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Sodium and potassium status of different feeds and fodders of Mehsana district of Gujarat

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Present study has been done regarding the availability of both sodium and potassium from feeds and fodders in Mehsana district (Gujrat) as a test case and an attempt has been made to calculate the difference, if any, from livestock requirement point of view. This approach is one technique which is relatively cost effective to provide assessed data from practical field application (Aggett *et al.* 1988).

At random 1 village from each taluka was selected for taking representative samples of fodders and other concentrate ingredients. Within the village, help was sought from local village co-operative society, for identification of 4 to 5 farmers. The recorded parameters were number of livestock, land area and fodder and other crops grown. In identification of farmers, land location was considered, essentially, one each from northern, eastern, western and southern directions to cover soil types on each side. Fodder and feed samples were collected for analysis of sodium and potassium. Simultaneously assessment was made for total feeds and fodders offered to their best milch buffalo or cow, to calculate intakes. Deficiency or sufficiency were estimated, so as to recommend supplementation (NRC 1989), if necessary in an organized way.

The crops, grown in Mehsana district are shown in Table 1. Green fodders are usually lucerne, Hybrid Napier and sorghum. Whereas, local green grass is 1 ingredient which is also fed to livestock. Straws from different crops, however, form the bulk of the total ration. Concentrates including, a compound feed, are usually fed to productive buffaloes and cows.

Table 1. Ingredient-wise sodium and potassium contents in villages of Mehsana district

Ingredients	No. of Samples	Sodium (%)		Potassium (%)	
		Range	Mean SE±	Range	Mean SE±
Bajra-grain	(10)	0.03–0.04	0.03±0.01	0.77–0.95	0.88±0.03
Bajra-husk	(7)	0.08–0.12	0.10±0.01	1.52–1.92	1.70±0.12
Bajra-straw	(31)	0.19–0.31	0.22±0.01	1.74–2.66	2.10±0.11
Chikudi	(4)	0.35–0.43	0.39±0.04	2.30–2.50	2.40±0.10
Cottonseed-cake	(25)	0.04–0.09	0.07±0.01	1.66–2.34	2.05±0.06
Hybrid Napier	(6)	0.09–0.14	0.11±0.01	1.95–2.65	2.21±0.22
Local grass	(16)	0.11–0.16	0.13±0.01	0.54–2.25	2.21±0.23
Lucerne	(30)	0.19–0.30	0.20±0.02	1.47–2.55	1.91±0.08
Sorghum-green	(24)	0.06–0.09	0.07±0.01	1.83–2.14	1.98±0.07
Sorghum-straw	(35)	0.04–0.09	0.06±0.01	1.10–2.31	1.52±0.09
Wheat-grain	(7)	0.04–0.05	0.04±0.01	0.73–1.01	0.83±0.05
Wheat-straw	(19)	0.15–0.22	0.11±0.03	1.73–2.05	1.82±0.09
Compound feed	(28)	0.80–0.98	0.88±0.02	1.22–2.10	1.75±0.13

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Sodium (Na)

The sodium content was unduly low in all the feeds and fodders ranging from 0.03 to 0.43%. Only *chikudi* green contained sodium as high as 0.43%. Compound feed had an appropriate quantity of sodium to the extent of 0.88%, because of added sodium chloride (Table 1). As expected, sodium

Table 2. Levels of deficient elements in animals without compound feeding (Mehsana district)

Village	Sodium (%)
Kherva	39.93
Boratwada	41.04
Gujarwada	43.44
Hathipura	39.39
Hansapur	37.31
Madhupura	33.28
Balva	37.15
Charada	40.10
Dhinoj	37.21
Meda-adaraj	32.66
Vav	35.67
Denap	34.45

Requirements :	Sodium (%)	Potassium (%)
(NRC 1989)	0.90	0.18
Potassium (%) :	adequate	

quantity village-wise varied significantly between samples for most of the feeds which might be due to geochemically different soil types. Further, it was evident that farmers were meeting the requirement of sodium who practised feeding of compound feed as one of the components in the total ration (Table 2), whereas other animals remained deficient.

Potassim (K)

The potassium content of all feeds and fodders ranged from 0.54 to 2.66%, which seemed to be selective uptake from the soil and was as much as 11 times more than sodium. Compound feed samples had potassium with mean value of 1.75%. Just as sodium levels varied between samples from different villages, potassium content also showed the same type of picture, though much higher than sodium content. Potassium seemed to be another element just like iron and cobalt (Garg *et al.* 1998) which did not require supplementation in the diet, because of its adequate levels in different feed resources.

Adequacy of sodium in diet is important because of its important role in sodium pump and its concentration being more in extracellular compartment. Its kinetic features, the stoichiometry of Na^{++} and H^{+} is 1: 1 which maintains pH at approximately 7.2 intracellularly by the distribution of H^{+} ions between the 2 compartments, on the basis of electrochemical gradient (Noel and Pouyssegur 1995). Though sodium is conserved by the body in a number of ways, such as its retrievement from urinary tract in the distal nephron, urinary bladder and from ducts of salivary glands (Chen *et al.* 1991), yet it is not stored in any body tissue. Aldosterone is the primary hormone which maintains body salt and water balance of vertebrates by its action on Na^{++} and K^{++} channels, with an overall objective to maintain acid base balance (Bastl and Hayslett 1992, Rossier and Palmer 1992). The second hormone which regulates apical Na^{++} permeability is antidiuretic hormone. Vasopressin, oxytocin and vasotocin are other hormones which increase Na^{++} channel activity to conserve Na^{+}. Potassium is mostly located in the intracellular compartment, playing a synergistic role with sodium, in cellular activity. Consequently, sodium needs to be supplemented with conventional ingredients whereas, potassium is in abundance in feeds and fodders and thus there is no need for its extra supplementation, in Mehsana district.

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