Journal of Animal and Veterinary Advances 6 (1): 139-141, 2007

Poultry By-Product Meal as a Feed Supplement in Mid-Lactation Dairy Cows

J.J. Álvarez González, J.R. Orozco Hernández, O. Orozco Ibarra, J.J. Uribe Gómez, V.O. Fuentes
Departamento De Ciencias Biológicas, Centro Universitario De Los Altos, Universidad De Guadalajara, Tepatitlán De Morelos, Zip Code 47600, P.O. Box 58 Jalisco, México

Abstract: The egg producing industry discards old stock to keep a dynamic population, which is dehydrated and pulverised to obtain a meal which is used as a source of amino acids, essential fatty acids and minerals. The resulting product is called Poultry By-Product Meal (PBM). The present study was undertaken to assess the impact of the addition of PBM to dairy cows feed on milk production. Nine mid-lactation (averaging 50 days in milk) were blocked as low, medium and high milk producers. Animals were individually stationed to monitor feed intake and dairy yield. The amount of PBM added to a corn silage based ration was 0, 500, or 1000 g day^{-1}, also ground sorghum and vitamin-mineral premix were utilised. In a general manner, the addition of PBM improved most of the production parameters ($p<0.05$) of cows. Hence, adding PBM as protein source to cow feed improves the milk production and characteristics in the mid-lactation stage.

Key words: Dairy cow, poultry-by-product meal, production, premix, sorgum

INTRODUCTION

The animal industry uses various sources of protein and essential lipids in monogastric and ruminant feeding, among these ingredients are the co-products from mammals and poultry industrialisation (Al-Saiady *et al*., 1997; Bohnert *et al*., 2000; Mustafa *et al*., 2000; Villasenoe, 2003). These animal by-product are thermally treated to produce a safe source of various nutrients (protein, fatty acids, minerals, etc.) for pets, pigs and ruminants (Bohnert *et al*., 2000; Hurton, 1999; Klopfenstein *et al*., 1998). But also the heat kills thermosensitive pathogens that may be present (Hunton, 1999; Mustafa *et al*., 2000) . The animal co-product use as ingredient in the feed may present a level of protein from 50% (meat meal, meat and bone) and up to 80% (fish meal, feather meal and blood meal) (Hunton, 1999; NRC, 2001).

The In the animal industry meat and bone meal are forbiden ingredients for the ruminant feeding. On the other hand poultry processing industry provides with a co-product rich in protein and energy, the Poultry By-product Meal (PBM), which has a more constant nutritive value compared to meat meal (Lallo and Gracia, 1994; Mustafa *et al*., 2000; NRC, 2001) . The by-pass protein content of the PBM is similar to that of the soybean meal (Henson *et al*., 1997; Kim and Palleison, 2003; Klemsrud *et al*., 1997; NRC, 2001; Weigel *et al*., 1997). Little published research has been done using the ingredient in the ruminant and less in the mid-lactation dairy cow feeding.

MATERIALS AND METHODS

Nine Holstein cows averaging 500 kg of body weight, 50±20 Days In Milk (DIM) and similar number of parturition were blocked according to their previous production record in three groups; low, medium and high milk producers. The cows were stationed in individual stalls (40% covered) with fixation to allow measurements, the floor was made of concrete to allow daily cleaning. Feed and water was always available.

One cow of each group was assigned randomly to one of the treatments. The rations were offered as totally mixed to fill the animal nutrient requirement (NRC, 2001) , using corn silage (pH 4.25, 12% crude protein, 54% neutral detergent fibre), ground sorghum grain and a commercial mineral mix. Three fixed levels (0, 500 and 1000 g day^{-1}; dry matter basis) of Poultry By-product Meal (Table 1) were added to the feed and assessed using the mid-lactation Holstein cows. Feed was daily prepared and a 10% of orts was allowed.

The experiment consisted in three periods of 21 days each; 15 days for adaptation and 6 to

Table 1: Poultry By-product Meal (PBM) value

	Mean	Minimum	Maximum
Humidity, %	7	1	10
Total fat, %	25	20	30
Crude protein, %	55	50	60
Ash, %	8	1	10
Calcium, %	4	1	5
Phosphorus, %	1.5	1	2

Corresponding Author: J.R. Orozco Hernández, Departamento De Ciencias Biológicas, Centro Universitario De Los Altos, Universidad De Guadalajara, Tepatitlán De Morelos, Zip Code 47600, P.O. Box: 58 Jalisco, México

measure intake and milk yield. Samples of ingredients and feed were obtained daily and pooled at the end of measurement period and a sub-sample was used to determined dry matter by drying during 48 h at 70°C to adjust the feed amount.

Milk yield measurement and sampling were performed during four consecutive milking periods (morning and evening), a milk nutritional (fat, protein, solids) evaluation was performed using ultrasound (Ekomilk-M™, Milkana Kam98-2A, Bulteh 2000 Ltd, Bulgaria) and the daily yield of nutrients was calculated. Data were statistically analysed as a Switch-back design, establishing an alpha of 0.05 to declare differences among treatments and when they were found the Duncan test was used to separate the means (SAS, 1985).

RESULTS AND DISCUSSION

Daily dry matter intake averaged 15.85 kg, increasing when the PBM was included in the feed compared to the control ($p<0.05$; Table 2). Other have reported no changes in the intake of beef steers (Bohnert *et al*., 2000; Klopfenstein *et al*., 1988; Villasehor, 2003) and growing sheep (Lallo and Gracia, 1994) when the PBM was added to the feed.

Uncorrected daily milk yield was augmented by the used of 1000 g of PBM ($p<0.05$) with similar production for 500 g and control ($p>0.05$). Also fat content in milk was affected with the use of the ingredient ($p<0.05$; Table 2). The milk production and its fat content response to the highest level of PBM could be related to the amount of fat (energy) and long chain fatty acids, included with the ingredients in the feed and transferred to the milk. The 4% fat corrected milk and fat yield showed increments in relation with the level of PBM in the feed ($p<0.05$; Table 2), which again could be the animal response to the ingredient composition.

Table 2: Performance of dairy cow fed different amounts of poultry by product meal

	Grams of poultry by product meal per day		
	0	500	1000
Dry matter intake, kg day^{-1}	15.66a	15.95b	15.95b
Yield, kg day^{-1}			
Milk	18.26a	18.41a	19.23b
4% fat corrected milk	17.72a	18.90b	24.86c
Lactose	0.82a	0.84b	0.92c
Fat	0.69a	0.76b	1.13c
Solids no-fat	1.53a	1.58b	1.68c
Protein	0.58a	0.62b	0.62b
Concentration, g kg^{-1}			
Protein	31.6a	32.4b	31.3c
Fat	36.7a	39.3b	57.0c
Lactose	44.1a	44.5b	44.5c
Solids no-fat	82.9a	84.1b	85.1c

a-c. Values within row not sharing the same letter denotes differ significantly ($p<0.05$)

When the PBM was augmented in the feed the lactose content of the milk increased ($p<0.05$; 4.41%, 4.45%, 4.65% for 0, 500 and 1000 g day^{-1}, respectively). Same behaviour was observed for the non fat solids of the milk ($p<0.05$). The protein content of the milk behaved in a quadratic form related with the PBM addition ($p<0.05$; Table 2), the highest value for the 500 g day^{-1}. However when it was expressed in a daily bases, no difference was observed among the PBM levels ($p>0.05$), which in turn resulted in similar 3% protein corrected milk between treatments (20.63, 20.71, 19.5 day^{-1} for 1000, 500 and 0 g day^{-1} of PBM respectively; $p<0.05$).

CONCLUSION

In conclusion, the daily production of milk components in the mid-lactation dairy cow had a positive response of the fixed addition of PBM to diet compared to the control.

REFERENCES

Al-Saiady, M., M.S. Kraidees, E.T. Eldin and M.A. Abouheif, 1997. Effect of supplemental poultry offal meal on feedlot performance and carcass characteristics of Holstein calves. J. Applied Anim. Res., 11: 121-128.

Bohnert, D.W., B.T. Larson, M.L. Bauer, A.F. Branco, K.R. McLeod, D.L. Harmon and G.E. Mitchell, 2000. Nutritional evaluation of poultry by-product meal as a protein source for ruminants: small intestinal amino acid flow and disappearance in steers. Univ. Kentucky Beef Cattle Res. Rep., pp: 59-64.

Hunton, P., 1999. Cycling spent hens for feed. Feed mix. 7: 29-32.

Henson, J.E., D.J. Schingoethe and H.A. Maiga, 1997. Lactational evaluation of protein supplements of varying ruminal degradabilities. J. Dairy Sci., 80: 385-392.

Kim, W.K. and P.H. Patterson, 2003. *In situ* evaluation of hen mortality meal as a protein supplement for dairy cows. J. Dairy Sci., 86: 3337-3342.

Klemsrud, M.J., T.J. Klopfenstein, A.J. Lewis, D.H. Shain and D.W. Herold, 1997. Limiting amino acids in meat and bone and poultry by-product meals. J. Anim. Sci., 75: 3294-3298.

Klopfenstein, T., R. Mass and R. Lucena, 1988. Nonenzymatically browned laying hen carcasses for ruminants. University of Nebraska Cooperative Extension. Report MP-70.

Lallo, C.H.O. and G.W. Garcia, 1994. Poultry by-product meal as a substitute for soybean meal in the diets of growing hair sheep lambs fed whole chopped sugarcane. Small Rum. Res., 14: 107-114.

Mustafa, A.F., S.Y. Qiao, P.A. Thacker, J.J. McKinnon and D.A. Christensen, 2000. Nutritional value of extruded spent hen soybean meal blend for pigs and ruminants. J. Sci. Food Agric., 80: 1648-1654.

National Research Council (NRC), 2001. Nutrient requirements for dairy cattle. (7th Edn.), National Academy Press, Washington, DC., USA.

SAS®, 1985. User's guide; Statistics. Version 5. SAS Institute Inc. Cary, NC., USA.

Villaseñor-Ruíz, F., 2003. Addition of poultry by-product meal to the feed of Charolais steers. M.Sc. Thesis. University of Guadalajara.

Weigel, D.J., J.P. Elliot and J.H. Clark, 1997. Effects of amount and ruminal degradability of protein on nutrient digestibility and production by cows fed tallow. J. Dairy Sci., 80: 1150-1159.