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Effect of three different Roofing Materials on Milk Production of Jersey Grade Cows in Different Seasons: A Field Study in Guwahati

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Abstract

Eighteen Jersey grade cows of third or fourth lactation and in second and third month of lactation maintained under thatch, CI sheet and asbestos roof in three different seasons pre-monsoon (April-May), monsoon (June-Aug) and winter (Dec-Jan) season respectively. Season had highly significant (P<0.01) effect, while roof and season x roof interaction did not have significant (P>0.05) effect on the maximum temperature, while roof had significant (P<0.05) and season had highly significant (P<0.01) effect, while season x roof interaction did not have any significant (P>0.05) effect on the average minimum temperature in the present study. In case of relative humidity roof had significant (P<0.05) and season had highly significant (P<0.01) effect, season x roof interaction did not show significant (P>0.05) effect. The average daily feed, (green, dry and concentrates) consumption differ significantly (P<0.01) among seasons while roof and seasons x roof interaction did not reveal any significant (P>0.05) effect. In case of milk production, season showed highly significant (P<0.01) effect on the milk yield of the cows while roof and season x roof interaction did not influence the trait significantly (P>0.05).

Keywords: Environment, foot hill, shed, season, roof, milk production.

Introduction

The climatic environment has profound effect on the physiology of the animals and in turn manifest resultant effect on their feeding, health condition and ultimate production of the animals. As regards to the effect of climatic environment on the milk production of dairy animals, it's the microclimate of ambient temperature and humidity inside the shed to which the animals are exposed to; affect the performance of the dairy cows.

On the other hand, the different types of roof having varying degree of heat conductivity are likely to create different microclimatic environment inside the dairy shed. So, the present work has been planned to study the effect of three different type of roofing on milk production performance of Jersey cows.

Material and Methods

The study was conducted in the Khanapara, Uparkholi, Guwahati milk shed area where dairy farming was a commercial proposition. Eighteen Jersey cows divided into six in the dairy sheds with thatch, corrugated asbestos sheet (AC sheet) and corrugated galvanized iron sheet (CI sheet) located at foothills were included in the study and the sheds were alike in construction and direction with cement paved *pucca* floor.

Six Jersey grade cows of third or fourth lactation and in second or third month of lactation maintained under the three different roofs in pre-monsoon (April-May), monsoon (June-Aug) and winter (Dec-Jan) were considered for collection of data.

The maximum and minimum temperature inside of the different sheds and one of outside were recorded by the use of Maximum and Minimum Thermometer and corresponding average temperatures were worked out for each season. For recording of relative humidity, Dry and wet Bulb Thermometer readings inside the different cattle units and one of outside were recorded and respective relative humidity were computed from the hygrometric charts and then corresponding average relative humidity were worked out for each season.

Amount of green fodder, dry fodder and concentrate mixture fed to each cow was recorded at three consecutive days at fortnightly interval during the experimental period and respective average daily feed consumption was determined.

The milk yield of cows were observed twice daily at milking times for three consecutive days at fortnightly interval during the experimental period and the avg. daily milk yield was worked out and expressed in litre per day per cow.

The data obtained during the present study were analyzed following the procedure of Snedecor and Cochran (1968).

Results and Discussion

Maximum temperature: Results in table-1 indicated no significant difference among the average maximum

temperatures inside thatch; CI sheet and asbestos roof and this might be due to the fact that cattle sheds had no walls and as such allowed free air movements for exchange of inside and outside temperature. However, although statistically not significant, apparently thatch roof recorded lower maximum temperature followed by asbestos and CI sheet roof[1].

Minimum temperature: The average minimum temperature in thatch significantly (P<0.05) differed from CI sheet roof while asbestos roof did not differ significantly from thatch and CI sheet roof in table-1. The lower average minimum temperature inside thatch roof may be due to the fact that thatch being less dense material and remaining in a discontinuous state in the roof had very low heat conduction[2], which ultimately kept the microclimate more cooler than the asbestos and CI sheet roof. On the other hand, irrespective of type of roof, the average maximum and minimum temperature inside of the sheds was highest in monsoon followed by pre-monsoon and winter season with a highly significant (P<0.01) difference between each other.

Relative humidity: Results in the table-2 revealed that relative humidity in thatch roof significantly (P<0.05) differed from CI sheet roof while both thatch and CI sheet averages did not differ significantly (P>0.05) from asbestos roof. Comparatively lower average maximum and minimum temperature under thatch roof, may be the reason for holding up of more water vapour vis-a-vis more relative humidity than the asbestos and CI sheet roof[3]. For different seasons, the average relative humidity inside the sheds was highest in monsoon followed by winter and pre-monsoon season and values inside the sheds were comparatively higher than the respective outside values[4].

Table-1
Average Maximum and Minimum Temperature (°C) inside and outside the sheds with different roofs in different seasons

Source	Roof	Pre-monsoon	Monsoon	Winter	Overall
Inside	Thatch	28.42 ±0.92 21.23 ±0.64	29.75 ±0.35 24.76 ±0.46	20.61 ±0.97 12.18 ±0.82	26.78^{a} ±0.65 20.20^{a} ±0.77
	CI sheet	29.82 ±0.86 22.75±0.65	30.78±0.37 25.98±0.43	21.76±0.84 13.28±0.71	27.96^{a} ±0.63 21.47^{b} ±0.77
	Asbestos	29.37 ±0.92 21.76±0.72	30.35±0.34 25.33±0.43	20.99±0.92 12.90±0.71	27.42^{a} ±0.66 20.80^{ab} ±0.75
	Overall	29.21^{a} ±0.52 21.9^{a} ±0.39	30.29^{b} ±0.21 25.36^{b} ±0.26	21.12^{c} ±0.52 12.78^{c} ±0.43	27.39 ±0.37 20.82 ±0.44
Outside	No roof	29.85^{a} ±0.87 20.70^{a} ±0.61	30.65^{a} ±0.36 23.99^{b} ±0.40	22.71^{b} ±0.84 11.31^{c} ±0.72	28.21 ±0.58 19.54 ±0.75

Subclass means within sources with at least one common superscript in a row or column do not differ significantly (P>0.05) among themselves.

Table-2
Average relative humidity (%) inside and outside the sheds with different roofs in different seasons

Source	Roof	Pre-monsoon	Monsoon	Winter	Overall
Inside	Thatch	83.35 ±1.61	89.19 ±1.06	88.82 ±1.42	87.438^{a} ±0.82
	CI sheet	80.71 ±1.63	86.04 ±1.18	85.82±1.44	84.47^{b} ±0.84
	Asbestos	82.29 ±1.59	87.92±1.13	87.47±1.41	86.20^{ab} ±0.83
	Overall	82.12^{a} ±0.92	87.72^{b} ±0.66	87.37^{b} ±0.82	86.03 ± 0.49
Outside	No roof	75.88^{a} ±2.03	81.69^{b} ±1.31	81.18^{b} ±1.50	79.90 ± 0.96

Subclass means within sources with at least one common superscript in a row or column do not differ significantly (P>0.05) among themselves.

Feeding: Table-3 revealed that average daily fodder (green, dry) consumption per cow had no significant difference among thatch, CI sheet and asbestos roofs. This may be due to the fact that the environmental temperature humidity inside the different sheds could not affect the fodder consumption of the cows significantly. However, apparently it appeared that fodder consumption was higher in thatch roof than other roofs[5].

On the other hand, irrespective of roof, average fodder consumption in different season differed significantly (P<0.01) from each other being highest average green fodder consumption in monsoon season followed by pre-monsoon and winter season. Again, highest average dry fodder consumption in winter season followed by pre-monsoon and monsoon season. The reason for the present findings mainly due to feeding practice of the dairy farmers. The farmers supplied maximum dry fodder in winter when green fodder became scarce and less. In addition, metabolic rate of the cows might had been enhanced by the winter climate resulting in more dry fodder consumption compared to summer[6].

Table-3 of average daily concentrate consumption of the Jersey grade cows have shown no significant difference reared under different roofs. This might be due to the micro climate temperature being more or less similar in all the roofs did not influence the concentrate intake of the cows[5].

In other way, the average concentrate consumption in different seasons differed significantly (P<0.01) being higher average consumption in winter than pre- monsoon and monsoon season[7]. The discrepancy in concentrate allowance as observed in the present study might be due to the concurrent availability of green fodders that determined the amount of concentrate fed to the animal.

Milk Production: The average daily milk yield per cow in different roofs in table-4 did not reveal any significant difference (P>0.05). This may be due to more or less similar micro climatic condition in respect of maximum -minimum temperature and relative humidity inside all the sheds and the temperature humidity factor did not significantly influenced the feed consumption of the cows resulting in similar and non-significant milk production of the cows in all the sheds[8].

Table-3
Average values of daily feed (green, dry, concentrate) consumption per cow (kg)

Roof	Feed	Pre-monsoon	Monsoon	Winter	Overall
Thatch	Green	7.78±0.15	12.77±0.86	3.68±0.25	8.08 [a]±0.95
	Dry	4.34±0.17	2.48±0.09	7.51±0.36	4.77 [a]±0.52
	Concentrate	5.56±0.44	4.29±0.07	6.63±0.14	5.49 [a]±0.27
CI sheets	Green	7.60±0.09	12.16±1.19	2.85±0.12	7.54 [a]±1
	Dry	4.35±0.17	2.43±0.07	7.33±0.31	4.70 [a]±0.50
	Concentrate	6.25±0.18	4.16±0.12	6.46±0.18	5.62 [a]±0.27
Asbestos	Green	7.78±0.25	12.82±1.16	2.92±0.11	7.84 [a]±1.05
	Dry	4.30±0.17	2.45±0.10	7.36±0.31	4.70 [a]±0.50
	Concentrate	6.38±0.24	3.91±0.14	6.50±0.09	5.59 [a]±0.30
Overall	Green	7.72 [a]±0.10	12.59 [b]±0.59	3.15 [c]±0.13	7.82±0.57
	Dry	4.33 [a]±0.09	2.45 [b]±0.05	7.40 [c]±0.18	4.73±0.29
	Concentrate	6.06 [a]±0.19	4.12 [b]±0.07	6.53 [c]±0.08	5.57±0.16

Table-4
Average values of daily milk yield per cow (litre)

Roof	Pre-monsoon	Monsoon	Winter	Overall
Thatch	8.16±0.23	8.10±0.22	10.80±0.98	9.02 [a]±0.44
CI sheet	8.11±0.32	7.35±0.18	9.98±0.44	8.48 [a]±0.32
Asbestos	8.11±0.25	7.68±0.32	10.06±0.44	8.62 [a]±0.31
Overall	8.13 [a]±o.15	7.71 [a]±0.15	10.28 [b]±0.37	8.70±0.21

However, apparently lower milk yield was observed inside CI sheet and asbestos roof than the thatch roof with average maximum temperature exceeding 27^0C. In support of the present findings, early workers reported that at temperature of 21-27^0C the milk production decreases slowly and above 27^0C the milk production decreases markedly[9].

While, irrespective of type of roof the average milk production of the Jersey grade cows in winter was significantly ($P<0.01$) higher than pre-monsoon and monsoon season. This may be due to the fact that cooler climate was more comfortable and activated the feed digestion metabolism and ultimate with synthesis mechanism resulting in increased milk production during these days[7].

Conclusion

Therefore, it can summarily be concluded that thatch roof was more suitable as the cows under thatch roof yielded apparently more milk and asbestos, CI sheet may be used with provision of fan, ceiling, wet curtains etc., specially during summer. Moreover, it will be more beneficial to put more cows in milk in winter than per-monsoon and monsoon season.

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