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Effect of Dietary Pigeon pea (*Cajanus cajana*) on growth and some Blood Parameters of Desert Goats

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ABSTRACT: The experiment was conducted in the Faculty of Animal Production, University of Khartoum, at Shambat for 6 weeks. The study aims to examine the effect of the dietary C. *cajan* on the growth of desert goat kids, chemical blood serum cholesterol, calcium (Ca), inorganic phosphorus (I.P), glucose total protein. Iron (Fe) and blood haemoglobin (Hb).Twenty four male kids of ages ranging from 3.5-4 months and the animal average weight (10.27± 0.69 kg) were divided into four equal groups of six animals each. The four groups were provided with basic diet consisting of sorghum grain, wheat bran and groundnut cake that supply male kids with all nutrients. Four experimental diets were formulated by addition of C. *cajan* to the basic diet at (0%, 3%, 6% and 9%) in group A, B, C and D respectively. Results showed that there was a significant effect (P< 0.05) on growth and consumed feed when using C. *cajan,* group D (9% C. *cajan*) had a significant increase in the growth rate. In addition, such group had the larger amount of the consumed feed as well as the best feed conversion ratio (FCR). Chemical blood measurements showed that there is ascending increase in blood indices such as (Hb), the group who was fed with the ration containing 9% of C. *cajan* scored the significant (P< 0.05) increase, however, higher level of serum cholesterol observed on animal fed 6% C. *cajan*, but serum total protein, glucose, Ca, I.P and Fe were not affected by C. *cajan.* Feeding *9% of* C. *cajan*, has no adverse effect on animal health and no bloat symptoms.

***Keywords*:** C. *cajan*, goat kids, serum protein.

INTRODUCTION

Goats are the most widely distributed domestic livestock, and mainly found in tropical and subtropical regions, they can survive in areas with low quality vegetation. They are important to farmers because it provide them with milk, meat, skin. In Sudan goats are kept mainly for milk production around riverain areas in the towns and rural areas. Population of goats in Sudan is a proximately 38.8 million (M.A.R., 2001), this huge number f animal wealth formulates the considered of Sudanese economy and is expected to play an important role as a source of human food. However 90% of animal resources in the Sudan are possessed by nomads with their seasonal migratory habits in search of water and pasture. Sudanese livestock are mostly raised under open range grazing conditions, where tropical grasses were known for their early maturity, high fiber, high lignin and low protein, which adversely affected livestock reproductive and productive performance. In Sudan *C.cajan* considered as human diet, having high level of protein 21% - 28% (Tangta and Elliot, 1989) with high level of lysine (Singh and eggum, 1984) and good source of minerals (Meiners et al., 1976). Regarding the scarce information on it's use as animal feed, the main objective of this study is to investigate the effect of feeding *C.cajan* seed on desert goat kids performance and some blood parameters.

MATERIALS AND METHODS

Twenty four males desert goat kids, were purchased from Ombader livestock market ranging in age between 3.5 - 4 months, and average live weight 10.27 ± 0.69 kg, they were then transported to livestock unit. Faculty of Animal Production, University· of Khartoum.

On arrival animals were rested, eartagged and allowed to adapt for 15 days. During this period the animals were fed the assigned diets adlibitum. Before the adaptation period pens were disinfected with Gamatox powder against ticks and mites prior to animal arrival, then dipping in Gamatox to remove external parasites, drenched with antihelmntic (Albendazole) against internal parasites and injected with antibiotic as prophylactic measure. The animals were divided randomly into four groups with 4 pens of 6 animals each. Group A as control with average mean weight 10.08 kg, group B for treatment with 3% *C. cajan* with average mean weight 10.08 kg, group C for treatment with 6% *C. cajan* with average mean weight 10.25 kg and group D for treatment with 9% *C. cajan* with average mean weight 10.66 kg. Four groups were separately penned, each pen was provided with watering and feeding facilities.

Experimental diets:

The experimental diets were prepared to cover the nutrient requirement of growing kids according to NRC (1981), the basal rations were contained primarily contains sorghum, groundnut cake and wheat bran. The ration for control group without *C. cajan* (diet A). Other rations were supplements with *C. cajan* at rate 3%, 6%, 9% B, C and D respectively. The ingredient proportion calculated, chemical composition and proximate analysis of the experimental diets are given in Tables (3, 4, 5,) respectively. During the feeding period, the animals were fed daily the assigned experimental diet adlibitum at 7:30 am throughout the study period, which extended for 42 days. Abu sabeen was also offered daily at rate of 0.04 kg/head/day.

Table 1. Composition of experimental diet as fed

Ingredients %	A	B	C	D
Sorghum	55	56.5	57.5	65
Wheat bran	30.75	26.75	24.75	16
Groundnut cake	6	5	3	3
Cajanus cajan	0	3	6	9
Molasses	5	5	5	3.75
Bone meal	0.75	0.75	0.75	0.75
Salt	1	1	1	1
Lime stone	1.5	1.5	1.5	1
Tallow	0.5	1	1	1

A = diet contain 0% *Cajanus cajan*
B= diet contain 3% *Cajanus cajan*
C = diet contain 6% *Cajanus cajan*
D = diet contain 9% *Cajanus cajan*

Table 2. Calculated chemical composition of the experimental diet

	experimental diets			
Ingredients %	A	B	C	D
CP	16	16.1	16.1	16.1
CF	6.4	6.05	6.1	6.1
*ME	12	12	12	11.9
Ca	0.98	0.96	0.96	0.9
P	0.55	0.50	0.50	0.50

A = diet contain 0% *Cajanus cajan*
B= diet contain 3% *Cajanus cajan*
C = diet contain 6% *Cajanus cajan*
D = diet contain 9% *Cajanus cajan*
* ME (Mj/kg) calculated according to Ellis, (1981).
ME (Mj/kg) = 0.012 CP + 0.031 EE + 0.005 CF + 0.014 NFE

Table 3. Determined chemical composition of experimental diets on dry matter basis

	Ration			
Ingredients %	A	B	C	D
Dry matter (%)	92	92.2	92	92.5
Crude protein (%)	19.8	17	16.6	17
Ether extract (%)	3.2	4	3	4.2
Crude fibre (%)	11.25	9.75	11.5	12
Ash	6	7	6	5.5
N FE (%)	51.75	54.45	54.9	53.8
*ME (Mj/kg)	11.17	11.38	11.18	11.47

A = diet contain 0% *Cajanus cajan*
B= diet contain 3% Cajanus cajan
C = diet contain 6% *Cajanus cajan*
D = diet contain 9% *Cajanus cajan*
* ME: Calculated according to Ellis, (1981).

Data records:

Total feed offered and residual for each pen was recorded daily to calculate feed intake. The animals were weighed weekly, they were fasted overnight except for water before weighing, the average weekly weight gain of each animal and its feed conversion efficiency was calculated.

Blood sampling:

Blood samples were collected from all animals at the end of the experiment by vein puncture in vacutainer tubes, serum was separated and stored frozen in -20°C until analyzed.

Haemoglobin (Hb):

Blood hemoglobin was determined by Sahali method (Appendix 2).

Chemical analysis:

Feed:

Proximate analysis of the diets was done according to (AOAC, 1982).

Serum total protein:

Total protein was analyzed by the method described by Kind and King (1954)

Serum glucose:

Serum blood glucose was measured by method described by Grod Wohl (1956).

Serum cholesterol:

Serum cholesterol was determined by the spectrophotometer using enzymatic calorimetric test (CHOD-PAP) (Trinder, 1969; Flegg, 1972; Richomond, 1972; Fasce, 1982; Deeg and Ziegenohrm, 1982).

Serum Ca, ip, and Fe:

Were analyzed using spectrometer model (uican 8625). Serum Ca was analyzed according to the method described by (Trinder, 1960).

Serum inorganic phosphorous was determined by method described by Varley, 1967).

Statistical analysis:

The data collected was analyzed according to the analysis of variance (ANOVA) appropriates for CRD was used according to Gomaez and Gomez (1984). Means separation was carried out using the least significance difference (LSD).

RESULTS AND DISCUSSION

Chemical composition of C. cajan:

The results of chemical composition of C. cajan was shown in Table (4). The result revealed that C. cajan contain 21.7 CP, 12.0 CF, 64.3 NFE, 2.0 EE, 4.0 ash and DM 93.5.

Feed lot performance:

Feed lot performances were presented in Table (5). The addition of C. cajan to ration at level 3, 6 and 9% in group B, C and D respectively resulted in consistent increase in feed intake. The highest feed intake was observed in animal fed 9% C. cajan followed by animals fed 6% C. cajan and then animals fed 3% C. cajan, The growth performance of desert goat was significantly (P<0.05) affect by C. cajan level, the highest average live body weight gain observed in group D (9% C. cajan).

Table 4. Chemical analysis of *C. cajan* (on dry basis)

(%)	C. cajan
DM	93.5
CP	21.7
CF	12.0
NFE	53.8
Ash	4.0
EE	2.0
ME (Mj/kg)	11.36

ME calculated according to the equation of Ellis, (1981).
ME (Mj/kg) = 0.012 CP + 0.031 EE + 0.005 CF + 0.014 NFE

Table 5. Effect of dietary *C. cajan* on overall performance of desert kids

Item	A	B	C	D	±S.E	L.S
Number of animals	6	6	6	6	-	-
Initial live body weight (kg)	10.08^{a}	10.08^{a}	10.25^{a}	10.66^{a}	±0.69	N.S
Final live body weight (kg)	12.31^{c}	$13.47b^{c}$	14.27^{ab}	15.4^{a}	±0.36	*
Average daily feed intake (g/head/day)	391.44	418.61	439.51	459.8	-	-
Average daily gain (g/head/day)	53^{d}	81^{c}	96^{b}	113^{a}	±3.70	*
G Feed/g gain	7.4	5.16	4.57	4.06	-	-

N.S = Non significant

L.S = Level of significance

± S.E = Standard error of means

* = Significant (P<0.05)

a, b, c, d = Value with different superscript in the same row are significant difference

The overall feed conversion ratio (g feed/g gain) of dietary treatment of C. cajan are presented in Table (5). The best feed conversion ratio was observed on animals fed 9% C. cajan (4.06), followed by animals fed 6% C. cajan (4.57) and then animal fed 3% C. cajan (5.16), however, the control, groups showed the worst (FCR) (7.4).

Blood composition:

Serum total protein, glucose, cholesterol, calcium, inorganic phosphorus (ip), iron and haemolglobin are presented in table (6). The treatments had a significant (P<0.05) effect on blood haemoglobin. There was consistent increase associated by increasing the level of C. cajan in the ration, the higher level of haemoglobin reported on animals fed 9% C. cajan followed by animal fed 6% C. cajan and then animal fed 3% C. cajan. On the other hand, treatments had a significant (P<0.05) effect on blood cholesterol.

Table 6. Effect of dietary C. cajan on blood composition of desert kids

Parameters	A	B	C	D	+SE	Level of significant
Hemoglobin (gm/dl)	6.14c	8.78b	9.34b	11.83a	±0.34	*
Cholesterol (mg/dl)	65.45b	66.93b	89.53a	74.33b	±4.94	*
Ca (mg/100ml)	8.13	8.33	8.13	8.52	±0.12	NS
(IP)(mg/100ml)	4.70	4.77	4.70	4.70	±0.08	N.S
Glucose (mg/100ml)	74.01	62.4	72.9	69.6	±4.93	N.S
Total protein (g/100ml)	7.60	7.77	7.85	7.97	±0.09	N.S.
Fe (mg/100ml)	56.17	58.83	60.33	64.50	±2.9	N.S

a, b, c, d = Value with different superscript in the same row are significant difference at (P<0.05).
± S.E = Standard error of means
(iP) = inorganic phosphorus.

Highest level of cholesterol showed in kids fed 6% C. cajan. As far as serum total protein, glucose, calcium, inorganic phosphorous and iron were not significantly affect by dietary C. cajan, however, the level of the serum iron a numerical increase by increasing the level of C. cajan.

Chemical composition of C. canjan showed that it contains about 21.7% crude protein, these results were in line of that reported by Sibarani (1982); Tangta and Elliot (1989); Fialho, et al., (1985), but disagreed with the finding of Purseglove (1980) and Elhardalou (1980) who reported that CP was 19%, also the results showed that seeds contained 12.0 crude fibre. These results were inconsistent with the finding of Purseglove (1986); Fialho, et al., (1985); Sibarani (1982); Elhardalou (1980); who showed lower value of crude fibre in range 5 – 10%. In the present study calculated metabolizable energy was approximately (11.36 Mj/kg).

Feed intake of ration containing *C. cajan* might be low at the beginning, this may be due to tannin taste (singh, 1988). However high feed intake was reported on animals fed 3, 6 and 9% *C. cajan* during the whole period, and this may indicate that animals were tolerated the taste of tannin. Although some antinutritional factors of *C. cajan* which cause flatulence has been reported by (Singh, 1988), in this study there was no sign of toxicity or bloat, diarrhea or other side effect were observed during experimental period. Also the highest daily feed intake was noticed at level 9% similar results are reported by Karachi and Zengo (1997).

The animals fed ration supplemented with *C. cajan* showed an increase in weight gain. The growth increased consistently to initial live body weight as percentage (33.6, 39, 44.5%) in group fed 3, 6, 9 *C. cajan* respectively. This positive response on growth coincided with high feed intake to the ration supplemented with *C. cajan.* This may be attributed to high level of lysine (Singh and Eggum, 1984), and may lead to increase the biological value of the protein in these rations. Similar results were reported by Karachi and Zengo (1997). Amaefule and Obioha (1998) and Elhag and Elwakeel (1998) but disagreed with that of Grimaud (1988) who fed pigs ration supplemented with 45% *C. cajan*, the results showed that treatment had no effect. This variations in response of *C. cajan* may be related to the level used and the kind of digestive system of animal. The presence of microflora in ruminant that play an important role in digestion and detoxification of some toxin substances (McDonald, et al. 1987). The best feed conversion ratio has been noticed on animal fed 9% *C. cajan* and this may be related to its content of lysine and quality of protein (Singh and Eggum, 1984).

The high level of blood haemoglobin observed on animals fed 9% *C. cajan* and this may be attribute to the level of methionine and cystine (Singh and Jambunathan, 1982) that are essential for protein synthesis. The seed contain high level of iron (Meiners et al., 1976) which coincided with haemoglobin synthesis and may enhance the level of Hb on animal fed *C. cajan*. In the present study the increase in serum cholesterol was not consistent with increasing the level of *C. cajan*, however high level of serum cholesterol observed on animals fed 6% *C. cajan*. This response may be due to associative effect of saturated and unsaturated fatty acids in *C. cajan* at this level, with may enhance the absorption and synthesis of cholesterol (McDonald, et al., (1987). The treatment of *C. cajan* had no effects on serum total protein, calcium, inorganic phosphorous and glucose,

The treatment of *C. cajan* had no effect on serum iron, but there is a numerical increase in the level of serum iron and this may be related to iron content of *C. cajan* (Meiners et al., 1976) and it may be in corporate into Hb synthesis which increase Hb level.

REFERENCES

A.O.A.C., 1982. Methods of analysis. Association of official analytical chemistry. Washington, D.C.

Amaefule, K.U. and Obioha, F.C. 1998. The substitution ;of pigeon pea seed for Groundut cake and maize in broiler finisher nation. Nigerian, J, Anim. Prod. College of Animal Science, Federal University of Agriculture, Umudike, Abiastate, Nigeria, 25 (1-2), 9-12.

El Hag, F.M. and El Wakeel, A.S. 1998. Forage legume hay as a dry season Supplement for goats in North Kordofan. Sudan. J. Agric. Res., Elobeid Research Station, Elobeid, Sudan, 1:1, 41-44.

Elhardalou, S.B. 1980. Chemical characteristics of some legumes grown in Sudan. The Sudan J. of Food Sec. 12:35-42.

Fialho, E.T.,Albino, L.F. and Blume, E. 1985. Composicao quimica evalores energeticos de algunos alimetos para suines, Pesq. Agropec. Brasilia, 20: 1419-1431.

Gomoez, K.A. and Gomez, A.A. 1984. CRD design In: Statistical procedure for agricultural research. Johnwilly and Sons, New York.

Grimaud, P. 1988. Pigeon pea a possible alternative for traditional pig and poultry farming in new Caeonia. Review of Medicine Veterinary Tropics.11:29-36.

Karachi, M. and Zengo, M. 1997. Legume forages from pigmeon pea, leucaena and sesbania as supplements to natural pastures for goat production in Western Tanzania. Agro-forestry Systems, Tobora, Tanzania, 39 (1): 13-21.

M.A.R.2001. Ministry of Animal Resources. Statistic of Animals Resurce in Sudan.

Mcdonald, P.; Edwards, R.A. and Greenhalgh, J.F.D. 1987. Animal Nutrition, Fourth ed., English Language book Society (ELBS), Longman.

Purseglove, J.W. 1980. Tropical crops dicotyledons. Longmans Green and Co. Ltd., And Hard. Lon. Sudan. J. Fd. Sci. Tech. 1980, 12:35-40.

Sibarani, S.A. 1982. Study on tempch preparation using pigeon pea (Cajanus).Cajan) by traditional inculum and analyses of its nutritive value. Master of Science Thesis, University of Indonesia, Jakarta, Indonesia.

Singh, U.1988. Antinutritional factors of chickpea and pigeon pea and their reoved by processing. Plant Foods for Human Nutrition. Qualitas plantarum. 38:251-261.

Singh, U. and Eggum, B.O. 1984. Amino acids composition of C. cajan. Plant Food for Human Nutrition. 34:273-283.

Singh, U. and Jambunathan, R. 1982. Distribution of seed protein fractions and Amino acid in different anatomical parts of chick pea and pigeon pea (C.Cajan) plant food for human nutrition. Qualitas plantarum. 31:374-354.

Tangta, S. and Elliot, R.1989. Utilization of C. cajan as poultry feed inm Evaluation of C. cajan as protein energies sources in layers rations. J. Agric.,5 (1): 37-45.