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Comparative study of long term consumption of *Corchorus olitorius* (Ewedu) and *Ocimum gratissimum* (Efirin) Diet-inclusion on male Wistar rat

Kunle Ogungbemi[1]*, Ilesanmi F.F[1], Odeniyi T. A.[1], Ilori A.O.[1], Oke O.A.[1], Ogungbemi A. M.[2], Balogun B.[1] and Ogunremi O.B[3]

[1]Department of Chemistry/Biochemistry, Nigerian Stored Product Research Institute, Ibadan, Oyo State, Nigeria.
[2]Department of Crop production and soil science, Ladoke Akintola University of Technology, Ogbomosho, Oyo State, Nigeria.
[3]Outreach Department, Nigerian Stored Product Research Institute, Ibadan, Oyo State, Nigeria.

*Corresponding author. E-mail: kunleoguns484@gmail.com. Tel: +234(0)8066970191.

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ABSTRACT

This study was carried out to determine the effects of long term consumption of different levels of *Corchorus olitorius* and *Ocimum gratissimum* diet-inclusion on male Wistar rat. A total of thirty-five (35) rats (average weight of 80 g±10g) were purchased and randomly allotted into seven (7) treatment groups with graded levels of *C. olitorius* and *O. gratissimum* (2.5, 5, and 10%) while the control had neither *C. olitorius* nor *O. gratissimum*. The feed intakes, weight performance and also their histology of the experimental rats were monitored for eight weeks. The results obtained showed that the highest level of feed intake was recorded for animals in the group fed with 10% level of *C. olitorius* supplementation when compared with other treatment groups. A similar result was observed for the weight performance which can be attributed to the efficient utilization of feed consumption. Also, group of rats fed with the lowest supplementation (2.5%) of *O. gratissimum* showed a significant increase (P< 0.05) in the feed intake than the group fed with the highest supplementation (10%). Also, the weight gain by the rats fed 2.5% of *O. gratissimum* diet supplementation had the highest weight gain. The observable increase in the feed intake, weight gain and feed efficiency observed in the lowest supplementation level (2.5%) can be attributed to the spicing and seasoning of food with O. *gratissimum* and as such could also increase the palatability of the food. Therefore, it can be concluded that the leaves of *C. olitorius* are palatable and highly nutritious and can improve growth performance. Whereas, it can also be found that 2.5% *O. gratissimum* supplementation had better palatability than other experimental diets which reflected on the performance characteristics of this treatment and imposed an adverse effect with increasing dosage at 10% *O. gratissimum*. Thus, intake of *C. olitorius* should be encouraged while *O. gratissimum* is advised to be taken as a spice, not as a soup.

Key words: *Corchorus olitorius*, *Ocimum gratissimum*, Feed intake, Feed efficiency, Weight performance, Wistar rat.

INTRODUCTION

Plant foods especially vegetables contribute substantially to both local diets and ethno-medicine in developing countries especially Nigeria (Okafor, 1980). Several vegetable have been used in traditional medicine worldwide and is now recognized by World Health Organization (WHO) as an essential building block for primary healthcare (Onayade et al., 1990). According to the WHO, more than 80% of the world population still relies on naturally occurring medicinal plants as their primary source of healthcare (Adeyemi et al., 2009). Thus, dietary plant plays an

important role in healthcare management system. Dietary medicinal plant, thus are plants that posses some substances either in their leaves, stem, root etc that can therefore be used in the treatment of ailments. Phamacognostical evaluation of *Ocimum gratissimum* used as traditional medicine to treat various diseases was drawn up according to WHO guidelines (Matasyoh, 2012). Additionally, recent study on the phytochemical of this plant by Barku et al. (2013) showed the presence of polyphenols and flavonoid and other phytochemical constituent similar to that of *Corchorus olitorius* (Lin et al., 2002). The presence of these materials in these plants accounts for their usefulness as Medicinal plants. *C. 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 (Zeghichi et al., 2003). 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 (Tulio et al., 2002). Traditionally, its leaves are used in the treatment of pain, fever, chronic cystitis and tumors (Abu-Hadid et al., 1994). *C. olitorius* leaves are rich in antioxidants, fatty acids, minerals, vitamins and mucilaginous polysaccharides (Matsufuji et al., 2001). They have become a part of daily diet improving the metabolic and physiological processes in the human body including in the weight performance. Similarly, in Africa *O. gratissimum* belongs to the family laminacea and is widely distributed in tropical and warm regions of the world (Okigbo and Ogbonnaya, 2006). Among the numerous functions and role played by *C. olitorius*, the impact of this plant on weight performance and it palatability is yet to be assessed. Thus, it expedient to assess the feed intake and weight performance in male Wistar rats fed with different levels of *C. olitorius* diet inclusion. Also, pumpkin is often recommended by veterinarians as a dietary supplement for dogs and cats that are experiencing digestive problems. The high fiber content helps to aid proper digestion. Raw pumpkin can be fed to poultry as a supplement to regular feed, during the winter to help maintain egg production, which usually drops off during the cold months. Similarly, in Africa, *O. gratissimum* belongs to the family laminacea and is widely distributed in tropical and warm regions of the world (Okigbo and Ogbonnaya, 2006). Leaf of *O. gratissimum* have been found to contain methylchavicol, linalool, eugenol, thymol and xanthamicrol and the amount produced is dependent on the area that it is cultivated as well as part of the plant (Okujagu et al., 2008, Odebiyi and Sofowora, 1977). It is mainly used as a spice to flavor foods and meats (Okigbo, 1975). Their use as spice is known to reduce microbial load and extend the shelf life of foods. A lot of research has been done on *O. gratissimum* especially on its medicinal properties generating an abundance of information. However, there is a need to see the effect of long term consumption of this plants on growth performance and it palatability via the intake

MATERIALS AND METHODS

Experimental animals

A total number of twenty (35) Wistar rats weighing 70-90 g were purchased and housed in the Faculty of Pharmaceutical Science Animal house, Ahmadu Bello University, Zaria, Nigeria and allowed free access to water and standard diet 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 (Chah et al., 2006).

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 leaves of the *C. olitorius* and *O. gratissimum* were air-dried at room temperature (25°C). They were grounded into fine powder using an electric blender and stored in a dry sample container.

Formulation of experimental diets

Two experimental diets namely, the control diet (which contained 0% inclusion of *C. olitorius, and O. gratissimum) C. olitorius,* and *O. gratissimum* supplemented diet were varied according to according to Yan et al. (1998) at 2.5, 5, and 10%.

Determination of feed intake

The average feed intake (AFI) in the various supplemented groups and the control group for 8 weeks was calculated. The average weight gain (AWG) of the animal in their respective group was also calculated. The Feed intake (g/kg body weight/week) was extrapolated as:

$$\text{Feed intake} = \left(\frac{\text{Average feed intake (g)}}{\text{Average Body weight (kg) of rat}} \times 1000\right) / 8\text{weeks}$$

Table 1: The cumulative body weight performance, feed intake and feed efficiency of wister rats fed with different levels of *C. olitorius* diet inclusion for 8 weeks.

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

Table 2: The cumulative weight performance, feed intake (g/rat) and feed efficiency of wister rats fed with different levels of *O. gratissimum* diet inclusion for 8 weeks.

Treatment	Body weight gain (g/rat)	Feed intake (g/rat)	Feed efficiency (gain/food)
Control feed	41.60±3.60^{ab}	109.09 ± 1.55^{a}	0.3813±0.056^{a}
2.5% *O. gratissimum* diet Supplementation	47.32±4.99^{a}	120.09 ± 1.56^{b}	0.3940±0.035^{a}
5% *O. gratissimum* diet Supplementation	44.77±1.77^{a}	115.29 ± 4.92^{ab}	0.3893±0.042^{a}
10% *O. gratissimum* diet Supplementation	33.07±6.20^{b}	108.50 ± 5.54^{a}	0.3047±0.051^{b}

Values with different superscript down the column are significantly different (P<0.05) with n=5.

Determination of weight performance (weight change)

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

Average weekly weight change = FAW – IAW

b). 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 respectful groups were sum 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 level of 95% (p≤0.05).

RESULTS

The cumulative body weight performance, feed intake and feed efficiency of wister rats fed with different levels of *C. olitorius* diet inclusion are shown in Table 1. The result obtained showed that group fed with the highest feed intake gave the highest weight performance when compared with animal fed with Normal control (0% *C olitorius* inclusion) and 2.5 and 5% *C. olitorius* diet inclusion and it turns, the feed efficiency increased with increasing diet inclusion.

Values with different superscript down the column are significantly different (P<0.05) with n=5. The body weight performance, feed intake and feed efficiency of wister rats fed with different levels of *O. gratissimum* diet inclusion are shown in Table 2. From the result obtained, a consistent increase was observed in the weight performance of animal fed with normal control (0% *O. gratissimum)* and 2.5% *O. gratissimum* diet inclusion while the highest *O. gratissimum* diet inclusion (10%) showed a decrease in its weight performance as the supplementation tally to 8 weeks when compared with groups fed with lowest *O. gratissimum* diet inclusion.

DISCUSSION

The utilization of leaves of *C. olitorius* and *O. gratissimum* added to a standard feed (vital feed growers mash) by male wister rats gave some substantial results on the feed intake, feed efficiency, weight gain, as seen in the results obtained from this findings. There was an appreciable increase in the feed intake, weight performance and feed efficiency

obtained in rats fed with the *C. olitorius* diet supplementation with 10% *C. olitorius* having the highest feed rate. This can be attributed to leaves of *C. olitorius* that possesses good amount of minerals and vitamins (Ndlovu et al., 2008; Shitanda et al., 2006), which play a role in stimulating the appetite of the rats. 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 broadening the feed intake (lyimo et al., 2003). 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 nutritional endowments. Thus, it can be concluded that plant *C. olitorius* enhances weight gain and improves the look of the staple food taken, which return, improves feed efficiency. Whereas, the long term consumption of *O. gratissimum* diet inclusion by male Wister rats had some considerable effect on the weight/growth performance and also on the rate of their feed intake as seen in the results obtained from the studies. It was observed that *O. gratissimum* diet inclusion with vital feed resulted in increase weight gain as shown in Table 2. This is attributed to the nutrient composition of the leaves of *O. gratissimum*. *O. gratissimum* contain nutrient that can increase weight, such as carbohydrate, protein and lipid, minerals and vitamin (Edeoga et al., 2006). The increase in the feed intake observed in Table 2 could be explained from the fact that *O. gratissimum* leaves are rich in minerals and vitamins (Adepoju and Oyewole, 2008), which also stimulated the appetite of the rats. Ibrahim et al. (1997) reported that *O. gratissimum* could be used for spicing and seasoning of food and as such could also increase the palatability of food which is in agreement with the result gotten showing 2.5% supplemented diet group having the highest intake. The aroma from the *O. gratissimum*, which are mainly eugenol methyl cinnamate, camphor and thymol (Nakamura et al., 1999), might have some feed digestive properties that increase the appetite of the rats but at a very high dosage, the diet can become repulsive which probably made 2.5% supplementation the best, giving a growth performance resulting from the palatability potentials of the spice (2.5%) of *O. gratissimum* inclusion.

Histology result as seen in plate (1-4) shows that *C. olitorius* does not in any way affect the architecture of the colon, whereas *O. gratissimum* at 10% shows an adverse effect on the architecture of the colon with some abnormal cell absorbing maximally the die to give different color to other cells in the normal control.

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