



Carcass Characteristics and Meat Quality Attributes of Sudanese Goat Desert kids fed graded levels of *Rhynchosia Minima*.

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Abstract

This study was conducted to investigate the effect of feeding graded levels of *Rhynchosia Minima* (0%, 5%, 10%) on carcass characteristics and meat quality attributes of Sudanese desert goat kids. Twenty seven kids (less than one year old and of initial body weight of 8.14 kg) were used in this experiment. The animals were randomly divided into three experimental groups of nine kids each. Isocaloric and isonitrogenous diet containing graded levels of *Rhynchosia Minima* was offered to respective groups. At the end of the experimental period (9 weeks), six kids from each group were randomly selected and slaughtered. Carcass characteristics, meat chemical composition and meat quality attributes were recorded. Results revealed that addition of *Rhynchosia Minima* to the ration produced significant increase ($P < 0.05$) in wholesale cuts yield as breast, ribs and neck. Insignificant increase in other carcass characteristics, as slaughter weight, hot and half carcass weight, total body muscles, fat, dressing percentage was observed. On carcass components and meat chemical composition were almost insignificantly increased by inclusion of *Rhynchosia Minima* to the kid's diet.

Key words: Carcass Characteristics, Meat quality attributes, Sudanese Desert kids and *Rhynchosia Minima*.

Introduction

Sudan was a huge Arab and African country possesses a large livestock population which estimated at 110 million heads, comprising of 41.12 million sheep, 32.4 million goats, 32.08 million cattle and 4.9 million camels (MARF, 2021). Most of these animals represent a source of meat for local and export consumption.

The available resources of feed for these livestock include natural pastures, crop residues and agro industrial by-products. Although ranges and pasture can offer and support feed for a large number of livestock, the nutritive value of these resources in the Sudan are greatly affected by seasonal variations. Sudan encompasses diverse ecological zone that support the natural growth of various plants which contribute the nutritional requirement of livestock (FAO, 2010). *Rhynchosia Minima* is a member of family Fabaceae, tribe phaseoleae and subtribe cajaninae (Lackey, 1981; Jayasuria, 2014). It includes more than 232 species and distributed in tropical regions in both hemispheres (Gear 1978; Jaca *et al.*, 2018; Schrire 2005; Turner 2011). *Rhynchosia minima* is a member of the Leguminosae (Fabaceae) family, it found with adequate amount in different regions of the Sudan (FAO, 2010). Gillett *et al.*



(1971) mentioned that the plant is used as animal forage; its palatability vary widely with different ecotypes that occur in different habitats. Hassell (1945) stated that in queens land, the plant is eaten readily by animals when young due to high palatability however, mature plant is not eaten due to fibrous and coarse nature. Beeston (1978) listed *Rhynchosia minima* as highly palatable for animals in the Blackall district of central west queens land while Boyland (1973) mentioned this plant as moderately palatable for animals in the far south-west of Queen's land. Bogdan (1977) stated that in Kenya, the plant is readily eaten by cattle than sheep; however, the cattle stay away during its flowering phase due to slight emission of scent from flowers. Shukla *et al.* (1970) noted that this plant is palatable to sheep in India. However, Shukla, et al (1970) showed a daily consumption of 3.5 kg. per 100 kg. body weight by rams in India, was considered palatable to sheep as well. Crude protein was only 15.1 percent and crude fiber 45.9 percent, with 60 percent digestibility of dry matter, 54 percent of crude fiber and 64 percent of crude protein. In Sudan there is limited information regarding its nutritive value as animal feed. Therefore, this study was conducted to evaluate the effect of gradual levels of *Rhynchosia Minima* on carcass Characteristics and meat quality attributes of Sudanese desert goat kids.

Materials and Methods:

Date and place of the experiment: This study was conducted at University of Elneelain College of Agricultural Technology and fish sciences, Department of Animal Production in Jabal Awila at Khartoum State, about 40 km south of Khartoum. The experiment lasted for 9 weeks term from January to March 2023.

Plant Collection:

Table (1). Proximate analysis of *Rhynchosia Minima*.

Component%	Fresh Basis	Dry Matter
Moisture	13.07	4.07
Dry matter	86.93	95.97
Ash	5.80	7.03
Crude protein	7.06	15.67
Ether Extract	2.93	2.73
Crude Fiber	9.03	15.77
Nitrogen Free Extract	62.07	54.43
Metabolizable Energy MJ/Kg Dm	2.58	2.51

Rhynchosia Minima was collected manually, sun dried and then chemically analyzed according to A.O.A.C (2019).

Experimental Diets:

Table (2) Ingredients and calculated chemical analysis of experimental diets.

Component	Percentage of <i>Rhynchosia minima</i>.		
	A (0%)	B (5 %)	C (10 %)
Sorghum	40.0	40.0	43.5
Groundnut Cake	17.0	19.0	19.0
Wheat bran	14.0	8.00	3.50
Groundnut hulls	15.0	7.00	0.00



Molasses	12.0	19.0	22.0
Salt	1.00	1.00	1.00
Limestone	1.00	1.00	1.00
Metabolizable Energy (Megajoles)	10.28	10.24	10.23
Protein (%)	17.06	17.08	17.03

Based on this analysis three isonitrogenous and isocaloric diets, contains *Rhynchosia Minima* with percentages of 0%, 5% and 10% was formulated (table2).

Experimental Animals: Twenty seven Sudanese desert goat kids less than one year of average initial weight 8.14 kg were randomly allocated to three dietary treatments (nine animal per treatment).

Data Collection: The feeding trial lasted 9 weeks. At the end of the experiment six kids from each group were randomly selected and slaughtered then carcass characteristics and meat quality attributes data was recorded.

Statistical Analysis: Data were statistically analyzed using analysis of variance applicable to complete randomized design as described by Snedecor and Cochran (1980).

Results and Discussion:

More recent researchers as Atta Elmnan and Elamin (2015); Atta Elmnan et al., (2022) and Balgees, Elmnan, Rania, et al (2023), were concentrated on the constituents of *Rhynchosia Minima* as an animal feed and on its palatability and its invitro digestibility. Majority of these studies stated that the plant is palatable and its digestibility is excellent in ruminant animal. These studies also tend to evaluate the plant as an animal feed but there is scarcity of researches on the effect of *Rhynchosia Minima* on feedlot performance and carcass characteristics of these animals.

Table (3). Effect of graded levels of *Rhynchosia minima* on Carcass yield and characteristics of Sudanese Desert goat kids.

Parameter	Percentage of <i>Rhynchosia minima</i> .			L.S		S. E
	A (0%)	B (5%)	C (10%)	1%	5%	
Slaughter Weight (kg)	30.7	44.1	48.9	NS	NS	0.99
Empty Body Weight (kg)	12.7	20.4	23.3	NS	NS	8.70
Cold body weight (kg)	12.2	19.5	23	*	NS	8.90
Left side weight (kg)	6.0	10.2	12	NS	NS	2.8
Chiller shrinkage (%)	2.1%	3.7%	1.5%	NS	NS	0.3
Hot dressing percentage	48.4%	57.2%	59.8%	NS	NS	0.01
Cold dressing percentage	46.3%	53.5%	58.3%	NS	NS	0.6
Total muscle weight (kg)	3.44	6.06	6.90	NS	NS	1.07
Total bone weight (kg)	1.7	2.3	1.9	*	*	0.7
Total fat weight (kg)	0.12	0.17	0.16	NS	NS	0.13
Eye muscle area (cm)	9.6	10.8	13.8	NS	NS	4.6

NS: no significant difference. L.S: least significant difference. S.E: standard error.

Carcass yield and characteristics of goat kids are shown in (Table 3). Slaughter weight, hot and half carcass weight, total body muscles and fat weight and dressing percentage were insignificantly increased with the increase of



Rhynchosia Minima level in the diet but cold body weight and total fat weight were increased significantly ($p < 0.01$). The increase in feed intake is due to plant palatability and excellent digestibility. Atta Elmnan and Elamin (2015); Atta Elmnan et al., (2022) found that *Rhynchosia Minima* is more palatable plant so it increases the feed intake and hence the body weight, slaughter weight and carcass weight.

Table (4). Effect of graded levels of *Rhynchosia minima* on Wholesale cuts of Sudanese Desert goat kids.

Parameter	Percentage of <i>Rhynchosia minima</i> .			L.S		S . E
	A (0%)	B (5%)	C (10%)	1%	5%	
Shoulder	0.41	0.94	1.00	NS	NS	0.12
Breast	0.70	1.39	2.00	*	NS	0.11
Ribs	0.35	0.70	0.94	*	*	0.53
Loin	0.55	0.80	0.90	NS	NS	0.14
Thigh	2.01	3.62	4.23	NS	NS	0.73
Diaphragm	0.35	0.63	0.96	NS	NS	0.65
Neck	0.69	0.99	1.00	*	NS	0.63

NS: no significant difference. L.S: least significant difference. S.E: standard error.

Table (4) showed wholesale cuts weights of Sudanese Desert kids fed graded levels of *Rhynchosia Minima*. There were no significant differences except in the breast ($p < 0.05$) and ribs ($p < 0.01$) which were significantly increased with increase of inclusion of *Rhynchosia Minima*. These cuts are most bony cuts than other carcass cuts and due to its early maturing tissue (bone is maturing early than meat and fat) there was significant increasing in the weights of these cuts.

Table (5) Effect of graded levels of *Rhynchosia minima* on Non carcass components weights of Sudanese Desert goat kids fed.

Parameter	Percentage of <i>Rhynchosia minima</i> .			L.S		S . E
	A (0%)	B (5%)	C (10%)	1%	5%	
Legs (kg)	1.25	1.40	1.50	NS	NS	0.16
Heart weight (kg)	0.20	0.30	0.41	NS	NS	0.30
Lungs and Trachea (kg)	0.46	0.68	0.68	NS	NS	0.34
Intestine full (kg)	4.05	4.60	4.70	NS	NS	0.33
Intestine empty (kg)	1.40	1.70	2.30	NS	NS	0.15
Rumen full (kg)	3.20	3.70	4.40	NS	NS	1.14
Rumen empty (kg)	0.58	0.85	0.89	NS	NS	0.01
Liver (kg)	0.60	0.93	1.01	*	NS	0.09
Pancreas (kg)	0.73	0.90	1.20	NS	NS	0.13
Kidney (kg)	1.20	1.70	2.02	*	NS	0.01
Omental fat (kg)	0.13	0.54	1.10	NS	NS	0.09
Intestinal fat (kg)	0.61	0.64	1.01	NS	NS	0.25
Genital organs (kg)	0.50	0.54	0.60	NS	NS	0.50
Kidney Knob fat (kg)	0.12	0.54	0.81	NS	NS	0.22

NS: no significant difference. L.S: least significant difference. S.E: standard error.

Non-carcass components as Head, Legs, Empty stomach, Intestine, Heart, Kidney, diaphragm, lung and skin were stated in (Table 5). These parameters showed no significant ($P > 0.05$) increase between animal groups with the



increase of *Rhynchosia Minima* levels. These results follow the same trend of the above results and this might be due increase in feed intake by more inclusion of *Rhynchosia Minima* in animal feed (Balgees, Elmnan, Rania, et al (2023)).

Table (6). Effect of graded levels of *Rhynchosia minima* on Meat Chemical analysis of Sudanese Desert goat kids.

Parameter	Percentage of <i>Rhynchosia minima</i> .			L.S		S . E
	A (0%)	B (5%)	C (10%)	1%	5%	
Protein	14	16.4	15.9	NS	NS	0.30
Ash	0.28	0.14	0.30	NS	NS	0.30
Fat	3.16	2.80	3.36	NS	NS	0.30
Water Holding Capacity	0.20	0.30	0.40	NS	NS	0.10
PH	6.10	6.13	6.00	NS	NS	0.10

NS: no significant difference. L.S: least significant difference. S.E: standard error.

Table (6) showed meat chemical analysis of Sudanese desert goat kids fed graded levels of *Rhynchosia Minima*. There were no significant differences ($P>0.05$) in meat chemical composition which were almost follow the same trend of the experiment results.

Conclusion

Introduction of dry *Rhynchosia Minima* up to 10% in the diet of male goat kids did not affect carcass characteristics or meat quality attributes but can be used as supplementary feed without adverse effect on carcass and meat composition.

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