International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2015): 6.391

Effect of Dietary Levels of Safflower (*Carthamus tinctorius L*) Seeds Supplemented with Molasses on Broiler Chicks Performance and Carcass Traits

Bakheit M. Dousa[1], Huwaida E. E. Malik[2], El Tahir A. Abdelaleem[3]

[1,2]Department of Poultry Production, Faculty of Animal Production, University of Khartoum, Sudan Posted code 13314 Khartoum

[3]Department of Agronomy, Faculty of Agriculture Science, University of Gezira, Sudan

Abstract: ***A farm study was carried out to evaluate the inclusion of safflower seeds supplemented with molasses on broiler chicks performance and carcass traits. A total of one hundred and eight Cobb strain unsexed one day old broiler chicks were distributed into six isocaloric and isonitrogenous diets and each contained three replicates (6birds/replicate) in a complete randomized design. Dietary treatments were a no additives as control (A) and diets containing 5% safflower seeds without molasses (B), 10% safflower seeds without molasses (C), 5% safflower seeds with 3% molasses (D), 10% safflower seeds with 3% molasses (E) and 3% molasses without safflower seeds (F). Feed and water were provided ad libitum till the termination of the trial after 42 days. Parameters measured were feed intake, body weight gain, feed conversion ratio (FCR), relative weights of internal organs (dressing percentage, liver, gizzard, abdominal fat, heart and shrink percentage) and meat proximate analysis. The results revealed that birds fed on diets containing 5% safflower seeds with 3% molasses consumed higher feed. However, no significant (P > 0.05) differences were observed between dietary treatment groups for body weight gain, feed conversion ratio (FCR), pre slaughter weight, hot carcass, cold carcass and relative weights of liver, abdominal fat, gizzard and heart. Inclusion of 10% safflower seeds without molasses and 5% safflower seeds with 3% molasses decreased shrink relative weight. Birds fed control diet and those received diets C, E and F recorded significantly (P < 0.05) higher protein content. Moreover, non significant (P > 0.05) difference was observed for moisture content, ash content, ether extract and fiber content of meat.***

Keywords: broilers, molasses, performance, safflower seeds

1. Introduction

Feed is a major component affecting net return from the poultry business because 80% of the total expenditure in terms of cash is spent on feed purchase (Khan et al., 2010) .Ensuring more net return and minimizing high expenditure of feed are the main challenges for which many research strategies have been practiced such as introduction of feed supplements and feed additives (Khan et al., 2009). Safflower (*Carthamus tinctorius* L.) is an annual herbaceous plant cultivated mainly for its seed which is used as edible oil seeds and as bird feed (Dajue et al., 1996). Oilseeds are one of the best and common energy sources used in poultry nutrition (*Scott* et al., 1998; Sanz et al., 1999). Also using oilseeds is a practical and economical mean to increase energy levels in poultry diets (Peebles et al., 1997). Safflower seed is a source of magnesium, lysine, pyridoxine, biotin, pantothenic acid and choline (Oguz and Oguz, 2007). Protein content is about 20-25% in the un-decorticated meal but can be over 40% in decorticated meals (Dajue et al., 1996). Crude fiber content is about 30-40% for un-decorticated meal and can be as low as 10% in the dehulled meal (GRDC, 2010), an excellent source of Phosphorus and a good source of Zinc and Ferrous (Gowda et al., 2004). Rodriguez et al. (2005) reported that non significant differences in weight gain, feed intake and feed utilization among the chicks receiving control diet and those fed diets with increasing level of full fat safflower seeds from 5 to 25% of diet. Molasses allows the feed granules to stick together during the pelleting process and produce pellets that are less likely to break down during transportation and passage through feeding equipment (Blair, 2007). Molasses also reduces dustiness in fine-particle feeds, due to its sucrose content it improves the palatability of feeds and can even mask the bitter taste of urea (Blair, 2007). This study was designed to determine the effect of feeding graded levels of safflower seeds supplemented with molasses on broiler chicks' performance, carcass characteristic and meat composition.

2. Materials and Methods

Experimental Birds

One hundred and eight one day old unsexed broiler chicks of a commercial strain (Cobb) were obtained. All chicks were assigned to the control diet for the first six days as adaptation period after being vaccinated against Mark's Disease then the chicks were randomly assigned to the six experimental diets. Eighteen birds per treatment group in a completely randomized design each treatment group was further subdivided into three replicate of 6 birds and the initial weight of chicks in each pen was approximately equal.

Experimental diets

Six isocaloric and isonitrogenous experimental diets were formulated to meet the nutrients requirements of broiler chicks stated by (NRC, 1994). In addition to basal control diet (A) without safflower and molasses, five experimental diets were formulated to contain safflower seed and molasses. On basis of safflower inclusion levels and molasses the experimental diets were defined as follow:

(A) Basal control diet, neither containing safflower seeds nor molasses

(B) Represents the diet containing 5% safflower seeds without molasses

(C) Represents the diet containing 10% safflower seeds without molasses
(D)Represents the diet containing 5% safflower seeds with 3% molasses.
(E) Represents the diet containing 10% safflower seeds with 3% molasses.
(F) Represents the diet containing 3% molasses without safflower seed.

Samples of experimental diets were analyzed for proximate chemical composition by methods of analysis stated by AOAC (1990). Percent composition, calculated and determined analysis of the experimental diets are presented in Tables 1, 2, 3.

Management
The chicks were reared in deep litter with feed and water offered *ad libitum.* Drinkers and feeders were leveled using red brick cuboids, feed samples were analyzed for proximate composition according to AOAC (1990). Each pen was provided with bulb lamb (60 watts) for continuous lightening throughout experimental period, artificial light was provided by lambs 12 hours in the evening and 12 hours natural day-light. The birds were vaccinated against Newcastle disease at 7 day-old (IB) and at the 21 day (lasota). Gumboro disease vaccine was given at the 14 day. Vitamins offered as supportive dose in drinking water.

Data collection
At the end of the experimental period two birds from each replicate of each dietary treatment were randomly selected and weighted individually then slaughtered and allowed to bleed. Birds were scalded using boiling water, feather handpicked, washed left to drain. Then a complete removal of trachea, esophagus, crop, intestinal tract, giblet (liver, heart and gizzard), kidney and hot carcasses weight was recorded and the dressing percentage was determined by expressing hot carcass weight to the live weight. Meat samples were analyzed for proximate composition according to AOAC (1990) after dried under sun.

Experimental design and statistical analysis
A complete randomized design was employed (2×3) factorial arrangement and two levels of molasses (0, 3%) with three levels of safflower seeds (0, 5, and 10%). The collected data was subjected to ANOVA using one way analysis of variance (Steel and Torrie, 1980) procedure of SPSS. Significant differences among treatment means were determined using Duncan`s multiple range tests

3. Results and Discussion

Overall performance
Results of overall performance of broiler chicks as affected by inclusion of different levels of safflower seeds and molasses are presented in Table 4. Feed intake was significantly ($P < 0.05$) affected by the inclusion of safflower seeds and molasses. Birds received the diet contained 5% safflower seeds with 3% molasses consumed higher feed than other groups. However, there was no significant ($P > 0.05$) differences in feed intake for those groups consumed diets control, 5% safflower, 10% safflower, 10% safflower + 3% molasses and 3% molasses. Treatments had no significant ($P > 0.05$) effect on body weight gain and feed conversion ratio FCR. According to the result of the present experiment, the higher consumption of feed was observed for birds fed diet contained 5% safflower seeds with 3% molasses. This observation may attribute to the palatability of those feed. Overall performance of broiler chicks was not affected by the dietary inclusion of safflower seeds and molasses. This statement in line with the findings of Rodriguez et al, (2005) who reported that not significant differences in weight gain, feed intake and feed utilization among the chicks receiving control diet and those fed diets with increasing level of full fat safflower seeds from 5 to 25% of diet. Njidda et al, (2006) reported that broilers fed low levels of molasses in the starter and finishing rations respectively in substitution for sorghum grain had similar performance than birds fed the control diet.

Weekly feed intake
Weekly feed intake of broiler chicks as affected by inclusion of safflower seeds and molasses are presented in Table 5. In the first week, feed intake was not influenced ($P > 0.05$) by the dietary treatments. Feed intake in the second and third week was significantly ($P < 0.05$) affected by the dietary treatments. Higher feed was consumed by the birds given the diet containing 5% safflower seeds with 3% molasses than those fed other groups. While, feed intake of birds fed control, 5% safflower, 10% safflower, 10% safflower + 3% molasses and 3% molasses were not significantly ($P > 0.05$) different. There was no significant ($P > 0.05$) difference in feed intake among the dietary treatment groups in the fourth and fifth week of age. The higher consumption of feed in the second and third weeks of age may attribute to the higher palatability. Molasses usually added to the feed to improve its palatability and increase intake (Leclerc, 2003).

Weekly body weight gain
The results of weekly body weight gain as affected by the dietary inclusion of safflower seeds and molasses are summarized in Table 6. There was no significant ($P > 0.05$) effect of dietary treatments on weekly body weight gain. This finding is consistent with the results of Selvaraj et al, (2004) who used various levels of full fat safflower seeds (0%, 5%, 10%, 15% and 20%) and reported that weight gain and feed consumption were not affected by the full fat safflower seeds inclusion. Molasses could be included up to 5% with no effect on growth and performance (Rahman et al., 1991).

Weekly feed conversion ratio (FCR)
The mean values of feed conversion ratio affected by different levels of safflower seeds and molasses are given in Table 7. Dietary treatments had no significant ($P > 0.05$) effect on feed conversion ratio throughout experimental period. This result agreed with the findings of Rodriguez et al, (2005) who reported not significant differences in weight gain, feed intake and feed utilization among the chicks receiving control diet and those fed diets with increasing level of full fat safflower seeds from 5 to 25% of diet, and Rahman et al, (1991) who reported molasses could be included up to 5% with no effect on growth and performance

Pre slaughter and relative weights of internal organs

Results of pre slaughter weights and internal organs relative weights of broiler chicks as affected by dietary inclusion of different levels of safflower seeds and molasses were shown in Table 8 and Table 9. Dietary treatments did not show significant ($P > 0.05$) effect on pre slaughter weight, hot carcass, cold carcass and relative weights of liver, abdominal fat, gizzard and heart. Shrink relative weigh was significantly ($P < 0.05$ influenced by the treatments. Birds fed diet contained 10% safflower + 3% molasses recorded the highest value of shrink relative, it followed by control and 3% molasses. However, 10% safflower and 5% safflower + 3% molasses groups observed the least relative weight of shrink. Elangovan et al, (2000) showed that live weight gain, feed intake, nutrient retention and carcass characteristics did not show significant differences ($P > 0.05$) when full fat safflower seeds meal increased in the diets. Growth performance and carcass traits were not affected by safflower seeds; only blood cholesterol was significantly decreased (Malakian et al., 2011).

Proximate chemical analysis of meat

Proximate chemical analysis of broilers meat as influenced by different levels of safflower seeds and molasses are demonstrated in Table 10.The results revealed that dietary treatments had no significant ($P > 0.05$) effect on moisture content, ash content, ether extract and fiber content. Protein content was significantly ($P < 0.05$) influenced by dietary treatments. Birds fed on control group and those received 10% safflower, 10% safflower + 3% molasses and 3% molasses recorded significantly ($P < 0.05$) higher protein content of meat than those groups received diets 5% safflower and 5% safflower + 3% molasses. Oguz and Oguz, (2007) reported that un-extracted whole safflower seed as a feed ingredient in pig and poultry diets without negative effects on digestion or on meat quality.

4. Conclusion

Inclusion of safflower seeds and molasses in broiler chicks diets could be effective in enhancing broiler performance. Broiler chicks consumed 10% safflower seeds without molasses or 5% safflower seeds with 3% molasses their carcass decreased shrink relative weigh. Boilers fed diets contained 5% safflower seeds without molasses or 5% safflower seeds with 3% molasses observed a significant reduction in meat protein. Dietary different levels of safflower seeds and molasses which carried out in the current study had obtained similar performance to control

References

[1] **AOAC. 1990.** Association of Official Analytical Chemists. Official methods of analysis, 15th Edn.,Washington, DC.

[2] **Blair R. 2007.** Nutrition and feeding of organic pigs. Cabi Series, CABI, Wallingford, UK.

[3] **Dajue L., Mündel HH. 1996.** Safflower (*Carthamus tinctorius* L.) Promoting the conservation and use of underutilized and neglected crops.4th ed. Int. Plant Genetic Resources Institute (IPGRI), Roma, Italy.

[4] **Elangovan AV., Verma SVS., Sastry VRB. 2000**. Response of growing and laying Japanese quails (Coturnix japonica) to dietary sunflower seed meal. Asian Austral. J. Anim. 13:1726-1730.

[5] **Gowda NKS., Ramana JV., Prasad CS., Khub Singh. 2004.** Micronutrient content of certain tropical conventional and unconventional feed resources of Southern India. Trop. Anim. Health Prod., 36 (1): 77-94

[6] **GRDC. 2010.** Raising the bar with better safflower agronomy - autumn 2010. GRDC - Grain Research and Development Corporation

[7] **Khan FU., Durrani FR., Sultan A., Khan RU. and Naz S. 2009.** Effect of fenugreek (*Trigonellafoenum-graecum*) seed extract on visceral organs. J. Agric Bio. Sci. Vol. 4. P 58-60.

[8] **Khan RU., Durrani FR., Chand N. and Anwar H. 2010.** Influence of feed supplementation with Cannabis sativa on quality of broilers carcass. Pakistan Veterinary Journal. Vol. 30. Issue 1.P 34-38.

[9] **Leclerc MC**. 2003. Beet and cane molasses. Institut de l'Elevage.

[10] **Malakian M., Hassanabadi A., Heidariniya A. 2011.** Effects of Safflower Seed on Performance, Carcass Traits and Blood Parameters of Broilers. Res. J. Poult. Sci., 4 (2): 8-21

[11] **Njidda AA., Igwebuike JU., Ngoshe AA., Tijjani AO. 2006**. Effect of substituting maize with graded levels of cane molasses on the performance of broiler finisher birds in the semi-arid region of Nigeria. J. Sustain. Agric. Environ., 8 (1): 1-13.

[12] **NRC. 1994**. Nutrient requirements of poultry, 9th rev. ed. National Academy Press, Washington, DC.

[13] **Oguz FK., Oguz MN. 2007.** The effect of safflower seed on performance and some blood parameters of broiler chicks. Indian Veterinary Journal. 84:610-612.

[14] **Peebles ED., Cheaney JD., Brake JD., Boyle CR., Latour MA., McDaniel CD. 1997.** Effects of added lard fed to broiler chickens during starter phase. 2. Serum lipids. Poultry Sci. 76:1648-1654.

[15] **Rahman MA., Islam MMT., Ali A., Das AK. 1991.** Effect of partial replacement of wheat by rice polish and molasses on the performance of laying pullets. Bangladesh J. Anim. Sci., 20 (1-2): 113-117

[16] **Rodriguez ML., Ortiz LT., Alzueta C., Rebole A., Trevino J. 2005**. Nutritive value of high-oleic acid sunflower seed for broiler chickens. Poultry Sci. 84:395-402.

[17] **Sanz M., Flores A., Perez-de Ayala P., Lopez-Bote CJ. 1999**. Higher lipid accumulation in broilers fed on saturated fats than in those fed on unsaturated fats. Brit. Poultry Sci. 40: 95-101.

[18] **Scott TA., Silversides FG., Classen HI., Swift ML., Bedford MR. 1998**. Comparison of sample source and age of broiler chick on measurement of apparent digestible energy of wheat and barley. Poultry Sci. 77:456-463.

[19] **Selvaraj RK., Purushothaman MR. 2004**. Nutritive value of full-fat sunflower seeds in broiler diets. Poultry Sci. 83:441-446.

[20] **Steel RDG. and JH. Torrie 1980**. Principles and procedures of statistics (1st edition) Mc Graw-Hill, New York.

Table 1: Composition of experimental broiler chick's diets

Ingredients	Experimental diets					
	control	5% safflower	10% safflower	5% safflower 3% molasses	10% safflower 3% molasses	3% molasses
Sorghum	60.20	59.90	55.60	56.60	51.60	57.30
Groundnut meal	26.66	26.20	25.68	27.00	26.70	27.45
Wheat bran	6.05	2.50	1.80	1.90	1.50	5.44
Super concentrate*	5.00	5.00	5.00	5.00	5.00	5.00
Limestone	0.83	0.71	0.80	0.80	0.82	0.73
Di-calcium phosphate	0.21	0.13	0.05	0.12	0.10	0.10
Salt	0.20	0.20	0.20	0.20	0.20	0.20
Lysine	0.05	0.06	0.06	0.06	0.06	0.05
Methionine	0.13	0.10	0.11	0.09	0.14	0.09
Vegetable oil	0.57	0.10	0.60	0.13	0.78	0.54
Anti fungi	0.10	0.10	0.10	0.10	0.10	0.10
Molasses	0.00	0.00	0.00	3.00	3.00	3.00
Safflower seeds	0.00	5.00	10.00	5.00	10.00	0.00

** contain (%): CP 32, CF 2, Ca 7, P 5, Lysine 11, Methionine 3.7, ME 1900 kcal/kg*

Table 2: Proximate analysis of experimental broiler chick's diets

Items	Experimental diets					
	control	5% safflower	10% safflower	5% safflower 3% molasses	10% safflower 3% molasses	3% molasses
ME kcal/kg diet	3051.13	3051.62	3058.95	3051.46	3051.26	3051.49
Crude protein%	22.60	22.64	22.60	22.59	22.61	22.60
Crude fiber%	5.02	4.94	5.12	4.85	5.08	4.95
Calcium%	1.06	1.00	1.02	1.06	1.07	1.03
Av. phosphorus%	0.47	0.49	0.51	0.49	0.52	0.45
Lysine%	1.11	1.10	1.10	1.10	1.10	1.11
Methionine%	0.43	0.47	0.48	0.46	0.51	0.46

Table 3: Determined analysis of experimental broiler chick's diets

Items	Experimental diets					
	control	5% safflower	10% safflower	5% safflower 3% molasses	10% safflower 3% molasses	3% molasses
Dry matter	90.94	89.75	88.57	87.95	87.55	87.31
Ether extract	10.03	10.59	9.99	12.12	12.59	10.50
Crude protein	32.52	33.54	33.98	35.73	36.60	34.71
Crude fiber	7.97	8.39	7.82	7.03	6.65	7.63
Ash	10.38	11.36	12.47	12.66	13.26	12.99
NFE	29.50	26.11	24.33	19.91	18.45	21.48

Table 4: Effect of dietary safflower seeds and inclusion of molasses on overall performance of broiler chicks

Parameters	Experimental diets						±SEM
	Control	5% Safflower	10% Safflower	5% Safflower 3% Molasses	10% Safflower 3% Molasses	3% Molasses	
Feed intake(g/bird)	3744.7^{b}	3791.5^{b}	3832.9^{b}	4196.3^{a}	3808.3^{b}	3817.7^{b}	103.79
Weight gain(g/bird)	1661.9	1906.7	1808.3	1911.7	1747.2	1805.6	83.77
FCR (g feed/g gain)	2.26	2.00	2.12	2.20	2.18	2.13	0.10

Means values with different letters at the same row (a –b) were significantly different P ≤ 0.05.
±SEM = Standard error of treatment means.

Table 5: Effect of dietary safflower seeds and inclusion of molasses on weekly feed intake (g/bird) of broiler chicks

Age (weeks)	Experimental diets						±SEM
	control	5% safflower	10% safflower	5% safflower 3% molasses	10% safflower 3% molasses	3% molasses	
1-2	296.63	306.81	309.00	314.34	310.16	301.18	5.86
2-3	637.94^{b}	627.43^{b}	645.54^{b}	714.43^{a}	640.49^{b}	642.57^{b}	15.98
3-4	775.65^{b}	791.66^{b}	785.42^{b}	880.78^{a}	802.78^{b}	800.00^{b}	22.14
4-5	977.78	975.00	992.92	1069.00	997.22	966.39	37.36
5-6	1058.00^{b}	1091.00^{ab}	1100.00^{ab}	1222.00^{a}	1067.00^{b}	1094.00^{ab}	41.15

Means values with different letters at the same row (a –b) were significantly different P ≤ 0.05.

Table 6: Effect of dietary safflower seeds and inclusion of molasses on weekly body weight gain (g/bird) of broiler chicks

Age (weeks)	Experimental diets						±SEM
	Control	5% safflower	10% safflower	5% safflower 3% molasses	10% safflower 3% molasses	3% molasses	
1-2	164.56^{ab}	163.44^{ab}	158.54^{ab}	209.47^{a}	127.56^{b}	173.61^{ab}	8.24
2-3	353.44	338.06	334.54	290.10	437.39	280.28	50.53
3-4	395.95	395.72	446.84	473.77	390.61	532.22	50.45
4-5	391.67	450.00	447.58	538.34	438.89	472.22	53.44
5-6	358.33	559.44	420.83	400.00	352.78	347.22	88.14

Means values with different letters at the same row (a –b) were significantly different P ≤ 0.05.

Table 7: Effect of dietary safflower seeds and inclusion of molasses on weekly feed conversion ratio FCR (g feed/g bird) of broiler chicks

Age (weeks)	Experimental diets						±SEM
	control	5% safflower	10% safflower	5% safflower 3% molasses	10% safflower 3% molasses	3% molasses	
1-2	1.84^{ab}	1.91^{ab}	1.99^{ab}	1.51^{b}	2.53^{a}	1.85^{ab}	0.22
2-3	1.84	1.88	1.95	2.47	1.47	3.45	0.67
3-4	1.97	2.01	1.78	1.89	2.12	1.64	0.22
4-5	2.52	2.20	2.28	2.14	2.27	2.09	0.24
5-6	3.88	2.01	2.74	3.15	3.25	3.60	0.67

Means values with different letters at the same row (a –b) were significantly different P ≤ 0.05.

Table 8: Effect of dietary safflower seeds and inclusion of molasses on Pre slaughter weight and some organs weight of broiler chicks

Parameters	Experimental diets						±SEM
	control	5% safflower	10% safflower	5% safflower 3% molasses	10% safflower 3% molasses	3% molasses	
Pre slaughter weight (g/bird)	1841.7^{b}	1983.3^{ab}	2225.0^{a}	2225.0^{a}	1916.7^{ab}	1966.7^{ab}	104.87
Hot carcass (g/bird)	1175.0	1275.0	1366.7	1366.7	1183.3	1250.0	71.59
Cold carcass (g/bird)	1124.7	1227.7	1319.5	1317.3	1131.3	1203.2	70.80
Liver weight(g/bird)	35.75^{b}	42.17^{ab}	46.70^{a}	44.33^{a}	41.50^{ab}	40.87^{ab}	2.59
Gizzard weight(g/bird)	54.08	54.32	57.20	61.70	52.68	60.70	3.85
Abdominal fat(g/bird)	18.43	28.72	31.63	27.07	27.10	30.17	4.24
Heart weight(g/bird)	7.98^{b}	9.20^{ab}	11.02^{a}	9.57^{ab}	8.68^{b}	8.87^{b}	0.66
Shrink weight (g/bird)	50.33	47.33	47.17	49.33	52.00	46.83	2.15

Table 9: Effect of dietary safflower seeds and inclusion of molasses on dressing percentage and some organs weights relative of broiler chicks

Parameters	Experimental diets						±SEM
	control	5% safflower	10% safflower	5% safflower 3% molasses	10% safflower 3% molasses	3% molasses	
Dressing %	63.82	64.20	61.56	61.59	61.60	63.17	1.22
Liver relative weight	3.09	3.35	3.34	3.25	3.54	3.32	0.22
Gizzard relative weight	4.73	4.28	4.21	4.49	4.47	4.88	0.28
Abdominal fat relative weight	1.67	2.23	2.28	2.01	2.28	2.40	0.31
Heart relative weight	0.70	0.73	0.81	0.70	0.74	0.72	0.06
Shrink relative weight	4.31^{ab}	3.75b^{c}	3.46^{c}	3.62^{c}	4.46^{a}	3.89^{abc}	0.22

Values are means of different 3 replicate per treatment (6bird/replicate).
Means values with different letters at the same row (a –c) were significantly different P ≤ 0.05.

Table10: Effect of dietary safflower seeds and inclusion of molasses on meat characteristics of broiler chicks

Parameters	Experimental diets						±SEM
	control	5% safflower	10% safflower	5% safflower 3% molasses	10% safflower 3% molasses	3% molasses	
Moisture (%)	8.04	9.35	10.66	9.88	9.70	8.75	0.93
Ash (%)	4.48	5.18	4.67	5.20	4.10	3.86	0.64
Protein (%)	70.81^{a}	68.73^{b}	70.68^{a}	68.84^{b}	70.88^{a}	71.56^{a}	0.56
Ether extract (%)	15.22^{a}	14.57^{ab}	12.30^{b}	14.09^{ab}	13.84^{ab}	14.34^{ab}	0.78
Fiber (%)	1.22	2.05	1.34	1.90	1.49	1.49	0.30

Means values with different letters at the same row (a –b) were significantly different P ≤ 0.05.