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Influence of Gum Arabic *(Acacia senegal)* in Dairy Cows Feed, Its Effect on Quantity and Quality of Milk

By

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Abstract

In this study, the quantity and quality of milk was assessed in nine lactating of cows reared in Khartoum University farm at Shambat. They were divided into three separate groups each three. They were provided with three dietary regimens containing 0% or 5% or 10% Arabic Gum from *Acacia Senegal.* The duration of the experiment was four weeks. Results obtained indicated that the production is increased in the three groups by 7.7%, 18.7% and 19% respectively. Moisture content of the milk was increased by 3%, 0.6% and 0.2%, respectively. Protein is decreased by 11% in the first group and increased by 12% and 10% for the other two groups respectively. Ash of the milk is increased by 50% in the first group and decreased by 5% and 10% for the other treated groups. Fat is increased by 42% in the first group and decreased by 46% for both treated groups. Lactose of the milk is decreased by 2%, 3%, and 2% for the three groups respectively. Total solids increased by 5% for the three groups. Bulk density of the milk is decreased by 0.3% for the first group and increased by 0.2% and 0.1% for the other two groups respectively. Calcium content in the three groups is increased three times while phosphorous content is increased two times. No health problems or adverse effects were reported in experimental animals following consumption of Gum Arabic.

Introduction

Dairy animal production in the Sudan has shown considerable expansion in recent years, following these expansions many research work dealing with improving quantity of milk production was conducted. Most of this work neglected one of the most important areas, which is the quality of milk produced. In the present study parallel study of both quality and quantity of milk production will take place a standard cattle ration with inclusion of different amounts of Arabic Gum from (*Acacia Senegal*) to detect the bioavailability of different nutrients of *Hashab* Gum. Chemical constituents of Arabic Gum are: 10.9% moisture, 2% protein, 3.7% ash, -31.3 specific rotation and 4.6 pH (Karamalla et al., 1998). In addition to that Arabic Gum is free – toxic matter (Anderson et al., 1983). Arabic Gum is widely used in food, pharmaceutical, cosmetics and other industries. It is described as dietary fibre and has been considered by European Economic Community (EEC) as safe food additive, since it does not cause any health problems as it is degraded in human colon to volatile fatty acids by natural micro flora (Ross et al., 1983). The objectives of this study are to study the effect of Arabic Gum, if any, for the improvement of the quality and quantity of cattle milk and to report on the possible adverse or toxic effect that might occur.

Materials and Methods

Experiment animals: nine lactating cows obtained from the department of Animal Production, Faculty of Veterinary Science, University of Khartoum. The animals were divided into three groups, each group was kept separately. The animals were cross breed with the same age. Arabic Gum was obtained from the Acacia Agriculture Company; duration of the experiment was four weeks.

Experimental diet: different feed treatments were added in terms of three dietary regimens containing 0%, 5% and 10% Gum Arabic from *Acacia Senegal*,

respectively. Table (1) shows ingredients of the three dietary regimens and table (2) presents the proximate analysis of the three dietary regimens, in addition to that fodder *berseem* and *Abu sabaeen* were given to animals at night.

Chemical analysis: moisture %, ash%, fat%, total soluble solid (TSS) and bulk density were determined as described by JEFCA-FAO (1990), and protein content was measured according to AOAC (1984). The mineral extraction was estimated according to Pearson (1981). Calcium% was measured as described by Chapman (1968), phosphorous% was measured as described by JAOA (1965). Lactose % was measured as described by JAOA (1979) and cholesterol% was determined as described by JAOA (1942).

Results and Discussion

Table (3) shows mean value of milk production is increased by 7.7%, 18.7% and 19% for group 0%, 5% and 10%, respectively. Mean value of moisture % for milk is increased by3%, 0.6%, and 0.2% for the treated groups respectively. Mean value of protein% is decreased by 11% for group 0% and increased by 12% and 10% for group 5% and 10%, respectively. Mean of ash% for milk is increased by 50% in the first group and decreased by 5% and 10% for the other treated groups. Fat is increased by 42% in group 0% and decreased by 46% for both group 5% and 10%, respectively. The mean value of lactose of the milk is decreased by 2%, 3%, and 2% for the three groups respectively. Cholesterol content for the three groups is nil. Mean value of total soluble solid for milk is increased by 5% for the three groups. Mean value of bulk density of the milk is decreased by 0.3% for group 0% and increased by 0.2% and 0.1% for group 5% and 10%, respectively. Calcium% for the milk is increased by three times while phosphorous% for the milk is increased two times comparing with control group. No health problems or adverse effects were reported in experimental animals following consumption of Gum Arabic. Table (4) indicates that there was no significant difference in the feed intake regarding the different levels of Gum Arabic included in the diet, which means that Gum Arabic is palatable to cattle up to 10%. These results are in agreement with those reported by Anderson (1983) and Ross (1983).

Conclusion:

The nutritional value of the milk is indicated mainly by its chemical composition, in addition to economic bases. We concluded that 5% (5 kilograms Gum Arabic complete to 100 kilograms concentrate) is preferred for feed of the cattle. In addition Gum Arabic is palatable and not toxic for the cattle.

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Table (1): Ingredient composition of the three dietary regimens containing 0%, 5% and 10% Gum Arabic from *Acacia Senegal*.

Ingredients	0%	5%	10%
Sorghum	70	65	60
Groundnut	25	25	25
Gum Arabic	0	5	10
Oyster shell	2	2	2
Salt	1	1	1
Lysine	1	1	1
Methionine	1	1	1
Total	100	100	100

Table (2): Proximate analysis of the three dietary regimens containing 0%, 5%, and 10% Gum Arabic from *Acacia Senegal*

Parameters	0%	5%	10%
Moisture	3.9	3.7	3.5
Ash	8.7	9.0	10
Protein	23	25	27
Oil	3.2	2.1	2.0
Fiber	5.0	2.0	2.0
CHO	56.2	58.2	55.5

Table (3): Milk production and chemical composition of milk

Group	Ration without Gum			Ration with Gum		
	A	B	C	0%	5%	10%
Milk (pound)	700	633	510	754	752	607
Moisture%	85	87	87	88	87	87
Protein%	3.2	2.9	3.0	3.1	2.5	3.0
Ash %	0.5	0.9	1.1	0.8	0.8	0.8
Fat%	6.2	6.4	2.6	3.6	3.4	3.0
Lactose%	5.5	4.9	4.8	4.4	4.7	4.7
Cholesterol%	Nil	Nil	Nil	Nil	Nil	Nil
TSS%	10	10	10	9.5	9.5	9.5
Bulk density	1.025	1.030	1.032	1.029	1.029	1.029
Calcium%	0.23	0.23	0.26	0.7	0.6	0.6
Phosphorous%	0.23	0.8	0.12	0.35	0.37	0.34

Table (4): Feed intakes (Kg) for the three dietary regimens containing 0%, 5% and 10% Gum Arabic from *Acacia Senegal*

Week	0%	5%	10%
1st	228	199	220
2nd	397	361	373
3rd	519	489	493
4th	410	529	600

الملخـــص

أثر إضافة الصمغ العربي إلي عليقه أبقار الحليب علي كمية و نوعية الحليب

عمر فضل إدريس، مروان خالد صباح الخير وهشام إسماعيل سري

تسعة من الأبقار تمت تربيتها بمزرعة جامعة الخرطوم بشمبات تم استخدامها في هذه الدراسة، تم تقسيم الأبقار إلي ثلاثة مجموعات بحيث تحتوي كل مجموعة علي ثلاثة أبقار علما أن أعمار جميع الأبقار متساوية وتم إعطاء الأبقار عليقه تحتوي عل الصمغ العربي. المجموعة الأولي عليقتها كانت خالية من الصمغ العربي والمجموعتين الثانية والثالثة احتوت كل منهما علي ٥% و ١٠% صمغ عربي علي التوالي. استمرت الدراسة لفترة أربعة أسابيع. خلصت الدراسة إلي الآتي: زيادة كمية اللبن المنتجة في المجموعة الأولي والثانية والثالثة بنسبة ٧,٧% و ١٨,٧% و ١٩% علي التوالي. وعند تحليل اللبن المنتج بواسطة كل مجموعة كانت النتائج كالآتي: المحتوي المالي للألبان في كل من المجموعة الأولي والثانية والثالثة زاد بنسبة ٣% و ٠,٦% و ٠,٢% علي التوالي، ونقصان البروتين في المجموعة الأولي إلي ١١% وزاد في كل من المجموعة الثانية والثالثة إلي ١٢% و ١٠% علي التوالي. نسبة الرماد في لبن المجموعات الثلاث زاد بنسبة ٥٠% و ٥% و ١٠% علي التوالي. نسبة الدهون في لبن المجموعة الأولي زاد بمقدار ٤٢% وزاد في كل من المجموعة الثانية والثالثة بمقدار ٤٦%. نسبة سكر اللاكتوز في لبن المجموعات الثلاث نقص بمقدار ٢% و ٣% و ٢% علي التوالي. نسبة المواد الصلبة الذائبة الكلية في لبن المجموعات الثلاث زاد بمقدار ٥%. نسبة الكالسيوم في لبن المجموعات الثلاث زاد ثلاث أضعاف بينما الفسفور في لبن المجموعات الثلاث زاد ضعفين. لم يلاحظ على الأبقار التي أعطيت عليقه تحتوي علي الصمغ العربي أي مشاكل صحية أو أعراض جانبية.