

การศึกษาถึงการใช้ประโยชน์ของแร่ทองแดงโดยวัวพันธุ์สาเรียนา

The Retention of Copper in Hariana Cattle

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Cattle and sheep in many countries have been found to suffer from the copper deficiency. A general statement made by G.K. Davis of Florida that most of the area in the world where the rainfall is heavy, copper and cobalt deficiencies in that area are common. Ataxia, stringy wool, depigmentation of hair, anemia, etc., are the common symptoms associated with copper deficiency (Russell and Duncan, 1956). Sahia and Kehar (1951) have reported low copper content in straws and hays. Sahia (1948) carried out metabolism trials in cattle with different levels of copper intake and found the requirement of this trace mineral to be 6.5 mg./100 lb. body weight. This value nearly corresponds with the finding of Chou and Adolph (1953) that copper

deficiency in ruminants can be prevented when the animals are kept on a ration containing 7 ppm of copper.

This investigation was designed to study:

1. The retention of copper when super-mindif mixture was used at the rate of 1% in the total ration.
2. The effect of rice bran and wheat bran on the utilization of copper from the ration.

MATERIALS AND METHODS

Seven Hariana bullocks were divided into two groups. The four animals in group I were offered ration I. The other three animals in group II were offered ration II (Table 1).

Table 1. Formulas of rations fed to animals in group I and group II

Feeds	Formula of ration I	Formula of ration II
Paddy straw	78.30	81.90
Urea	1.10	1.10
Rice bran	13.90	—
Wheat bran	—	10.00
Molasses	4.70	5.00
Super-mindif mixture	1.00	1.00
Salt	1.00	1.00
Total	100.00	100.00

Note: Crude protein contents in the two rations are approximately the same.

Urea mixed with molasses was sprinkled on paddy straw and thereafter the mass was mixed well. It was offered to the experimental animals *ad libitum* after they had consumed the concentrate portion entirely.

In this experiment, 12.55 kg. of ration I was offered to each animal in group I and 12.00 kg. of ration II was offered to each animal in group II. One kg. of green feed was offered to each animal. For super-mindif mixture feeding, 120 grams of super-mindif mixture was mixed well with the concentrate portion and then offered separa-

tely from the roughage to each animal. The concentrate to which super-mindif mixture was added was consumed entirely by the experimental animals. In this experiment copper was estimated by the micromethod of Eden and Green (1940).

RESULTS

a. Copper content in the feeds and residue

Each of the feeds was analysed for copper content on dry basis which are given in Table 2.

Table 2. *Copper content in the feeds and residue*

Feeds	Copper content (microgram per gram)
Paddy straw	6.95
Urea	1.87
Rice bran	9.68
Wheat bran	17.77
Molasses	12.53
Super-mindif mixture	1846.51
Common salt	19.32
Green feed supplement	10.42
Residue	11.04

b. Copper intake per day

It was found that copper intake per 100 lb. body weight per day ranged from 26.02 to 31.40 mg. with the average of 28.88 mg. for animals in

group I, and it ranged from 26.47 to 33.47 mg. with the average of 29.27 mg. per day for animals in group II. The data are shown in Table 3.

c. Copper excreted per day

The copper in faeces and urine of animals was analysed. Copper excreted in faeces ranged from 248.06 mg. to 280.84 mg. per day in group I and 257.24 to 283.31 mg. in group II. The copper in urine from 0.52 to 1.19 mg. per day in group I and 0.46 to 0.82 mg. in group II. The total excreted per day ranged from 248.76 to 281.95 mg. in group I and 257.80 to 284.09 mg. in group II. The data are shown in Table 4.

d. The balance of copper

The balance of copper was determined by deducting the quantity excreted in faeces and urine from the quantity consumed through feed. The result show positive balances for copper with the average of $+11.53 \pm 5.35$ mg. per day for animals in group I and $+13.39 \pm 4.46$ mg. per day for those in group II. The retention in the two group did not show any significant variation. (T value observed 0.485 when compared with theoretical 2.571 of T at 5% level) The data are shown in Table 5.

DISCUSSION

In this experiment super-mindif mixture was used as the mineral supplement for copper. The average intake of copper per 100 lb. body weight per day was 28.88 mg. for group I and 29.27 mg. for group II. This quantity was more than sufficient when compared with the requirements found by Sahai (1948) who indicated that the requirement of copper is about 6.5 mg/100 lb. body weight per day. The balances for copper were positive for animals in both groups. The retention of copper in the two groups

was of the same magnitude and did not show significant variation which may be interpreted to indicate that rice bran and wheat bran as a source of copper in the ration mentioned earlier were of comparable usefulness.

SUMMARY

Seven Hariana bullocks were divided into two groups. One percent of super-mindif mixture along with 13.90% rice bran in ration I and 10.00% of wheat bran in ration II and the other ingredients were offered to the animals in groups I and II respectively. The average intake of copper per 100 lb. body weight per day was 28.28 mg. and 29.27 mg. and the animals maintained positive balance for copper with the average of $+11.53$ mg. and $+13.39$ mg. in group I and II respectively. Rice bran and wheat bran had the same values on the retention of copper.

สรุป

เนื่องจากมักจะปรากฏเสมอว่าในเขตที่มีฝนตกชุก สัตว์มักจะขาดธาตุทองแดง อันเป็นสาเหตุของโรคโลหิตจาง ขนของสัตว์จะหยาบและสีซีด สัตว์มีสุขภาพไม่สมบูรณ์เท่าที่ควร และการให้นมมักจะลดลง ด้วยเหตุนี้จึงได้ทำการทดลองเกี่ยวกับการใช้อาหารแร่ซูเปอร์มินดิฟเป็นตัวช่วย เพิ่มธาตุทองแดงลงไปในการอาหารสัตว์ เพื่อการให้ประโยชน์ของธาตุทองแดงในวัว ตอนใช้งาน พันธุ์ชาเรียนา ในการทดลองได้แบ่ง

Table 3. *Copper intake in milligram per 100 lb. body weight per day*

	Group I (ration I)				Group II (ration II)		
	Animal No.				Animal No.		
	16	30	23	27	17	22	24
Copper offered (mg.)	305.68	305.68	305.68	305.68	305.68	305.68	305.68
Copper left in residue (mg.)	16.01	16.69	37.92	29.29	15.90	19.36	33.36
Copper intake (mg.)	289.67	288.99	267.75	276.39	292.89	289.43	275.43
Weight of animals (lb.)	1113.02	920.17	984.09	894.82	1106.41	989.60	823.19
Intake per 100 lb. body wt. (mg.)	26.02	31.40	27.20	30.90	26.47	29.24	33.47

Table 4. *Copper excreted per day*

Animal No.	Faeces voided per day (gm.)	Copper in faeces microgram per gram	Copper in faeces per day (mg.)	Urine voided per day (c.c.)	Copper in urine microgram per 100 c.c.	Copper voided in urine per day (mg.)	Total excreted per day (mg.)
Group I							
16	5541.60	50.55	280.13	12646	9.43	1.19	281.32
30	5238.60	53.61	280.84	13724	8.12	1.11	281.95
23	4122.60	60.17	248.06	11416	6.11	0.70	248.76
27	4468.00	59.12	264.15	10766	4.84	0.52	264.67
Group II							
17	5577.00	50.80	283.31	12474	6.25	0.78	284.09
22	4733.60	58.07	274.88	15500	5.47	0.82	275.70
24	3732.80	68.94	257.34	10952	4.49	0.46	257.80

Table 5. *Copper balance during metabolism (in mg. per day)*

Group I														
Animal No.	offered from								left in residue	Total intake	Out go			Balance
	Paddy straw	Urea	Rice bran	Molas- ses	Super- mindif mixture	Salt	Green feed	Total			Faeces	Urine	Total	
16	6.33	0.24	15.45	5.36	218.04	2.30	3.97	305.68	16.01	289.67	280.13	1.19	281.32	+ 8.35
30	6.33	0.24	15.45	5.36	218.04	2.30	3.97	305.68	16.69	288.99	280.84	1.11	281.95	+ 7.04
23	6.33	0.24	15.45	5.36	218.04	2.30	3.97	305.68	37.92	267.75	248.06	0.70	247.76	+18.99
27	6.33	0.24	15.45	5.36	218.04	2.30	3.97	305.68	29.29	276.39	264.15	0.52	264.67	+11.72
Average														+11.53
S.D.														+ 5.35
Group II														
Animal No.	offered from								left in residue	Total intake	Out go			Balance
	Paddy straw	Urea	Wheat bran	Molas- ses	Super- mindif mixture	Salt	Green feed	Total			Faeces	Urine	Total	
17	60.33	0.24	18.56	5.36	218.04	2.30	3.97	308.79	15.90	292.89	283.32	0.78	284.09	+ 8.80
22	60.33	0.24	18.56	5.36	218.04	2.30	3.97	308.79	19.36	289.43	274.88	0.82	275.70	+13.73
24	60.33	0.24	18.56	5.36	218.04	2.30	3.97	308.79	33.36	275.43	257.34	0.46	257.80	+17.63
Average														+13.39
S.D.														+ 4.46

วัวออกเป็นสองพวก พวกแรกได้ให้อาหาร แร่ซูเปอร์มินิฟในอัตรา 1% โดยมีรำข้าว จ้าวเป็นตัวเพิ่มโปรตีนตามธรรมชาติ และ ยูเรียเป็นสารเคมี เพื่อเป็นแหล่งของไนโตรเจนในสัตว์เคี้ยวเอื้อง พวกที่สองก็ให้อาหาร แร่ซูเปอร์มินิฟในอัตรา 1% เช่นกัน แต่มี รำจากข้าวสาลีเป็นตัวเพิ่มโปรตีน โดยมีจุด ประสงค์ที่จะศึกษาถึงการใช้ประโยชน์ ของ ธาตุทองแดง

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