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Efficacy of a polyherbal antistressor liquid at reducing heat stress and improving milk production in Gir cows during summer

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Abstract

Heat stress is one of the most common types of stress faced by dairy animals, resulting in loss of milk yield and milk solid content. 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 untreated while the second group received treatment with a polyherbal anti-stressor (Restobal® liquid, 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 antistressor-treated group T1 showed significant improvements in yield, milk fat content, and serum cortisol levels over the untreated control group T0, upholding the efficacy of the polyherbal antistressor in heat-stressed dairy cows. Based on the results of the study, the polyherbal antistressor, Restobal liquid, at 50 mL twice daily for 7 days, was found efficacious for the reduction of stress and improvement of milk yield and fat content in dairy cows under summer stress.

Keywords: polyherbal antistressor, reducing, heat, improving, during summer

Introduction

Heat stress is one of the most common types of stress in livestock. Depending on the magnitude of thermal stress present, mild to severe derangements in psychosomatic functions may be manifested and losses of production both in terms of quantity and quality can be encountered (West, 2003; Herbut *et al.*, 2019) [14, 2]. In times of thermal stress, water consumption is initially increased and later decreased, feed intake is reduced, transit of feed through the gut is slowed, and blood circulation and nutrient resources are diverted from production to cope with the stress. In dairy animals, losses of milk production in terms of volume of milk and content of milk solids are seen (Hammami *et al.*, 2013; Herbut *et al.*, 2019; Mbuthia *et al.*, 2021; Potts, 2021) [1, 7, 9, 2].

Anti-stress therapies should be directed at promoting animal welfare by reducing the levels of stress and at improving profitability by restoring production levels and reverting the losses of milk solid content. Polyherbal formulations are a popular choice for the management of heat stress in dairy animals. Many traditional Indian herbs are reputed for their ability to reduce stress and improve stress tolerance. Polyherbal formulations, based on such herbal ingredients, have been shown to be capable of reducing levels of somatic stress in the dairy animals, and improving appetite and reversing decrements in milk production and milk solid concentration (Kumar *et al.*, 2008; Singh *et al.*, 2009; Tiwari and Sahni, 2012; Kalra *et al.*, 2018; Sivajothi *et al.*, 2018, Mendoza Martinez *et al.*, 2022) [5, 10, 13, 3, 12, 8].

Here, we report the results of a trial on the evaluation of efficacy of a liquid polyherbal formulation at reducing stress and improving milk production and milk protein and fat content in heat-stressed 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 healthy, lactating Gir cows, negative for 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	Restobal @ 50 mL twice daily for 7 days

Both groups of animals were allotted same 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 THI was calculated as per the method of Mader *et al.* (2006)^[6]:

$$THI = (0.8 \times T^{\circ}C) + [(RH/100) \times (T^{\circ}C - 14.4)] + 46.4$$

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 statistical significance of the differences in results between the groups was tested by analysis of variance (ANOVA; Snedecor and Cochran, 1967)^[11]. Unless stated otherwise, the significance of the differences in the results was ascertained 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)^[9]. Treatment with polyherbal antistressor, Restobal liquid, for 7 days improved average daily milk yield, and milk protein and fat contents (Fig. 1); however, the improvements in milk protein were statistically non-significant ($p < 0.05$).

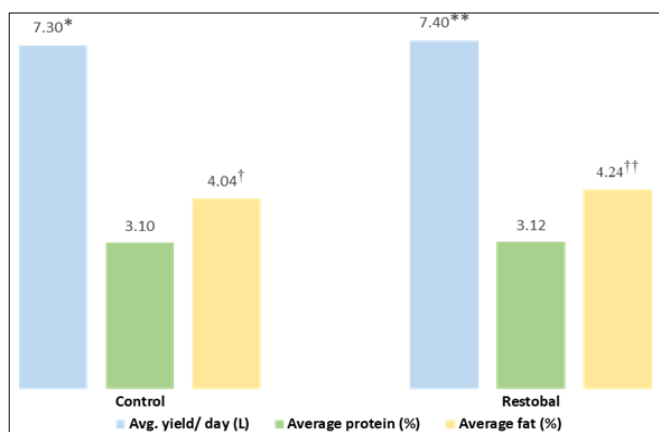


Fig 1: Group-wise average daily milk yield, and milk protein and fat contents per cow over 30-days' period of study

[Figure 1 Here]

The improvement in milk yield of the Restobal-treated group was even more conspicuous when corrections for 4% fat content were applied (Fig. 2); treatment with Restobal liquid

for 7 days resulted in an increase of 0.47 litres in daily average fat-corrected yield over a 30-day period, equating to 14 litres or 6.38% extra fat-corrected milk per cow per month in the Restobal-treated group.

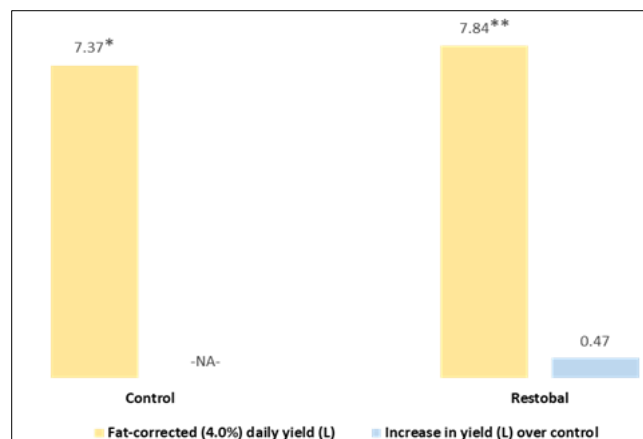


Fig 2: Group-wise average fat-corrected daily milk yield per cow over 30-days' period of study

[Figure 2 Here]

Similarly, improvements of 2.02% ($p > 0.05$) and 6.38% ($p < 0.05$) were seen in average daily milk protein and average daily fat produced per cow, respectively, in the Restobal-treated group (Fig. 3).

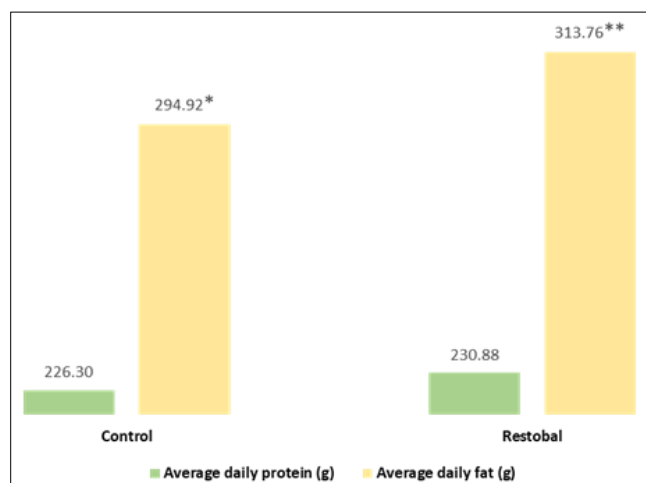


Fig 3: Group-wise average daily protein and average daily fat production per cow over 30-days' period of study

[Figure 3 Here]

Zebuine cattle breeds like Gir are more tolerant to thermal stress than exotic breeds of cattle (West, 2003)^[14]. Still, a state of heat stress during the study period is evident from the continuing increase in serum cortisol levels of the untreated control group. Significant improvements ($p < 0.05$) in the serum cortisol levels could also be attributed to treatment with the polyherbal antistressor. Over a period of 7 days, the serum cortisol levels of the cows of the untreated control group increased by 4.55%, whereas those of cows of the Restobal-treated group reduced by 2.38% (Fig. 4).

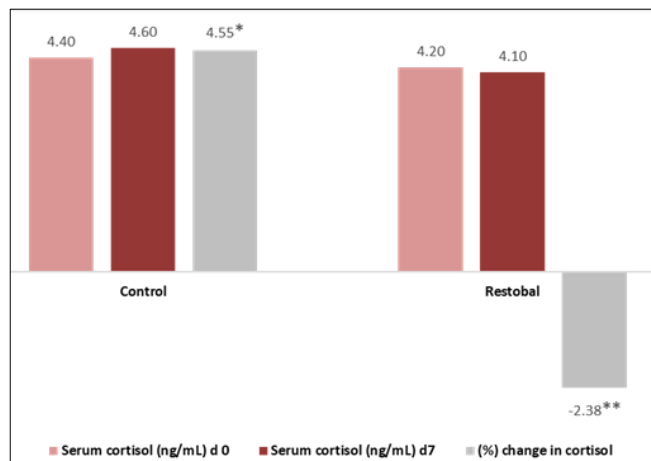


Fig 4: Group-wise mean serum cortisol levels values, and percent changes thereof, on days 0 and 7 of study

[Figure 4 Here]

Improvements in milk yield and milk solids of heat-stressed dairy animals receiving polyherbal antistressor formulation has also been reported previously (Sivajothi *et al.*, 2018; Kothandaraman and Christy, 2019) [12]. Restobal is a scientifically-formulated polyherbal antistressor and immunomodulator containing several herbal ingredients *viz.* *Withania somnifera* (Tiwari and Sahni, 2012) [13], *Ocimum sanctum*, *Mangifera indica* (Kalra *et al.*, 2018) [3] and *Phyllanthus emblica* (Mendoza Martinez *et al.*, 2022) [8] that are reputed in traditional Indian *materia medica* for their Antistressor properties.

Elevated glucocorticoids play an important role in the impairment of production in heat stress (West, 2003) [14]. The ability of the constituent herbal ingredients of the polyherbal antistressor liquid to diminish stress-induced increase in serum cortisol (Kalra *et al.*, 2018; Sivajothi *et al.*, 2018; Kothandaraman and Christy, 2019) [3, 12], as evident from our results, may be one of the important mechanisms by which losses in milk yield and milk fat content were restored.

Based on the improvements in yield and fat content of milk and reduction in elevated serum cortisol levels in heat-stressed cows, the polyherbal antistressor, Restobal® liquid, at 50 mL twice daily for 7 days, was found to be efficacious in the amelioration of summer stress in dairy animals.

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