قسم : الصحة ومراقبة الاغذية ٠
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دور بعض الاملاح المعدنية في تغذية عجول الجاموس وعلاقتها بالانتاج

٣- تأثير اضافة سلفات المنجنيز٠

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استخدم في هذه التجربة عدد ثمان ذكور جاموس صغير لدراسة تأثير اضافة سلفات المنجنيز الى العلائق المصرية الشائع استخدامها على الحالة الصحية والانتاجية لهذه الحيوانات ٠ امتدت فترة التجربة الى ٩٠ يوما تمت تغذية الحيوانات على عليقتين اساسيتين الأولى تم استخدامها لمدة ١٥ يوما وكانت تتكون من البرسيم والمركزات التجارية المخلوطة والردة والعليقة الاساسية،الثانية استعملت بعد هذه الفترة وكانت تتكون من الدريس والمركزات التجارية المخلوطة والدراوة ٠ هذا وقد قسمت الحيوانات الى ثلاث مجموعات الأولى تناولت غذاءها بدون اية اضافات في حين أُضيف لعلائق كل من المجموعتين الثانية والثالثة سلفات المنجنيز بنسبة ٥٠٠ مجم، ١٠٠٠مجم على التوالي يوميا يتم اضافتها الى المركزات التجارية٠

وقد تم تسجيل الزيادة في الوزن على مدار فترة التجربة كذا تم تحليل عينات من الدم لتقدير مستوى كل من المنجنيز والنحاس والزنك والكلسيوم والفوسفور والماغنسيوم هذا واسفرت التجربة عن النتائج التالية :ـ

١ـ لم تتأثر الزيادة في الوزن في المجاميع الثلاث نتيجة لاضافة سلفات المنجنيز٠

٢ـ لم تكن هناك ايضا اية زيادة معنوية في مستوى المنجنيز في مصل الحيوانات نتيجة لاضافة المعدن في العلائق٠

٣ـ الزيادة في مستوى المنجنيز في المصل صاحبها زيادة في مستوى النحاس في المصل خاصة في المجموعة الثالثة والتي لوحظ فيها ارتباط ايجابي لهذين المعدنين(ر= +٦٧ر٠)

٤ـ لوحظ ارتباط سلبي قوى بين مستوى كلا من المنجنيز والزنك في مصل حيوانات كل من المجموعتين الثانية والثالثة(ر=ـ٩١ر٠)، (ر=ـ٩٠ر٠) على التوالي٠

٥ـ تم تسجيل ارتباط ايجابي قوى بين مستوى كلا من المنجنيز والكالسيوم في امصال الحيوانات لكل من المجموعتين الثانية والثالثة (ر=+٥٩ر)، (ر=+٨١ر٠))علىالتوالي٠

٦ـ وجد ارتباط سلبي بين مستوى كل من المنجنيز والفوسفور في حيوانات المجموعة الثانية (ر= ـ ٧ر)٠ والثالثة (ر = ٤٨ر٠)٠

٧ـ هناك ارتباط ايجابي بين مستوى كل من المنجنيز والماغنسيوم في امصال الحيوانات في كل من المجموعة الثانية (ر= +٥٣ر) والثالثة (ر = ٤٥٤ر)٠

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ROLE OF SOME MICROELEMENTS IN NUTRITION OF WATER BUFFALO AND ITS RELATION TO PRODUCTION
III. Effect of Manganese Supplementation

(With 8 Tables)

By
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SUMMARY

For 90 days, eignt buffalo- calves were used to study the effect of fortifying the commonly fed Egyptian rations with manganese sulphate on their health and performance. Throughout the experiment all calves were received two basal rations. Basal ration one, were fed for 15 days and was composed of green barseem, commercial concentrate mixture, and wheat bran. After that the animals received basal ration two, which was composed of barseem hay, commercial concentrate mixture, and green corn. The calves were divided into 3 groups, group one received no supplementation with manganese sulphate, while groups 2 and 3 were received in addition to the basal ration 500 mg and 1000 mg manganese sulphate respectively. During the experiment, body weight gain was recorded and blood samples were collected for the determination of manganese, copper, zinc, calcium, phosphorus and magnesium levels in blood serum. The results were as follow:

- Body weight gain of calves in different groups did not significantly affected by different manganese supplementation, however, a high weight gain was recorded in all groups.
- Strong positive correlation was observed between serum manganese and serum copper level in group III, also the same positive correlation was recorded between serum manganese level and that of serum calcium in group III, and between serum manganese and serum magnesium levels in group II and group III while a negative correlation was recorded between serum level of manganese and phosphorus levels in group III.

INTRODUCTION

The group of essential trace elements are known to play a fundamental role in the regulation of body metabolism. Research work during the last few decades has shown the marginal deficiencies or mineral imbalances especially manganese, are of great importance for the productivity and economy of animal production in many parts of the world. UNDERWOOD (1962) described a wide range of distrubances as a result of the lack of dietary manganese in different

species under varying conditions. BENTLY and PHILLI (1951); RADANI (1971); SHEPELEV, et al. (1983) found that calves born from manganese defficient cows, showed congenital bone abnormalities and lowered growth rates. Also ROSBECH, 1968; THOMAS, 1970; ANKE, et al. 1972 demonstrated that, impaired growth in calves was a common symptom recorded in calves fed on low manganese diets.

Moreover, CUNNINGHAM, et al. 1966 recorded that body weight gains and feed consumption of calves were insignificantly decreased as the amount of manganese in the diet was increased over 820 p.p.m. so they found that, high dietary manganese levels had marked effect on rumen microflora. The preceeding data was pronounced clearly to study the effect of study in different levels of manganese supplementation to the rations of buffalo calves on their health conditions and performance.

MATERIAL and METHODS

To study the effect of manganese supplementation at different levels on buffalo- calves performance and its inter relationship with copper, zinc, calcium, phosphorus and magnesium, Eight male buffalo- calves aged 13-19 months were used, kept separately at calf- disease Research Centre. Faculty of Veterinary Medicine, Cairo University, Cairo, Giza. Calves were assigned into three groups, group I was fed on basal ration one for 2 weeks and basal ration 2 for the rest of the experimental period. Basal rations amounts and ingredient are shown in Table one. The basal ration was estimated to cover the buffalo- calves requirements according to RANJHAM and PATHAK (1979) Group II were fed on the same basal rations given to group I, plue 500 mg manganese sulphate added to the commercial concentrate mixture daily. While Group III calves were fed on the same basal rations as in Group I, plus 1000 mg manganese sulphate daily. The manganese level of the basal rations was estimated using Atomic Absorption Spectrophotometer. The obtained results, and details concerning the dietary manganese supply are presented in Table 2. Blood samples were collected during the preliminary period and at 15, 30, 60 and 90 days following manganese supplementation. Collected serum samples were analysed for manganese, coper, zinc, calcium, phosphorus and magnesium using the same methods described in the preceeding work (Copper Supplementation). Feed samples of body estiamtion were followed the same dose in the preceeding work "Copper estimation". The average contents of calcium, phosphorus, magnesium, copper, zinc and manganese in feed stuff are presented in the preceeding work (zinc supplementation) in Table 2. The amounts of manganese sulphate supplemented and total manganese (mg) received by each calf in different groups during experiment, were given in Table 1.

RESULTS

The obtained results are illustrated in tables 3,4,5,6,7 and 8.

DISCUSSION

The results concerning the body weight development and body weight gain of calves in different groups during the experiment are presented in table 2. The maximum body weight

gain was obtained in calves of group III followed by calves of group II, while those in group I, showed the lowest value. The analysis of variance of data revealed non significant differences ($P/ 0.05$) concerning the average daily body weight gain between the three groups. In other words it was clear that manganese supplementation did not significantly improved the body weight gain of calves during the experimental period. This results could be explained on the basis that the amount of manganese present in the basal ration was nough to produce the maximum weight gain at that age, in comparison to that weight gain recorded by RANJHAN and PATHAK (1979). This results comes in agree with those reported in many studies (BOUTLY and PHILIPS, 1951; ROBINSON, et al. 1960. CANNINGHAM, 1966; HOWAS and DYER, 1977.

From table (3), serum manganese level of calves in group II and group III increased greatly from 15 days following manganese supplementation till the end of the experiment. While the maximum level was recorded after 30 days for the same groups. On the other hand, serum manganese levels of the control group, increased from 15 days after supplementation. Non significant differences ($P/ 0.05$) in the average of serum manganese levels between calves of the different groups could be demonstrated as a result of manganese supplementation. This results are in agreement with that reported by HAWKINS, et al. (1955), KUME, et al. (1983).

All the recorded higher serum manganese levels were within normal limits reported for such element (VANDER HORST, 1960, HADY, 1984).

The alteration in serum copper levels of different groups of buffalo calves during the experiment are demonstrated in Table (4). Serum copper levels showed continuous increase from 15 days after manganese supplementation toward the end of the experiment, reaching a maximum level at the day 90 after manganese supplementation in group II and III. However in group I, serum copper levels tended to decrease from 15 days up to 60 days following manganese supplementation. All the recorded serum copper levles in the different groups were within the normal ranges for such element as stated by OMRAN (1979).

Statistical analysis revealed non significant correlation coefficients between serum copper and manganese levels in group II, while a strong correlation coefficient between such element was recorded in group III. From tabulated data one can easy observe that the increase in serum manganese level in group III was followed by increase in the serum copper level, this finding may be attributed to the increase in the dietary level of manganese and also the high manganese level followed by the supplementation, which interfere with the body regulation of the copper content in the blood, MILLER (1975). Table 5 presents the average serum zinc levels in different groups during the experiment. It is clear that in all groups, the levels of serum zinc were decreasing from 15 days after manganese supplementation toward the end of the experiment. It was striking that, the sharp declination in serum zinc level was accompanied by an increase in serum manganese level in both of the treated groups.

Statistical analysis revealed a strong significant negative correlations between serum manganese and serum zinc levels in groups II and III.

This correlation might explain the decrease of serum zinc level after increasing the dietary manganese intake, as proved by HOWES and DYER, 1971. The results regarding the serum calcium level changes in calves during experiment are illustrated in Table 6. In group II and III, serum calcium levels were increasing from 15 days after supplementation, then decreased gradually toward the end of the experiment. Statistical analysis of the data, showed significant positive correlation in group II and III between the serum levels of both manganese

and calcium. These results were also reported in the work of HOWKIINS, et al.(1955);ROBINSON, et al. 1960, CUNNINGHAM, et al. (1966). RADANI, et al. (1969).

Table 7 presents the changes in the serum phosphorus levels of calves of the different groups during the experiment. Phosphorus level tended to decrease below its initial level from 15 days after manganese supplementation till the end of the experimental period. Manganese supplementation did not significantly affected serum phosphorus levels ($P/ 0.05$). In agree with this finding were those recorded by ROBINSON, et al. (1960). RADANI, et al. (1961). A non significant negative correlations were recorded between serum levels of phosphorus and manganese in groups II and III.

Regarding the serum magnesium levels of the different groups during the experiment, data in Table 8 showed that the maximal levels were recorded at the day 15 after supplementation in groups II and III, while for group I the maximum level was recorded at the day 30 following manganese suplementation. The serum magnesium level did not significantly affected by any increase in the dietary manganese. This results are in accordance with CUNNINGHAM, et al. (1966). Positive correlation were found between serum levels of both manganese and magnesium in group II and III.

From the present work it could be concluded that, manganese supplementation did not significantly affect the body weight gain of buffalo-calves, although a high weight gain was recorded in all groups, this indicate that the ration, used were sufficient to cover the requirement of such element. Positive correlations were recorded in group II & III between serum manganese level and that of copper and calcium while negative correlations were recorded between the serum levels of manganese and that of the phosphorus.

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Table (1)

Amounts of manganese sulphate supplemented and total manganese (mg) received by each calf in different groups

Groups	Type of basal ration	Amount of manganese mg/Kg DM of basal ration	Manganese sulphate supplied mg/day	Calculated manganese supplied in mg daily	Total amount of manganese mg/Kg DM	Total manganese mg/calf/ day
I	1	69.60	-	-	69.60	451.70
	2	55.23	-	-	55.23	358.99
II	1	69.60	500 mg	123.00	88.5	574.68
	2	55.23	500 mg	123.00	74.15	481.99
III	1	69.60	1000 mg	246.00	107.50	697.68
	2	55.23	1000 mg	246.00	93.10	605.15

Table (2)
Average daily dry matter intake, body weight development and body weight gain of different groups of calves during experiment III.

Group	Number of animals in each group	Average daily dry matter intake (kg)	Total manganese intake per calf per day (mg)	Average intial body weight (kg)	%	Average final body weight (kg)	%	Total average gain in kg	Average daily gain in kg
I	2	6.49 6.50	451.70 358.99	296.50	100	375.00	126.48	78.5	0.872
II	3	6.49 6.50	574.68 481.99	276.33	100	358.66	129.79	82.34	0.915
III	3	6.49 6.50	679.68 605.15	289.67	100	375.33	129.57	85.66	0.952

° Non-significant difference in average daily body weight gain in different groups (P/ 0.05).

Table (3)
Average serum manganese levels (Mg/100 ml and %) in buffalo-calves during experiment III.

Time of sampling	Group I.		Group II.		Group III.	
	Mg/100 ml	%	Mg/100 ml	%	Mg/100 ml	%
Prelimenary period	3.13	100	2.81	100	2.92	100
After manganese supplementation						
15 days	3.77	120.45	8.48	301.78	7.88	269.83
30 days	6.66	212.78	13.33	474.38	13.33	456.51
60 days	4.44	141.85	10.36	368.68	9.77	334.58
90 days	5.33	170.29	16.22	221.35	7.11	243.49

- Non-significant difference in average serum manganese levels between groups and also, at different times after treatments (P/ 0.05).

Table (4)
Average serum copper levels (Mg/100 ml and %) in buffalo-calves during experiment III.

Time of sampling	Group I.		Group II.		Group III.	
	Mg/100 ml	%	Mg/100 ml	%	Mg/100 ml	%
Prelimenary period	124.25	100	136.84	100	100.64	100
After manganese supplementation						
15 days	123.58	99.46	146.96	107.39	111.33	110.62
30 days	119.94	96.53	136.38	99.66	150.30	149.34
60 days	121.59	97.86	141.85	103.66	161.09	160.07
90 days	128.73	103.61	190.71	139.37	155.86	154.87

- Non-significant difference in average serum copper levels in between groups (P/ 0.05).

Table (5)
Average serum zinc levels (Mg/100 ml and %) in buffalo-calves during experiment III.

Time of sampling	Group I.		Group II.		Group III.	
	Mg/100 ml	%	Mg/100 ml	%	Mg/100 ml	%
Prelimenary period	88.43	100	94.76	100	81.98	100
After manganese supplementation						
15 days	74.28	83.99	78.58	82.93	71.95	87.77
30 days	62.81	71.03	51.33	54.17	57.56	70.21
60 days	64.24	72.65	58.99	62.25	69.09	84.28
90 days	60.60	68.53	68.68	72.48	65.05	79.35

- Non-significant difference in average serum zinc levles in between groups (P/ 0.05).

Table (6)
Average serum calcium level (mg/100 ml and %) in buffalo-calves during experiment III.

Time of sampling	Group I.		Group II.		Group III.	
	mg/100 ml	%	mg/100 ml	%	mg/100 ml	%
Prelimenary period	9.85	100	11.10	100	10.23	100
After manganese supplementation						
15 days	12.47	126.66	15.30	137.84	13.68	133.72
30 days	11.88	126.61	13.13	118.29	14.16	138.42
60 days	12.24	124.26	16.80	151.35	14.67	143.40
90 days	8.15	82.74	11.17	100.63	10.85	106.06

- Non-significant difference in average serum calcium levels in between different groups ($P \geq 0.05$).

Table (7)
Average serum phosphorus level (mg/100 ml and %) in buffalo-calves during experiment III.

Time of sampling	Group I.		Group II.		Group III.	
	mg/100 ml	%	mg/100 ml	%	mg/100 ml	%
Prelimenary period	8.00	100	7.33	100	7.30	100
After manganese supplementation						
15 days	6.10	76.25	5.35	72.39	7.33	100.41
30 days	6.90	86.25	7.40	100.95	5.80	79.45
60 days	6.20	79.50	6.06	82.67	6.36	87.12
90 days	6.68	83.50	6.46	88.13	5.19	71.10

- Non-significant difference in average serum phosphorus levels in between different groups ($P \geq 0.05$).

Table (8)
Average serum magnesium levels (mg/100 ml and %) in buffalo-calves during experiment III.

Time of sampling	Group I.		Group II.		Group III.	
	mg/100 ml	%	mg/100 ml	%	mg/100 ml	%
Prelimenary period	5.10	100	4.46	100	4.14	100
After manganese supplementation						
15 days	5.10	100	5.29	118.61	5.43	131.16
30 days	5.80	113.73	4.70	105.38	4.83	116.67
60 days	5.38	105.49	5.10	114.35	4.63	111.84
90 days	5.32	104.31	4.95	110.99	4.81	116.18

- Non-significant difference in average serum magnesium levels in between groups ($P \geq 0.05$).