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Evaluation of Para grass (*Urochloa mutica*) as litter material for laying hens

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Abstract

The increasing demand for wood shaving, a conventional litter material, necessitates research into alternative sources of litter for poultry. A total of 90 Shaver Brown pullets were used in a 126 day experiment to investigate the suitability of Para grass as litter material. The birds were allotted to 9 floor pens containing 10 birds each. The floor in 3 randomly selected pens was covered with one of the following materials: wood shavings (WSH), chopped Para grass hay (CPGH) and full Para grass hay (FPGH) in a completely randomised design. Growth and body weight change, feather count, and egg performance parameters formed the major response criteria. Results showed no significant effects of litter material on body weight change, feed intake, hen-day egg production, egg weight and egg mass. There was however, a significant increase in the count of floor primary feathers on FPGH compared to the control WSH and CPGH. No caking was observed on any of the materials. These results were used to conclude that Para grass hay can effectively replace wood shavings as litter material for laying hens. The substitution will save cost as well as reduce the invasive effect of Para grass in the study area.

Keywords: Wood shavings; grass hay; alternative litter; layer performance

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Introduction

Provision of a good litter material is an important welfare requirement in floor reared birds. Materials used for litter should be readily available and cheap, able to absorb moisture, provide warmth to the birds. In addition litter materials should be non-toxic as foraging on bedding materials is a natural behaviour in poultry. The suitability of a bedding material for foraging has been reported to reduce the incidence of feather pecking, a serious welfare issue in laying hens. Blokhuis and Beutler (1992) observed that laying hens will develop feather pecking in the absence of suitable foraging substrate. Using straw and sand as litter materials in laying hens, Huber-Eicher and Wechsler (1997) found that access to straw reduced the incidence of feather pecking but sand did not.

Wood shavings (WS) has been conventionally used as litter material but the increase use of this material for other purposes (roofing tiles, particleboard, and fuel among others) is making it gradually expensive for use as litter material. The gradual ban of the cage system of poultry production due to welfare issues (Rodenburg et al., 2013) will increase the use of the floor system and further increase the demand for wood shaving by the poultry industry.

Several materials have been used as alternatives to wood shavings. Straws from wheat, rice, rice and peanut hulls, corn cobs (Benabdeljelil and Ayachi, 1996; Grimes, 2004), oat hulls, sugar cane stalks (Grimes, 2004), sand (Bilgili et al., 1999; Abdul Hafeez et al., 2009) have been used as alternative litter materials to wood shavings. In Samoa, the study area, cereals and sugar cane are not grown and thus straws from these crops are unavailable. Para grass (*Urochloa mutica*), a native grass to Africa (Wunderlin et al., 2003) now widely cultivated in the tropical world as fodder for grazing animals (Weber, 2003). This grass grows very well in the study area. At the moment, this grass is grossly under-utilised due to the low population

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of grazing animals (cattle, sheep, goats and horses) in the area. Under such under-utilised conditions, Para grass has been reported to be very invasive thus displacing the native vegetation (Ferdinands et al., 2005). The invasion of Para grass has been reported in many Pacific Islands and Pacific Rim countries (PIER, 2005).

It may therefore be interesting to investigate the use of such readily available materials as source of litter in the area. This study was designed to evaluate the suitability of Para hay of different particle sizes as litter material for laying hens in Samoa.

Materials and Methods

Experimental site

The study was conducted at the Poultry Unit of the University of the South Pacific's School of Agriculture and Food Technology, Apia, Samoa (latitude: 13.5°S and longitude: 172°W). Para grass (*Urochloa mutica*) is a common grass species growing in the area all year round. This grass is not harvested for any commercial use at the moment and the population of grazing animals (cattle, sheep and goats) in the area is still very low thus making it readily available for use as bedding material.

Sources and processing of litter materials

Wood shaving (WS) was purchased from a commercial saw mill in Apia. Para grass was harvested from the farm premise and allowed to wilt for 48 h in the sun to obtain Para grass hay (PGH). The wilted PGH was divided into 2 equal parts with 1 part chopped to a length of 25 cm (9.84 inch) and labelled chopped Para grass hay (CPGH) and the other part left as full Para grass hay (FPGH).

Experimental birds and management

A total of 90, 18-wk old, Shaver Brown pullets (1477.40±7.41g) reared on WS from day-old to 18 weeks of age were housed in 9 floor pens measuring 3.4 m x 2.30 m. One of the 3 materials (WS, CH and FLH) was used as bedding material on the floor of 3 randomly selected pens at a depth of 10 cm. The commercial pullet grower feed (15% crude protein) used during rearing was fed up to the age of 20 wks from tube feeders providing 11.20 cm feeding space allowance per bird. From the 20th wk, all birds received a commercial layer feed (16.5% crude protein) *ad-libitum* throughout the duration of the experiment (18 weeks). Clean drinking water was also supplied *ad-libitum* throughout the experimental period from bell drinkers.

Data collection

Data were collected on feed intake, weight change and flock uniformity, hen-day egg production, egg mass, feed efficiency, floor primary feather count. Feed intake was monitored in each pen by feeding weighed quantity daily and subtracting the left over from the quantity fed the previous day. All eggs laid were recorded per pen and percent hen-day egg production (HDP) was calculated as:

Percent HDP = eggs collected / hens present × 100

Ten eggs were weighed weekly from each pen and mean egg weight was recorded. Egg mass was calculated as the product of the mean egg weight and the total eggs collected per pen. Feed conversion ratio (FCR) was calculated as:

FCR = Feed consumed (g) /Egg produced (g)

Primary feathers fallen on the floor were collected and counted weekly in each pen to assess the incidence of feather pecking. At the end of the experiment (week 36), all birds were weighed and weight change was calculated by difference between the initial and final weights. Flock uniformity was calculated per pen using the coefficient of variation (CV %) as:

CV % = standard deviation / mean weight × 100

Litter materials were observed for "cake" formation at 5 different points (4 angles and the geometric centre) in each pen.

Data analysis

All data collected were subjected to analysis of variance (ANOVA) of a completely randomised design (Steel and Torrie, 1980) using the SPSS software (SPSS, 2007) and means were compared using the Least Significant Difference (LSD).

Results and Discussion

The performance data of the hens (Table 1) showed no significant differences ($P>0.05$) in all the growth parameters (final body weight, weight change and flock uniformity). Floor primary feather count (feathers/hen/day) was significantly ($P<0.05$) increased in birds reared on whole hay compared to those reared on chopped hay and wood shavings which did not differ markedly ($P>0.05$) from one another. No mortality was recorded throughout the period of the experiment. No cake formation was associated with any of the litter materials. Feed consumption and egg performance results (Table 2) did not show significant treatment effects on daily feed intake (g/hen) and the egg performance parameters observed (hen-day production, egg weight, egg mass and feed conversion ratio). No mortality was recorded throughout the duration of the experiment.

Table 1: Growth performance data of Shaver Brown hens reared on different sources of litter materials

Parameters	Litter materials			SEM
	CPGH	FPGH	WSH	
Initial weight (g/pullet)	1,430.00	1,440.00	1,440.00	10.00^{NS}
Feed intake (g/hen/day)	112.49	112.41	110.54	5.71^{NS}
Final weight (g/hen)	1,970.00	1,985.00	1,980.00	16.92^{NS}
Weight change (g/hen)	540.00	545.00	540.00	11.90^{NS}
Flock uniformity (CV %)	1.24	1.21	1.23	0.01^{NS}
Floor primary feather count (feathers/hen/day)	0.59^{b}	0.67^{a}	0.60^{b}	0.02^{*}
Cake formation (observed)	NC	NC	NC	NA

CPGH: chopped Para grass hay; FPGH: full Para grass hay; WSH: wood shavings; SEM: standard error of the mean; NS: not significant (P>0.05); *: significant (P<0.05); NC: no cake; NA: not analysed

Table 2: Egg performance data of Shaver Brown hens reared on different sources of litter materials

Parameters	Litter materials			SEM
	CPGH	FPGH	WSH	
Feed intake (g/hen/day)	112.49	112.41	110.54	5.71^{NS}
Hen-day production (%)	70.54	71.54	72.07	5.84^{NS}
Mean egg weight (g)	63.75	62.69	62.67	2.07^{NS}
Egg mass (g/hen/day)	44.71	44.58	45.33	3.20^{NS}
Feed conversion ratio (g feed: g egg)	2.51	2.52	2.52	0.23^{NS}

CPGH: chopped Para grass hay; FPGH: full Para grass hay; WSH: wood shavings; SEM: standard error of the mean; NS: not significant (P>0.05)

These results agreed with those reported by other workers. Anisuzzaman and Chowdhury (1996) compared different materials (sawdust, paddy straw, sand and rice husk) as litter and found no significant effects of litter type on feed intake, weight gain and feed conversion ratio of broiler chickens. Similar observations were made by Davasgaium and Boodoo (2000) who compared different materials with sawdust. Abdul Hafeez et al. (2009) also confirmed these when comparing sawdust, sand and wheat straw as litter materials in broiler chickens. The effect of litter source on the incidence of feather pecking in laying hens is well documented. Access to foraging materials has been reported to reduce the incidence of feather pecking in laying hens. Huber-Eicher and Wechsler (1997) found that access to straw, a foraging material, decreased the incidence of feather pecking in laying hens while access to sand, a dust bathing material, did not. Although hay is an ideal foraging substrate, there were more floor feathers in birds with access to whole hay in the present study compared to those accessing chopped hay or wood shavings. This suggests that both litter particle size is an important factor in the incidence of feather pecking probably to improved ability of birds to forage on smaller particles. Grimes (2004) used straw as litter material and observed that the length is a more important factor than the type of material. He reported that chopped straw was a more effective litter material than whole straw. This author recommended chopping straw to not more than 1 inch length when using it as litter material. In the present study however, chopping hay even at 9.84 inch long was comparable to wood shaving. The absence of caking in all three materials is an indicator of their ability to absorb moisture, an important quality of a litter material.

Based on the results of this study, it was concluded that Para grass hay as litter material have beneficial effects. Economically, it will reduce cost through reduced competition over wood shavings. Environmentally, the maximum utilization of this grass will reduce its invasive effect on the natural vegetation which is becoming a major risk in the region.

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