A comparison of sawdust and wood shavings as litter materials for broilers

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ABSTRACT

The suitability of sawdust as litter material for broilers was assessed by comparing broiler performance on it with performance on wood shavings in a 49-day trial. Criteria for assessment included body weight at 21, 35, 42 and 49 days of age, feed efficiency, organ data, mortality, litter moisture, and foot pad damage. Broilers raised on shavings were heavier than those raised on sawdust at 49 and 42 days of age for males and females, respectively. Feed conversion efficiency was similar for broilers raised on sawdust and shavings. The heavier gastro-intestinal tract (GIT) and gizzard of broilers raised on sawdust, and the higher mortality due to crop impaction of these birds suggest that consumption of sawdust may be the main cause of lowered growth rate. Rate of increase of moisture in litter was higher for shavings than for sawdust which explains the higher incidence of foot pad damage on broilers raised on wood shavings. It was concluded that for short-cycle broiler production programmes (6 weeks), sawdust is less suitable.

RÉSUMÉ

BOA-AMPONSEM, K. & OSEI-SOMUAH, A.: *Une comparaison de la sciure de bois et les copeaux de bois en tant que matières litières pour les poulets de chair.* La convenance de sciure de bois en tant que matière litière pour les poulets de chair était évaluée par la comparaison du rendement de poulet de chair sur elle avec le rendement sur les copeaux de bois dans un essai de 49 jours. Les critères de l'évaluation comprenaient: poids du corps aux âges de 21, 35, 42 et 49 jours, l'efficacité de ration, les données d'organe, la mortalité, l'humidité de litière et les dégats du coussinet de la patte. Les poulets de chair élevés sur les copeaux étaient plus lourdes que ceux qui étaient élevés sur la sciure de bois aux âges de 49 et 42 jours respectivement pour les mâles et femelles. L'efficacité de conversion de ration était semblable pour les poulets de chair élevé sur la sciure et les copeaux. La plus lourde nature de système gastrointestinal (SGI) et de gésier des poulets de chair élevés sur la sciure et la mortalité plus élevée provoquées par l' impact de culture de ces volailles suggèrent que la consommation de sciure pourrait être la cause principale de la proportion de croissance baissée. La proportion d'augmentation d'humidité dans la litière étaient plus élevé pour les copeaux que pour la sciure qui explique le taux élevé des dégâts du coussinet de la patte sur les poulets de chair élevés sur les copeaux de bois. La conclusion était tirée que pour les programmes de production de poulets de chair à cycle court (6 semaines), la sçiure de bois est moins appropriée.

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Introduction

The poultry industry in Ghana depends mainly on wood shavings as litter material for broilers and layers. During periods of peak production such as before Christmas and Easter festivities, additional demand for litter materials occasionally results in shortage and increased cost of wood shavings. This situation is common in the Greater Accra and other regions where sawmills are few.

In Ghana, wood shavings/sawdust cannot be obtained from one particular specie as wood is planted or sawn, depending on availability and demand. Usually there are a mixture of woods; the commonest are Odum (*Chlorophora excelsa*),

Wawa (*Triplochiton scleroxylon*), and Amire (*Terminalia ivorensis*).

The characteristics of a good litter material have been reviewed (Weaver & Meijerhof, 1991). The ability to absorb moisture without caking or resulting in undue wetness is probably the most important. Poor litter has been associated with lowered carcass quality, growth rate, feed efficiency and increased susceptibility to disease (North, 1981; Harms, Damron & Simpson, 1977; Carlile, 1984).

The objective of this investigation was to assess the suitability of sawdust in comparison with wood shavings as litter material for broilers.

Materials and methods

Five hundred day-old Hypeco broiler chicks were wingbanded, weighed individually, and distributed at random to one of two compartments (i.e. 250 per compartment) with either sawdust or wood shavings as litter material. Each compartment measured 295 cm × 268 cm, for the 1st week, and 375 cm × 268 cm for the 2nd week.

At 21 days of age, 200 birds were randomly selected from each litter type (wood shavings or sawdust) and transferred to two pens (100 per pen) covered with the same type of litter material. The wood shavings and sawdust used were from a mixture of various species of tropical hard wood. The depth of litter on the floor was 5 cm. Birds were fed a diet containing 21.6 per cent crude protein and 2840 kcal/kg metabolizable energy throughout the trial period of 49 days. Feed and water were supplied *ad libitum* to the birds. Birds were vaccinated against Newcastle and Gumboro diseases.

Traits measured

At 21 days of age, 10 males and 10 females were randomly selected from each pen and weighed individually. A similar procedure was followed on days 35, 42 and 49. At 21 and 42 days of age, four males per pen were randomly selected for organ data. The birds were weighed, killed by cervical dislocation, defeathered, and eviscerated. The gastro-intestinal tract (GIT) was removed and weighed with contents. It was then emptied, washed, and dried by using absorbent paper. The following components were then weighed: oesophagus (including crop), proventriculus, gizzard, and the rest of the GIT. Feed efficiency was determined as the ratio of gain in weight over a period, to feed consumed on pen basis.

Litter samples were collected weekly from nine predetermined locations in each pen by means of sinking a cup into the floor and scooping the litter. These nine samples were mixed thoroughly before moisture determination.

The effect of litter material on the health status of the birds was also assessed. Faecal samples were collected from the litter on days 20, 39 and 46, and coccidia were counted by using the MacMaster egg counting technique (MAFF, 1986). Faecal sample was scored as Heavy, $>10^4$/g, Medium, 10^2-10^4/g or Nil, 0/g for coccidia presence. Dead birds were removed daily and the causes of death were classified at autopsy as impaction, respiratory, coccidiosis, enteritis, or miscellaneous. Foot pad damage was scored against birds with infected and calloused foot pads at 49 days of age. A score of '0' indicated no defects whilst '1' meant damaged pad.

Statistical analysis

Statistical analysis on body weights was conducted separately for males and females because sexual dimorphism usually occurs in body weight in chickens (Carts & Siegel, 1970). Data on organs of the body were converted to percent of carcass weight after subtracting contents of GIT. Body weight and organ data were then subjected to student's t-test. Mortality, foot pad damage, and the other health parameters were analyzed by using the chi-square statistic. The probability levels used for statistical tests were 5 and 1 per cent.

Results

Body weight and feed efficiency

Initial body weight was similar among males and

TABLE 1

Body Weight (BWT in %) and Weight Gain[1] (g) of Males and Females Raised on Wood Shavings and Sawdust

		Male		Female	
Age(d)	Variable	Shavings	Sawdust	Shavings	Sawdust
0	BWT	40.6 ± 1.0	42.2 ± 0.8	40.6 ± 6	41.1 ± 9
21	WT	444.5 ± 17.0	444.0 ± 17.0	481.5 ± 22	*464.1 ± 13
	gain	403.9	406.8	440.9	423.0
35	WT	1143.5 ± 20	*037.5 ± 34	1061.3 ± 26	943.4 ± 32
	gain	669.0	588.5	579.8	479.3
42	WT	1457.5 ± 28	*1349.8 ± 43	1296 ± 27	*1184 ± 40
	gain	314.0	312.3	234.7	250.6
49	WT	1842.5 ± 33	*1758.8 ± 52	1612.5 ± 36	1522.2 ± 47
	gain	385.0	409.0	316.5	328.1

* - denotes significant difference ($P<0.05$) between adjacent means.
Gain - increase in body weight over previous age.

females placed on the wood shavings and sawdust (Table 1). At 21 days of age, the weight gain of the males was similar and body weight did not differ significantly among those raised on wood shavings or sawdust. The females raised on wood shavings, however, gained more weight and were significantly heavier ($P<0.05$) than females raised on sawdust at the same age. The trend changed between the sexes when the birds were 35 days of age. Whereas the males on shavings grew faster and were significantly heavier than those on sawdust, no such difference in body weight was observed in females. Beyond this age, difference in weight gain narrowed (at 42 days of age) and favoured birds on sawdust (at 49 days), as birds on sawdust appeared to catch up on the body weight towards the end of the trial. For females, the differences in body weight disappeared at 49 days of age, whilst in males, it persisted. Feed efficiency to 21 and 49 days of age for broilers raised on sawdust and shavings were 0.61, 0.59 and 0.44, 0.45, respectively.

Organ size, health, and litter moisture

At 3 weeks of age, no significant differences were observed between the birds raised on the different litter materials for weight of the organs of the GIT (Table 2). At 6 weeks of age, the GIT of broilers, raised on sawdust, was heavier ($P<0.05$) than those raised on wood shavings. The gizzard was also heavier for broilers raised on sawdust. The trend for all the other organs, except the eviscerated weight, was the same as for GIT and gizzard, though the differences were not significant.

TABLE 2

Organ Weight (% of Carcass Weight[1]) of Broilers on Sawdust and Wood Shavings at 3 and 6 weeks of Age

	3 Weeks			6 Weeks		
Variable	Shavings	Sawdust	SEM[2]	Shavings	Sawdust	SEM[2]
Empty GIT	10.4	10.7	0.3	6.61	*7.97	2.26
Oesophagus (+ crop)	1.00	0.98	0.03	0.55	0.65	0.07
Proventriculus	0.72	0.75	0.06	0.39	0.45	0.03
Gizzard	3.19	3.54	0.22	2.33	**2.65	0.14
Rest of GIT	5.49	5.40	0.37	3.79	4.23	0.30
Eviscerated weight	83.3	86.4	1.5	85.7	83.6	1.3
Feathers	8.0	5.4	1.7	6.7	8.7	1.8

[1]Carcass wt. = body wt - GIT contents.
[2]SEM = pooled standard error of the mean in a row for a particular age.
* ** = denotes significant differences between means at ($P<0.05$) and ($P<0.01$), respectively.

Mortality was higher among broilers raised on sawdust than those raised on wood shavings (Table 3). There were deaths due to crop impaction only among birds raised on sawdust. The examination of crops of dead birds indicated that crop impaction was caused by excessive consumption of sawdust. Deaths due to enteritis,

respiratory and miscellaneous causes, though higher for broilers on sawdust, did not differ significantly ($P>0.05$) from those on shavings. The incidence of foot pad damage was, however, higher in birds on shavings than those on sawdust (Table 3).

Shavings was scored more heavily for faecal coccidia than sawdust at 20 days of age (Table 4), even though the incidence of clinical coccidiosis was similar between litter types (Table 3). Litter moisture content increased at a faster rate in the wood shavings than in the sawdust (Table 5). During the period up to 3 weeks of age, sawdust moisture increased by 2.1 per cent compared with the 7.5 per cent for wood shavings. Between the 4th and 7th week of bird's age, increase in litter moisture was 18.8 and 21.3 per cent for sawdust and wood shavings, respectively.

TABLE 3

Causes of Mortality (% of total) and Foot Pad Damage of Broilers Raised on Wood Shavings and Sawdust

Variable	*Sawdust*	*Shavings*
Mortality (0 - 49 days)	11.2	*5.2
Components of mortality:		
Impaction	0.8	0
Respiratory	4.4	1.6
Enteritis	1.6	0.8
Coccidiosis	2.0	2.0
Miscellaneous	2.4	0.8
Leg pad damage	4.5	**65.5

* ** = Signify significant difference between adjacent means at ($P<0.05$) and ($P<0.01$), respectively.

TABLE 4

Faecal Coccidia Scored at Various Ages on Sawdust or Wood Shavings

Age(d)	*Litter*	*Score*
20	Sawdust	low
	Shavings	heavy
39	Sawdust	nil
	Shavings	nil
46	Sawdust	low
	Shavings	nil

TABLE 5

Moisture Content (%) of Litter

	Weeks of use							
Litter material	*0*	*1*	*2*	*3*	*1**	*2*	*3*	*4*
Sawdust	17.1	17.3	19.9	19.2	17.1	16.2	21.0	35.9
Shavings	15.9	20.8	20.8	23.5	26.4	15.4	20.3	37.7

* Fresh litter material was used in pens to which broilers were transferred at 21 days of age.

Discussion

Differences observed in the pattern of growth of broilers of similar genetic composition, fed and managed similarly must be due to the litter material, since this was the only variable to which they were exposed. The superiority of growth rate on wood shavings over sawdust appeared to decline with time. These observations may be related to the consumption of sawdust by the broilers, as evidenced by the mortality from crop impaction which was recorded only among broilers raised on sawdust. Further, the heavier gizzard of broilers on sawdust suggests that the birds consumed some sawdust. Boa-Amponsem, Dunnington & Siegel (1991) observed that heavier gizzard was associated with the feeding of low energy (higher fibre) diets. Consumption of sawdust might have been due to its similarity in particle size to the mash diet fed to them. Thus, for short-cycle (6 weeks) broiler production programmes, sawdust may retard growth rate.

Differences in growth rate due to litter material (Malone, Tilmon & Taylor, 1990; North, 1981) have also been observed. Malone *et al.* (1990) observed that higher mortality of broilers was associated with the litter material which caused lower growth rate, much in agreement with results of this study.

Sawdust had higher dry matter than the wood shavings over the period of the trial. This may be due to its smaller particle size that gives it a greater surface to mass ratio and hence better ability to lose moisture. This also partly accounts for the differences in foot pad damage observed

as wet litter enhances microbial activity. The higher incidence of leg pad damage associated with higher moisture content of litter has also been reported by Harms *et al.* (1977) and Weaver & Meijerhof (1991).

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