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Article

Comparative efficacy of black cumin and domperidone therapy on milk yield and fat percentage of indigenous cow

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Abstract: The current study was designed to improve milk production and milk fat percentage by supplemented with black cumin and domperidone for thirteen weeks during lactation in indigenous cows. The experiment was performed in Kaligonjupazila of Lalmonirhat under the department of Physiology and Pharmacology, HSTU, Dinajpur, Bangladesh. At 7 days of lactation 16 deshi cows were randomly divided into 4 groups (n=4 lactating cows in each group). Group T_1 was kept as control, Group T_2 was treated with domperidone (Motigut®) orally at a dose of 100 mg /day per cow, Group T_3 was treated with Black Cumin Seed Powder (BCSP) at a dose of 80 g orally per cow per day and Group T_4 was treated with combination of domperidone with Black Cumin Seed Powder (BCSP) as above mentioned doses. All the animals were dewormed and vaccinated at initial stage. Over the course of the trial, observations were recorded for milk production and fat percentage in milk. Milk production were increased significantly ($P<0.05$) in all treated groups compared to the control group and highest was recorded in combined domperidone with Black Cumin Seed Powder (BCSP) group (Group T_4). Production level increased significantly ($p<0.05$) in all treated groups and highest was recorded in cows of group T_4. The present study reveals that additional supplementation with domperidone plus Black Cumin Seed Powder (BCSP) in feed of lactating cows should better performance over other groups in respect to increase milk production and fat percentage in milk without any health hazard in indigenous cows. This technology may be transferred to farmers since drug (Domperidone) and supplement (BCSP) is available and require minimum stillness.

Keywords: milk production; fat percentage; black cumin; domperidone; indigenous cow

1. Introduction

The role of livestock sub-sector is vital for the economic development of agro-based Bangladesh. The contribution of livestock to National Gross Domestic Product (GDP) is 2.79 percent and which is 17.15 percent in Agricultural share (DLS, 2016). About 44 percent of the animal protein comes from livestock sources. Moreover, 4.31 percent of the total export is from the export of leather and leather goods. Poverty reduction, gender equity and empowerment of women are amongst targets of Millennium Development Goals (MDG). To achieve the goals, Bangladesh government has identified livestock as one of the key player of poverty reduction strategy. The government has set strategic targets for meeting protein demand, employment generation, up-scaling export earnings and women's empowerment through the Livestock sub-sector. It is undeniable that the sector has been able to achieve this success due to support from the government in various forms.

Livestock population in Bangladesh is currently estimated to comprise 25.7 million cattle, 0.83 million buffaloes, 14.8 million goats, 1.9 million sheep, 118.7 million chickens and 34.1 million ducks (DLS, 2016). This density has been increasing every year in the country. In spite of a high density of livestock population, the country suffers from an acute shortage of livestock products like milk, meat and eggs (Sarker *et al.,* 2015). The shortage accounts for 85.9%, 88.1% and 70.7% for milk, meat and eggs, respectively. The annual growth rates of these products have significantly increased in recent years. It is expected that an increase in investment in livestock research and extension by one taka will give a return of taka 1.42 to 3.15 per year depending on the type of livestock species and products.

The cattle of Bangladesh are mostly of indigenous type (*Bos indicus*) with few cross breeds along with some pure breeds such as Sindhi, Sahiwal, Jersy, Holstein-Friesian. The number of cross bred cattle is increasing day by day with the spread of artificial insemination practices throughout the country. The milk production of our indigenous cattle is low compared to improved breeds of cattle (Ahmad *et al.,* 2013). Not only milk production, fat percentage also low due to the lack of balanced ration and poor genitical makeup of the breed associated with poor management practices (Islam, 2009). Studied that about 37% of heifers were found to be infertile due to delayed maturity observed slow rate of gain and delayed maturity heifers on low plane of nutrition, compare to that of unrestricted feeding, which showed better body formation (Hamid and Hossain, 2014).

All the same way the growth rate of calves is very poor. Because they don't get sufficient amount of milk from their mothers udder to meet their nutritional requirement. In present socio-economic condition the farmers are unable to supply sufficient amount of cereal grains to their dairy cows for milk production (Nath *et al.,* 2016). Hence the production of milk of their dairy cows are not increasing.

With the increasing human population (2.4% per year), farm size decreases and farms are fragmented from generation to generation. Therefore, the fibrous crop residues constitute an important source of food for dairy cattle nutrition in the country. Available feeds are sometimes fed without consideration of their quality or the requirement of the animal. Such diets adversely affect the growth rate and milk production (Samad *et al.,* 2014).

Black Cumin *(Nigella sativa)* can be used as a galactagogue in traditional medicine. Hence, the effects of aqueous and ethanolic extracts of *N. sativa* seeds on milk production in rats were evaluated (Khan, 1999). The measurement of milkproduction was by measuring pup weight during suckling period (Hosseinzadeh *et al.,* 2013). Approximately 2 kg of straw and 80 g of concentrate are available per cattle per day. Under the prevailing condition, the formulation of conventional balanced ration is difficult because of limitation in feed stuffs, both quantitatively and qualitatively. The strategy therefore, is to manipulate this limited amount of feed supplement, cereal, animal by-products, green grasses and tree leaves in such a way that the basic feed requirement are maximized. Galactogogues are medications that aid in initiating and maintaining adequate milk production. Most exert their pharmacologic effects through interactions with dopamine receptors, resulting in increased prolactin levels and thereby augmenting milk supply re-maximized. Protein is needed in a ration of dairy cows for their maintenance, production and reproduction. The main source of protein in dairy cow's ration in Bangladesh is oil cake. The possible way to improve the nutritive values of poor quality roughage by supplementing some concentrates in the ration of ruminants (Sarder *et al.,* 1997). Furthermore Black Cumin Seed Powder and domperidone increase the production level of milk simultaneously.

Therefore the present study was carried to know the effect of Black Cumin Seed Powder and domperidone on milk yield and milk fat percentage.

2. Meterials and Methods

2.1. Study area and period

The study was conducted over a period of six months from July to December-2015. Milk samples were collected from different experimental cows (which were reared under certain condition) in Kaligonj Upazila, Lalmonirhat district in Bangladesh.

2.2. Selection and management of animals

For the convenience of the study 16 indigenous lactating cows selected from different area of Kaligonj Upazila under Lalmonirhat district in Bangladesh. The selected animals used only for dairy purpose during the study period. The lactating animals were approximately 5-6 years old and on a 125 kg to 172 kg body weight and all the animals were maintained under traditional farm condition of Bangladesh where all the animals were kept under the same managemental conditions. Straw was the staple feed for the cows and green grasses were available depending on the season. The calves were tied or tethered at the night and allow to free access or suckling to their dam during the whole day.

2.3. Experimental design

All the 16 cows were randomly divided into 4 groups; four cows per group (T_1, T_2, T_3 and T_4) for assessing the efficacy of Black Cumin Seed Powder (BCSP) and domperidone for milk yield and fat percentage. Group T_1 considered as control, group T_2 was treated with domperidone (100 mg/cow/day), Group T_2 was treated with BCSP (80g /cow/day), and Group T_4 was treated with both domperidone and BCSP combined at previous dose. All the cows of control and treated groups were closely observed for thirteen weeks and following parameter were studied.

2.4. Feeding and milking management

The experiment was started after two weeks of calving. The supplements were fed about half an hour before milking. All cows were milked twice a day after having been suckled by their calves for about 1-2 minutes before milking. After milking, daily milk off-take was measured using graduated plastic jug by the farmers and yield was recorded daily. Representative milk samples were taken every two weeks (15 Days) in test tube. Samples from each cow were analyzed in Digital Fat Testing (DFT) machine at 15 days interval to monitor the quality. Analysis was carried out to measure the milk volume and milk fat percentage. Before starting the experiment weight of all the cows and their calves were taken initially by measuring heart girth and shoulder to bone by applying the formula: $LG^2/300$ pound (Shaeffer's formula).

2.5. Collection and examination of milk sample

Milk samples were collected from each cow once a month and analyzed for the percentage of milk fat, protein, lactose, Solid Not Fat (SNF) and minerals. The milk compositions were analyzed by using the automated milk composition analyzer (MILKOTESTER®, Milk analyzing device, Model: MINI 3Milkotester Ltd. BULGARIA) in CARE Rangpur branch, RO Circuit House Road Dhap Rangpur-5400, Bangladesh.

The Gerber Method is to test Milk Fat percentage. Briefly; milk fat is separated from proteins by adding sulfuric acid. The separation is facilitated by using amyl alcohol and centrifugation. Then the fat content is read directly via a special calibrated butyrometer.

2.6. Statistical analyses

Data were analyzed by analysis of variance using Completely Randomized Design with factorial arrangement of time and treatments. All analyses were performed by SPSS program.

3. Results and Discussion

3.1. Milk yield of cows

Average milk yield of the cows was 1.18±0.04, 1.39±0.05, 1.66±0.05 and 1.74±0.03 for groups T_1, T_2, T_3,T_4 respectively (Table 1). Statistical analysis showed that milk yield of group T_4 was significantly higher ($P<0.05$) than the cows that were on other groups. It is mentioned earlier that cows on T_4 group received the domperidone and BCSP mixture. Maizi *et al.* (2007), Roy *et al.* (2007) and Mohamed-Khair *et al.* (2007) reported the similar milk yields. They usually get the exact amount of nutrients which they need. Lower milk yield of T_1 group might be due to the fact that they did not receive any kind of supplements.

Average daily milk yield of the cows during the different weeks of lactation are presented in Table 1. In our study it is evident that milk yield increased gradually with advancing stages of lactation, up to around 10 weeks of experiment, after which there was a decreasing tendency of milk production in all group. This might be due to effect of stages of lactation as we know that milk production decrease after three months of lactation. In this situation, when domperidone and BCSP mixture was offered to them then milk production was high in T_4 group. Zuppa *et al.* (2010) reported that one of the most frequent indication for the use of domperidone is the diminution of milk production significantly ($P<0.05$) in mothers using indirect lactation, particularly in the case of preterm birth.

3.2. Milk fat of cows

Milk samples were analyzed to know the fat. Average fat content of milk during the different periods of study are shown in Table 2. It was observed that fat content in the milk of cows that were on group T_1, T_2, T_3 and T_4 was 4.31±0.133, 4.48±.034, 4.1±.074 and 4.11±0.074 milk respectively. Statistical analysis showed that there was no significant different between the fat content of milk of different groups of cows. The fat content of milk of indigenous cows also agrees with the findings of Islam *et al.* (2009), Paul *et al.* (2013). Slightly high fat content of milk of T_4 group might be due to the fact that they were reared mainly on domperidone and BCSP mixture. It is now well established that milk fat percentage depend on milk production also. When milk production decreases then milk fat percentage increases.

Table 1. Milk yield (L) of different groups of cows.

Groups	Weekly milk production of experimental cows (Mean±SEM)												
	Week 1	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**	**Week 9**	**Week 10**	**Week 11**	**Week 12**	**Week 13**	**Average**
T_1	1.08^{a}±.12	1.09^{a}±.09	1.22^{a}±.07	1.38^{b}±.08	1.25^{c}±.01	1.06^{c}±.11	1.19^{c}.04	1.25^{c}±.10	1.24^{b}±.02	1.23^{c}±.03	1.20^{c}±.03	1.10^{c}±.06	1.10^{d}±.08	1.18^{c}±.04
T_2	0.98^{a}±.06	1.13^{a}±.04	1.18^{a}±.04	1.29^{b}±.03	1.29^{c}±.07	1.35^{b}±.07	1.49^{b}±.01	1.54^{b}±.02	1.63^{a}±.07	1.63^{b}±.09	1.61^{b}±.10	1.55^{b}±.110	1.48^{c}±.062	1.39^{b}±.05
T_3	1.13^{a}±.07	1.34^{a}±.08	1.43^{a}±.09	1.64^{a}±.07	1.83^{a}±.06	$1.86±^{a}$.06	1.85^{a}±.09	1.76^{ab}±.10	1.80^{a}±.10	1.78^{b}±.09	1.73^{b}±.08	1.75^{b}±.102	1.75^{b}±.02	1.66^{a}±.05
T_4	1.18^{a}±.06	1.24^{a}±.03	1.38^{a}±.07	1.36^{b}±.05	1.51^{b}±.01	1.63^{a}±.08	1.76^{a}±.01	1.94^{a}±.06	1.88^{a}±.04	2.09^{a}±.05	2.00^{a}±.04	2.33^{a}±.059	2.31^{a}±.06	1.74^{a}±.03
Significant	NS	NS	NS	*	*	*	**	*	*	*	*	*	*	*

NS= Non significant
** = Significant at the (p< 0.01) level
*= Significant at the (p< 0.05) level

Table 2. Average fat content (/kg) in the milk of cows.

Groups	Initial (Mean ± SEM)	15 days (Mean ± SEM)	30 days (Mean ± SEM)	45 days (Mean ± SEM)	60 days (Mean ± SEM)	75 days (Mean ± SEM)	91 days (Mean ± SEM)	Average (Mean ± SEM)
T_1	4.05^{a}±.15	4.20^{a}±.12	4.12^{ab}±.12	4.22^{a}±.17	4.48^{bc}±.16	4.43^{b}±.11	4.55^{a}±.18	4.31^{ab}±.13
T_2	4.00^{a}±.07	4.08^{ab}±.04	4.48^{a}±.02	4.48^{a}±.18	4.88^{a}±.09	4.75^{a}±.06	4.70^{a}±.09	4.48^{a}±.03
T_3	3.65^{a}±.08	3.85^{b}±.11	3.90^{b}±.14	4.28^{a}±.17	4.20^{c}±.17	4.35^{b}±.17	4.55^{a}±.18	4.11^{b}±.07
T_4	3.78^{a}±.19	4.10^{ab}±.07	4.60^{a}±.13	4.73^{a}±.18	4.70^{ab}±.19	4.75^{a}±.06	4.75^{a}±.11	4.49^{a}±.09
Significant	NS	NS	*	**	*	**	**	*

NS= Non significant
* = Significant at the 0.05 level
** = Significant at the 0.01 level

4. Conclusions

Combined supplementation of domperidone with Black Cumin Seed Powder in cows is highly beneficial for enhanced milk production without making any potential hazards of indigenous cows and our formulations could be used as a milk enhancer of our indigenous cows.

Conflict of interest

None to declare.

References

Ahmad A, A Husain, M Mujeeb, SA Khan, AK Najmi and AK Siddique, 2013. A review on therapeutic potential of *Nigella sativa*: A miracle herb. Asian Pac. J. Trop. Biomed., 3: 337–352.

Das PK, SZ Ali, ABMM Islam and BK Roy, 2003. A comparative study of productive and reproductive performance and estimates of heritability for economic traits in different genetic groups of cattle available at Baghabarighatmilk pocket area of Bangladesh. Online J. Biol. Sci., 3: 726-740.

DLS, 2016. Livestock Economy at a Glance 2015-2016. Directoate of Livestock Services, Bangladesh.

Hamid MA and KM Hossain, 2014. Role of private sector in the development of dairy industry in Bangladesh.Livest. Res. Rural Dev., 26: http://www.lrrd.cipav.org.co/lrrd26/10/hami26179.htm.

Islam S, S Sultana, M Rokonuzzaman and MR Hassan, 2009.Productive and reproductive performance of crossbred and indigenous dairy cows under smallholder farming system. J. Bang. Agri. Univ., 7: 69–72.

Kabir F and JJ Kisku, 2013. Reproductive performance of different crossbred cows of Bangladesh. Afri. J. Agri. Res., 8: 723-726.

Khan MR, 1999. Chemical composition and medicinal properties of *Nigella sativa* Linn. Inflammo-pharmacology, 7:13–35.

Majid MA, TN Nahar and AI Talukder, 1995. Evaluation of productive and reproductive performance of F1, F2 and F3 progeny of localxFriesian and SahiwalxFriesian cattle in the Savar dairy Farm, Research Report of Animal production Research Division, Bangladesh Livestock Research Institute, Savar, Dhaka, Bangladesh, pp. 486-519.

Majid MA, AI Talukder and M Zahiruddin, 1996. Productive performance of pure breeds, F1, F2 and F3 generations cows raised in central cattle breeding and dairy farm of Bangladesh. Asian Aust. J. Anim. Sci., 9: 461-464.

Miazi OF, ME Hossain and MM Hassan, 2007.Productive and reproductive performance of crossbred and indigenous dairy cows under rural conditions in Comilla, Bangladesh. Univ. J. Zool. Raj.Univ., 26: 67-70.

Mohamed-Khair AA, TB Ahmed, LA Musa and KJ Peters, 2007. Milk production and reproduction traits of different grades of Zebu x Friesian crossbreds under semi-arid conditions. Arch. FuerTierz. Dumm., 50: 240-249.

Niraj K, E Alemayehu, T Abreha and AY Hailelule, 2014. Productive performance of indigenous and HolsteinFriesian crossbred dairy cows in Gondar, Ethiopia. Vet. World, 7: 177-181.

Paul AK, PKJ Abdullah-Al-Maruf and MGS Alam, 2013. Reproductive Performance of Crossbred and Indigenous (Desi) Dairy Cows under Rural Context at Sirajgonj District of Bangladesh. J. Emb. Trans., 28: 319-324.

Roy BK, A Wadud, MN Islam, A Roy, MSA Bhuiyan and S Faruque, 2007. Quantitative analysis on productive and reproductive performance of different groups of dairy cows in army military dairy farms, Bang. J. Livest. Res., 14: 136-145.

Roy BK, A Wadud, MN Islam, A Roy, MSA Bhuiyan and S Faruque, 2007. Quantitative analysis on productive and reproductive performance of different groups of dairy cows in army military dairy farms, Bang. J. Livest. Res., 14: 136-145.

Sarder MJ, MM Rahman, S Ahmed, MR Sultana, MM Alam and MM Rashid, 2007. Consequence of dam genotypes on productive and reproductive performance of dairy cows under the rural condition in Bangladesh. Pak. J. Biol. Sci., 10: 3341-3349.

Sarker YA, AH Miah, N Sharif, MH Himel, S Islam, RC Ray, TK Paul, MT Islam and MH Sikder, 2015. A retrospective study of common diseases at veterinary teachinghospital, Bangladesh Agricultural University, Mymensingh. Bangl. J. Vet. Med., 13: 55–61.

Zuppa AA, P Sindico and C Orchi, 2010. Safety and efficacy of galactogogues: substances that induce, maintain and increase milk production. J. Pharm. Sci. Exp. Pharmacol., 13: 162–174.