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SK Jain
Professor and Head, Department of Farm Structures, College of Agricultural Engineering and Technology, Dapoli, Maharashtra, India

Corresponding Author:
SK Jain
Professor and Head, Department of Farm Structures, College of Agricultural Engineering and Technology, Dapoli, Maharashtra, India

Effect of thatched poultry housing system on egg production in Konkan

SK Jain

Abstract
The relative humidity variation during raining season was found to be in the range of 82% to 98%. The average temperature difference between inside and outside poultry structure was about 0.7 ºC. The Relative humidity and temperature before thatching roof in sunny days showed that the average temperature difference between inside and outside poultry structure was 1.1ºC. The Relative humidity and temperature after thatching roof in sunny days showed that the average temperature difference between inside and outside poultry was 2.4 ºC. Thus, it was observed that after thatching the inside temperature was reduced considerably. The egg production after thatching roof was increased to the tune of 0.5 per cent which was reduced by 1.94 per cent.

Keywords: Thatched, humidity, raining, cashew, Konkan

Introduction
The Indian poultry sector is characterized by its industrialization, faster growth in consumption and trade than any other major agricultural sectors in the world. Today, India is the third largest egg producer in the world and the nineteenth largest broiler producer. India's contribution to world's egg and chicken meat Production is nearly 5.3% and 2.53%, respectively (FAO, 2010a) [2], whereas poultry sector contributes about 1% to national GDP and 11% of total livestock GDP in India. The estimated rate of growth in layers is 6-7% per annum and 10-15% for chicken meat. Thus, poultry development in the country has shown steady progress over the years. Along with this, poultry plays an important economic, nutritional and socio-cultural role in the livelihood of poor rural households in many developing countries, including India.

The most obvious constraint on poultry production is the climate. Poultry bird seems to be particularly sensitive to temperature associated environmental challenges, mainly heat stress. High temperature, especially when coupled with high humidity, imposes severe stress on birds and leads to reduced performance. Both of the climate change and poultry productions have always negative impacts one over the other.

The proportion of heat lost through radiation, conduction, and convection depends upon the temperature difference between the bird and its environment. The bird loses heat from surfaces such as wattles, shanks, and un-feathered areas under wings. The purpose of poultry house ventilation is to maintain a high enough air velocity or a low enough temperature in the house that the birds can maintain body temperature by sensible heat loss.

Heat stress interferes with the broilers comfort and suppresses productive efficiency, growth rate, feed conversion and live weight gain (Yalcin *et al*., 2001) [8]. Bouchillon *et al.* (1970) [1] developed the mathematical model indicates that as the ambient temperature approaches chicken body temperature, all heat rejected by the chicken must be in the latent form. Consequently, for ambient temperatures near 41 °C, the relative humidity of the ambient air was a critical factor in heat rejection from the chicken. Yalcin *et al*. (1997) [7] conducted study to examine the broiler production in tropical and subtropical regions. Body temperature was measured twice on three birds per sex per pen, 16 h and immediately before slaughter, and feather weight was determined for each of these birds. They found that the season effect was largest (33.5%) on body weight gain from 4 to 7 week, along with 23% and 15% reductions in feed consumption and efficiency, respectively, during these 3 weeks. Khan and Sardar (2005) [3] studied the effect of vitamin C supplementation on the performance of desi, fayoumi and commercial white leghorn chicken exposed to heat stress in which they concluded that during summer, egg production fallen to as low as 30%.

Nardone *et al.* (2010) [4] studied the effects of climate changes on animal production and sustainability of livestock systems from which it was concluded that the hot environment impairs production (growth, meat, egg yield, weight and quality) and reproductive performance, metabolic and health status, and immune response. Toguyeni *et al.* (2012) [6] discussed on the influence of roof insulation involving local materials on cooling loads of houses built of clay and straw showed that the clay-straw mixture reduces the air conditioning load by about 8% compared to clay walled houses. Narwaria *et al.* (2017) [5] found that by thatching the roof alone reduces heat stress to a greater extent in the tropical region.

The Konkan region of Maharashtra has hilly terrain and receives the heavy rainfall ranging from 3000 to 3500 mm mostly during June to September. Poultry owners face the problems of temperature and bird mortality because it is difficult to maintain the temperature during sunny days. As a result, both birds and owner of poultry suffer. Thus, it is necessary to lower down temperature in poultry structure with control conditions, to maintain egg production and reduce bird mortality during the summer. The thatching of roof is one of the viable option for maintaining temperature by using the paddy straw available in the region. Thus, the study has been undertaken with objective to assess microenvironment and egg production in an existing poultry house by thatching the roof.

Material and Methodology

The study was carried out in poultry structure situated at Shirgaon, Dist.-Sindhudurga. The building orientation was in the east-west direction. The poultry house was of size 24 m x 10 m. The Side wall height was 2.5 m and height at the center was 3.2 m. The ventilation was through windows with total ventilation area from side walls was about 88%. The asbestos sheeted roof slope was 35˚. Roof overhanging on all sides was 0.70 m. The numbers of bird were 1500. Feeders and waterers are attached to cages from outside, except nipple waterers, for which pipeline is installed through or above cages. The type of cage used in the poultry was multiple bird cage (2 to 4) based on the arrangement M-type stair stage cage, Double deck and layer cage are used. The birds used in the poultry are white leghorn. Egg production of white leghorn is about 280-320 numbers per year per bird and the life span is about 80 weeks. The birds were purchased at the cost of Rs. 40 per bird. The floor space required for the bird varies according to age. The feed used for the bird throughout the study was Layer Crumbles PH-1. The quantity of feed rate was 100gm/bird.

The thatching material on roof was paddy straw a light weight material. The thatch was laid, to a total minimum thickness of 150 mm. Each successive layer conceals the poplar stick or wire that secures the previous layer. As thatching proceeds a layer of selected stems is spread evenly on the roof battens to a thickness of about 12 mm. The instruments used for measurement of microenvironment were Hygrometer and Thermometer. The readings were taken 3 times per day for ten days in rainy and summer season before and after thatching roof to check the inside and outside temperature and relative humidity. The number of eggs was counted daily.

Results and Discussion

The data of measured environmental parameters *viz.* indoor and outdoor Temperature (°C) and relative humidity (%) of Poultry house is revealed in Table 1.

Table 1: Observations of microenvironment and egg production

	Rainy season				Before thatching roof in summer				After thatching roof in summer			
Day	**Rh (%)**	**T_{Inside} (^{0}C)**	**$T_{Outside}$ (^{0}C)**	**Egg production**	**Rh (%)**	**T_{Inside} (^{0}C)**	**$T_{Outside}$ (^{0}C)**	**Egg production**	**Rh (%)**	**T_{Inside} (^{0}C)**	**$T_{Outside}$ (^{0}C)**	**Egg production**
1	98	24	25	1278	96	25	26	1246	92	24	26	1240
	98	25	24		88	27	27.5		63	28.5	32	
	98	23.5	23		77	26	27		73	27	30	
2	95	23	24	1280	88	23	24.5	1245	92	24	25	1248
	97	25	26		68	24.5	25		58	28	31	
	90	25	26		79	28	29		73	28.5	30	
3	92	23	24	1285	90	24	25	1250	91	23	24	1252
	83	24	25		66	26	26		50	27	31	
	87	22	23		82	28	29		58	27.5	30	
4	85	25	26	1270	84	23.5	24	1247	85	23	24	1243
	82	26	28		66	25.5	26		40	28	32	
	80	26	25		76	28	29		56	27	30	
5	90	26	27	1260	89	24	25	1230	79	24.5	25	1244
	92	25.5	27		78	26	27		50	28.5	32	
	98	25	26.5		85	29	28		63	28	31	
6	95	27	26	1253	87	24	25	1248	83	22	23	1252
	94	28.5	27		80	25	26		55	27	30	
	98	29	28		76	30	29		62	27.5	29	
7	98	25	26	1263	90	25	26.5	1241	71	22	23	1247
	89	26	26		83	26.5	27		52	28	31	
	90	24	25		70	26	27		65	27	30	
8	92	26	27	1272	90	24	25	1249	89	24	25	1249
	90	26	26.5		60	26	27		55	28	31	
	87	25	26		68	28	29		49	27.5	30	
9	99	24	25	1265	87	23	24	1240	73	24	25	1256
	95	25	26		60	24	25		53	26	29	
	89	24	25.5		71	29	30		59	25.5	28	
10	93	26	27	1257	90	23.5	24.5	1237	91	23	26	1251
	86	26	26.5		67	25	26		62	28	31	

Day	Rainy season				Before thatching roof in summer				After thatching roof in summer			
	Rh (%)	T Inside (^{0}C)	T Outside (^{0}C)	Egg production	Rh (%)	T Inside (^{0}C)	T Outside (^{0}C)	Egg production	Rh (%)	T Inside (^{0}C)	T Outside (^{0}C)	Egg production
	80	24	26		78	27	28		72	26	31	
Average	91.4	25.1	25.8	1268.3	78.9	25.6	26.7	1243.3	67.1	26.1	28.5	1248.2

T_{inside} – Inside temperature of poultry house
$T_{outside}$ – Outside temperature of poultry house

Relative humidity and temperature before the thatching in rainy season: Table 1 and Fig 1 and Fig. 4 showed that as temperature outside poultry structure was increased the relative humidity inside poultry structure decreased. The observed inside day time temperature of poultry structure varied from 22 ºC to 28.5 ºC. The highest outside temperature was 28 ºC and corresponding inside temperature was 26 ºC. The atmospheric relative humidity was varying from 82% to 98%. The average temperature difference between inside and outside poultry was about 0.7 ºC. The temperature inside the poultry was almost uniform throughout the rainy days and thus any cooling treatment was not required in the poultry.

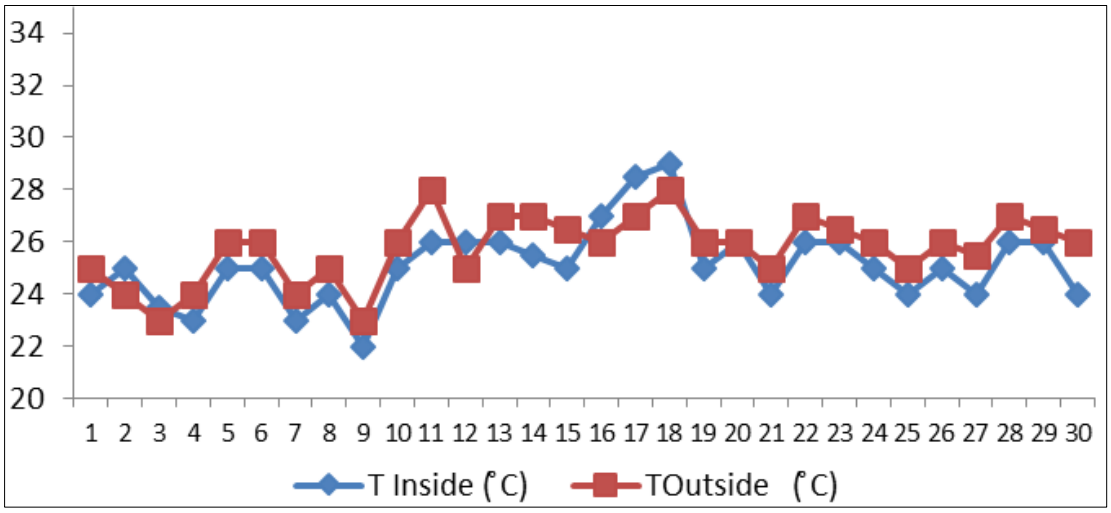

Fig 1: Temperature of poultry structure during rainy season

Relative humidity and temperature before thatching roof in sunny days
Table 1 and Fig. 2 and Fig. 4 showed that the observed inside day time temperature varies from 23 ºC to 29 ºC. The highest outside temperature was 30 ºC and the corresponding inside temperature is 29 ºC. The atmospheric relative humidity was varying from 60% to 96%. The average temperature difference between inside and outside poultry was about 1.1 ºC. The rise in temperature in the poultry showed that the cooling is required.

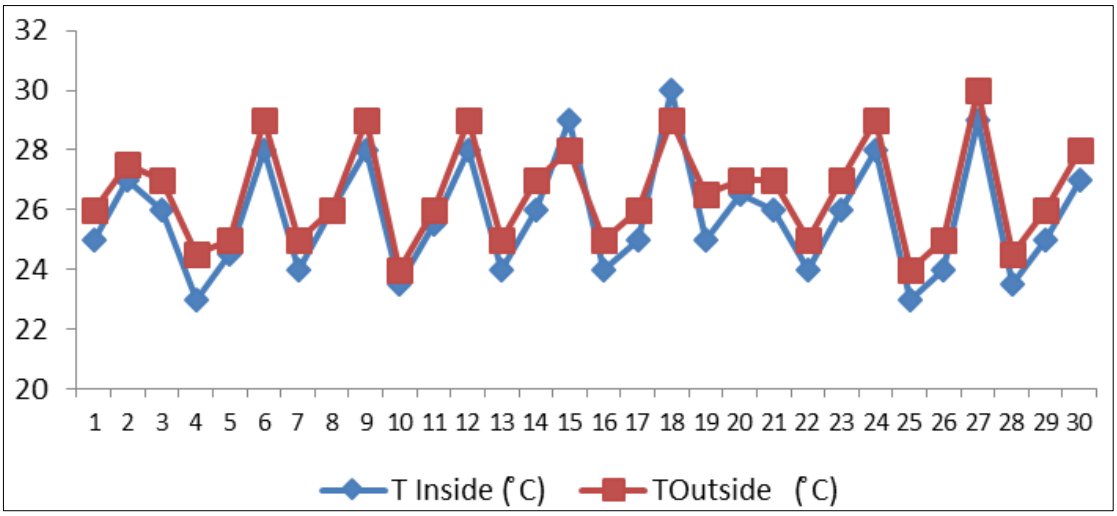

Fig 2: Temperature of poultry structure before thatching roof in summer

Relative humidity and temperature after thatching roof in sunny days
Table 1 and Fig. 3 and Fig. 4 showed the observed inside day time temperature varied from 22ºC to 28.5ºC. The highest outside temperature was 32ºC and the corresponding inside temperature was 28ºC. The atmospheric relative humidity was varying from 40% to 92%. The average temperature difference from the inside and outside poultry is about 2.4ºC. Thus, it was observed that after thatching the inside temperature was reduced considerably.

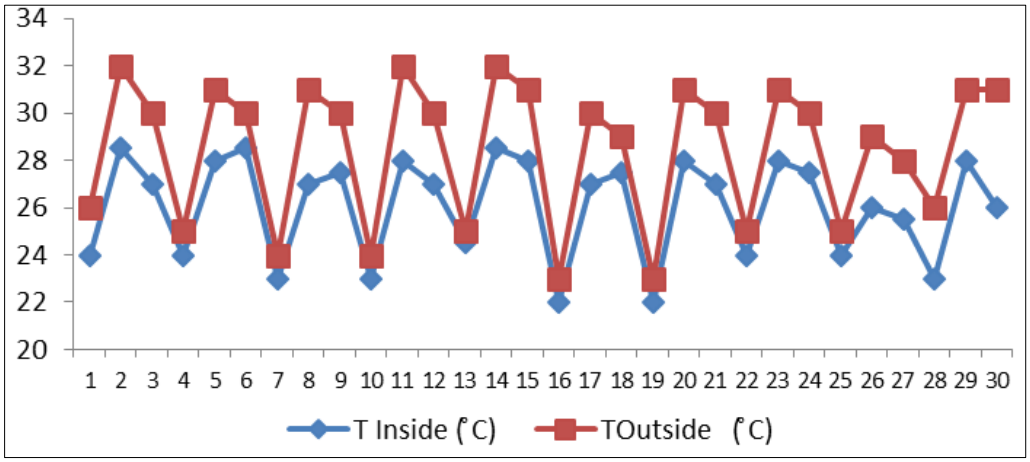

Fig 3: Temperature of poultry structure after thatching roof in summer

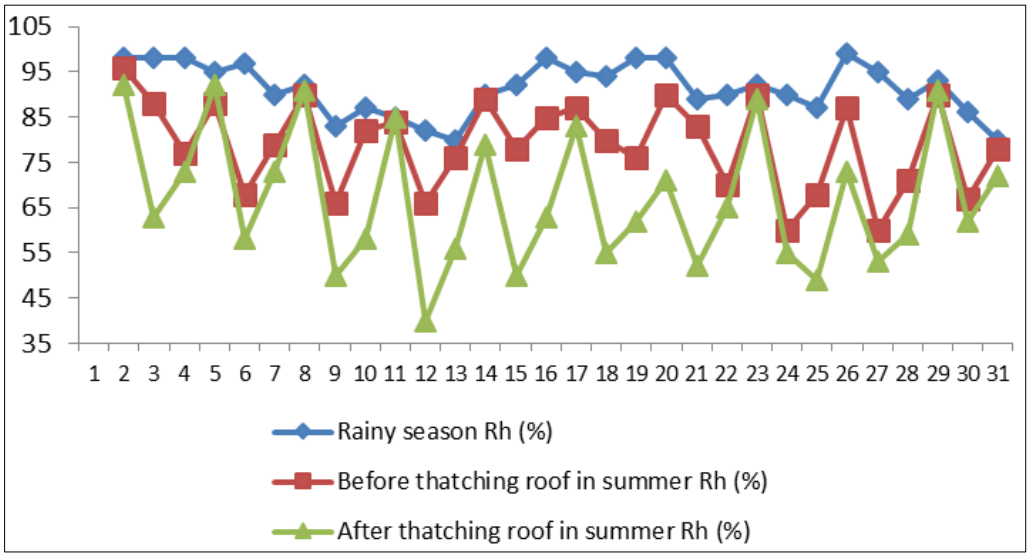

Fig 4: Comparative relative humidity of poultry structure

Egg production

Table 1 and Fig. 5 showed that the average eggs production during rainy season was 1268 eggs while it reduced to 1243 eggs during summer before thatching roof. After thatching the roof the temperature was reduced and average egg production was increased to 1248 eggs. Thus, thatching was having a positive impact on egg production.

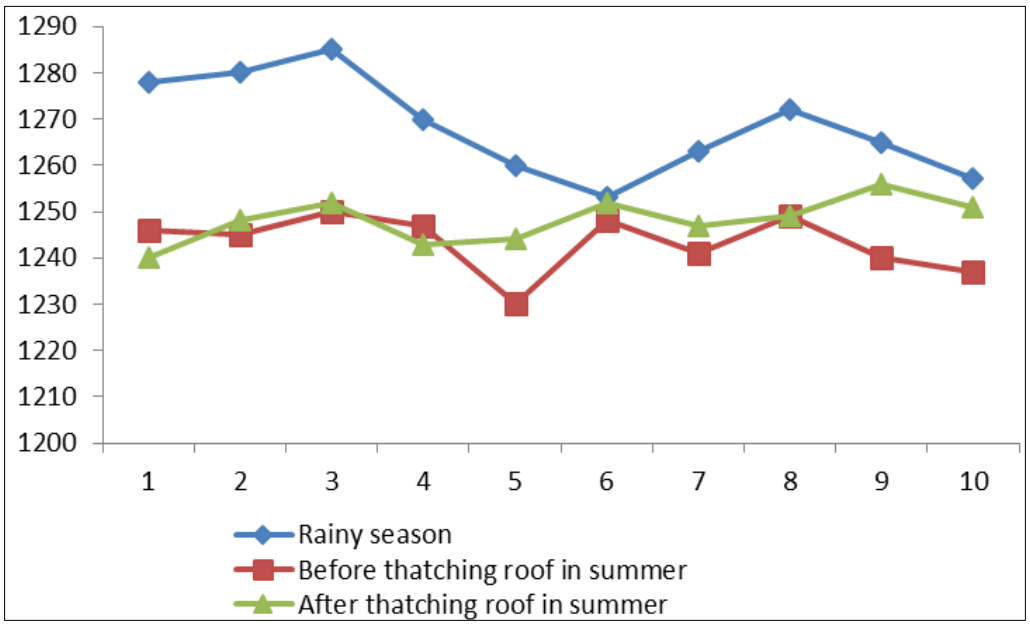

Fig 5: Egg production in poultry

Conclusion

It was concluded from the study that after thatching the roof, the temperature inside poultry structure decreased. Consequently, the egg production after thatching roof was increased to the tune of 0.5 per cent which was reduced during summer by 1.94 per cent.

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