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Economics of feed additives supplementation in KF heifer during summer stress

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Abstract
The objective of this study was to access the economics of protected fat plus yeast, niacin, zinc and chromium dietary supplementation on Karan Fries (KF) heifers. The basal ration for both the groups were same. However, the treatment group was supplemented with protected fat (2.5% of dry matter intake (DMI)), yeast (10g /animal/day), niacin (6 g/animal/day), zinc (40mg/kg DMI) and chromium (1.5 mg/kg DMI). Additional amount spend on treatment group animal is Rs 1755.35 during the experimental period which can be easily compensated if the treatment group animal attains sexual maturity earlier by 15 days only. The present study concludes that the supplementation of above feed package in the ration of growing KF heifers during summer stress period is economically viable proposition.

Keywords: Economics, supplementation, heifer

Introduction
Dairy Heifers are very sensitive to heat stress, which has a significant economic impact on the farmer in form of less growth rate, increased maintenance requirement and health related problems. Environments of high temperatures and humidity are detrimental to the productivity of dairy heifer. Domestic animals have known zones of thermal comfort (ZTC)that are dependent on the species, physiological status, relative humidity, ambient air velocity, and insolation (NRC, 1981) [7]. The approximate thermal-comfort zone (TCZ) for optimum performance of adult cow is reported to be 5–15°C (Hahn 1999). However, significant changes in feed intake or in numerous physiological processes will not occur within the range of 5-25°C (McDowell 1972) [6]. The upper critical temperature of dairy cow is lower than other livestock species. Hot and humid environmental conditions cause heat stress in heifers. Heat stress induces behavioral and metabolic changes, which include reduced dry matter intake and metabolic activity and thereby a decline in their productivity (NRC 2001) [8]. Climate change is likely to have severe effect on feed crops and grazing systems. Animals are prone to heat stress (HS) when the body temperature is higher than the optimal range. (Bernabucci *et al*., 2010) [1].

This summer stress can be reduced to some extend by using sprinklers along with fan for air movement. The major strategies like high insulated roof housing, sprinklers, fans, Air Conditioner etc. require more financial investment and may not be applicable for small and medium size dairy farms. Thus there is need to develop other means also to reduce thermal stress, such as feeding management and incorporation of feed additives and feed supplements to improve productivity of the animals.

Various workers have studied different feed supplements that can help in reducing the summer stress and improve the growth and production performance of dairy animals. However, only a few studies have been conducted to evaluate the synergetic or collective effects of different supplements as a package. Accordingly, the present study was planned to evaluate the economics of potential of a mixture of feed supplements and additives supplementation on KF heifers during summer months [9, 10].

Material and method
The study has been carried out at Livestock Research Centre, National Dairy research Institute, Karnal for a period of 120 days on 18 KF heifers. After random selection, the heifers were divided into treatment and control groups (based on the body weight) comprising 9 animals in each group. At the beginning of experiment the average age and body weight of the heifers in treatment group was 372.44±18.07 days and 125.32±7.46 kg and in control group was 377.33±13.11 days and 125.55±8.27 kg, respectively (Purwar *et al.*, 2017) [9, 10]. All the animals under study were dewormed and found clinically healthy.

They were kept under the same conditions, with appropriate facilities for feeding and watering. The heifers were fed with total mixed ration (TMR) which was prepared manually. The prepared TMR was fed in two lots, half in the morning and half in the evening. The nutrient requirements suggested by ICAR, (2013) were considered for ration formulation [4]. The ingredients of the TMR used were maize fodder and concentrate mixture (60:40). In treatment group besides the ration offered to the control, following supplements and additives were also added in the TMR: i) Protected Fat @ 2.5% of daily DMI (Suraj, 2015) [12] ii) Yeast @10g /animal/day (Singh, 2011; Das *et al*. 2014) [12, 2] iii) Niacin @ 6 g/animal/day (Das *et al*. (2014) [2] iv) Zinc @ 40 mg/kg DMI (ICAR, 2013) [4] and v) Chromium @1.5 mg/kg DMI (Kumar, 2013) [5]. The concentrate mixture that was fed to heifers contained 71% TDN and 20% CP. The various parameters for determination of economics are calculated by using the following formula.

- Cost of TMR/Kg = Cost of per kg fodder + Cost of per kg concentrate mixture + Cost of supplement (Treatment group)
- Additional Cost of supplementation/kg for treatment group animal= Cost of TMR/Kg (Treatment group) + Cost of TMR/Kg (control group)
- Average DMI(Kg/d) (Purwar *et al*., 2017) [9]
- Total feeding Cost (Rs)=cost of TMR/Kg*average DMI*experimental Period
- Difference in expenditure (Rs) due to supplementation /animal for experimental period= Total feeding Cost (Treatment group) - Total feeding Cost (Control group)
- Total gain (kg) (Purwar *et al.*, 2017) [9]
- Cost /kg gain (Rs) = Total Gain (Kg)/Total Cost
- Average feeding cost/day (Rs)= Total Cost/Duration of feeding
- Average calculated total expenditure on rearing/day/animal for control group (calculated assuming feeding cost as 65% of total rearing cost) = 100/65*(Average feeding cost/day)
- Minimum days of early sexual maturity required to offset extra feeding cost in treatment = average cost of maintaing heifers/ Extra expenditure

Result and Discussion

The costs of feeding in treatment and control group has been calculated considering average DMI values and the prevailing market prices of roughages and concentrate fed and are presented in Table 1. The average cost of feeding/day in control group animal was Rs 74.41 and in treatment group animal was Rs 89.04. Cost of feeding during the 120 days experimental period of summer stress was Rs 8929.44 and Rs 10684.794 per animal in the control and experimental group respectively. The cost of feeding during the 120 days experimental period is more in treatment group by an amount of Rs 1755.35 animals due to the additional cost of additives and supplements fed to the treatment group animals.

Considering feeding cost is 65% of the total maintenance cost of these heifers, the maintenance cost has been worked as Rs 114.48/day. Additional amount spend on treatment group animal is Rs 1755.35 during the experimental period which is equivalent to 15.3 days maintenance cost of a heifer. There by it can be stated that extra amount is easily compensated if the treatment group animal attains sexual maturity earlier by 15 days only. Further if other long term expected benefits like better immune status, better reproductive and milk production performance are also considered then the use of supplementation package during the summer stress period is a economically viable proposition.

Conclusion

The present study concludes that the supplementation of Protected Fat @ 2.5% of daily DMI and addition of Yeast @10g /animal/day, Niacin @ 6 g/animal/day, Zinc @ 40 mg/kg DMI, Chromium @1.5 mg/kg DMI in the ration of growing heifers during summer stress period as a package is a viable option. The extra cost of supplementation of feed package is Rs 1755.35 and it can be easily compensated if the treatment group animal attains sexual maturity earlier by 15 days only.

Table 1: Cost of Feeding during Experiment and economic viability of supplementation

Paticular	Control	Treatment
Cost of TMR/Kg(Rs)	15.6	17.84
Additional Cost of supplementation/kg for treatment group animal	-	2.24
Average DMI(Kg/d)	4.77	4.99
Experimental Period(days)	120	120
Total feeding Cost (Rs)	8929.44	10684.794
Difference in expenditure (Rs) due to supplementation /animal for experimental period	0	1755.35
Total gain (kg)	65.42	73.69
Cost /kg gain(Rs)	136	145
Average feeding cost/day (Rs)	74.41	89.04
Average calculated total expenditure on rearing/day/animal for control group (calculated assuming feeding cost as 65% of total rearing cost)	114.48	
Minimum days of early sexual maturity required to offset extra feeding cost in treatment		15.33
Economic viability of supplementation: If treatment animals attain sexual maturity 15.3 days earlier, extra expenses of rupees 1755.35 are recovered (considering 114.48 rupees /day expenditure on rearing).		

References

1. Bernabucci U, Lacetera N, Baumgard LH, Rhoads RP, Ronchi B, Nardone A. Metabolic and hormonal acclimation to heat stress in domesticated ruminants. Animal. 2010; 4(7):1167-83.
2. Das KS, Singh J, Singh G, Upadhyay R, Malik R, Oberoi P. Heat stress alleviation in lactating buffaloes: Effect on physiological response, metabolic hormone, milk production and composition. Indian J Anim Sci. 2014; 1:84(3):275-80.
3. Hahn GL. Dynamic responses of cattle to thermal heat loads. Journal of animal science. 1999; 1:77(2):10-20.
4. ICAR. Nutrient Requirements of Cattle and Buffalo. Indian Council of Agricultural Research, New Delhi, 2013.

5. Kumar M, Kaur H, Tyagi AK, Kewalramani NJ, Mani V, Deka RS *et al*. Effect of feeding inorganic chromium on growth performance, endocrine variables, and energy metabolites in winter-exposed buffalo calves (Bubalus bubalis). Biological trace element research. 2013; 1:155(3):352-60.
6. McDowell RE. Improvement of livestock production in warm climates. Improvement of livestock production in warm climates, 1972.
7. National Research Council. A Guide to Environmental Research on Animals. The National Academy Science, Washington, DC, 1971.
8. National Research Council. Nutrient requirements of dairy cattle: National Academies Press, 2001, 9.
9. Purwar V, Oberoi PS, Dang AK. Effect of feed supplement and additives on stress mitigation in Karan Fries heifers. Veterinary world. 2017; 10(12):1407.
10. Purwar V, Oberoi PS, Alhussien MN, Santoshi P, Diwakar Kumar N. Effect of protected fat, yeast, niacin, zinc and chromium supplementation on the productive performance of heat-stressed Karan Fries heifers. Indian Journal of Dairy Science. 2018; 1:71(3):252-7.
11. Singh SP, Hooda OK, Kumar P. Effect of yeast supplementation on feed intake and thermal stress mitigation in buffaloes. Indian Journal of Animal Sciences (India). 2011.
12. Suraj. Effect of Bypass Fat Feeding on Physiological Functions During Heat Stress in Crossbred Heifers. M.V.Sc. Thesis, National Dairy Research Institute (Deemed University), Karnal, India, 2015.