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Nutrient evaluation of *Couroupita guianensis* fruits and flowers and effect of feeding *Couroupita guianensis* flowers on growth and haemato - biochemical parameters in Wistar rats

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Abstract

A study was undertaken to access the nutritive value of fruits and flowers of cannon ball tree (Couroupita guianensis Aubl.*) harvested from different trees at the College of Veterinary and Animal Sciences, Mannuthy, Thrissur. The samples were oven dried at 100°C until constant weight was obtained for dry matter determination. The dried samples were ground and subjected to proximate analysis. Results showed that Couroupita guianensis fruit and flowers contain moderate crude protein, nitrogen free extract and total ash. For animal experimentation fifteen healthy Wistar rats of three weeks of age were selected and divided into three groups of five each and allotted randomly to three experimental treatments T_1 (control), T_2 (T1 + 1% Couroupita guianensis flower (CGF) on dry matter basis), T_3 (T1 + 2% CGF on dry matter basis). All the experimental animals were fed with feed containing 24% CP and 3000 kcal/kg energy and were fed as per NRC standard. Feeding trial was conducted for a period of 30 days. The results showed that dry matter intake and body weight of animals were similar among the groups. Haemato-biochemical parameters such as haemoglobin, total protein and plasma glucose were similar among the groups whereas the triglycerides and total cholesterol were significantly lower in CGF supplemented group.*

Key words: *Couroupita guianensis* flower, Wistar rats, Growth, Blood

C*ouroupita guianensis* Aubl. (Cannon ball) is a large deciduous tropical tree 20-30 metres in height commonly called “Kailashpati”. The leaves, up to 15 cm long, are simple with serrate margin; the flowers are yellow, reddish and pink with a stunning fragrance. The flowers which grow on the trunk are aromatic, large and waxy and look like a Shivalinga and it’s pollen is snake shaped. Fruits are large and globose with a woody look like big rusty cannonballs hanging in clusters or like balls on a string. The fruit contains small seeds in a white, unpleasant smelling edible jelly (Kumar *et al*., 2017). The plant is indigenous to rainforest of the Guianas in North-eastern South America.

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It is a popular ornamental in Caribbean and South East Asian botanical gardens and listed as a rare tree and flower in India.

The components of this tree have many medicinal properties such as antioxidant (Pinheiro *et al*., 2010), anthelmintic (Regina and Uma Rajan, 2012), anti-inflammatory (Gupta *et al*., 2012), antiulcer (Elumalai *et al*., 2012) and antibacterial (Sivakumar *et al.,* 2015). Researches to evaluate the nutritive value of *Couroupita guianensis* fruit and flower and feeding trials as feed additive are very scanty. Hence this research work was done to evaluate the nutritive value of the *Couroupita guianensis* fruit and flower and to study the effect of supplementation of CGF on growth performance in Wistar rats.

Materials and Methods

Fruits and flowers of cannon ball tree were harvested from different trees from the College of Veterinary and Animal Sciences, Mannuthy (geographical coordinates10.5332° N, 76.2641° E). The samples collected were sliced and oven dried at 100 °C until constant weight was obtained for dry matter determination. The dried samples were grinded and subjected to proximate analysis as per AOAC 2016. The samples then analysed for nutrient content viz. Crude Protein (CP), Crude Fiber (CF), Ether Extract (EE), Total Ash (TA), Acid insoluble ash (AIA) and Nitrogen free extract (NFE).

The experimental animals of this study were fifteen male Wistar rats with good health selected from Small animal breeding station (SABS), Mannuthy. The rats were allotted randomly to three experimental treatments T_1 (control), T_2 (T1 + 1% *Couroupita guianensis* flower (CGF) on dry matter basis) and T_3 (T1 + 2% CGF on dry matter basis) uniformly. All the experimental animals were fed with feed containing 24% CP and 3000 kcal/kg energy.

The experimental animals were kept individually in clean and dry cage with good air circulation with amenities for feeding and watering. The feed was given in the morning after weighing the quantity. Potable water was given *ad libitum* to all the animals. Ambient conditions were maintained in the experimental house. Daily recording of the dry matter intake was performed. Also, the body weights of the rats were taken weekly and based on this data, the feed offered was revised.

Blood samples were collected from all the animals at the end of the experiment to estimate haemoglobin (cyanmetahemoglobin method), total protein (Biuret method), glucose (GOP-PAP methodology), total cholesterol and triglycerides (enzymatic colorimetric methods) using standard kits supplied by Agappe diagnostics Ltd, Ernakulam, India. Feed samples were analysed for proximate principles (AOAC, 2016). Analysis of Variance (Snedecor and Cochran, 1994) method was used for the statistical analysis.

Results and Discussion

Chemical composition of *Couroupita guianensis* fruit and flower (DM basis) is presented in Table 1. *Couroupita guianensis* fruit and flower contain moderate CP, NFE and TA. Shah *et al*., 2012 observed comparable TA value in the fruit of *Couroupita guianensis.*

Initial body weight of rats in treatments T_1, T_2 and T_3 were 149.60, 148.0 and 150.6 g respectively. Body weight of rats recorded at weekly intervals and final body weight was 208.6, 214.2 and 209.0 g, respectively for T_1, T_2 and T_3 at the end of experiment. There was no significant difference ($P > 0.05$) in body weight between the dietary treatments. Total weight gain and average dry matter intake of animals were similar in all the dietary treatments and presented in Table 3. James *et al*. (2002) and Manjula *et al.* (2016) observed similar total dry matter intake in rats.

Data on haemato-biochemical studies have been given in Table 4. The haemoglobin concentrations at the end of the experiment for group T_1, T_2 and T3 were13.72, 13.78 and 14.02 g/dL respectively and were similar in all the groups indicating that dietary incorporation of CGF powder did not affect these parameters to any significant effect. The average plasma protein concentrations at the end of the experiment for group T_1, T_2 and T3 were 6.31, 6.20 and 6.24 g/dL, respectively. The average

Table 1. Chemical composition of experimental feed % (DM basis)

Parameters	T_1	T_2	T_3
Dry matter (DM)	91.66	91.05	91.25
Crude Protein (CP)	24.04	24.56	24.61
Ether extract (EE)	5.12	5.64	5.81
Crude fibre (CF)	4.99	5.08	5.14
Total Ash (TA)	6.12	6.44	6.72
Nitrogen free extract (NFE)	59.73	58.28	57.72
Acid insoluble ash (AIA)	0.84	0.79	0.82

Table 2. Chemical composition of *Couroupita guianensis fruit* and flower % (DM basis)

Parameters	Fruit	Flower
Dry matter (DM)	14.13	7.82
Crude protein (CP)	7.60	11.23
Ether extract (EE)	9.13	4.06
Crude fibre (CF)	13.58	6.78
Total Ash (TA)	11.43	8.94
Nitrogen free extract (NFE)	58.26	68.99

Table 3: Body weight (g) and dry matter intake (g) of experimental rats

Parameters	T_1	T_2	T_3
Initial body weight (g)	149.60 ± 3.23	148.00 ± 2.92	150.60 ± 3.08
Final body weight (g)	208.60 ± 5.90	214.2±5.24	209.00±6.50
Total weight gain (g)	59.00 ± 8.75	66.20 ± 3.92	58.40 ± 6.14
Total dry matter intake (g/animal)	332.60 ± 9.21	337.60 ± 11.66	322.20 ± 9.64

Table 4. Haemato- biochemical parameters of experimental rats

Parameters	T1	T2	T3
Haemoglobin (g/dL)	13.72 ± 2.62	13.78 ± 2.28	14.02 ± 1.53
Total Protein (g/dL)	6.31 ± 0.05	6.20 ± 0.07	6.24 ± 0.05
Glucose (mg/dL)	88.73 ± 0.36	88.77 ± 0.34	89.38 ± 0.25
Total Cholesterol (mg/dL)	78.42 ± 0.33^a	77.01 ± 0.31^b	76.23 ± 0.26^b
Triglycerides (mg/dL)	44.56 ± 0.28^a	41.77 ± 0.36^b	40.40 ± 0.31^b

plasma glucose values were 88.73, 88.77 and 89.38 mg/dL for group T_1, T_2 and T3 respectively. The average serum cholesterol and triglyceride values were 78.42, 44.56, 77.01, 41.77 and 76.23, 40.40 mg/dL, respectively for group T_1, T_2 and T_3.

The results revealed that the serum biochemical values are within the normal range reported to the species. There was no significant difference in the values of serum total protein and glucose. In contrary to this Morankar *et al.* (2013) reported that supplementation of the aqueous and methanolic extracts of *Couroupita guianensis* flower (100 mg/kg) significantly ($p<0.05$) reduced the blood glucose level in alloxan induced diabetic mice and has antidiabetic activity.

The values of total cholesterol and triglycerides were significantly lower ($p < 0.05$) in CGF supplemented group compared to the control group. The hypercholesteraemic effects may be due to the polyphenolics and flavonoids present in the CGF which positively modify lipid profile. In agreement with present results Ramyasai *et al.* (2013) also reported that treatment with methanolic extract of *Couroupita guianensis Aubl*. flowers significantly decreased the total serum cholesterol, triglycerides,

low density lipoproteins, very low-density lipoproteins and increased the high-density lipoproteins in obese rats and was comparable with that of standard Atorvastatin. Hassan *et al.* (2018) also reported that supplementation of extracts of *Couroupita guianensis* leaves to rats at a dose rate of 1.25 g/kg showed significant reduction in the serum cholesterol level.

Conclusion

It can be concluded that *Couroupita guianensis* flower has anti-hyperlipidemic and atherosclerotic properties and that it can be used as a feed additive with anti-atherogenic property without any adverse effect on their growth in Wistar rats. Furtherresearch is needed to find the phytochemical profile and to detect the active principles for the beneficial health effects.

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