Status of Sodium and Potassium and N:S Ratio in Different Feeds and Fodders of Kaira District of Gujarat

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An assessment was attempted in Kaira district of Gujarat State regarding sodium and potassium availability and nitrogen: sulphur ratio in feeds and fodders from requirement point of view and thereafter, to recommend appropriate mineral mixture for that area. Sodium was unusually low even to the extent of 0.03 per cent. Lucerne green was however rich in sodium (0.20%). Its quantity varied, ingredient-wise and village-wise, showing the effect of soil type. On the other hand, potassium was found abundant in most of the feeds and fodders, so that its supplementation was not recommended in the mineral mixture. Sulphur content was also low (0.11%) in most of the feeds and fodder samples, giving broader N:S ratio (> 10:1). For efficient utilization of nitrogen, sulphur supplementation through mineral mixture is required in that area.

Keywords: Sodium, potassium, N:S ratio, feeds, dairy animals, Gujarat

Sodium, potassium and sulphur are macro-elements, which are required in the diet of ruminant animals. Sodium is required to the extent of 0.10 per cent for growing cattle and 0.18 per cent for lactating dairy cows, whereas potassium is needed to the extent of 0.65 per cent for growth and 1.0 per cent for lactation. Sulphur is required to the extent of 0.16 per cent for growing cattle and 0.20 per cent for lactating animals (NRC, 1989). For supplementation of sodium in diet, common salt is generally used, whereas, nitrogen in the rumen is available through proteins and NPN compounds. For their efficient utilization, Na and K need to be in a particular ratio and level, in the diet of ruminants. This is true for N and S as well.

In this paper, assessment has been made regarding the sodium and potassium availability and N:S ratio in different feed ingredients to calculate the difference, if any, from livestock requirement point of view.

One randomly selected village in each taluka of Kaira district was included for collection of feeds and fodder samples. Within the village, help was sought from Village Milk Cooperative Society and Kaira District Cooperative Milk Producers' Union. Selection of farmers was based on the location of their agricultural land, so as to cover the soil types, on each side of the village. Fodder and feed samples fed to the animals were collected and analyzed for sodium and potassium contents, using Atomic Absorption Spectrophotometer (Varian Model). Nitrogen contents were estimated by Kjaldahl method (AOAC, 1980), whereas, sulphur was estimated by turbidity method (Anon 1960). Fodders were mostly straw, lucerne and maize, while concentrate was 'Amuldan', a compounded cattle feed produced and marketed by Kaira District Cooperative Milk Producers' Union Ltd. Additional concentrate in the form of maize bhardo or rice polish were also fed to their milch animals, which were collected for the analysis.

Quantitative data on different feeds and fodders being fed to each of the milch animals was also recorded, to calculated total intake of each mineral element. Total intake was compared against the requirement, on dry matter basis (NRC, 1989), so as to identify quantitative deficiency, sufficiency or even excess. Data were analyzed statistically as per Snedecor and Cochran (1968).

Sodium (Na)

The sodium content was low in all the feeds and fodders ranging from 0.03 to 0.30 per cent. Corn green, a non-leguminous fodder had around 0.10 per cent sodium, while lucerne green, being leguminous crop had 0.20 per cent sodium.

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However, sodium level (0.04%) was poor in corn and wheat grain. Cotton seed cake, rice straw, sorghum straw and millet straw also exhibited somewhat similar picture with 0.09 per cent sodium. 'Amuldan', a compounded cattle feed, had an appropriate quantity of sodium to the extent of 0.64 per cent, because of added sodium chloride (Table 1). Those animals not given Amuldan were mostly deficient in sodium in the diets (Table 2). As expected, sodium levels varied significantly between samples for most of the feeds, which might be due to the geochemically different soil types in different villages. In most circumstances, Na declines as the plant matures (Underwood, 1981).

Potassium (K)

The potassium content of all feeds and fodders ranged from 0.57 to 2.49 per cent on dry matter basis. Usually, forages were higher in potassium than concentrates. Potassium levels in fodders were 1.78 per cent, while grains had 0.66 per cent potassium.

Rice polish had 1.29 per cent K, while cotton seed cake had 2.02 per cent potassium. 'Amuldan' samples had potassium with a mean value of 1.70 per cent (Table 1). Just like Na, village-wise variation in K content was also noticed.

Potassium is the most abundant mineral in feeds and fodders, which did not require supplementation in the diet of ruminant animals (Table 2).

Sulphur (S)

Sulphur levels in crop residues were low ranging from 0.05-0.19 per cent. However, lucerne green had around 0.21 per cent sulphur (Table 1). Corn and wheat grains contained lower S content which gave a N:S ratio of 23:1. Sulphur contents

Table 1: Sodium and Potassium Contents and N:S Ratio in Feeds and Fodders in Villages of Kaira District (DM basis)

Ingredients	Sodium (%)	Potassium (%)	Nitrogen (%)	Sulphur (%)	N:S Ratio
Corn grain (7)	0.045 ±0.007	0.52 ±0.036	1.91 ±0.11	0.09 ±0.010	23.29
Corn green (4)	0.10 ±0.010	1.54 ±0.088	1.14 ±0.10	0.13 ±0.012	8.76
Cottonseed cake (11)	0.09 ±0.005	2.02 ±0.06	3.55 ±0.081	0.12 ±0.007	29.58
Deoiled maize cake (8)	0.07 ±0.004	0.99 ±0.049	3.27 ±0.098	0.09 ±0.005	36.33
Local grasses (7)	0.08 ±0.007	1.24 ±0.16	1.23 ±0.11	0.10 ±0.006	12.36
Lucerne green (16)	0.20 ±0.014	2.19 ±0.052	2.89 ±0.15	0.21 ±0.008	13.76
Millet straw (15)	0.11 ±0.012	1.98 ±0.034	1.19 ±0.044	0.09 ±0.003	13.22
Rice Polish (10)	0.10 ±0.007	1.29 ±0.054	1.4 ±0.076	0.11 ±0.007	14.90
Rice Straw (31)	0.09 ±0.007	1.35 ±0.077	0.71 ±0.023	0.08 ±0.003	8.65
Sorghum straw (4)	0.06 ±0.010	1.59 ±0.10	0.48 ±0.077	0.06 ±0.008	7.50
Wheat grain (7)	0.04 ±0.002	0.80 ±0.037	2.27 ±0.01	0.10 ±0.009	22.70
Amuldan (30)	0.64 ±0.012	1.70 ±0.10	4.28 ±0.053	0.28 ±0.006	15.28

Figures in parentheses indicate no. of samples analyzed

Table 2: Per Cent Deficiency of Sodium in Animals Without Amuldan Feeding (Kaira District)

Village	Sodium Deficiency %
Gada	42.41
Nagra	43.24
Umlav	48.40
Vanoti	47.00
Makwa	46.45
Lingda	48.04
Rampur	45.18
Alindra	43.45
Telnar	34.02
Gundi-Na-Muwada	40.66
Potassium: Adequate Requirements (NRC, 1989) Sodium (%): 0.18 Potassium (%): 0.90	

were low in soil of Kaira district of Gujarat (Dangerwala, 1994). Most of feed ingredients were poor in sulphur content (0.11%), indicating that its supplementation was necessary to make up an optimum N:S ratio in the diet of ruminants.

Optimum N:S ratio (10:1) in diet is important because of efficient utilization of nitrogen and sulphur (Arora *et al.* 1977; Walli and Mudgal 1978, 1982) and normal rumen microbial activity (Bouchard and Conrad. 1973; Ahuja and Arora 1981, 1982). Sulphur is used by rumen microbes for the synthesis of S-containing amino acids, which are subsequently incorporated in microbial protein and used for the synthesis of tissue protein (McDowell, 1992).

Thus, it is evident from the present study that sodium and sulphur are the elements, which need to be supplemented in the diet of ruminant animals, whereas, potassium is abundant in different feed ingredients in Kaira district.

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