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Evaluation of efficacy of a polyherbal galactagogue at ameliorating summer-stress associated Hypogalactia in dairy cows

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Abstract

High ambient temperature and humidity during summer season are common causes of thermal stress in dairy animals and exposure to heat-stress can result in decreased yield and poor, watery consistency of milk. Here, we report the results of a trial on the evaluation of efficacy of a polyherbal galactagogue at ameliorating summer-stress associated milk yield losses in dairy cows. 12 healthy lactating Gir cows in early to mid of first to third lactations were randomized to one of two groups. The first group was left unsupplemented while the second group received supplementation with a polyherbal galactagogue (Payapro™ bolus, *M/s* Ayurvet Limited, India) for seven days. Daily milk yield was recorded over a 30 days' period of moderate heat stress (THI = 81.9). Protein and fat content of milk and serum cortisol levels were also measured at specific intervals. The polyherbal galactagogue-supplemented group T1 showed significant improvements in milk yield, protein and fat contents, and serum cortisol levels over the untreated control group T0. Based on these findings, the polyherbal galactagogue, Payapro bolus, at 4 boli once daily for 7 days, was found to be efficacious at improving yield, and protein and fat contents of milk in dairy cows under summer stress.

Keywords: polyherbal galactagogue, ameliorating, summer-stress, Hypogalactia

Introduction

Seasonal heat stress is a common problem in livestock and depending on the magnitude of the stress in terms of duration of exposure, *viz.* acute or chronic, and harshness of the exposure, *i.e.* ambient temperature and humidity, mild to severe disturbances in physiology and mentation may be manifested that result in milk production losses both in terms of quantity and quality (West, 2003; Herbut *et al.*, 2019)^[15, 6]. Heat-stressed animals have elevated levels of glucocorticoids and turn hypophagic. Glucocorticoids, particularly, cortisol, diminish milk production by diverting the energy utilization toward coping with stress. Such physiological alterations ultimately cause losses due to hypogalactia and poor, watery consistency of milk (Hammami *et al.*, 2013; Herbut *et al.*, 2019; Mbuthia *et al.*, 2021; Potts, 2021)^[5, 10, 6, 11].

Anti-stress interventions in heat-stressed dairy animals should aim to promote animal welfare by reducing the levels of stress and to improve profitability by restoring optimum production levels and reverting the losses of milk solids. Herbal preparations commonly find use as galactagogues in stressed dairy animals and several traditional Indian herbs are established for their ability to improve milk production and let-down in animals and humans alike (Tānase *et al.*, 2021)^[14]. Polyherbal preparations, based on such herbal constituents, have been shown to reduce levels of circulating cortisol in the dairy animals, and improve appetite and reverse changes in milk production and milk solid concentration (Kumar *et al.*, 2008; Singh *et al.*, 2009; Behera *et al.*, 2013; Kalra *et al.*, 2018; Chakravarthi *et al.*, 2017, Bharti *et al.*, 2012)^[8, 3, 1, 7, 4, 2].

Here, we report the results of a trial on the evaluation of efficacy of a polyherbal galactagogue at ameliorating summer-stress associated hypogalactia in dairy cows.

Materials and Methods

The trial was held at Ganga Dairy Farm, Mehergaon, Dhule (20.9°N 74.78°E, 250 m above msl) in Maharashtra state of India. Twelve apparently healthy Gir cows, testing negative for mastitis in California Mastitis Test, in early to mid of their first to third lactations were randomized to one of two groups, as shown in Table 1.

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Table 1: Trial design

Group (n = 6)	Treatment
T0	Untreated control
T1	Payapro @ 4 boli once daily for 7 days

Both groups of animals were allotted nearly equal floor space of 50-60 sq. ft. per animal. Temperature and humidity inside the barn were measured with a digital hygrometer at about 11.00 hrs. and the temperature-humidity index (THI) was calculated as per the method of Mader *et al.* (2006) [9]. The animals received similar feed consisting of maintenance and production ration along with *ad lib* access to drinking water and green and dry fodder as per the standard farm practice. Daily record of milk yield was kept during the experimental duration of 30 days for both groups. Random milk samples from each group were subjected to estimation of fat and

protein content on days 0, 7, 14, 21 and 30 of the treatment. Serum cortisol levels were also measured on days 0 and 7 of treatment by bovine cortisol ELISA kit (Cusabio Biotech Co., Ltd, Wuhan, China) as per the manufacturer's recommendations.

The differences in results between the groups were tested for statistical significance by analysis of variance (ANOVA; Snedecor and Cochran, 1967) [13] and unless stated otherwise, all statistical inferences were drawn at $p \leq 0.05$.

Results and Discussions

The average THI during the period was calculated to be 81.9, which can be classified as moderately high stress (Potts, 2021) [11]. Treatment with the polyherbal galactagogue, Payapro bolus, at 4 boli once daily for 7 days, improved milk yield, milk protein and milk fat contents (Fig. 1; $p < 0.05$).

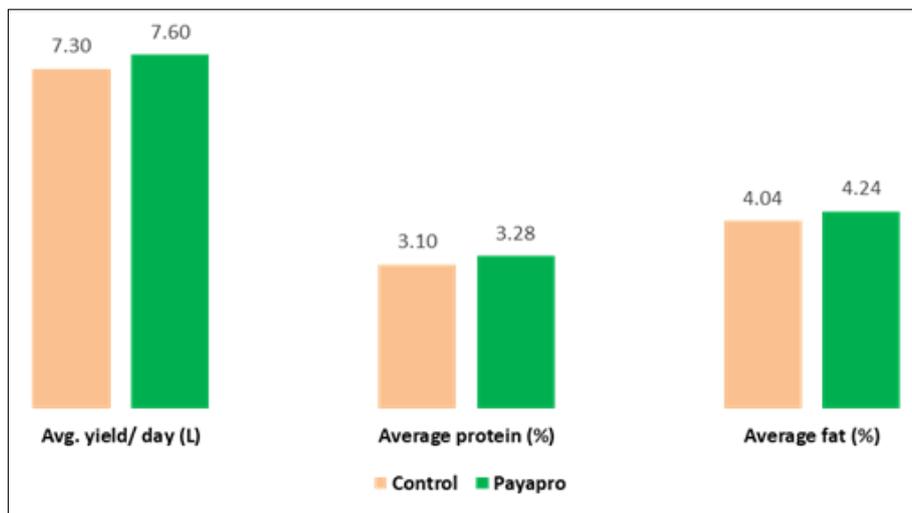


Fig 1: Group-wise average daily milk yield, and milk protein and fat contents per cow over 30-days' period of study

The improvement in milk yield of the Payapro-supplemented group became even more pronounced when corrections for 4% fat content were applied (Fig. 2); supplementation of the cows with Payapro bolus for 7 days resulted in an increase of

0.68 litres in daily average fat-corrected yield over a 30-day period, equating to 20.40 litres or 9.23% extra fat-corrected milk per cow per month in the Payapro-supplemented group.

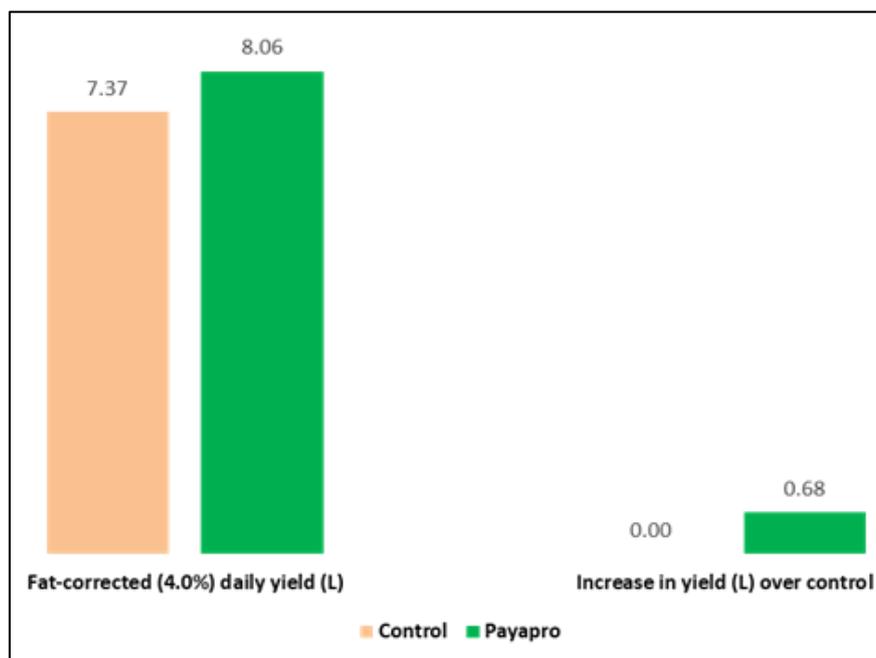


Fig 2: Group-wise average fat-corrected daily milk yield per cow over 30-days' period of study

Similarly, improvements of 5.8% and 4.9% ($p < 0.05$) were seen in average daily milk protein and average daily fat

produced per cow, respectively, in the Payapro-supplemented group (Fig. 3).

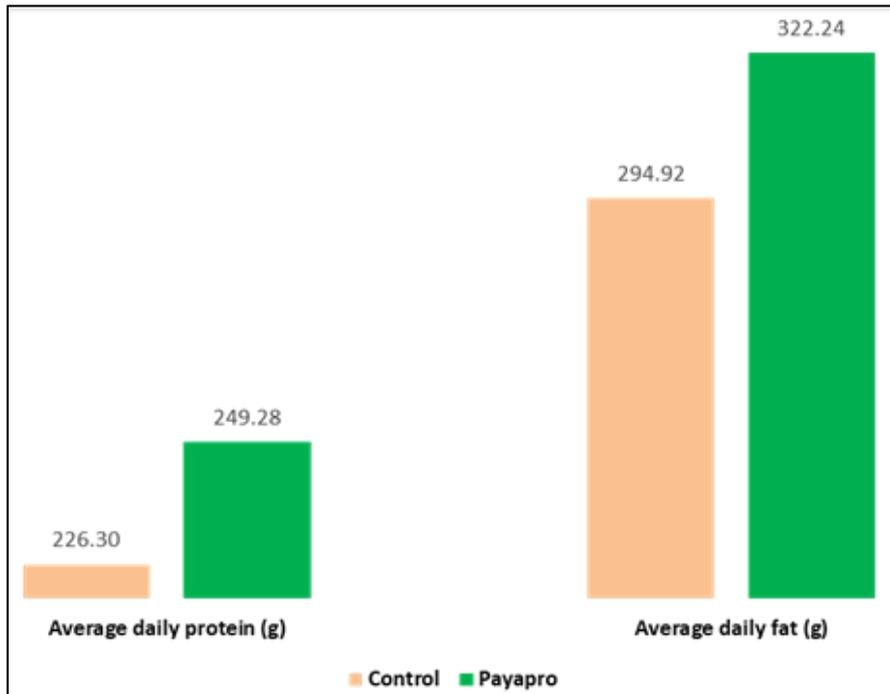


Fig 3: Group-wise average daily protein and average daily fat production per cow over 30-days’ period of study

Indicine breeds of cattle, such as Gir, are more thermo tolerant than taurine breeds of cattle (West, 2003) [15]. Still, heat stress is evident from the continuing increase in serum cortisol levels of the unsupplemented control group during the study period. Significant improvements ($p < 0.05$) in the serum cortisol levels were recorded in the group receiving

supplementation with the polyherbal galactogogue. Over a period of 7 days, the serum cortisol levels of the cows of the unsupplemented control group increased by 4.55%, whereas those of cows of the Payapro-supplemented group reduced by 6.82% (Fig. 4).

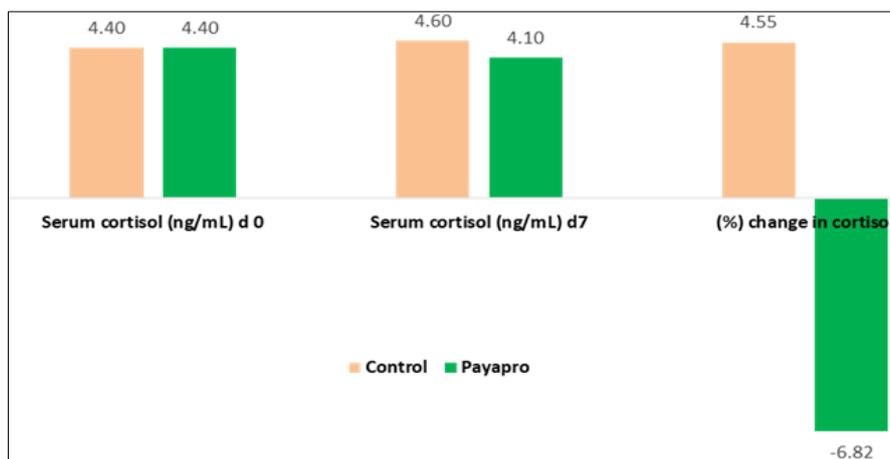


Fig 4: Group-wise mean serum cortisol levels values, and percent changes thereof, on days 0 and 7 of study

Improvements in milk yield and milk solids of heat-stressed dairy animals receiving a polyherbal galactogogue formulation has also been reported previously (Bhatt *et al.*, 2009; Chakravarthi *et al.*, 2017) [4, 3]. Payapro is a scientifically-formulated polyherbal galactogogue containing several herbal ingredients *viz.* *Asparagus racemosus* (Behera *et al.*, 2013) [1], *Leptadenia reticulata* (Kalra *et al.*, 2018) [7] and *Cuminum cyminum* (Bharti *et al.*, 2012) [2] that are well-known in traditional Indian *materia medica* for their Galactogogue properties.

Elevated glucocorticoids play an important role in the impairment of milk production in heat stress (West, 2003) [15].

The ability of the constituent herbal ingredients of the polyherbal galactogogue premix to diminish stress-induced increase in serum cortisol (Bhatt *et al.*, 2009; Chakravarthi *et al.*, 2017; Kalra *et al.*, 2018) [7, 3, 4], as evident from our results, may be one of the important mechanisms by which hypogalactia was relieved in heat-stressed dairy cows.

Based on the improvements in yield, and protein and fat contents of milk, and the reduction in elevated serum cortisol levels in heat-stressed cows, the polyherbal galactogogue, Payapro bolus, at 4 boli once daily for 7 days, was found to be efficacious in the amelioration of summer stress-associated hypogalactia in dairy cows.

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