Influence of Depth of Rice Husk Litter on Broiler Performance, Litter Dampness and its Coccidial Oocyst Population During Winter

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ABSTRACT : Four groups each containing 48 seven-day-old broiler chicks were reared for 7 weeks during winter on rice husk litter spread to depths of 20, 30, 40 or 50 mm. Broiler performance was evaluated in terms of weight gain, feed consumption, feed efficiency and production number. Litter dampness was determined and coccidial oocyst populations were counted at different weeks of age. The depth of litter did not significantly affect live weight gain, feed consumption, feed conversion ratio, liveability or production number. Variation in moisture contents of litter was observed but the coccidial oocysts count per gramme of litter was within the safety level and therefore, there was no outbreak of coccidiosis in any group. Use of rice husk litter at different depths (20 to 50 mm) did not cause any breast blisters or leg abnormalities. It was concluded that rice husk can be used as litter at depths of between 20 and 50 mm during winter to raise broilers without affecting performance characteristics and health of birds.
(**Key Words**: Litter, Rice Husk, Depth, Broiler Performance, Oocysts, Litter Dampness)

INTRODUCTION

Rice husk is produced abundantly in the paddy growing countries of the world particularly Bangladesh, India and Pakistan. Apart from its use as fuel by the poorer sections of the society, this material is being considered as a bedding material for raising broliers because of its availability and low cost. Andrews and McPherson (1963) and Dendy et al. (1968) reported that broilers reared on rice husk performed as well as or even better than those reared on wood shavings. Although the importance of having good quality litter for floor reared birds is well recognised, it was found that performance was unlikely to be affected by the type of the litter (Sharma, 1987; Kassid and Coleman, 1989; Ranade and Rajmane, 1990). In agreement with this result, it is reported that neither the litter type nor its depth significantly affected broiler performance (Anonymous, 1992). Moisture content in the litter affects the sporulation and viability of oocyst (Tomhave, 1949) and therefore it is an important factor in the development *Eimera* infections. Davies and Joyner (1955) established that the number of litter oocysts is commercial poultry houses is correlated with moisture in the litter. Recently, Anisuzzaman and Chowdhury (1995) compared four common types of litter (saw dust, sand, paddy straw and rice husk) and reported that rice husk was the most suitable litter material for broiler chicks. Haque and Chowdhury (1994) used rice husk for broiler chicks and concluded that this material can be used as litter at depths of between 20 and 50 mm during summer without affecting performance. Since this information concerning appropriate depths of rice husk litter is available for summer only and seasonal variation in performance of broiler is likely to occur, a study to obtain information during winter seemed worthwhile. The present study was therefore undertaken to investigate production performance, dampness of litter and coccidial oocysts populations of broiler chicks reared on different depths of rice husk litter during winter.

MATERIALS AND METHODS

Birds, treatments and diets

Four groups each of 48 seven-day-old broiler chicks (Tropicbro) were reared on rice husk litter spread to depths of 20, 30, 40 or 50 mm on cement floor. The 30 mm group was considered as control in accordance with Huff et al. (1984). Each litter depth was evaluated in three replicate pens of 16 birds. The pens were clean and disinfected with potassium permanganate solution before

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spreding litter and placing birds at random. Two types of diet were fed to experimental birds. A broiler- starter diet isocaloric and isonitrogenous in nature (209.7 g CP, 11.81MJ, ME/kg) having approximately similar in composition with respect to calcium and total phosphorus (14.0 g and 8.8 g/kg, respectively) was fed to all treatment groups for the first 4 weeks of growth. A broiler-finisher diet having slightly lower in CP content (190.4 g) and slightly higher in energy (12.0 MJ ME) and 10.8 g calcium and 7.3 g total phosphorus/kg was fed to all groups for the remaining 4 weeks of the experiment. Both diets were formulated using locally available feed ingredients and prepared as mash and offered *ad libitum*. Drinking water was made available to the birds at all times.

Brooding

Brooding up to seven days old (before the start of the experiment) was done at 32.2 to 35℃. After placing on the experimental floor, the chicks were brooded by providing electric bulbs and the temperature was maintained in such a way that the birds were gradually acclimatized to the ambient temperature. The average temperature at the 7th and 8th week was 25.5 and 23℃ respectively.

Sampling of litter

At the end of each week, during 4 to 8 weeks of bird's age, five samples of litter one each from the four corners and one from the centre, from each of the 12 pens were collected and were mixed properly to make a composite. Half of each of the 12 samples was used for the determination of moisture and the remaining half for counting of coccidial oocysts.

Determination of litter moisture

Duplicate samples were weighed and dried over night at 105℃ in an electric oven to determine moisture contents. The difference between the initial weight and the weight after drying was considered as the moisture content which was expressed as percentage.

Immunization

The birds were immunized against Newcastle Disease and Gumboro Disease following the recomendations of the vaccine manufacturers.

Observation on leg abnormality and breast blister

The incidence of leg problems and breast blisters were monitored throughout the experimental period, the criteria being a visual assessment of lameness and feather shedding from the region of breast (as a result of contact with litter), respectively.

Determination of coccidial oocysts

The method of Long et al. (1975) was followed with slight modification. Ten grammes of litter were soaked in 100 ml of water for 24 hours and mixed thoroughly by vigorous shaking in a screw capped bottle and subsequently sieved through a tea strainer to remove the course particles. After centrifugation at 1,100 g for 5 minutes, supernatant was discarded, the sediment was resuspended in 100 ml of saturated salt solution. Two chambers of McMaster counting slide were filled with the suspension with the help of a plastic transfer pipette and allowed 3 to 5 minutes for floatation of the oocysts before examination. The number of oocysts was counted using a × 6 eye piece and × 10 objective of a compound microscope.

Record keeping and data transformation

Records of body weight, feed supply and mortality were kept, and data on live weight gain, feed consumption, feed conversion ratio (FCR), survivability and litter moisture were obtained by calculations. The efficiency of performance was evaluated in terms of production number (PN) as follows (Euribrid, 1994):

$$P.N. = \frac{a.l.w \times \%\ liv}{Days \times f.c.} / 10$$

Where, a. l. w = average live weight in grammes
% liv = % liveability
Days = duration of fattening in days
f. c. = food conversion

Statistical procedures

Data were subjected to analysis of variance in a completely randomized design using MICROSTAT statistical computerized packaged programme. Significant differences between treatment means were identified by Duncan's New Multiple Range Test (DMRT). Correlation coefficients were also determined between litter moisture and oocysts populations. All statistical procedures were in accordance with Steel and Torrie (1980).

RESULTS AND DISCUSSION

Production performance

The production performance of broiler chicks reared on four different depths of rice husk litter is shown in table 1. The variations in live weight gain and feed consumption among different treatments were small and

Table 1. Performance of broiler chicks reared on different depths of rice husk litter (7 to 56 days)

Variables	Depths of litter (mm)				SED of means
	20	30	40	50	
Live Weight gain (g)	1,319 ±21.3	1,314 ±27.3	1,322 ±34.3	1,354 ±11.3	20.40
Food Consumption (g)	3,447 ±34.7	3,427 ±10.7	3,443 ±40.6	3,481 ±21.7	23.95
Food Conversion (g food/g gain)	2.61± 0.023	2.60± 0.047	2.60± 0.072	2.56± 0.006	0.037
Liveability (%)	100.00± 0.0	100.00± 0.0	97.91± 3.608	100.00± 0.0	1.473
Production Number*	103.33± 2.466	103.11± 4.030	101.76± 6.863	107.84± 1.016	3.427

Values indicate ± SD.
* Calculated as Euribrid (1994).
All variables showed no significant differences ($p > 0.05$).

Table 2. Percent moisture and coccidial oocysts ($\times 10^3$/gramme of litter) in different depths of rics husk litter

Age in weeks			Depths of rice husk litter (mm)				SED of means
			20	30	40	50	
4th	Moisture	NS	28.633 ± 3.692	28.703 ± 2.097	31.630 ±10.482	37.133 ±11.588	6.611
	Oocysts	**	6.693^{a} ± 0.750	6.423^{a} ± 0.780	7.767^{a} ± 0.591	10.367^{b} ± 0.702	0.580
5th	Moisture	NS	37.143 ± 5.800	29.433 ± 8.359	30.003 ± 4.899	40.563 ±10.039	0.168
	Oocysts	NS	11.873 ± 1.565	12.877 ± 0.895	9.557 ± 0.620	11.243 ± 1.339	0.951
6th	Moisture	NS	35.260 ± 2.876	29.793 ± 5.271	34.340 ± 5.880	34.430 ± 0.740	3.445
	Oocysts	**	6.647^{bc}± 0.585	7.467^{c} ± 1.508	4.500^{ab}± 0.644	3.120^{a} ± 0.415	0.731
7th	Moisture	NS	32.850 ± 1.902	29.987 ± 6.756	43.107 ± 9.672	41.340 ± 3.758	5.114
	Oocysts	*	6.627^{b} ± 0.650	7.293^{b} ± 2.088	3.810^{a} ± 1.651	3.187^{a} ± 0.995	1.191
8th	Moisture	*	47.067^{b} ± 1.349	39.963^{a} ± 6.320	36.410^{a} ± 1.914	35.703^{a} ± 1.452	2.133
	Oocysts	*	5.510^{ab}± 0.574	6.223^{b} ± 1.419	3.307^{a} ± 1.073	3.223^{a} ± 0.970	0.860

Means bearing no common superscripts differ significantly.
* $p < 0.05$; **, $p < 0.01$; NS, Nonsignificant ($p > 0.05$).

therefore did not differ significantly ($p > 0.05$). These findings were in agreement with the result of a recent study conducted during summer (Haque & Chowdhury, 1994). The nonsignificant difference in live weight gain also agreed with a previous report (Brown et al., 1977) and that for feed consumption with the finding of Veltmann et al. (1984). It appears from performance data (table-1) that feed conversion ratios were very close to each other despite difference in depths of litter and showed no significant difference ($p > 0.05$). The non-significant difference among different depths was in agreement with the result of summer study (Haque & Chowdhury, 1994), but feed conversion was, in general, better in winter. The production number which was calculated using data on body weight gain, rate of survival, duration of fattenning and food conversion ratio revealed no significant difference across treatments ($p > 0.05$). The production number was comparable for 30 mm depth or higher for 20, 40 and 50 mm depth than those reported for summer (Haque and Chowdhury, 1994). This result indicates that broilers raised during winter performed as well as or better than those raised during summer.

Health performance

Only one bird died from those reared on 40 mm depth and this was not related to litter depth. Hence liveability result was quite satisfactory and therefore quite acceptable. Oliveira et al. (1974) observed no significant effect of six types of litter including rice husk on mortality. In an experiment involving ground rice hulls and whole rice hulls, Veltmann et al. (1984) also obtained no adverse effects on liveability in turkey poults. The rate of liveability in the present study was, in general higher than those recorded by Haque and Chowdhury (1994) during summer. The birds of all treatment groups showed no leg abnormalities or breast blisters during the experimental period, a finding in agreement with result of summer study (Haque & Chowdhury, 1994). The moisture content of the litter revealed no significant difference among different depths upto 7th week but at 8th week significantly reduced ($p < 0.05$) in 30, 40 and 50 mm

groups from that of 20 mm group (table-2). In the present study, litter/excreta did not adhere to the toes of birds and no litter caking was observed, contrast to the results previously reported for summer. This was probably due to low temperature and low humidity during winter which caused litter moisture to dry-up more quickly than summer resultig in no litter caking and a little bit soiled plumage. The number of oocysts per gramme of litter from different treatment groups are summerized in table 2 which were generally lower than the figures reported earlier by Long & Russel (1975) and Karim et al. (1994). However highest number oocysts per gramme of litter was found in samples collected at 5 weeks and the subsequent gradual reduction over the weeks were in agreement with previous reports (Long et al., 1975; Karim et al., 1994). This gradual decline in oocyst number was not related any way with therapeutic or preventive treatment, since the birds did not receive any anticoccidial drug.

This was probably due to destruction of oocysts by bacterial action and ammonia production at increasing levels as the birds became older. Such a possibility was previously pointed out by Long et al. (1975).

Table 3. Correlation coefficients between moisture contents and oocyst numbers

Age in week	r-values (moisture & oocyst number)	Level of significance
4th	0.4235	NS
5th	0.3259	NS
6th	−0.4371	NS
7th	−0.7992	**
8th	0.4036	NS

NS, Nonsignificant ($p > 0.05$).
** Significant ($p < 0.01$).

It also appears from table 2 that an increase in the depth of rice husk litter can minimize the number of oocysts during later period of broiler raising (6 to 8 weeks). However coccidial oocysts numbers in all litter depths were within the safety level and therefore clinical coccidiosis was not observed in any treatment group. Similar result was also reported by Haque and Chowdhury (1994) from their summer study. The relationships between moisture contents and oocyst numbers showed positive correlations at 4, 5 and 8 week ($r = 0.423$, 0.325 and 0.403, respec-tively) which were in agreement with Chapman and Johnson (1992). In contrast, the negative correlations at 6 and 7 weeks were difficult to explain.

On the basis of the result of this study it can be concluded that rice husk can be used as litter at depths of between 20 and 50 mm during winter without affecting production characteristics and health performance of broiler birds.

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