Performance and External Body Measurements of Sudanese Desert Goat kids fed graded levels of *Rhynchosia minima*. (A).

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Abstract:
This study was conducted to investigate the effect of feeding graded levels of *Rhynchosia Minima* (0%, 5%, 10%) on the performance and external body measurements of Sudanese desert goats. Twenty seven goat kids less than one year old and of initial body weight of (8.14 kg) were utilized. These kids were divided into three experimental groups of nine kids each. Three isocaloric (12.2 Mj/kg) and isonitrogenous diet (17%) containing graded levels of *Rhynchosia minima* was offered to the kids groups. Results revealed that addition of *Rhynchosia minima* to the ration significantly ($p<0.05$) increase the feed intake and the body weight gain. Also feed conversion efficiency was significantly ($p<0.05$) influenced by adding *Rhynchosia minima* to the ration. As far as external body measurements was concerned, back length and thigh circumference was significantly ($p<0.01$) increased by increase inclusion of *Rhynchosia Minima* in the ration while heart girth was significantly ($p<0.05$) increased by inclusion of the tested material.

Key Words: *Rhynchosia minima*, Performance, Body Measurements and Sudanese Desert Kids.

Introduction

Rhynchosia minima are a wild species belonging to the genus *Rhynchosia* of family leguminosae (Lersten and Curtis, 1994). The genus *Rhynchosia* consist of 230 species distributed in tropical and subtropical hemisphere (Grear, 1978). The word

‘‘Rhync” refer to its nose-or snout shaped flowers while the ‘‘minim” indicates its very small pod, flowers and seed. *Rhynchosia* is a diploid species having 2n=22 number of chromosomes (Dundas, 1990). *Rhynchosia minima* are annual, perennial weed, herbaceous plant found in every continent (Lopez, 2012). *Rhynchosia minima* known by various names in different countries such as Least Snout bean and Turvel in India Sri Lanka and United States (Kirtikar and Basu, 1999). Their Stems are lean and 80 to 120 cm long. Leaves are trifoliate having rhomboid leaflets which is 0.5 to 3 cm wide and 0.5 to 3 cm long. The texture of leaves are velvet or glabrescent. *A Rhyncosia minima* has raceme inflorescence with 6 – 12 flowers. The floral part consists of 3 to 4 mm long calyx with five acuminate lobes. Corolla is 1 cm long and yellow in color. Pods are two seeded with short beaks. Mature pod color is black and often 1 to 1.5 cm long and 0.4 to 0.6 cm wide. The seeds are 3 mm long having a short hilum. The color of seeds range from brown or black and grey to tan (FAQ, 2006). Palatability of *Rhyncosia minima* appears to vary widely from place to place. It is probable that it varies with the wide range of different ecotypes that exist. Hassell *et al* (1983) states it is eaten readily in Queensland when young but becomes rather fibrous and coarse when mature, while Beeston (1978) lists it as highly palatable in the Blackall District of central west. Bogdan (1977) says its slight scent prevents it from being completely eaten in the flowering stage in Kenya. In Kenya, *Rhyncosia minima* is more readily eaten by cattle than sheep Bogdan, (1977). However, Shukla, Ranjhan and Katiyar (1970) showed a daily consumption of 3.5 kg. per 100 kg. Body weight by rams in India, and considered it 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. The animals showed positive balance for N, Ca and P, and gained 0.32 kg / day. Studies with fistulated sheep at Toorak Research Station, on the northern end of the Queensland Mitchell grasslands, showed that *Rhyncosia minima* was an important component of the "other species" in the pasture. These, while rarely exceeding 10 percent of the forage on offer, at times accounted for 60 percent of the diet consumed (Lorimer, 1978). There are no known toxicities. In Barbados, *Rhyncosia minima* was among the most frequent plants on soils with a salt concentration of 1.6 meq/100 g, a concentration that prevented establishment of 30 other species Eavis, Cumberbatch and Medford, (1974). *Rhyncosia minima* is a very hardy and widely adapted plant, to date much neglected. Many lines are slowly

productive but others grow much more vigorously. The species warrants a thorough examination for pasture cultivars, especially for harsher, heavy-textured soils. The high digestibility of whole plant and leaves may strengthen their potential use as feed for ruminants whether being used alone as a feed or in concentrate feed containing different nutrients. This potential use could be strengthened even further because of its estimated high content of CP, NFE, slightly less ash percentage and the moderate percentage of NFE. Balgees, Elmnan, Rania, et al (2023). The objective of this study is to investigate the effect of *Rhynchosia Minima* on the performance and external body measurements of Sudanese desert kids.

MATERIALS AND METHODS:

Study area: This study was conducted at University of Elneelain College of Agricultural Technology and fish sciences, Department of Animal Production in Jabel Awlia at Khartoum State, about 40 km south of Khartoum.

Experimental animals: Twenty-seven Sudanese Desert goat kids (less than one year old, with an average body weight of 8.14 kg) were used in this study to evaluate feedlot performance and body measurements. The kids were randomly allocated into three experimental groups**.** Kids were ear tagged and subjected to an adaptation period of two weeks.

Adaptation period: During this period experimental kids were fed a mixture of experimental diets**.** Experimental kids were vaccinated against septicemia and pests Des Petit Ruminant (P.P.R) and sprayed with an acricide solution against ectoparasites and deworming with thiobenzol as drench solution was performed. The thiobenzol treatment was repeated after 15 days.

Experimental procedure: At the end of the adaptation period the animals were individually weighed and then randomly divided into 3 groups (A, B, and C) of similar number and similar weight. Each group was separately penned and provided with watering and feeding facilities.

Feeds and feeding

Plant Collection: *Rhynchosia minima* were collected manually. After sun drying a sample was taken and subjected to a proximate analysis according to (A.O.A.C 2019. Table1). According to this analysis three iso-caloric diets (10.2 Mj/kg) and iso-

nitrogenous (17%) diets were formulated (Table2). These diets contained graded levels of *Rhynchosia minima* (0, 5%, and 10%). During the feeding period animals were fed the assigned diets adlibitum. The diets were offered in one morning meal at 8 a.m. throughout the study period. Green fodder (Medicago sativa) was also given at a rate of one kg/animal/week to avoid vitamin A deficiency. The experiment lasted for 63 days.

Data Collection: Performance data which include feed intake, weight gain and feed conversion ratio were collected throughout the experimental period which was extended for 9 weeks. Body measurements which include heart girth, back length and thigh circumference were taken at the beginning and at the end of the experiment using meter tape according to the procedure described by Brown et al (1973).

Data analysis:

Data were statistically analyzed according to the analysis of variance applicable to complete randomized design as described by Snedecor and Cochran (1980).

Results and Discussion:

Effect of *Rhynchosia minima* on Feed Intake:

Table (3) showed the Performance characteristics of Sudanese Desert kids fed graded levels of *Rhyncosia minima*. Feed intake of the kids is significantly increased ($P<0.01$) by addition of the tested grass to the animal feed and this might be to good palatability of the diet as many workers observed e.g. Elmnan and El amin (2015); Atta Elmnan et al., (2022). Other researchers as **Masters et al. (2019)** who add forage legume to the small ruminant's feed also observed increase of feed intake of the animals.

Effect of *Rhynchosia minima* on Body Weight:

As seen in Table (3) addition of *Rhyncosia minima* significantly improved ($P<0.05$) the final body weight of the experimental kids and this due to the increase of feed intake. Results obtained here were in line with those of **Benchaar et al. (2015)** who study the feeding behavior, feed intake and performance in lambs and goats offered forage legumes found improvement in the performance of the small ruminants. Also the plant high digestibility will lead to increase of the feedlot performance parameters of the tested animals. This high digestibility accompanied by high content of CP, NFE, slightly less ash percentage and the moderate percentage of NFE was stated by Balgees, Elmnan, Rania, *et al* (2023).

Effect of *Rhynchosia minima* on Feed Conversion Ratio:

Feed conversion ratio was significantly (P<0.05) improved as inclusion of *Rhynchosia minima* in the diet increased Table (3). This is due to increase of feed intake and weight gain. These results follow the manner of results obtained by Rochon et al (2004).

Effect of *Rhynchosia minima* on External Body Measurements:

In table (4) initial external body measurements of the kids was presented. There was no significant difference in heart girth, back length and thigh circumference. Inclusion of graded levels of *Rhynchosia minima* table (5) induced significant (P<0.05) increase in the heart girth and significant (P<0.01) increase in back length and thigh circumference respectively. External body measurements are reflections of animal growth and it increases by the increase of weight gain of tested animals.

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

Item	Wet	Dry
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 (%)	2.58	2.51

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

Item	Percentage of *Rhynchosia minima*.		
	A (0%)	B (5 %)	C (10 %)
Sorghum	40	40	43.5
Groundnut Cake	17	19	19
Wheat bran	14	8	3.5
Groundnut hulls	15	7	0
Molasses	12	19	22
Salt	1	1	1
Limestone	1	1	1
Metabolizable Energy (Megajoles)	10.28	10.24	10.23
Protein (%)	17.06	17.08	17.03

Table (3) Performance characteristics of Sudanese Desert kids fed graded levels of *Rhynchosia minima*.

Parameter	Percentage of *Rhynchosia minima*.			L.S 1% 5%	S. E
	A (0%)	B (5%)	C (10%)		
Experimental Days	63	63	63	- -	-
Experimental animals	9	9	9	- -	-
Initial body weight (kg)	8.14	8.14	8.14	- -	-
Final body weight (kg)	10	12.01	12.25	* NS	0.35

Body weight gain(kg/head/week)	1.6	3.61	3.85	NS *	0.32
Feed intake (kg/head/week)	2.37	2.85	3.65	* *	1.73
Feed conversion ratio	1.48	0.78	0.94	NS *	0.13

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

Table (4). Initial body measurements of Sudanese Desert kids fed graded levels of *Rhynchosia minima* (in centimeter).

Parameter	**Percentage of *Rhynchosia minima*.**			**L.S 1% 5%**	**S. E**
	A (0%)	**B (5%)**	**C (10%)**		
Heart Girth	47.2	48.1	50.2	NS	0.6
Back length	28.6	27.3	35.7	NS	0.8
Thigh Circumference	22.4	24.8	25	NS	0.7

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

Table (5). Final body measurements of Sudanese Desert kids fed graded levels of *Rhynchosia minima* (in centimeter).

Parameter	**Percentage of *Rhynchosia minima*.**			**L.S 1% 5%**	**S. E**
	A (0%)	**B (5%)**	**C (10%)**		
Heart Girth	48.4	53.2	57.4	NS *	0.5
Back length	31.6	33.6	36.2	*	0.5

				NS	
Thigh Circumference	23.3	25.5	27.5	* NS	0.4

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

Conclusions:

From this study, the following can be concluded:

1. Adding *Rhynchosia minima* at 5% and 10% to the diets of desert goat kids resulted in a significant improvement ($P<0.05$) in weight gain and feed intake.
2. The addition significantly improved feed conversion efficiency.

3. The weight gain was reflected in increased measurements of chest girth, back length, and thigh circumference, indicating well-rounded animal growth.

4. It is recommended to use this plant as an unconventional feed source at levels up to 10% in goat fattening diets.

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أداء وقياسات الجسم الخارجية لجديان الماعز الصحراوي السوداني المغذاة على مستويات متدرجة من نبات "*Rhynchosia minima*"

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الملخص :

أجريت هذه الدراسة لمعرفة تأثير التغذية بمستويات متدرجة من عشبة *Rhynchosia minima* (٠%، ٥%، ١٠%) على الآداء وقياسات الجسم الخارجية لجديان الماعز الصحراوي السوداني. تم استخدام سبعة وعشرين جديا (عمر أقل من عام واحد ووزن الجسم الأولي ٨,١٤ كجم). تم تقسيم هذه الجديان إلى ثلاث مجموعات تجريبية تضم كل منها تسعة جديان. تم تقديم ثلاثة أغذية متساوية في الطاقة (٢و١٠ميجاجول لكل كجم) ومتساوية في البروتين (١٧%) و تحتوي على مستويات متدرجة من عشبة *Rhynchosia minima* لمجموعات الصغار. كشفت النتائج أن إضافة عشبة *Rhynchosia minima* إلى العليقة أدت إلى زيادة معنوية ($P<0.05$) في تناول العلف وزيادة وزن الجسم. كما تأثرت كفاءة تحويل العلف بشكل معنوي ($P<0.05$) بإضافة عشبة *Rhynchosia minima* إلى العليقة. أما فيما يتعلق بقياسات الجسم الخارجية، فقد زاد طول الظهر ومحيط الفخذ بشكل ملحوظ ($P<0.05$) بزيادة تضمين *Rhynchosia minima* في النسبة بينما زاد محيط القلب بشكل ملحوظ ($P<0.05$) بإدراج المادة المختبرة.

الكلمات المفتاحية: *Rhynchosia minima*، الأداء، قياسات الجسم الخارجية وجديان الماعز الصحراوي السوداني.