The Pharma Innovation Journal 2022; 11(12): 3926-3927

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(12): 3926-3927

www.thepharmajournal.com
Received: 28-10-2022
Accepted: 30-11-2022

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Effect of dietary inclusion of *Phalaris minor* seeds on economics of feeding in lactating crossbred cows

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Abstract
Phalaris minor is an annual fast spreading weed in the entire north-western belt of India, where rice-wheat cropping system is being followed, viz. Punjab, Haryana, Uttar Pradesh, Uttaranchal, Madhya Pradesh and parts of Bihar, and Himachal Pradesh. The present study was carried out to see the effect of incorporation of *P. minor* seeds in the diet of crossbred cows on economics of feeding. Experimental cows (n=18) were equally divided into three groups of six animals each *viz.*, C, T1 and T2 on the basis of milk production (12.56±0.73 kg/d). Maize grains were replaced by *P. minor* seeds in the concentrate mixture at 0, 50 and 75% (DM basis) level in groups C, T1 and T2, respectively. Cows were fed as per NRC (2001) feeding standard. Duration of study was 120 days. It was concluded that feeding of *P. minor* seeds to lactating cows was cost effective and feeding of animals can be economized by incorporating *P. minor* seeds in the diet as partial replacement of maize grains.

Keywords: Crossbred cows, *Phalaris minor* seeds, economics

Introduction
India is the largest producer of milk in the world with milk output of 209.96 million tonnes (MT) in 2020-21. Per capita availability of milk is maximum in Punjab (1219 g/d) followed by Rajasthan (1075 g/d) and Haryana (1063 g/d). Though, there is a consistent increase in milk production in the country, but considering the pace of population growth, the dietary habit of Indians and surge in demand for milk, there is need to multiply its output. To achieve these targets, the animals must be fed quality feedstuffs as per their production potential.
The availability of feed and fodder remains a major area of concern; there is a gap between its demand and supply in the country. There is shortage of conventional feedstuffs in the country, viz. 41 percent concentrate feed ingredients, 35.6 percent green fodder and 26 percent dry crop residues for feeding to livestock (DARE, 2013) [1]. Thus, to meet the nutrient requirements of animals and to achieve the targets in milk production, we need to improve either the efficiency of utilization of already existing feed ingredients/nutrients or need to tap new non-conventional feed resources.
Phalaris minor is one such feedstuff. Its seeds are widely available in agricultural fields where rice wheat crop rotation is practiced. Kaur *et al.* (2006) [2] reported that *Phalaris minor* seeds could replace wheat grains up to 100% on nitrogen basis without any deleterious effect on the nutrient utilization or health of male buffaloes. Thus, the present experiment was planned to work out the economics of feeding of *P. minor* seeds in the diet of crossbred cows.

Materials and Methods
The experiment was performed in compliance with regulations of the Institutional Animal Ethics Committee (IAEC). Eighteen healthy lactating crossbred cows (Karan Fries) in their mid-lactation were divided into 3 groups of 6 animals each in a completely randomized design *viz.*, C, T1 and T2 on the basis of milk production (12.56±0.73 kg/d) and days in milk (86.67±6.49 DIM). Nutrient requirements of animals were met as per NRC (2001) [3] feeding standards. Animals in control group (C) were fed chopped wheat straw, chaffed green sorghum fodder and maize grain based control concentrate mixture. While maize grains were replaced by *P. minor* seeds to the extent of 50 and 75% in the concentrate mixtures in groups T1 and T2, respectively. The duration of the study was 120 days.
The animals were provided with fresh and clean drinking water free of choice thrice daily at 6:00, 11:00 and 17:00 h. During study period, all the cows were housed in well-ventilated shed in Livestock Research Centre, ICAR-National Dairy Research Institute, Karnal having the arrangement for individual animal feeding. Healthy surroundings and proper sanitary

conditions were maintained throughout the experiment. Dry matter intake was recorded daily by subtracting the residual DM from the quantity of DM offered. The economics of feeding was calculated by taking into account the cost of feed ingredients prevalent at the time of study. The data were analyzed by one way ANOVA using SPSS (2012) [4] software.

Result and Discussion

The concentrate mixtures offered to cows in C, T1 and T2 groups were isonitrogenous. The economics of feeding *P. minor* seeds to lactating cows has been presented in Table 1. The dry matter intake (DMI) in C, T1 and T2 groups was 12.20, 12.26 and 11.71 kg/day and was statistically similar among the groups. Cost of *P. minor* seeds and maize grains was Rs. 1350/quintal and Rs. 1840/quintal, respectively at the time of the experiment. Based on the prevalent cost of different ingredients, the cost of concentrate mixtures fed to cows in C, T1 and T2 groups was worked out to be Rs. 2381.22/quintal, Rs. 2288.12/quintal and Rs. 2241.57/quintal in C, T1 and T2 groups, respectively. The decreased cost of concentrate in T1 and T2 groups was due to higher proportion of *P. minor* seeds which were comparatively cheaper than maize grains. The prevalent cost of green fodder and wheat straw was Rs. 135/quintal and Rs. 350/quintal, respectively during the course of study.

Net return in C, T1 and T2 groups was Rs. 136.60, 154.19 and 164.82 per cow per day, respectively, indicating that it was higher by Rs. 17.59 and Rs. 28.22 in T1 and T2 groups, respectively, over that of C group. Thus, based on the results of present study, it could be concluded that feeding of *P. minor* seeds to lactating cows was cost effective and feeding of animals can be economized by incorporating *P. minor* seeds in the diet. Similarly, Shi *et al*. (2014) [5] investigated the effects of partial or total replacement of maize with alternative feed sources (brewer's grains, Chinese jujubes and soyabean hulls) replacing maize grains in the diets of feedlot cattle and indicated that partial or total replacement of dietary maize with alternative feed sources is economically feasible due to their lower costs and comparable nutrient digestibility of DM, CP, NDF, and ADF.

Table 1: Comparative cost of milk production on feeding* *Phalaris minor* seeds as a partial replacement of maize grains to lactating crossbred cows

Attributes	C	T1	T2
DMI (kg/day)	12.20±0.23	12.26±0.16	11.71±0.14
Feed intake (fresh basis)			
Green sorghum intake (kg/d/animal)	41	42	40.70
Total green sorghum intake in 120 days trial by 6 animals (kg)	29520	30240	29304
Wheat straw intake (kg/d/animal)	1	1	1
Total wheat straw intake in 120 days trial by 6 animals (kg)	720	720	720
Concentrate intake (kg/d/animal)	6.23	5.80	5.23
Total concentrate intake in 120 days trial by 6 animals (kg)	4485.6	4176	3765.6
Feed cost (Rs.)			
Cost of concentrate for C group (@ Rs. 2381.22/Q)	106812	-	-
Cost of concentrate for T1 group (@ Rs. 2288.12 /Q)	-	95551.89	-
Cost of concentrate for T2 group (@ Rs. 2241.57 /Q)	-	-	84408.56
Total cost of wheat straw (@ Rs. 350/Q)	2520	2520	2520
Total cost of green sorghum (@ Rs. 135/Q)	39852	40824	39560.4
Total input/feed cost (Rs.)	149184	138895.9	126489
Input cost /animal/day	207.20	192.91	175.68
Average milk yield (kg/d/animal)	11.46	11.57	11.35
Total milk yield of 6 animals in 120 days (kg)	8251.2	8330.4	8172
Gross income (Rs.) from selling milk	247536	249912	245160
Net return (Gross income-Total feed cost) from 6 animals in 120 days	98352	111016.1	118671
Net return (Rs./animal /day)	136.60	154.19	164.82

*120 days experimental period

Conclusion

It was included that feeding of *P. minor* seeds as partial replacement of maize grains in the diet of lactating crossbred cows was cost effective.

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