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Effects of Feeding Different Levels of *Monechma ciliatum* on the Performance of Rabbits in Sokoto, Nigeria

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Abstract: In an experiment conducted to determine the effect of including *Monechma ciliatum* (MC) in the diet of rabbit at 0 (control) 10, 20 and 30% levels, the results showed that increasing the level of supplementation of MC beyond 10% decreased feed intake and subsequently live weight gain. Dry matter digestibility also follow similar pattern. The least cost of feed per kilogram (kg) live weight gain of $0.75 also occurred at the 10% inclusion level of MC. Although, blood parameters differed between treatments, they were mostly within physiological limits, suggesting no adverse effects in feeding MC to the animals.

Key words: *Monechma ciliatum*, fibre, digestibility, liveweight, parameters, dry matter

INTRODUCTION

Monechma ciliatum (MC) is a weed of semi-arid areas and belongs to the family Acanthaceae. It can grow up to about 1 m in height occurring widely in tropical Africa. It is characterized by long tap root and lanceolate leaves. It is commonly grazed by domestic animals especially sheep and goats. Animal keepers in Sokoto State in Nigeria harvest the weed at the end of the rainy season and store it as hay to be used during the dry season.

Fadayomi *et al*. (1992) reported that *M. ciliatum* is the most dominant weed species in the Sudan Savannah ecological zone of Sokoto state of Nigeria. Hot Methanolic Extract (HME) of *M. ciliatum* has been reported to have potent oxytocic activity while column chromatographic studies using silicon, accompanied by bioassay of the extract tested on isolated rat uterus enable partial isolation of the oxytocic agent (Uguru *et al*., 1999). This study was conducted to evaluate the effects of feeding different levels of MC on the performance of rabbits.

MATERIALS AND METHODS

Experimental diet: *M. ciliatum* was obtained from the fallow of experimental crop farm of the Faculty of Agriculture, Usmanu Danfodiyo University, Sokoto. Nigeria. The plant specimens were collected when they were young, fresh and green. Samples of *M. ciliatum* were air dried on a concrete floor in a ventilated room for 6 days during which they were turned over twice daily. On the 7th day, they were sun-dried for 3 days and thereafter pounded using local mortar and stored in jute bags.

Random samples of the prepared plant were analyzed for proximate components. Other feed ingredients used to formulate experimental diet include wheat offal, yellow maize, groundnut cake, blood meal, bone meal, trace minerals and common salt. They were obtained from Sokoto central market and used to prepare diet containing 0 (control) (without MC), 10, 20 and 30% inclusion levels of *M. ciliatum*.

Experimental animals: The 6-8 weeks old weaned rabbits of Nigeria ecotypes weighing between 550 and 590 g were used in the experiment. A total of 117 male rabbits were divided into groups of nine animals and assigned to each dietary treatment. The animals in each treatment were divided into three groups of 3 animals each thus giving three replicates per treatment. The animals were housed in metabolism cages and each treatment was fed the experimental diet for an initial 7 days adjustment period which was followed by an experimental period of 56 days. About 200 g of experimental diet was provided daily and water was given *ad libitum*. The experimental animals were weighed weekly.

Digestibility trial: The 4 weeks from the commencement of the experiment, a digestibility trial was introduced which lasted for 10 days. During this period, daily feed

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intake and faecal output were measured. About 100 g of faecal samples were obtained from each animal and put in clean polythene bags and transferred into a refrigerator. At the expiration of the 10 days digestion trial, the faecal samples were analysed for proximate composition using methods described by AOAC (1990).

Blood analysis: Whole blood samples were collected through jugular vein of the animals on the day they were put into the metabolism cages and thereafter, samples were collected fortnightly. Haemoglobin was analysed using dippelfarstab haemoglobinometer; total protein by biuret method; bilirubin, Serum Glutamicoxaloacetic Transaminase (SGOT) and Serum Glutamic-Pyruvic Transaminase (SGPT) were assessed using Corning colorimeter.

Alkaline phosphatase, urea and creatinine were determined using diacetyl monoxine extraction procedure (Tietz, 1987); sodium and potassium were analysed on Seac Fp 20 flame photometer while bicarbonate ion was determined by the tetrimetric method.

RESULTS

Gross and chemical composition of experimental diet: The gross and chemical composition of *M. ciliatum* (MC) and its diets are shown in Table 1 and 2, respectively. The Crude Protein (CP) contents of the diets were similar.

Table 1: Gross composition of experimental diets fed to rabbits

	Treatments (% inclusion levels of MC)			
Ingredients	1 (0)	2 (10)	3 (20)	4 (30)
Wheat offal	56.55	50.55	39.95	27.55
Groundnut cake	8.76	8.05	8.40	8.78
Blood meal	2.95	3.25	3.25	4.26
Yellow maize	27.74	24.15	24.35	26.38
Monechma ciliatum	0.00	10.00	20.00	30.00
Bone meal	2.65	2.65	2.65	2.65
Vitamins*	0.01	0.01	0.01	0.01
Trace minerals**	1.33	1.33	1.33	1.33
Total	100.00	100.00	100.00	100.00

*Vitamin A: 15,000,000 I.U; D3: 4, 4000 I.U: E1:, 350 mg, K 4,350 mg, B2 4,350 mg B6: 2,350 mg: B12: 11.350 mg: C: 1,000 mg; **Magnesium: 1,400 mg kg^{-1}; Iron: 1,500 mg kg^{-1}; Copper 400 mg kg^{-1}; Phosphorus: 1%; Sodium chloride 97%

Table 2: Chemical composition of experimental diets fed to rabbits

		Treatments (% inclusion levels of MC)			
Ingredients	*M. ciliatum*	1 (0)	2 (10)	3 (20)	4 (30)
Dry matter	97.09	92.39	92.70	92.82	92.63
Crude protein	14.07	18.00	17.90	17.95	18.14
Crude fibre	24.97	6.78	8.57	10.03	11.33
Crude fat (EE)	2.33	4.82	3.92	4.30	4.56
N.F.E	36.73	65.81	63.21	59.69	56.44
Total ash	22.76	4.59	6.40	8.03	9.53
Calcium	1.65	0.12	0.28	0.43	0.58
Phosphorus	0.30	0.21	0.56	0.67	0.77
ME (kcal kg^{-1})	2269.20	2412.30	2384.70	2435.40	2427.10

Crude Fibre (CF), calcium and phosphorus ions increased with increasing levels of MC while Nitrogen Free Extract (NFE) levels decreased (Table 2).

Feed intake and liveweight gain: Average daily feed intake decreased from 74 g for the control diet to 45 g for the 30% MC diet ($p<0.05$) (Table 3). Consequently, average daily weight gain also decreased from 16 g for the control diet to 7 g for the 30% MC diet ($p<0.05$). Protein intake and protein efficiency ratio also decreased progressively with increasing levels of MC in the diets. The control diet was more expensive compared to the other diets.

Cost of feed decreased with increasing levels of MC in the diets. Cost of feed consumed followed a similar pattern with significant differences between the treatments (Table 3). Cost of feed kg^{-1} liveweight gained was however, lower for the 10 and 20% MC diets followed by the control diet.

Nutrients digestibility: The results in Table 4 show that digestibilities of Crude Protein (CP), Nitrogen Free Extract (NFE), Total Ash (TA) and Phosphorus (P) were higher for the control diet while Dry Matter (DM) and Crude Fibre (CF) digestibilities were higher for the 30% MC diet.

Table 3: Performance characteristics of rabbits fed diets containing graded levels of *M. ciliatum*

	Treatments (% inclusion levels of MC)			
Parameters	1 (0)	2 (10)	3 (20)	4 (30)
Initial weight (g)	580.0±5.5	593.0±5.1	579.0±3.3	582.0±6.2
Final weight (g)	1462.1±6.3	1192.2±6.2	1118.3±3.0	977.8±6.4
Final weight gain (g)	882.1^a	599.2^b	539.2^d	359.8^c
Daily weight gain (g)	15.8^a	10.7^b	9.6^c	7.1^d
Daily feed intake (g)	73.9^a	50.5^b	49.1^c	45.0^d
Daily protein intake (g)	13.3^a	9.1^b	8.8^c	8.1^d
Feed conversion ratio	4.7^c	4.7^c	5.1^b	6.4^a
Protein efficiency ratio	1.2^a	1.2^a	1.1^c	0.9^c
Cost of feed (₦ kg^{-1})	25.97	23.71	22.33	21.4
Cost of feed consumed (₦ day^{-1})	1.92^a	1.20^b	1.10^c	0.96^c
Cost of feed kg^{-1} liveweight gained (₦)	121.52^b	111.90^c	114.21^c	135.21^a

Means on the same row with different superscripts (a-d) are significantly different ($p<0.05$)

Table 4: Nutrients digestibility of rabbits fed diets containing graded levels of *Monechma ciliatum*

	Treatments (% inclusion levels of MC)			
Parameters	1 (0)	2 (10)	3 (20)	4 (30)
Dry Matter (DM)	68.88^b	63.60^d	65.49^c	70.96^a
Crude Protein (CP)	80.27^a	71.12^d	75.32^c	77.19^b
Crude Fibre (CF)	53.61^c	51.87^d	64.85^b	78.67^a
Crude Fat (CF)	45.22^c	58.28^b	79.82^a	45.89^c
Nitrogen Free Extract (NFE)	80.84^a	71.65^d	79.70^b	76.55^c
Total Ash (TA)	70.56^a	42.74^c	41.96^d	62.63^b
Calcium (Ca)	73.28^b	52.86^c	75.59^a	47.16^d
Phosphorus (P)	63.69^a	57.54^c	59.88^b	26.76^d

Means on the same row with different superscripts (a-d) are significantly different ($p<0.05$)

Table 5: Blood chemistry of rabbits fed diets containing graded levels of *Monechma ciliatum* (MC)

	Treatments (% inclusion levels of MC)			
Parameters	1 (0)	2 (10)	3 (20)	4 (30)
Haemoglobin (g/100 mL blood)	11.4^{a}	9.80^{c}	10.8^{b}	9.6^{c}
Total bilirubin (mg/100 mL blood)	0.4^{a}	0.30^{b}	0.3^{b}	0.4^{a}
Conjugate bilirubin (mg/100 mL)	0.1	0.10	0.1	0.1
Total protein (g dL^{-1})	7.7^{a}	6.00^{c}	6.1^{c}	6.4^{b}
Albumin (g dL^{-1})	4.7^{a}	3.30^{c}	3.5^{c}	3.8^{b}
SGOT (IU L^{-1})	3.5^{c}	6.80^{b}	7.0^{b}	10.0^{a}
SGPT (IU L^{-1})	4.0^{b}	8.00^{a}	8.0^{a}	8.0^{a}
ALP (King Armstrong Unit, KAU)	82.8^{d}	170.00^{a}	165.6^{b}	138.0^{c}
Urea (mg/100 mL blood)	6.2^{c}	11.80^{a}	11.2^{a}	8.8^{b}
Creatinine (mg/100 mL blood)	1.1^{c}	1.35^{b}	1.4^{b}	1.7^{a}
Na^{+} (mmol L^{-1})	137.0^{b}	128.00^{c}	136.0^{b}	151.0^{a}
K^{+} (mmol L^{-1})	5.6^{c}	5.40^{d}	5.8^{b}	6.6^{a}
Cl^{-} (mmol L^{-1})	99.0^{c}	98.00^{c}	100.0^{b}	121.0^{a}
HCO_3 (mmol L^{-1})	22.0^{c}	25.0^{b}	26.0^{a}	22.0^{c}

Means on the same row with different superscripts (a-d) are significantly different ($p<0.05$); SGOT = Serum Glutamic-Oxaloacetic Transaminase; SGPT = Serum Glutamic Pyruvic Transminase; ALP = Alkaline Phosphatase

Blood chemistry: Table 5 showed that haemoglobin concentration was higher ($p<0.05$) for the control diet, followed by the 20% MC diet. Total bilirubin, albumin and total protein were higher for the control and 30% MC diets, compared to the other treatments while conjugate bilirubin level was similar in all the treatments. Urea levels seemed to be enhanced by including MC in the diets.

DISCUSSION

Results of the experiment showed that feed intake, liveweight gained and protein efficiency ratio all decreased with increasing levels of MC in the diets. These decreases could be associated with the increase in the Crude Fibre (CF) levels in the diets with increasing levels of MC. Thus CF increased from 7% for the control diet to 11% for the 30% MC diet.

Heckmamm and Mehuer (1970) reported that rabbits perform best on diets containing 8% fibre. Gaman *et al.* (1970), Maff (1978) and Agunbiade *et al.* (2003) in separate reports recommended a level of 2-14% crude fibre for all purpose rabbits. High fibre levels promote longer retention time of ingesta in the gut (Hoover and Heitmann, 1972) and this influences the rate of digestion of various nutrients in diets (Randall, 1977). Thus increasing the fibre contents in feeds causes rabbits to eat less and this makes less nutrients especially protein to be available for digestion (Ajala and Alli-Balogun, 2004). This would lead to reduced feed intake and weight gain (Aitken and Wilson, 1962; De Bias *et al.*, 1986). It is therefore not surprising that in this experiment, the best performance was recorded for animals on the control diet (which contained 7% CF) followed by the 10% MC diet (which contained 9% CF). The lower performance in the animals fed MC diets could also be attributed to the effect of oxytocin, an antinutritional factor present in MC. The oxytocic principle partially isolated using hot methanolic extraction method from the leaves of MC caused contraction of the uterus of female rat (Uguru *et al.*, 1999).

This property of oxytocin could cause increased gastrointestinal motility with resultant stomach disorder. This, in addition to the minty odour of MC could contribute to the observed reduction in feed intake. Even though cost of feed decreased with increasing levels of MC in the diet, the lowest cost per kg liveweight gained was obtained with the 10 and 20% inclusion levels of MC. This therefore, indicates that incorporating levels of MC in the diets of rabbits should not exceed 20%. Total bilirubin was similar at 10 and 20% levels and different at control and 30% levels but the increase to 0.4 mg% at 30% could only be said to be transient as it coincided with the control level. Similar trend existed with the bicarbonate ion. SGOT increased from 6.8 IU L^{-1} in the 10% diet to 10 IU L^{-1} in the 30% diet. Cornelius *et al.* (1959) reported that SGOT and SGPT are present in some body tissues of domestic animals but alteration in cellular permeability due to necrosis or changes in normal cell membrane phenomena may allow for the escape of these enzymes into the serum in high concentrations.

CONCLUSION

In this study the SGPT value though higher than the control is similar for 10, 20 and 30% diets as it is said to be present in some body tissues (Cornelius *et al.*, 1959). Thus, the animals may not experience liver dysfunction. Similarly with increase in total protein from 6.0-6.4 g dL^{-1} from 10-30% diet and decrease in urea from 11.8-8.8 mg% also help to explain why there may not be liver dysfunction for the end product of protein catabolism taking place in the liver is urea (Benjamin, 1970). The increases in sodium and chloride ions could come from the continuous ingestion of common salt used in the preparation of the diets. However, the levels of Na^{+} and Cl^{-} at 10% are less than the control indicating a steady state in the electrolyte balance at the 10% level and there recall that best performance in the animals was at the 10% inclusion of MC.

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REFERENCES

AOAC, 1990. Official Methods of Analysis Association of Official Analytical Chemist. 15th Edn., AOAC, Arlington, Virginia.

Agunbiade, J.A., A.A. Taiwo, O.E. Fasina and O.A. Adeyemi, 2003. Effect of source of fibre and chemical treatment of dietary maize cob, sawdust and mango leaves on the productive performance of growing rabbits. Proceedings of the 28th Annual Conference of the Nigeria Society for Animal Production, (NSAP'03), Nigeria, pp: 358-362.

Aitken, F.C. and W.K. Wilson, 1962. Rabbit Feeding for Meat and Fur. 2nd Edn., Commonwealth Agricultural Bureaux, UK., pp: 63.

Ajala, M.K. and J.K. Alli-Balogun, 2004. Economics of rabbit production in Zaria, Kaduna State. Nigeria. Trop. J. Anim. Sci., 7: 1-3.

Benjamin, M.M., 1970. Outline of Veterinary Clinical Pathology. 2nd Edn., The Iowa State University Press, Iowa, USA.

Cornelius, C.E., J. Bishop, J. Switzer and E.A. Rhode, 1959. Serum and tissue transaminase activities in domestic animals. Cornell Vet., 49: 116-126.

De Bias, J.C., G. Santoma, R. Carabano and M.J. Fraga, 1986. Fiber and starch levels in fattening rabbit diets. J. Ani. Sci., 63: 1897-1904.

Fadayomi, O., B.L. Aliero and C.O. Muoneke, 1992. Pattern of field emergence of weeds in an upland farm in the Sudan savanna ecological zone of Northern Nigeria. Nig. J. Bot., 5: 193-202.

Gaman, E., H. Fisher and A.S. Feigenbaum, 1970. An adequate purified diet for rabbits of all ages. Nutr. Rep. Int., 1: 35-48.

Heckmamm, F.W. and A. Mehuer, 1970. Experiment on protein and crude fibre level on a complete diet for young fattening rabbits. Arch. Fur Getugelzucht Kleiniierkunde, 1: 23-43.

Hoover, W.H. and R.N. Heitmann, 1972. Effects of dietary fiber levels on weight gain, cecal volume and volatile fatty acid production in rabbits. J. Nutr., 102: 375-379.

Maff, 1978. Commercial rabbit production. Ministry of Agric. Fisheries and Food HM 50 London.

Randall, K.E., 1977. Digestion of fibre and energy in the adult Newzealand white rabbit. Nutr. Abstracts Rev. Ser. B, 47: 228-279.

Tietz, N.W., 1987. Fundamentals of Clinical Chemistry. 3rd Edn., W.B. Saunders and Company, London.

Uguru, M.O., M.M. Ekwenchi and F. Evans, 1999. Bioassay-directed isolation of oxytocic principles from the methanol extract of *Monechma ciliatum*. Phytoether Res., 13: 696-699.