

## NUTRIENT COMPOSITION AND DEGRADABILITY OF ROSELLE (*Hibiscus sabdariffa* L.)

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### ABSTRACT

The objective of this experiment was to study nutrient composition and degradability of roselle (*Hibiscus sabdariffa* L.) seeds and pods in sheep. Previous studies indicated that roselle seeds were high in protein, lipid and inorganic sources and could be used as feed for ruminants. Four fistulated male local sheep were used in the experiment. They were assigned in 2x2 Latin Square with two animals per group with one group given roselle seeds and the other roselle pods and conducted over two periods. The result indicated that dry matter and organic matter degradabilities of roselle seeds were slightly higher than roselle pods (39.87±1.97; 26.30±1.70 and 31.00±1.85; 20.85±1.54, respectively). Rumen degradability of roselle seeds and pods increased with incubation time, but in general the values were lower than 50%. The result suggests that either seeds or pods require pre-treatment to increase their degradabilities. However, the chemical analysis suggests that both seeds and pods are potential energy and protein sources for ruminants.

Key words: Nutrient composition, Degradability, Roselle

### INTRODUCTION

One factor limiting the development of animal production in the tropical countries is the poor quality of forage. The low energy of forages is the main constraint, although protein supplementation is needed to obtain the high performance of livestock production. From an economic point of view, using conventional feed stuff as sources of energy or protein is quite expensive. To develop and increase animal production as well as income of the farmer, the use in conventional feed stuff should be explored particularly for small holdings.

Roselle (*Hibiscus sabdariffa* L.) seeds and pods can be used as in conventional feed stuff. Usually roselle is cultivated mainly for the calyces, but the leaves are also used as a pot herb and some varieties are grown for their fiber. In Sudan it is used for making a beverage, but in Europe it is being used for making sauces, jams, jelly, wines, powder instant and as a coloring material for food and wine. (Ibrahim-MEH *et al.*, 1971).

Samy-MS in 1980, reported that chemical composition of whole and defatted roselle seeds, resp. was determined to be (%) : moisture 7.58, 8.18 crude protein (CP) 23.95, 29.04; digestible CP 15.36, 27.50; ether extract (EE) 22.24, 0.69; digestible EE 14.4, 0.68; N-free extract (NFE) 23.81, 32.86; digestible NFE 22.52, 32.51; estimated using Rhode Island Red cocks. El-Adawy *et al.* in 1994, reported that chemical composition and nutritional studies of roselle seeds were performed. Amino acid analysis indicated that roselle seeds were potential high protein source. Lipid analysis showed those roselle seeds to be a good source of lipid. And the most predominant in organic elements in roselle seeds were K, Na, Mg, and Ca. So far information on the utilization of roselle seeds and pods as a ruminant feed is still lacking.

The objectives of this experiment were to evaluate the nutrient composition and degradability of roselle seeds and pods in sheep.

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Roselle (*Hibiscus sabdariffa* L.), Malvaceae, is an herb which come from tropical region in Africa or sub tropical region in America (Bailey, 1963). Although it has been planted in tropical region of Asia since three decades (Brouk, B., 1975). Roselle usually is planted using seeding and cutting.

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Fruit and stems of roselle which is grown for its calyces, fibers and seeds had protein 22.0 and 2.1, ether extract 3.7 and 1.9, fiber 25.6 and 62.4, N-free extract 33.3 and 22.0 and DM 90.2 and 90.9%, respectively. From studies with 2 cockerels it was thought that ground roselle fruits or mixed fruit and stem could replace 25% of concentrate (Abdel-Rahmah, MM., El-Shafie-Salah, A., 1977). Seeds of roselle, which is grown for its calyces, pigments, fiber and oil, contained moisture, 7.6, crude protein 24.0, fat 22.3, fiber 15.3, N-free extract 23.8, ash 7.0, calcium 0.3, phosphorus 0.6 and sulfur 0.4%. Seed extracted with ether had fat 0.7, protein 29.0 and N-free extract 32.9%. In studies with cockerels given extracted and non extracted seed, digested nutrients were protein 15.4 and 27.5, N-free extract 22.5 and 32.5% with total digestible nutrients 75.8 and 68.8, starch value 84.1 and 64.2% and metabolizable energy 3184 and 2891 kcal/kg, respectively (Samy, -MS., 1980).

## MATERIALS AND METHODS

Four fistulated male local sheep, one and half years old were used in the experiment. The effects of roselle seeds and pods on rumen metabolism were studied. The design of experiment was a 2x2 Latin Square with two animals replicate in each treatment

The method used was according to the one described by Ørskov *et al.*, (1980). Sample of seeds and pods were prepared by

grinding through a 3-4 mm screen incubated in the rumen in nylon bag (size 5x7 cm, 42µ). The degradability of roselle seeds and pods were determined at 2, 6, 12, 24, 48 and 72 hours. At the end of each incubation period, the bags were withdrawn washed thoroughly under running tap water with gentle squeezing until the rinse water became clear. The bags were then dried at 60 °C for 72 hours in the oven, then weighted and the samples kept in desicator. For 0 hour the bags were placed in the rumen for 1 minute and than withdrawn. The dried samples were analysed for Dry matter and Organic matter for determination of percentage loses and degradation parameters.

The Dry Matter and Organic Matter degradability at various incubation times were fitted according to the equation given by Ørskov and MC.Donald (1979):

$$P = a + b(1 - e^{-ct})$$

Where:

- p = The cumulative amount degraded at time (t)
- a = The rapidly-soluble fraction
- b = The potentially degradable fraction in the rumen
- c = The fraction rate constant of b
- a+b = The potential degradability

a, b and c are degradation constants obtained by an iterative least squares procedure (non liner) in the SAS programmer (1988, Appendix D). The nutrient of roselle seeds and pods were analyzed which is described by AOAC (1984).

## RESULTS AND DISCUSSION

The nutrient composition of roselle seeds and pods are presented in Table 1. The CP content of the roselle seeds and pods were 20.1 and 7.3 respectively. On the other hand the CF content were 27.7 and 45.3% for seeds and pods respectively. The CF content of the seed is much higher than many conventional seeds. The pods were rich in fiber but poor in CP content. The roselle pods could be used as energy source for ruminant after treating it chemically.

Table 1. Nutrient composition of roselle seeds and pods

Nutrient	Seeds	Pods	Pods and seeds
Dry Matter	94.7	95.4	96.6
Crude Protein	20.1	7.3	16.5
Fat	12.24	0.08	2.58
Fiber	27.7	45.3	31.27
NDF	54.3	58.9	57.54
ADF	38.7	42.2	41.27
ADL	12.8	12.5	14.91
Ash	8.0	5.2	8.52

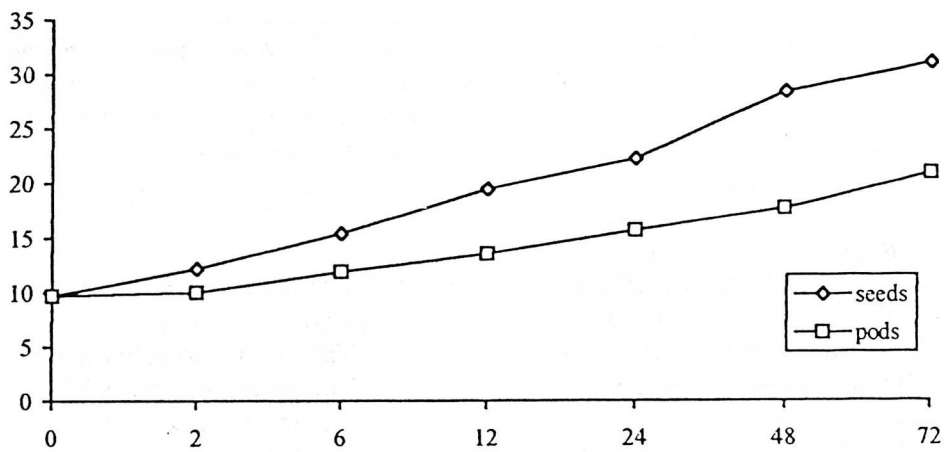


Figure 1. Rumen degradability of Organic Matter of roselle seeds and pods

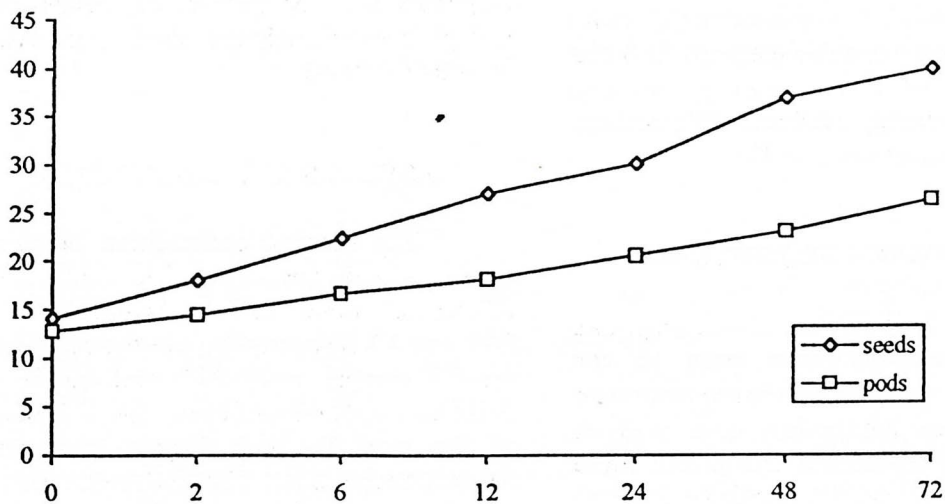


Figure 2. Rumen Degradability of Dry Matter of Roselle Seeds and Pods

Table 2. Rumen degradability (%) of roselle seeds and pods

Incubation Time (hour)	Organic Matter		Dry Matter	
	Seeds	Pods	Seeds	Pods
0	9.68	9.68	14.13	12.82
2	12.19	9.97	18.10	14.51
6	15.41	11.90	22.41	16.69
12	19.44	13.46	27.02	18.16
24	22.25	15.61	30.04	20.58.
48	28.36	17.66	36.80	23.01
72	31.00	20.85	39.87	26.30

The rumen degradability of the dry matter and organic matter (Table 2) were low for both seeds and pods. This could be due to the high lignin content.

### CONCLUSION

It can be concluded that in terms of composition and degradability, the roselle seeds and pods are potential feed stuff for energy and protein sources for ruminant.

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