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BENTONITE CLAY EFFECTS AS ANIMAL FEED ADDITIVES ON MEAT QUALITY AND HEALTH. (Abst.)

Authors: Kianoosh, S. (shadi.kianoosh@gmail.com), Shivazad, M., Yazdi, K., University of Tehran, Agricultural College, Department of Animal Science

Introduction

Bentonite is a natural clay that comes from volcanic ash and consists mainly of montmorillonite with minor amount of illite, kaolinite, cristobalite and other minerals. (Adamis,2005). Because of properties and accessibility, bentonite is widely used as a feed additive. Today high concentrate diets for elimination of high production animals nutrient needs and maximize growth are used. This great change in the diets has not enough conforming to evolution itinerary of ruminant gut. So to improve fermentation conditions and prevention of metabolic disorders, different additives are used. Bentonite helps eliminate aflatoxins, cadmium and radiocaesium, and ameliorate food allergies, mucus colitis, spastic colitis, viral infections, and parasites that are unable to reproduce in the presence of the clay (Debbinski,1985, Grosicki,2000, Jacques,1986). aflatoxin B1 is a genotoxic carcinogen and a strong acute toxin in various animal species; it can also contaminate milk if lactating animals are exposed to significant levels. Moreover, this mineral taken internally supports feed passing and proper ruminal ammonia concentration in the intestinal system (Ivan et al.1992). Mineral metabolism was found to be affected by bentonite used in diet. Moreover, the response of mineral metabolism to bentonite treatment seems to be variable with respect to the element involved (Schwartz,1990). However, using of bentonite in diets decreases aflatoxin and undesirable substances in meat.

Materials and Methods

This research has been done to study the effects of sodium bentonate and sodium bicarbonate on Holstein steers meat quality and health by using 20 steers with average weight of 250±25 kg. The experiment period was 111d with 21d of adaptation. This research has been done in a completely randomized design with a 2×2 factorial arrangement with 4 experimental diets and 5 replicas (steer) in each diet. The diets were control diet (1) (without additive), diet with 4% sodium bentonite (2), diet with 1% sodium bicarbonate (3), and diet with 4% bentonite plus 1% bicarbonate (4). The basal diet is shown in table 1. The ratio of forage to concentrate was 30 to 70%. Feed consumption of each steer measured daily and the amount of weight gain measured each 21d and the feed conversion ratio was calculated. Digestibility of diets measured with the methods of acid insoluble ash (AOAC,1990). The blood sampling were taken in day before slaughter in periods of 0, 3 and 6 hours after feed consumption and frozen for later analysis of metabolites (sodium, potassium, calcium, phosphorus and urea nitrogen). At the end of experiment steers were slaughtered and the carcass specifications were measured. Data were analysed using each observation as repeated measured in a covariance components analysis using mixed procedure of SAS.

Results

The result showed that, the using of bentonite improved weight gain of steers but this effect was not the same in all diets, and most effect in daily weight gain belongs to diets 2 and 4 and the less effect was belongs to diet 1. No significant effect was found between the steers feed consumption. Using of bentonite improved feed consumption efficiency of steers received diet 2 in compared to the other groups significantly ($P<0.05$). Diet intake responses to additives vary but not significant. Increases appear most frequently during the early portion of the feeding period in the feedlot steers. After analyzing of blood samples, the significant difference were seen in concentration of plasma urea nitrogen between diet 4 and others ($P<0.05$). Coiling (1975) observed an increase in apparent nitrogen digestibility and retention in sheep fed bentonite in high-roughage diets. Also, Rindsig (1970) reported a decreased nitrogen digestibility, but increased retention as a result of adding 5% and 10% bentonite to a high-concentrate dairy cow diet. Plasma Ca and P concentration of steers received diet 4 had significant difference compared with those fed diet 1 & 2 ($P<0.05$). Huntington (1977) showed that there were no significant differences in serum levels of Ca & P among treatments. Other workers have reported that bentonite lowered Ca and P retention in dairy cow or lowered Ca but increased P retention in sheep. 6h after feed consumption the concentration of plasma Na and K of steers fed diet 4 had significant difference compared to others ($P<0.01$). No significant difference was found between steers carcass fed by different diets.

DISCUSSION

weight gain improvement were caused by prevention of metabolic disorders, increasing of microbial protein production, improvement of rumen pH and fermentation conditions. (Cho, 2001). From data obtained in Dunn et al., experiment (1979) with lambs, it appears that 2% sodium bentonite, 2% sodium bicarbonate or a combination of these can be used effectively to provide a high degree of protection against death losses from rumen acidosis during an abrupt change from a high-roughage to a high-concentrate diet.

The beneficial effects of dietary bentonite observed in the early phase of the feeding period and the absence of economically important adverse effects, related to use of small particle size bentonite, indicate a potential for its use in the adaptation of steers to high-concentrate diets. Results showed no adverse effects of bentonite on blood metabolites. But using of high amount of bentonite causes some nutrients deficiencies due to its binding capacity. The final conclusion showed that the using of sodium bentonite in feedlot steers high concentrate diets is recommended.