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UTILIZATION OF MACRONUTRIENT ELEMENTS OF A ROUTINE FARM RATION BY DRY, LACTATING AND PREGNANT BUFFALOES

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Three balance trials one each on dry, pregnant, and lactating buffaloes were conducted to study the macronutrient element balance. All the animals were provided a routine farm ration (fresh maize) *ad libitum*. In addition, the lactating buffaloes were provided a concentrate mixture for milk production. The intake of calcium by dry, pregnant, and lactating animals was 99.31, 94.69 and 100.43 gm per day. The uninary loss of calcium in dry, pregnant, and lactating buffaloes was 26.85, 30.53 and 18.43 per cent, respectively. In lactating group of buffaloes, the loss of calcium through milk secretion was 28.43 per cent of the intake. All the animals were observed to be in positive calcium balance. Phosphorus intakes by dry, pregnant, and lactating buffaloes were 31.11, 29.46 and 48.72 gm. Lactating buffaloes showed a higher absorption of phosphorus than pregnant and dry animals. In lactating animals 95.81 per cent of the dietary phosphours was lost in milk and the balance was found to be negative. The net balance of phosphorus in dry and pregnant was marginally positive. The dry, pregnant and lactating animals absorbed 94.16, 86.03 and 89.35 per cent of the dietary sodium. The loss through milk secretion was 7.83 per cent Urinary loss was too high which put the animals in negative balance. The dry, pregnant, and lactating buffaloes digested 88.70, 86.38 and 86.38 per cent of the dietary potassium Due to the high urinary loss of potassium, the net balance was 130.49,-113.16 and 126.72 gm in dry pregnant and lactating buffaloes. Intakes of magnesium in dry, pregnant, and lactating animals were 58.76, 55.64 and 57.18 gm, respectively and the absorption of magnesium was 35.98, 44.30 and 53.57 per cent, respectively. A loss of only 0.27 per cent magnesium was observed through milk secretion. As compared to the dry and pregnant, the lactating-buffaloes had a higher net retention of magnesium.

INTRODUCTION

In Pakistan, livestock is usually fed only the roughages from which the animals have to derive their nutrient needs. All the animals are treated

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alike whether they are dry, pregnant or lactating and the mineral supplementation is rarely practised. The only exception to this is the supply of common salt. This imbalanced nutrient supply leads to poor health and low production of the animals.

The fresh maize is the widely used cereal fodder in the months of September, October and November. The information regarding the metabolism of bulk minerals in dry, lactating and pregnant buffaloes fed on maize fodder is scanty. This probablly is the main hindrance in making precise recommendations for dry, pregnant and lactating buffaloes for formulating suitable mineral mixtures to supplement the roughages.

Among the macronutrient elements, calcium, phosphorus, sodium, potassium and magnesium are of practical importance. A research project was, thus, undertaken to study the utilization of macronutrient elements of a routine farm ration by dry, pregnant and lactating buffaloes.

MATERIALS AND METHODS

Three balance trials one each on three dry, three pregnant and three lactating buffaloes were conducted to study the utilization of macronutrient elements in a routine farm ration in the months of November. All the animals were apparently healthy and of the uniform weight, age and production. The experiment was conducted according to completely randomized design. Only green maize was fed *ad libitum* for maintenance to all animals except the lactating buffaloes who were given an additional allowance of concentrate mixture (maize oil cake 2 parts, maize glutten feed 1 part and wheat bran 1 part) for milk production according to Morrison Feeding Standard (Morrison, 1959).

In each trial preliminary period of seven days was allowed to eliminate the effect of the previous feeds and for the adjustment of animals to the new foeds. A collection period of seven days was observed during which complete record of feed consumed, dung and urine voided was kept. Representative samples of dung, fodder, maize glutten feed maize oil cake and wheat bran were drawn, weighed and placed in hot air oven (105°C) for the estimation of moisture content. The dried samples were ground and seived to pass through 20 mm mesh.

Milk produced by each animal at each milking was also recorded. Representative samples of urine and milk from their respective bulk were

drawn and preserved under deep freeze conditions. The completely homogenized samples were digested in 20 ml of nitric acid (60 per cent), kept overnight and were heated gently on a low flame till all the material was apparantly dissolved. Then 5 ml of per chloric acid were added and the samples were heated continously in open till about 2 ml remained. The dilution was made upto 100 ml with demineralized distilled water. The determination of sodium and potassium was done on Eel flame photometer and reagent grade sodium chloride and potassium chloride were used as standards. Phosphorus was determined on photoelectric colorimeter by the method of of Fiske and Subba Row (1925).Calcium was determined by verserate titration whereas magnesium was estimated on atomic absorption spectro-Photometer.

RESULTS AND DISCUSSION

The data on macronutrient element balance in dry, pregnant and lactating buffaloes fed routine farm ration have been summarized in table 1.

TABLE 1. *Macronutrient element balance in dry, pregnant and lactating buffaloes fed routine farm ration (gm)*

Group	Description	Calcium	Phosphorus	Sodium	Potassium	Magnesium
Dry	Intake	99.31	31.11	34.56	142.73	58.76
	Undigested	15.52	24.78	2.02	16.13	37.62
	Digested	83.79	6.33	32.54	126.60	21.14
	Excretion	26.85	0.59	34.18	257.09	8.69
	Balance	+56.94	+5.74	_1.64	_130.49	+12.45
Pregnant	Intake	94.69	29.46	32.40	135.33	55.64
	Undigested	16.46	23.47	3.45	18.42	30.99
	Digested	78.23	5.99	28.95	116.81	24.65
	Excretion	30.53	0.16	39.17	229.96	8.53
	Balance	+47.70	+5.83	_11.02	_113.16	+16.12
Lactating	Intake	100.43	48.72	35.35	148.72	57.18
	Undigested	21.77	36.59	4.94	34.09	26.55
	Digested	78.66	12.13	30.41	114.63	30.63
	Exeretion	18.51	0.16	31.91	232.35	11.40
	Secretion	28.55	46.68	2.61	9.00	0.27
	Balance	+31.60	_34.83	_4.11	_126.72	+18.96

Calcium :

The dry buffaloes retained more calcium but the difference in retention in different groups of buffaloes was found to be non-significant. The

ration of dry and pregnant buffaloes had 0.72 per cent calcium on dry basis and lactating animals had little higher percentage of calcium in their ration. Hillman (1973) recommended 0.34 and 0.40 to 0.50 per cent calcium in the ration of dry and lactating cows, respectively. It showed that the calcium supply in the routine farm ration was almost more than double the recommended allowance. Losses of dietary calcium in urine of dry, pregnant and lactating animals were 27.04, 32.24 and 18.43 per cent, respectively. Urinary loss of calcium was low in lactating group because a greater amount of it was secreted through milk. Higher losses of calcium in pregnant group of animals would be due to more remobilization of calcium from bones to meet the requirements of developing foetus (Meigs *et al.*, 1919). Net retention of dietary calcium in dry, pregnant and lactating animals was 57.34, 50.37 and 31.46 per cent, respectively. Comparatively lesser retention of calcium in lactating animals was due to secretion of 28.43 per cent of dietary calcium in milk.

Phosphorus :

The lactating animals had higher intakes of phosphorus (48.72 gm) as compared to those of dry and pregnant buffaloes (31.11 and 29.46 gm) The results showed statistically significant ($P < 0.05$) difference amoung the three groups. The pregnant and dry buffaloes had significanty higher phosphorus balance than the lactating buffaloes. The maize fodder used in this study contained 0.225 per cent phosphorus on dry basis. The level was a little less than the recommendation (0.26 per cent) of Hillman (1973). The lactating buffaloes digested more phosphorus (24.90 per cent) than the other two groups because of the high demands of this element for milk secretion.

Reed *et al.* (1965) reported that in bullock fed different rations the intakes of phosphorus per 24 hours were 15.2, 19.2, 19.6 and 18.2 gm. The present study however, showed enhanced intake of phosphorus (31.11, 29.46 and 48.72 gm in dry, pregnant and lactating animals, respectively). This increase in intake could be ascribed to higher content of phosphorus in roughages which constituted a predominant part of the ration fed to the experimental buffaloes. Excretion of phosphorus in faeces was 24.78, 23.47 and 36.59 gm in dry, pregnant and lactating groups, respectively. High phosphorus excretion in faeces could, be attributed to the higher passage rate of green roughage through the digestive tract thus decreasing the absorption. The loss through urine in pregnant and lactating animals was 0.54 and 0.55 per cent while the corresponding loss in dry

animals was more than three times as compared to that in animals of other two groups.

Sodium :

The lactating animals had comparatively higher intakes of sodium (35.35 gm) than pregnant and dry buffaloes (32.40 and 34.56 gm, respectively). The ration of the dry buffaloes contained 0.25 per cent sodium on dry basis which is more than the recommended level of 0.198 per cent (Hillman, 1973). Renkema et. al., (1962) fed such diets to heifers and a lactating cow that contained 1,778 to 2,020 meq of sodium per day. The excretion of sodium in urine was observed to be 14.88 to 4.26 meq per 100 ml while in the present study, the intake was 1502.4, 1408.7 and 1536.9 meq per day in dry, pregnant and lactating buffaloes, respectively. These levels are comparatively lower than those used by Renkema *et al.* (1962). The lower intake resulted in lesser excretion through urine (3.40, 4.09 and 3.85 meq per 100 ml of sodium in dry, pregnant and lactating buffaloes, respectively). The results of the present study are in accordance with Hennaus *et al.* (1965) who fed heifers on silages of lucerne or maize and reported that the balance of sodium was nearly always negative even with the largest intake. Excretion of sodium in faeces did not differ greatly and the difference in balance was due mainly to the amounts excreted in urine.

Potassium :

The lactating animals had higher intakes of potasium (148.72 gm) as compared to dry and pregnant buffaloes (142.73 and 135.22 gm). The digestibility coefficients of potassium were 88 70, 77.08 and 86.38 in dry, lactating and pregnant buffaloes, respectively. The results are in agreement with those of Field (1967) who observed that mean values for excretion of potassium in sheep were 28.20 to 29.10 gm per day in urine and 3.9 to 7.10 gm in faeces. A similar wide range (16.13 to 34.07 gm) for excretion of potassium in the faeces of buffaloes was observed in this study. The lactating buffolocs had higher excretion through faeces as reported by Field (1970). The secretion of potassium through milk (9.0 per cent) is similar to that reported by cargle (1961) who reported that during 66 hours, 4.2 per cent potassium^{42} was recovered from the milk. No doubt the ration in the present study contained enough potassium was excreted through urine which resulted in negative balance.

Magnesium :

The intake of magnesium in dry, pregnant and lactating buffaloes, was

58.76, 55.64 and 57.18 gm, respectively and the faecal losses of magnesium were 37.62, 30.99 and 26.55 gm, respectively. The dry animals lost more magnesium in faeces than those in other two groups. Based on the requirements of experimental buffaloess, the amount of digested magesium was greater in lactating group than that in dry animals. The loss of magnesium through urine was greater in lactating than in dry and pregnant buffaloes and the secretion through milk was too small (0.27 gm). Due to less loss through faeces and milk, the lactating animals retained more magesium as compared to others. The retention of magnesium was higher in lactating than in dry and pregnant animals but difference was not statistically significant. The digested dietary magnesium in dry, pregnant and lactating animals was 35.98, 44.30 and 53.57 per cent, respectively, which is in agreement with the results of Smith (1959).

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