THE EFFECTS OF FEEDING DIFFERENT LEVELS OF CUMINUM CYMINUM L ON MILK YIELD AND COMPOSITION AND SOME BLOOD METABOLITES OF HOLSTEIN DAIRY COWS

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Abstract—An experiment was conducted to determine the effects of feeding cuminum cyminum L(CCL) to lactating dairy cows. In their 35±5 days in milk, 8 Holsteins (4 primi- and 4 multi-parous) averaging BW of 660±15 and initial milk production of 47±2 kg were assigned according to parity to a 4×4 change over design with 21 day periods. Cows fed the same TMR except that CCL was included and mixed with TMR at rates of 0, 100, 200 and 300 g/d to Constitute experimental treatments. Adding CCL to lactating cows TMR increased DMI and milk production when compared to control group ($p<0.05$) with no changes in milk component concentrations. Blood glucose, BHBA, cholesterol and urea were also unaffected by treatments. Overall, Results of the present study showed that supplementing dairy ration by CCL at 200 g/d may be more beneficial for milk production efficiency.

Index Terms—Dairy cow, Cuminum Cyminum, Milk yield, Blood Parameters.

I. INTRODUCTION

Sustainable dairy farming necessitates new approaches to improve milk production efficiency. The need for more efficient production systems is growing due to the ongoing increases in the costs of production particularly those of feedstuff in developing countries such as Iran. On the other hand, research has showed that the use of chemical additives especially antibiotics in animal nutrition may result in the accumulation of chemical residues in animal products. Therefore, the use of organic feed additives in animal nutrition has gained more attention during recent years due to concerns about food safety and human health.

Feed additives are included in small quantities in the diet to improve nutrient utilization by the animal and to increase production efficiency. *Cuminum cyminum L* (CCL) is one of the most important herbal medicines in Iran regarding its cultivation area and has been used to treat a wide range of diseases in Iranian traditional medicine (2). Since CCL has been shown to have anti-fungal and anti-bacterial activity (4).

it has been used as a food preservative and thus is potentially a safe alternative to chemical preservatives used in dairy industry. The positive effects of CCL on milk production in humans have been proved (1). However, data describing its efficiency to improve dairy cow performance is lacking. Therefore, the present study was conducted to evaluate the ability of CCL to improving milk production efficiency and to investigate its effects on some blood metabolites of Holstein dairy cows in early lactation period.

II. MATERIAL AND METHODS

In their 35±5 days in milk, 8 Holstein dairy cows (4 primi- and 4 multi-parous) averaging BW of 660±15 and initial milk production of 47±2 kg were assigned according to parity to a 4×4 change over design with 21 day periods. Cows fed the same TMR except that CCL was included and mixed with TMR at rates of 0, 100, 200 and 300 g/d to Constitute experimental treatments. The animals had free access to water and sodium chloride blocks. The first 18 days of each period was considered as adaptation period to experimental diets followed by 3 days of milk and blood samplings. Blood samples were analyzed for glucose, BHBA, urea and cholesterol. The blood metabolite measured using special size kits with an autoanalyzer (model BS380). Feed samples were taken weekly for DM analysis and DMI calculation. Milk yield was recorded during the last 10 days of each period and feed intake was recorded during the last week of each period. Data obtained was analyzed using the MIXED procedure of SAS software (version 9.2) with parity as block and cow as random effects. Least squares means difference was used to make comparison among groups and significance level was set at 0.05.

III. RESULT AND DISCUSSIONS

A. DMI and milk production

Adding CCL to lactating cows TMR increased DMI when compared to control group ($p<0.05$) but there were no significant differences among different supplementation levels (table 1). However cows feed 200 g/d CCL showed numerically more DMI compared to those feed lower or higher amounts of CCL. Increased DMI is in agreement with the results of Forster et al (1980) and could be attributed to increased palatability of the TMR since most herbal feed additives stimulate DMI by means of their flavor (7). In addition, increased secretion and function of pancreatic and intestinal enzymes could not be ruled out. Therefore, Increased DMI in cows fed CCL might

have been mediated by improved nutrient digestibility (12).

Cows received CCL in TMR produced more milk than those fed the control diet ($p<0.05$) but again there was no significant difference among different levels of CCL on milk yield. However, Cows in 200 g/d CCL group produced numerically more milk than other treatment groups. Higher DMI and improved nutrient digestibility caused by CCL supplementation and therefore increased nutrient supplied to mammary glands might have led to increased production of milk in cows receiving CCL in the diet. Additionally, CCL contains about 2-5% volatile compounds 40-65% of which is composed of cumin aldehyde (11).

Cumin aldehyde, thymine and terpenoides could have played a role in increasing milk production of cows fed CCL. Milk component concentrations were not affected by the treatment that was in accordance with the results of Moheghi et al (9) who observed no effects on composition by feeding dried CCL pulp to dairy cows. In addition, no change in milk flavor was observed by the use of CCL in the diet.

Bhatt et al. (3) reported that cumin has galactapoiesis property that partially explains the increase in milk production in the cows fed CCL. Feeding galactagogue herbs to ruminants have been previously studied (8). The galactagogue substances have been found to mediate their effects by stimulating the endogenous hormonal secretion in mammals (8). These results were not observed in the cows consumed high level of CCL which indicated that an -optimum dose of supplemented CCL is required in the diet of lactating cows. Similarly, Heidarian et al. (6) observed the effect of supplementation cumin extract for lactating goats was not different when the amount of supplementation was changed.

B. Blood Metabolites

Blood glucose, cholesterol and BHBA were not significantly affected by the CCL supplementation (table 2) but despite higher milk production, there was a numerical trend toward improvements in energy status as indicated by higher glucose and lower levels of BHBA and cholesterol in CCL treated cows particularly in those received 200 g/d CCL. Blood urea was also unaffected by the treatments although it was numerically lower in cows fed CCL and this might indicate the more efficient use of dietary protein for production purposes. Reduced blood cholesterol in CCL treated cow may be attributed to decreased acetate to propionate ratio since the acetate to propionate ratio in rumen fluid is a major determinant of blood cholesterol (10).

Table 1. Effects of feeding different levels of CCL on DMI, milk yield and composition of Holstein dairy cows

	CCL (g/d)					
Item	0 (control)	100	200	300	SEM	P-value
DMI (kg/d)	22.74^{b}*	25.14^{a}	25.97^{a}	25.87^{a}	0.65	0.01
Milk yield (kg/d)	47.9^{b}	52.3^{a}	56.0^{a}	53.7^{a}	1.41	0.007
Milk fat (%)	3.17	3.01	2.86	2.80	0.17	0.45
Milk protein (%)	2.72	2.73	2.72	2.71	0.026	0.92
Milk lactose (%)	4.73	4.76	4.74	4.72	0.022	0.74

DMI=Dry Matter Intake

* Values with different superscripts differ significantly at 0.05

Table 2. Effects of feeding different levels of CCL on blood metabolites of Holstein dairy cows

	CCL (g/d)					
Item	0 (control)	100	200	300	SEM	p-value
BHBA (mmol/L)	0.513	0.491	0.461	0.460	0.046	0.81
Urea (mg/dL)	13.11	12.82	12.82	12.65	0.3	0.75
Cholesterol (mg/dL)	202.0	196.9	197.9	171.8	12.38	0.33
Glucose (mg/dL)	52.8	56.3	56.4	54.4	1.82	0.46

BHBA=Beta Hydroxy Butyric Acid

* Values without different superscripts differ significantly at 0.05

CONCLUSION

Generally, feeding *cuminum cyminum* L to Holstein dairy cows increased DMI and milk yield with no changes in milk composition and blood glucose, BHBA, cholesterol and urea concentrations. Among others, feeding 200 g/d of CCL seemed to be more beneficial to milk production efficiency.

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