Determination of weight performance (weight change)

The weekly weight change was evaluated by subtracting the initial average weight of the animals (IAW) from the final average weight of the animal (FAW) on weekly basis

$$\text{Average weekly weight change} = \text{FAW} - \text{IAW}$$

The average cumulative weight change (ACWC) was evaluated by summing up the result obtained from (FAW-IAW)

Determination of feed efficiency

The weight changes by the animal in respective groups were summed up on weekly basis to the end of the study (8 weeks). The weekly feed intakes were calculated for the supplemented and control groups and the feed efficiency is evaluated as

$$\text{Feed efficiency} = \frac{\text{weight gain (g/rat)}}{\text{Feed intake (g/rat)}}$$

Statistical analysis

The statistical significance between the control and other groups of experimental animals were determined by one-way analysis of variance (ANOVA) followed by Bonferroni t-test for multiple comparisons. The results are presented as mean±SD at confidence interval of 95% (p ≤ 0.05).

RESULTS

Assessment of the feed intake by Wistar rats fed with different levels of diet supplementation as seen in Table 1 showed that the group fed with the highest supplementation had the utmost feed rate within the eight weeks 640.37±29.87 when compared with the normal control feed (0% *Corchorus olitorius* supplementation) 545.43±7.75 which gave the lowest feed rate amongst all other groups while, there was increase in the feed rate with increasing supplementation.

Table 1: Assessments of the weekly feed intake in male Wistar rats fed with different levels of *Corchorus olitorius* diet inclusion.

Treatment	Weekly feed intake (g/week)
0% Supplementation	545.43 ± 7.75 ^a
2.5% Supplemented diet	577.81 ± 30.47 ^{ab}
5% Supplemented diet	579.16 ± 27.47 ^{ab}
10% Supplemented diet	640.37 ± 29.87 ^b

Values are expressed as means ± SD and are mean of three replicates (n=5); values mean with different superscript down the column are significantly different (P<0.05).

Feed efficiency

The estimation of the feed efficiency of rats fed with different levels of *C. olitorius* was carried out using Muramatsu method.¹⁰ Animal fed with the highest level of *Corchorus olitorius* supplementation (10%) conferred the highest feed efficiency (0.438±0.032), while, 2.5% *Corchorus olitorius* supplementation gave the lowest feed efficiency 0.3760±0.048 there was no significant difference in the feed efficiency of groups fed with 5% *Corchorus olitorius* and the normal control given 0% *Corchorus olitorius* diet supplementation as shown in Table 2.

The weekly body weight gain (g)

The result obtained from the weekly weight gained of rats fed with *Corchorus olitorius* as seen in Table 3 and 4

showed that there was an appreciable weight gain in the group of animals fed with the highest supplementation (10%) when compared to other supplementation diet group whereas, 2.5% diet supplementation gave the lowest weight gain both on weekly basis and cumulatively.

The body weight gain in percentage (%)

The body weight performance of Wistar rats fed with different levels of *Corchorus olitorius* supplementation as seen in Figure 1 was evaluated in percentage (%). The result obtained showed that group that had the highest feed intake gave the highest weight performance when compared with animal fed with normal control (0% *Corchorus olitorius* inclusion) and 2.5% *C. olitorius* diet inclusion with a notable decrease in their percentage (%) while the lowest supplementation diet inclusion (2.5%) showed a decrease in its weight performance.

Proximate analysis

The proximate analysis carried out on the different levels of *Corchorus olitorius* in vital feed as depicted in Table 5, showed that the percentage of carbohydrate (CHO) and protein and Ash content increases with increasing supplementation. The normal control (vital feed with 0% *Corchorus olitorius*) gave the lowest moisture content, ash and protein while the pure leaves of *Corchorus olitorius* in the entire nutritional constituent investigated except in the lipid component.

Table 2: The feed efficiency (gain/feed) of Wistar rats fed with long term consumption of *Corchorus olitorius* diet inclusion in Wistar rats.

Treatment	Body weight gain (g/rat)	Feed intake (g/rat)	Feed efficiency (gain/feed)
Control feed	41.60±3.60 ^{ab}	109.09 ± 1.55 ^a	0.3813±0.056 ^a
2.5% <i>C. olitorius</i> diet supplementation	43.47±3.77 ^a	115.56 ± 1.56 ^b	0.3760±0.048 ^a
5% <i>C. olitorius</i> diet supplementation	44.02±5.29 ^{ab}	115.43 ± 4.92 ^{ab}	0.3800±0.073 ^a
10% <i>C. olitorius</i> diet supplementation	56.05±6.30 ^b	128.078± 5.54 ^a	0.438±0.032 ^b

Values are expressed as means±SD and are mean of three replicates (n=5); values mean with different superscript down the column are significantly different (P<0.05).

Table 3: The biweekly weight gain (g) of Wistar rats fed with long term consumption of *Corchorus olitorius* diet supplementation in Wistar rats for 8 weeks.

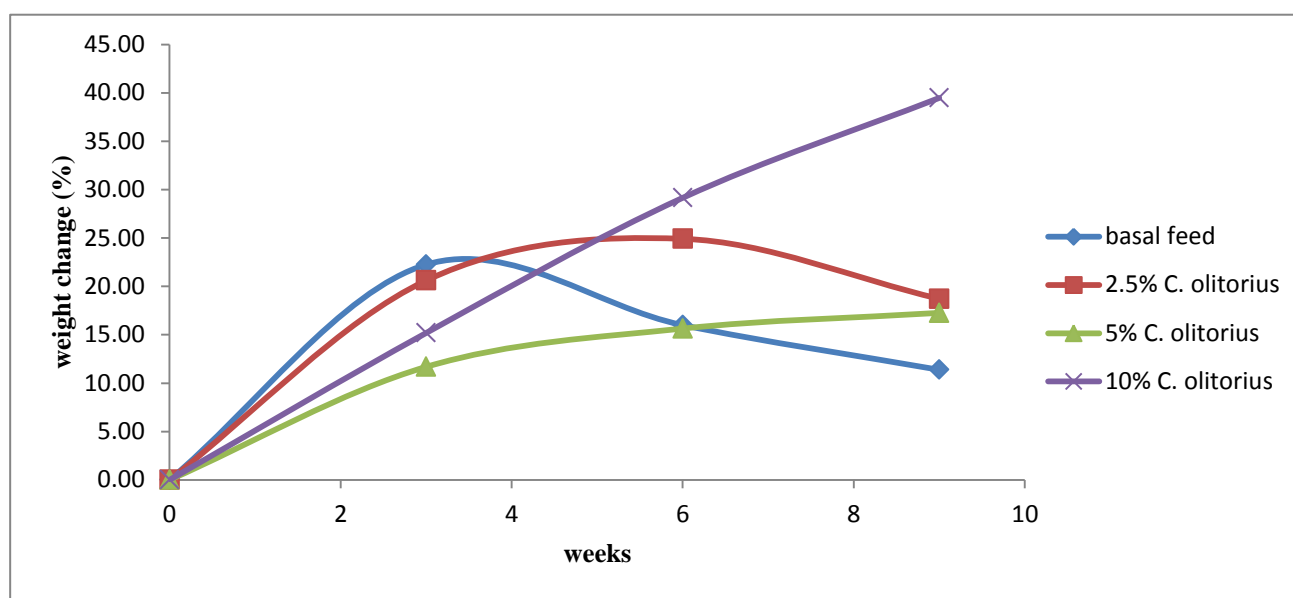
Treatment	Week (1-2)	Week (3-4)	Week (5-6)	Week (7-8)
Control feed	10.41±2.57 ^a	7.48±1.17 ^a	5.32±2.91 ^a	23.55±2.06 ^a
2.5% <i>C. olitorius</i> supplementation	8.38±1.38 ^a	7.62±1.69 ^a	8.57±2.15 ^a	18.57±1.43 ^b
5% <i>C. olitorius</i> supplementation	4.90± 2.27 ^b	7.75±1.58 ^a	7.50±1.28 ^a	22.47±1.76 ^a
10% <i>C. olitorius</i> supplementation	7.30 ± 1.02 ^{ab}	16.50±3.34 ^b	7.67±1.83 ^a	24.30± 4.50 ^{ab}

Values are expressed as means ± SD and are mean of three replicates (n=5); values mean with different superscript down the column are significantly different (P<0.05).

Table 4: Cumulative weight gain with long term consumption of *Corchorus olitorius* leaf supplementation (g/week) on Wistar rats for 8 weeks.

Treatment	Cumulative weight gain (g/week)
0% supplementation	41.62 ± 3.609 ^a
2.5% supplemented diet	43.47 ± 3.770 ^a
5% supplemented diet	44.02 ± 5.290 ^{ab}
10% supplemented diet	56.05 ± 6.300 ^b

Values are expressed as means ± SD and are mean of three replicates (n=5); values mean with different superscript down the column are significantly different (P<0.05).

**Figure 1: The body weight performance in percentage (%) of long term consumption of *C. olitorius* diet inclusion in Wistar rats.****Table 5: Proximate analysis of experimental feeds.**

Level of Supplementation	Moisture (%)	CHO (%)	Protein (%)	Ash (%)	Lipid (%)	Crude fiber (%)
0% supplementation	2.35	58.58	17.88	5.66	8.04	7.49
2.5% supplementation	5.86	50.99	18.31	8.44	7.63	8.77
5% supplementation	6.48	53.01	18.10	8.20	4.87	9.34
10% supplementation	7.44	54.56	19.00	8.52	4.13	6.35
Pure leaf	8.26	34.99	32.44	8.44	5.98	9.89

DISCUSSION

The utilization of leaves of *Corchorus olitorius* added to a standard feed (vital feed growers mash) for male Wistar rats gave some substantial results on the feed intake, feed efficiency, weight gain, cumulative growth performance as seen in this research work. There was an appreciable increase in the feed intake and feed efficiency as in Tables 1 and 2 obtained in rats fed with the *Corchorus olitorius* diet supplementation with 10% *C. olitorius* having the highest feed rate. This can be attributed to the fact that, leaves of *C. olitorius* which possesses good amount of minerals and vitamins, which plays a role in stimulating the appetite of the rats.^{11,12} Also, *C. olitorius*

plays a supplementary role, by adding variety to the diets such as good flavor and improve palatability and taste of the main staple food hence enhancing the feed intake.¹³ Also, dietary fat increases the palatability of food by absorbing and retaining flavor.¹⁴ 10% (*C. olitorius*) gave the highest ash content (%) as seen in Table 5 which hypothetically means it possess more of the minerals which play a major role in fatty acid synthesis as precursor and in protein build up. Thus, the 10% *C. olitorius* gave the highest cumulative weight gain as seen in Table 4 and Figure 1 attributed to the high nutritional constituent associated with weight gain such as carbohydrate, protein and lipid and also minerals (ash content).

Several medicinal plants such as *C. olitorius* has been utilized worldwide and is now recognized by world Health Organization (WHO) as an essential building block for primary healthcar.¹⁵ According to the WHO, more 80% of the world populations still rely on the naturally occurring medicinal plant as their primary source of healthcare.¹⁶ This dietary plant plays an important role in healthcare management system and substantially, in the weight performance and feed efficiency due to its palatability and it nutritional endowments.

CONCLUSION

It can be concluded that *Corchorus olitorius* enhances weight gain and improves the nutritional and palatability of the experimental diets by improving their feed efficiencies compared to the control.

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