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EFFECT OF POULTRY LITTER LEVEL ON STATUS OF SOME MINERALS IN GROWING CALVES

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ABSTRACT

Eighteen male Friesian calves averaging 275 kg body weight were used to study the effect of feeding rations containing two different levels of poultry litter and corn silage on digestibility, nutritive values, animal performance and minerals status. Calves were divided into three similar groups assigned randomly to feed on three experimental rations as follows:

R1 (control): 65 % concentrate feed mixture + 15 % berseem hay 3 third cut + 20 % rice straw. **R2:** 12.5 % poultry litter + 12.5 % corn grain + 75 % corn silage. **R3:** 25 % poultry litter + 25 % corn grain + 50 % corn silage.

The results showed that digestibility coefficients, nutritive value , pH and ammonia-N were higher in R2 and R3 compared with the control group , mean while the TVFA's was lower in R2 and R3 comported with the control group.Live body gain and feed efficiency recorded higher value in R2 than R3 and the control group. Minerals content of poultry litter was higher compared with the other ingrediens feedstuffs. Minerals contents of the experimental rations increased with increasing the level of poultry litter. Minerals intake, absorption and retention increased significantly (P<0.05) with increasing the level of poultry litter. The efficiency of minerals absorption and retention significantly decreased (P<0.05) with increasing dietary minerals intake. Minerals concentrations in blood and seminal plasma, liver, kidneys, testis and muscles of Friesian calves increased significantly (P<0.05) with increasing the level of poultry litter and decreasing the level of corn silage in the rations. The concentrations of minerals in blood and seminal plasma, liver, kidneys, testis and muscle of Friesian calves fed R3 (contained 25% poultry litter) were higher than the normal levels.

It could be concluded that using 12.5% from poultry litter with 50% corn silage in feeding of Frisian calves appeared to give better results of daily gain and more efficient to get feed efficiency as well as to cover the mineral efficiency.

Keywords: Growing Friesian calves, poultry litter, corn silage, minerals, blood and seminal plasma, body tissues.

INTRODUCTION

Feeding corn silage alone does not support optimum growth rates of beef cattle because it is not a balanced diet of growing animals. Poultry manure is a good source of macro and trace elements and could ensure against minerals deficiencies *(Ben-Ghedalia et al., 1996)*. Analyses of soils and pasture are not reliable for assessing minerals status of grazing cattle. Analyses of tissues and blood appear to provide better indices *(Khalili et al., 1993)*. Evaluation of trace elements status can be difficult because many disease states will alter blood analyses used to evaluate nutrient adequacy. Proper dietary and animal evaluation as well as response to supplementation are necessary before diagnosing a minerals deficiency *(Graham, 1991)*. The chemical composition of body tissue particularly the liver is a better reflection of the dietary status of domestic and wild animals *(Webb et al., 2001)*.

Animal responses are useful means for evaluating and assessing nutritional status. Blood minerals concentrations are related for nutritional responses. The strategy for use mineral status assessment is to minimize non-nutritional variation by grouping animals for testing based on physiological factors that affect or are likely to affect the concentration of minerals or minerals being tested *(Herdt et al., 2000).* Trace elements are essential based on growth and other effects with animals under improved procedures for purification of diets and use of metal free isolator systems for raising animals *(McDowell, 1992)*. The objective of this study was to investigate the effect of feeding rations containing two different levels of poultry litter and corn silage on minerals status of growing Friesian calves.

MATERIALS AND METHODS

The current work was carried out at Karada Animal Production Research Station, Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture during summer2002. Eighteen male Friesian calves with average body weight of 275 kg and 12 months of age were assigned randomly for three similar groups (6 in each) according to live body weight and age. Calves were fed individually on the experimental rations containing different levels of layer poultry litter(sun dried) and whole corn silage to cover the recommended requirements of growing calves according to NRC (1996). Formulation and average daily feed intake are shown in table (1).

Table 1: Formulation of the experimental rations and average daily feed intake by growing Friesian calves.

Items	Experimental rations (on DM basis)					
	R1 (control)		R2		R3	
	Kg	%	Kg	%	Kg	%
Concentrate mixture	6.11	65.0		-		-
Berseem hay	1.88	15.0		-		-
Corn silage		-	6.86	75.0	4.64	50.0
Corn grain		-	1.14	12.5	2.32	25.0
Poultry litter		-	1.14	12.5	2.32	25.0
Rice straw	1.41	20.0		-		-
DM intake (kg / day)	9.40	100	9.15	100	9.28	100
TDN (kg/ day)	5.47	58.2	6.21	67.8	6.40	69.0
DCP (g/day)	693	7.4	629	6.8	722	7.7

R1 (control): 65 % concentrate mixture + 15 % berseem hay third cut + 20 % rice straw. R2: 12.5 % poultry litter + 12.5 % corn grain + 75 % corn silage. R3: 25 % poultry litter + 25 % corn grain + 50 % corn silage.

Concentrate feed mixture, poultry litter and corn grain mixture were offered two times daily at 8.00 a.0m. and 4.00 p.m. while berseem hay third cut was offered once daily at 11.00 a.m. and rice straw as it is or corn silage were given at 9.00 a.m. Calves were watered three times daily. Animals were weighted monthly to adjust the feed intake crosponding the changes of body weight for each animal per day.

Three metabolism trails were conducted with three Friesian calves which chosen randomly from each group to determine the digestibility of the experimental rations. Calves were fed individually the experimental rations in stalls. Each experimental ration was fed for 21 days as a preliminary period followed by 7 days as collection period. Samples of feedstuffs were taken three times during the collection period. Feces was collected by using plastic pages. It was weighed daily and representative sample of 10% by weight was taken. Also, urine was collected daily from each calf during the collection period by rubber funnel adjoining with plastic hose in plastic bucket containing 100 ml sulfuric acid (10%), urine volume was measured and sample of 10% of the volume was taken in glass bottle.

Blood samples were taken from the jugular vein by clean sterile needle in a clean dry plastic tubes using heparin as an anticoagulant after six hours of feeding from each animal at the last day of the experiment. Then centrifuged at 4000 rotations per minute for 15 minutes to obtain plasma and then stored at – 20 °C till analysis. Two successive ejaculates semen were collected weekly from each calf (from six calves) an interval of 30 minutes using artificial vagina to determine the semen quality. At the end of the experiment during six monthes (average body weight of each group was about 450 kg), three calves from each group were chosen randomly, weighed after fasted for 16 hours and slaughtered. Upon completion of bleeding, animals were skinned, dressed out and samples of muscles, liver, kidneys and testis were taken for minerals contents.

The samples of feedstuffs, feces, urine were chemical analyzed while blood and seminal plasma, muscle, liver, kidneys and testis were prepared for minerals determination according to the methods of *AOAC (1990)*. Calcium, magnesium, zinc, manganese, iron and cobalt were determined by Atomic Absorption Spectrophotometer *(Perkin Elmer 2380)*. Phosphorus was determined using Spectrophotometer (Milton Roy Company Spectronic 20 D). While, sodium and potassium were determined by Flame Photometer (Jenway PFP 7). The data obtained were statistically analyzed using general liner models procedure adapted by *SPSS10 (1999)* for user's guide with a one-way ANOVA.

RESULTS AND DISCUSSION

The chemical composition of dietary ingredients and experimental rations were given in table (2). Data indicated that the content of DM and CP in control group were higher than other groups EE and NFE were increased in R2 and R3 which contained corn silage. Also, CF was slightly increased in R2. It was attributed to higher proportion of corn silage in that rations.

This results were nearly similar with those obtained by *Gaafer (2001)* who found that the content of OM, CF and NFE increased with increasing the level of corn silage in the rations, while the content of DM, CP and Ash increased with increasing the concentrate mixture.

Table (2): Chemical composition of dietary ingradiens and calculated experimental rations on DM% basis :

Item	DM%	OM	DM % basis				Ash	AIA**
			CP	CF	EE	NFE		
Corn silage (CS)	33.44	93.33	8.56	28.98	3.21	52.58	6.67	2.58
Poultry litter (PL)	90.19	77.79	19.99	17.02	3.50	37.28	22.21	5.11
Corn graing (CG)	89.67	98.45	8.98	2.08	4.94	82.45	1.55	0.20
Berseen hay (BH)	88.01	89.01	13.36	29.94	1.53	44.18	10.99	0.37
Rice straw (RS)	89.26	82.02	3.23	31.65	1.41	45.73	17.98	7.52
*Concentrate mixture (CM)	88.88	94.51	15.70	9.63	3.64	65.54	5.49	1.57
Experimental ration :								
R1	88.69	90.18	12.36	20.55	2.52	54.75	9.82	2.45
R2	56.04	91.16	10.97	21.27	3.61	55.31	8.84	2.63
R3	61.69	90.62	11.58	19.34	3.71	55.99	9.38	2.64

Concentrate mixture (CM) consisted of : 30% undecorticated cotton seed cake, 5% linsead cake, 26% yellow corn, 24% wheat bran, 10% rice bran, 2% molasses, 2% limestone and. 1% common salt. **** AIA : Asid Insoluble Ash**

Nutrient digestibility coefficients :

Results concerning digestibility, nutritive values and rumen activity for experimental rations are presented in table (3). Digestion coefficients of DM and OM% were higher with ration 2. The significant difference was found between R2 and R3 with DM digestibility and between R1 and R2 with OM digestibility, CP and EE digestibility of R3 were significantly ($p<0.05$) higher than those reported with R1 and R2 . The same trend was observed with NFE digestibility , being significantly higher than that R1, as show in table (3).

Table (3): Nutrients digestibility, nutritive values and rumen activity of experimental rations by Friesian calves.

Item	R1	R2	R3
Digestibility coefficients %			
DM	62.04^{ab}	64.81^{a}	57.20^{bc}
OM	61.99^{c}	87.63^{a}	72.06^{b}
CP	59.71^{b}	61.90^{b}	66.30^{a}
EE	73.77^{b}	74.94^{b}	79.03^{a}
CF	57.30^{a}	55.59^{b}	55.07^{b}
NFE	63.74^{b}	76.91^{a}	78.72^{a}
Nutritive values % (on DM)			
TDN	58.22^{b}	67.87^{a}	69.03^{a}
DCP	7.37^{b}	6.87^{c}	7.79^{a}
Some Rumen parameters :			
PH	6.23^{c}	6.66^{a}	6.35^{b}
NH_3-N (mg/100ml)	17.40^{b}	19.37^{a}	20.14^{a}
TVFA'S (meq/100ml)	16.30^{a}	12.63^{b}	12.63^{b}

a, b and c: Means in the same row with different superscripts differ significantly ($P<0.05$).

The opposite trend was observed with CF digestibility, which was significant ($p<0.05$) lower with R2 and R3 containing corn silage and poultry letter. The improvement in CP digestibility could be due to increasing microbial protein synthesis and forming of NH_3-N being available to rumen microbes *(Mehrez*

1981 and 1992) and/or to the complementary effect of undegradable dietary protein and microbial protein *(Orskov, 1982)*.

Nutritive values : Present in table(3) results indicated that TDN was higher significant in R2 and R3 than control group (R1) . TDN was affected by feeding corn silage and poultry litter. These results are in agreement with those obtained by *EL-Sayes et al., (1997)* who found that TDN values of rations contained maize silage was higher than those of control ration.

On the other hand , DCP tended to higher significant with increasing percentage of poultry litter (R3) than (R2) . It could be noticed that the DCP values for different ration were related to the CP% of their rations. These results were in accordance with those obtained by *Gaafer (2001)* who explained that the physical and chemical nature of CP in PL is characterized by its high stability, degradability and susceptibility to the fermentation in the rumen.

Rumen activity: Results in table (3) showed that the ruminal pH values ranged in all groups between 6.23 and 6.66. The tested ration R2 containing 75% corn silage showed the highest value of pH. So, increasing the level of corn silage in the ration resulted in a significant ($P > 0.05$) increase in PH. *Gaafer (2001)* found also that ruminal pH value increased with increasing the level of corn silage in the ration for steers. *El-Bedawy et al. (1989)* reported also that raised rumen pH improved CF digestibility and sustained cellulalytic bacteria and protozoa count. Also, the addition of Poultry litter and CFM increased the fermentation rate and then nitrogen utilization increased accordingly. So, NH_3-N in R2 and R3 were significantly higher than in R1. Beneficial effects of high level of ammonia might be due to effects on ruminal PH *(Church and Pond 1988)* or indirectly via increasing the amount of substrate available for microbial protein synthesis in the rumen. Table (3) also showed that ruminal TVFA'S concentration in R1 was significantly higher than in R2 and R3 according to increasing the level of CM and decreasing the level of CS in the rations. *Gaafer (2001)* found the same results (TVFA decreased significantly ($P < 0.05$) with increasing the level of corn silage and decreasing the level of concentrate mixture.

Live body weight gain (LBW) and feed efficiency :

Date in table (4) showed that calve fed R2 and R3 recorded the higher daily BW gain (1.31, 1.19 kg) than those fed control ration (1.05 kg).

Oltjen and Dinius (1976) reported that N in processed poultry waste was utilized with more efficiency and supported more rapid and efficient weight gain by steers feed a high roughage than urea.

Feed efficiency : Data in table (4) showed that calves fed R2 were the highest efficiency which had the least amount of DM, TDN and DCP per kg gain 6.98, 4.74kg and 476g, respectively.

This result is an indication of higher metabolizable energy in the DM of R2 which would be more efficiency utilized for growth. *Mohamed et al., (1999)* found that calves fed control ration were the least efficient compared to those fed other rations contained corn silage.

Table (4): Live body weight gain and feed efficiency of Friesian calves :

Item		R1	R2	R3
No. of calves.		6	6	6
Duration of experiment	(day)	168	154	126
Initial LBW	(Kg)	275.5^{a}	271.17^{a}	305.17^{a}
Final LBW	(kg)	452.67^{b}	472.17^{a}	454.50^{b}
Total LBW gain	(kg)	177.17^{c}	201.00^{a}	149.33^{c}
Daily LBW gain	(kg)	1.05^{b}	1.31^{a}	1.19^{b}
Relative daily LBW gain	(%)	100	124.76	113.33
Feed efficiency :				
(Kg) DM/ kg gain.		8.95	6.98	7.80
(Kg) TDN/ kg gain.		5.21	4.74	5.38
(g) DCP / kg gain.		657	476	606

a, b and c: Means in the same row with different superscripts differ significantly ($P<0.05$).

Minerals concentration in the tested ingredients and experimental rations :

Minerals contents in poultry litter were higher compared with the other component feedstuffs especially corn grain and corn silage (Table 5).

Table (5): Macro and micro-minerals contents (on DM basis) of tested feedstuffs and experimental rations used in feeding of Friesian calves.

Items	Macro-minerals (g/kg)					Micro-minerals (mg/kg)			
	Ca	P	Mg	Na	K	Zn	Mn	Fe	Co
Feedstuffs									
Concentrate mixture	9.14	7.45	4.38	3.48	13.10	52.30	65.61	135.30	0.10
Berseem hay	12.91	2.70	3.95	1.70	25.30	24.90	31.75	195.50	0.25
Corn silage	3.34	2.60	2.50	1.23	12.80	21.60	19.50	165.40	0.06
Corn grain	1.35	2.90	1.50	1.32	7.85	14.22	6.78	35.30	0.05
Rice straw	1.95	0.65	1.20	1.45	14.25	8.50	42.25	159.40	0.04
Poultry litter	62.40	17.10	7.05	5.35	23.55	296.20	382.40	338.65	0.15
Experimental rations									
R1 (control)	8.27	5.38	3.68	2.81	15.16	39.43	55.86	149.15	0.11
R2	10.47	4.45	2.94	1.76	13.52	55.00	63.27	295.79	0.07
R3	17.61	6.30	3.39	2.28	14.25	88.41	107.05	426.19	0.08

Therefore, the contents of all measured minerals in the experimental rations increased with increasing the level of poultry litter and decreasing the level of corn silage as shown in Table (5). The contents of all micro minerals except Co in R3 (contained 25% poultry litter) were higher than the recommended requirements of growing calves according to NRC (1996). Poultry litter was a good source of minerals for growing calves, which the supplementation of poultry litter by 12.5 % of the rations containing corn grain and corn silage could ensure against minerals deficiencies of corn grain and corn silage.

Results in Tables (6) showed that, the intake of Mg, Na and Co were higher, while Ca, Zn, Mn and Fe were lower for control ration compared with rations contained poultry litter and corn silage (P<0.05). The intake of Ca, Mg, Na, Zn, Mn, Fe and Co increased significantly (P<0.05) with increasing the level of poultry litter and decreasing the level of corn silage in the experimental rations. These results may be attributed to increasing the contents of all minerals in the experimental rations with increasing the level of poultry litter (Table 5). These results are in agreement with those obtained by *Hanaa El-Amary (1995), Salama (1995) and Ben-Ghedalia et al. (1996)*. They found that mineral intake by lambs and calves increased with increasing the level of poultry litter in the rations. Moreover, the efficiency of minerals absorption and retention expressed as a percentage of minerals intake decreased significantly (P<0.05) as the minerals intake increased. Similar results obtained *Abdel-Raouf et al. (1994)* they indicated that the proportion of dietary mineral absorbed will decrease as dietary mineral increases above requirement of the tissues for absorbed mineral.

Table (6): average macro and micro-minerals intake by Friesian calves fed rations containing poultry litter and corn silage.

Items		Means of experimental rations			
		R1	R2	R3	S.E
Ca	Intake (g / day)	77.74^{c}	95.80^{b}	163.42^{a}	19.99
P	Intake (g / day)	50.57^{b}	40.72^{c}	58.46^{a}	2.95
Mg	Intake (g / day)	34.59^{a}	26.90^{c}	31.46^{b}	1.60
Na	Intake (g / day)	26.41^{a}	16.10^{c}	21.16^{b}	1.16
K	Intake (g / day)	142.50^{a}	123.71^{c}	132.24^{b}	1.14
Zn	Intake (mg / day)	370.64^{c}	503.25^{b}	820.44^{a}	28.21
Mn	Intake (mg / day)	525.08^{b}	578.92^{b}	993.42^{a}	32.83
Fe	Intake (mg / day)	1402.01^{c}	2706.48^{b}	3955.04^{a}	83.42
Co	Intake (mg / day)	1.03^{a}	0.64^{b}	0.74^{c}	0.05

a, b and c: Means in the same row with different superscripts differ significantly (P<0.05).

Mineral concentration in blood and seminal plasma:

The concentrations of macro and micro-minerals in blood and seminal plasma of Friesian calves increased significantly (P<0.05) with increasing the level of poultry litter and decreasing the level of corn silage in the rations (Table 7).

These results are in accordance with those obtained by *Hanaa El-Amary (1995) and Salama (1995)* who found that minerals concentrations in blood serum increased as the level of poultry litter in the ration increased. Moreover, minerals concentrations in blood plasma except Co for calves fed ration contained 25% poultry litter (R3) and Mg, Na and K concentrations in plasma of calves fed control ration were higher than the normal levels as reported by Georgievskii et al. (1982) being Ca 10-12, P 5-7, Mg 1.7-2.5, Na 330-340 and k 18-20(mg / dl); Zn 100-150, Mn 3-5, Fe 120-160 and Co 0.5 - 0.7(ug / dl).

Table (7): Minerals concentrations in blood and seminal plasma of Friesian calves fed rations containing poultry litter and corn silage.

Items	Means of experimental rations			
	R1	R2	R3	S.E
Blood plasma				
Macro-minerals	mg / 100 ml			
Calcium (Ca)	9.67^{c}	11.57^{b}	14.10^{a}	1.13
Phosphorus (P)	6.27^{b}	5.55^{c}	7.46^{a}	0.20
Magnesium (Mg)	3.30^{a}	2.40^{c}	2.87^{b}	0.28
Sodium (Na)	413.90^{a}	331.80^{c}	371.67^{b}	16.95
Potassium (K)	28.60^{a}	19.07^{c}	24.67^{b}	3.61
Micro-minerals	ug / 100 ml			
Zinc (Zn)	115.20^{c}	138.85^{b}	167.90^{a}	1.35
Manganese (Mn)	3.75^{b}	4.78^{b}	5.45^{a}	0.05
Iron (Fe)	125.55^{c}	150.20^{b}	188.40^{a}	1.54
Cobalt (Co)	0.67^{a}	0.56^{c}	0.61^{b}	0.18
Seminal plasma				
Macro-minerals	mg / 100 ml			
Calcium (Ca)	12.60^{c}	15.53^{b}	18.97^{a}	3.26
Phosphorus (P)	44.50^{b}	41.22^{c}	47.04^{a}	1.01
Magnesium (Mg)	8.33^{a}	7.13^{c}	7.61^{b}	0.59
Sodium (Na)	251.50^{a}	167.63^{c}	229.60^{b}	22.78
Potassium (K)	256.53^{a}	238.13^{c}	245.90^{b}	26.22
Micro-minerals	ug / 100 ml			
Zinc (Zn)	122.33^{c}	129.67^{b}	138.45^{a}	3.35
Manganese (Mn)	8.76^{c}	9.54^{b}	10.36^{a}	1.43
Iron (Fe)	20.72^{c}	23.83^{b}	26.72^{a}	0.71
Cobalt (Co)	0.75^{a}	0.60^{c}	0.67^{b}	0.18

a, b and c: Means in the same row with different superscripts differ significantly ($P<0.05$).

Mineral contents in body tissues :

Results obtained in Table (8) showed that the contents of some minerals in liver, kidneys, testis and muscle increased significantly ($P<0.05$) with increasing the level of poultry litter and decreasing the level of corn silage in the rations. These results could be attributed to increasing minerals intake, absorption and retention with increasing the level of poultry litter and decreasing the level of corn silage in the rations (Tables 6). Similar results obtained by *Salama (1995) and Webb et al. (2001)* who reported that minerals contents in body tissues increased with increasing the level of poultry litter in the rations of Friesian calves. Moreover, the contents of minerals in liver, kidneys, testis and muscles except Co for calves fed R3 and Mg, Na and K for calves fed control ration were higher than the normal levels and liver and kidneys revealed higher content of minerals compared with testis and muscles contents. *Georgievskii et al. (1982), Underwood (1981)* found that chemical composition of body tissues reflect the dietary status of the animal to varying degrees. Chemical estimations on tissues can therefore be used to assist in the detection and definition of a range of mineral disabilities in livestock.

From the results it could be concluded that replacing poultry litter at the level of 12.5 % in ration of growing calves fed corn silage give better results of daily gain and more efficient to get feed efficiency as well as to cover the minerals deficiencies detected in corn silage.

Table(8): Minerals contents in body tissues of Friesian calves fed rations containing different levels of poultry litter and corn silage.

Elements	Means of experimental rations			
	R1	R2	R3	S.E
	ppm on DM basis			
Liver				
Calcium (Ca)	455.60^{c}	468.80^{b}	475.65^{a}	2.94
Phosphorus (P)	6620.30^{b}	6545.50^{c}	6735.65^{a}	266.81
Magnesium (Mg)	770.20^{a}	680.70^{c}	725.55^{b}	12.92
Sodium (Na)	3495.40^{a}	3350.20^{c}	3420.85^{b}	13.75
Potassium (K)	10350.40^{a}	10190.15^{c}	10260.25^{b}	24.59
Zinc (Zn)	127.50^{c}	168.90^{b}	215.25^{a}	3.25
Manganese (Mn)	9.25^{c}	11.65^{b}	14.95^{a}	0.26
Iron (Fe)	190.40^{c}	242.65^{b}	335.80^{a}	6.70
Cobalt (Co)	0. 156^{a}	0. 118^{b}	0. 132^{b}	0.01
Kidneys				
Calcium (Ca)	350.55^{c}	394.15^{b}	445.35^{a}	5.06
Phosphorus (P)	5265.40^{b}	5180.25^{c}	5350.65^{a}	31.82
Magnesium (Mg)	880.70^{a}	765.80^{c}	815.60^{b}	16.63
Sodium (Na)	11375.15^{a}	11150.40^{c}	11235.50^{b}	32.75
Potassium (K)	10285.60^{a}	10095.10^{c}	10180.50^{b}	31.44
Zinc (Zn)	68.70^{c}	85.20^{b}	115.45^{a}	1.56
Manganese (Mn)	6.60^{c}	7.95^{b}	10.35^{a}	0.11
Iron (Fe)	225.75^{c}	258.30^{b}	310.25^{a}	7.90
Cobalt (Co)	0.15^{a}	0.10^{b}	0.12^{b}	0.002
Testis				
Calcium (Ca)	668.35^{c}	725.25^{b}	787.25^{a}	2.76
Phosphorus (P)	5640.35^{b}	5560.20^{c}	5760.75^{a}	29.14
Magnesium (Mg)	580.50^{c}	635.45^{b}	670.55^{a}	10.11
Sodium (Na)	7725.30^{a}	7580.65^{c}	7655.40^{b}	15.16
Potassium (K)	9895.20^{a}	9645.20^{c}	9780.40^{b}	36.12
Zinc (Zn)	45.50^{c}	58.20^{b}	75.45^{a}	1.87
Manganese (Mn)	1.95^{c}	2.50^{b}	3.10^{a}	0.17
Iron (Fe)	105.15^{c}	122.60^{b}	138.20^{a}	4.35
Cobalt (Co)	0.084^{a}	0.052^{b}	0.065^{b}	0.001
Muscle				
Calcium (Ca)	242.40^{c}	257.35^{b}	286.20^{a}	3.32
Phosphorus (P)	6850.35^{b}	6785.60^{c}	6935.10^{a}	41.08
Magnesium (Mg)	1270.60^{a}	1130.70^{c}	1180.50^{b}	7.39
Sodium (Na)	3325.40^{a}	3165.80^{c}	3235.50^{b}	12.96
Potassium (K)	15395.20^{a}	15115.20^{c}	15280.30^{b}	63.95
Zinc (Zn)	37.70^{c}	45.50^{b}	58.50^{a}	1.87
Manganese (Mn)	1.82^{c}	2.25^{b}	2.97^{a}	0.04
Iron (Fe)	65.75^{c}	88.65^{b}	115.40^{a}	4.29
Cobalt (Co)	0.017^{a}	0.010^{b}	0.012^{b}	0.001

a, b and c: Means in the same row with different superscripts differ significantly ($P<0.05$).

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تاثير مستوي فرشة الدواجن على حالة بعض العناصر المعدنيـــة فـــى العجـــول النامية

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استخدم ١٨ عجل فريزيان متوسط وزنها ٢٧٥ كجم لدراسة تأثير التغذية على مستويين مختلفين من فرشة الدواجن وسيلاج الذرة على معاملات الضم والقيمة الغذائية المأكول من العناصر المعدنية وتركيزها فـــى بلازما الدم والسائل المنوى وأنسجة الجسم، قسمت العجول إلى ثلاثة مجاميع وزعت عشـــوائيا للتغذيـــة علـــى العلائق التالية:-

العليقة الأولى (المقارنة): ٦٥% علف مركز + ١٥% دريس برسيم + ٢٠% قش أرز.
العليقة الثانية: ١٢,٥ % فرشة دواجن + ١٢,٥ % حبوب ذرة مجروشة + ٧٥% سيلاج ذرة.
العليقة الثالثة: ٢٥ % فرشة دواجن + ٢٥ % حبوب ذرة مجروشة + ٥٠ % سيلاج ذرة.

تشير النتائج الى ان معاملات الهضم والقيمة الغذائية كانت مرتفعة فى العليقة "الثانية والثالثة مقارنة بعليقـــة الكنترول وبالنسبة لمقاييس الكرش وجد ارتفاع فى درجة حموضة الكرش والامونيا نيتروجين مقارنة بعليقـــة الكنترول امابالنسبة للاحماض الدهنية الطيارة فقد انخفضت فى العليقة الثانية والثالثة مقارنة بعليقة الكنترول وكان معدل النمو اليومى فى المجموعة الثانية افضل من الثالثة وكذلك مـــن مجموعـــة الكنتـــرول .وكـــان ارتفاع محتوى العناصر المعدنية فى فرشة الدواجن بالمقارنة بمواد العلف الأخرى وكذلك ارتفـــاع محتواهـــا فى العلائق التجريبية مع زيادة مستوى فرشة الدواجن ونقص مستوى سيلاج الذرة. زيادة المأكول والممتص والمحتجز من العناصر المعدنية معنويا (على مستوى ٠,٠٥) مع زيادة مستوى فرشـــة الـــدواجن ونقـــص مستوى سيلاج الذرة. نقص كفاءة امتصاص واحتجاز العناصر المعدنية معنويا (على مســـتوى ٠,٠٥) مـــع زيادة المأكول منها فى العليقة.زيادة تركيز العناصر المعدنية فى بلازما الدم والسائل المنوى والكبـــد والكليتـــين والخصيتين والعضلات معنويا (على مستوى ٠,٠٥) مع زيادة مستوى فرشة الدواجن ونقص مســـتوى ســـيلاج الذرة. زيادة تركيز العناصر المعدنية ما عدا الكوبلت فى بلازمـــا الـــدم والســـائل المنـــوى والكبـــد والكليتـــين والخصيتين والعضلات في العجول المغذاة على العليقة الثالثة المحتوية على ٢٥% فرشة دواجن عـــن الحـــدود الطبيعية. نستخلص من هذه الدراسة أنه يمكن الاستفادة من فرشة الدواجن حتى مستوى ١٢,٥% فى علائق العجـــول النامية المغذاة على سيلاج الذرة لسد النقص فى العناصر المعدنية الموجودة فى سيلاج الذرة حيـــث ان هـــذا المســـتوى اعطى نتائج افضل مع معدل النمو اليومى وزيادة الكفاءة الغذائية معبراعنها بالكمية الماكولـــة مـــن المـــادة الجافـــة او TDN , DCP مما أدى إلى تحسين الكفائه الهضمية والقيمة الغذائية والتخمر للعلائق المحتوية على فرشة الدواجن وقـــد إنعكس ذلك على الأداء الإنتاجى للحيوانات.