Research Paper

Evaluation of Variously-Treated Sawdust as Part-Replacement for Molasses-Treated Wheat Offal in Goat (Capra prisca) Rations

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Abstract: A feeding trial, using Goat, (Capra prisca) as test animal was designed to evaluate the value of chemically treated sawdust (an urban solid waste) in a 50% replacement (1:1 ratio) with wheat offal. The aim was to recycle this waste by converting it to animal feedstuff, thereby preventing environmental pollution which it has constituted. The results showed a significant effect (P<0.05) of the rations on Average Daily Weight Gains, Feed Intake, Feed Conversion Ratio and Feed Cost. There was, however, no significant effect on Average Daily Weight Gains between the control, wheat offal and 50% replaced urea-treated sawdust. It was concluded that sawdust can be chemically treated to enhance its voluntary acceptability and nutritional parameters in small ruminant nutrition. The economic and health costs associated with its current management in under-developed nations can thus be transformed with this economically sound, healthy and sustainable method.

Keywords: Sawdust, Waste Management, Recycling, Livestock feedstuff.

1. Introduction:

Since the last century, and especially after the Second World War, there has been a dramatic increase in global production of wastes, indicative of the industrial and scientific revolutions that preceded the war and the unprecedented global levels of economic activities resulting from these revolutions, especially in developed nations (Adetunji, et al, 2006). This increase in wastes generations is attributed to factors such as cheaper consumer products, changing patterns of consumption, taste and
demand for convenient products as well as the proliferation of packaging industries (Gandy, 1994). Adetunji, et al (2006) further opined that wastes, have been, and will perhaps remain, the focus of environmental attention and research probably for the first quarter of this century as predicted based on the realization, worldwide, of the hazardous effects of mismanagement of wastes on biodiversity, environmental quality and particularly human health. The search for improved quality of human life, scientific and technological development, cum problems of population stress on the environment, has steadily worked its way into the environmental policy agenda and was endorsed at the 1992 UN Rio Conference. The Agenda 21 declaration called for the promotion of sufficient financial and technological capacities at the regional, national and local levels to implement waste and recycling policies and actions. Critical to these, is the need to employ sustainable waste management techniques, which is an index to living. Presently, sustainable maintenance of a clean environment in large towns and cities has continued to pose a major problem to estate managers and other environmental scientists. Large quantities of human, agricultural, forestry and industrial wastes that are not being effectively utilized are produced annually in the tropics, thereby constituting environmental and health hazards (Agboola, 1993).

Paterson, (2003) had indicated that the high fibrous ligno-cellulose contents of most of these wastes is the main limitation to their utilization as ruminant feeds. Various chemical treatment methods of delignifications of such fibrous lingo-cellulose materials, which is the principal anti-nutritive factor to utilizing most waste residues as ruminant feeds, have been tried. Among them, there are caustic soda or sodium hydroxide (NaOH) treatment, Urea ([NH₂]₂CO) treatment, Ammonia (NH₃) treatment and treatment with wood ash. Ibrahim, (2003) found-out that urea-treated sawdust can be a supplement to wheat offal in feeding goats. With the current trend of high volume of wasting sawdust in Nigeria and potential methods of making it acceptable to ruminants as feed, this work intend to focus on the acceptability of the chemically-treated sawdust as part-replacement to wheat offal.

The aim is to evaluate the acceptability and performance of goats (Capra prisca) on molasses-treated wheat offal (control) diet and variously treated sawdust (urban solid waste) as 50% replacement for the molasses-treated wheat offal.

2. Materials and Methods:

Treating the sawdust and wheat offal:

i. Wheat offal treatment: Wheat offal treated with molasses (blackstrap type) at a ratio of 1:9 (molasses: wheat offal) and designated WO-M. It serves as the control.

ii. Caustic soda treatment: A 2% (1.25moles/dm³) caustic soda solution was sprinkled on the sawdust at the rate of 1liter/kg. It was then air-dried under shade for 7days to make it crisp dry and prevent fungal growth while in storage. The dried caustic soda-treated sawdust was further treated with molasses at a ratio of 1:9 (molasses: sawdust) as described by Ibrahim (2005). This ration was mixed in 1:1 ratio with WO-M and labeled WCM-S.

iii. Urea treatment: A 2% (3.33moles/dm³) urea solution was sprinkled on the sawdust at the rate of 1liter/kg. The moist sawdust was then stacked, sealed in airtight polythene and buried in a pre-constructed pit of 2m³ for 30days. Thereafter, it was removed and dried (under shade) to disperse free ammonia. The resultant compound was then treated with molasses at a ratio of 1:9 (molasses: sawdust), mixed in a 1:1 ratio with WO-M and designated WUM-S.

iv. Wood ash treatment: The sawdust was soaked in clean ordinary water for 1hour at the rate of 1Kg/liter and then sprinkled with wood ash at the rate of 0.2Kg/Kg sawdust, stacked, sealed and buried in a pre-constructed pit for 30days. The anaerobically fermented sawdust was afterwards dried to disperse poisonous gasses and prevent fungual growth and treated with molasses the same way as caustic soda and urea treatments. This was mixed in 1:1 ratio with WO-M and identified as WWM-S.
The test animals comprise of twenty yearlings (10 Nanny and 10 Billy kids) with an average live-weight of 10.02 kg. The diets were fed to the experimental animals at the rate of 1.2 kg/head/day for 10 weeks. In addition, each animal was offered a basal diet of 0.5 kg groundnut haulms, water was provided ad libitum, plus free choice mineral salt lick and all the animals were de-wormed prior to the feeding trial.

Completely randomized experimental design, as outlined by Steel and Torrie (1980), was used in the feeding trial and the following data were collected from each replicate animal: feed intake; % dry matter digestibility (digestibility coefficient) as described by Ranjhan, (1990); weight gain; feed conversion ratio and feed cost in Nigerian Naira, NGN/Kg weight gain.

Data collected were summarized and subjected to analyses of variance (ANOVA) using statistical analysis system (SAS©, 1988). Differences between treatment means, where ANOVA was significant were compared using Duncan’s New Multiple Range Test as described by Gomez and Gomez, (1984) and Obi, (1986).

Costs of materials were based on the prevailing market prices.

3. Results and Discussions:

The performance of goats fed molasses-treated wheat offal, WO-M as the control and the variously treated sawdust as 50% replacement for the WO-M were as shown in Table 1.

**Table 1: Performance of Goats Fed Variously Treated Sawdust as Part Replacement for Wheat Offal Diet**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>WO-M</th>
<th>WCM-S</th>
<th>WUM-S</th>
<th>WWM-S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Weight (kg/head)</td>
<td>10.00</td>
<td>10.02</td>
<td>10.08</td>
<td>10.21</td>
</tr>
<tr>
<td>Final Weight (kg/head)</td>
<td>14.06</td>
<td>14.12</td>
<td>14.43</td>
<td>13.93</td>
</tr>
<tr>
<td>Digestibility Coefficient (%)</td>
<td>50.60</td>
<td>48.80</td>
<td>49.80</td>
<td>46.80</td>
</tr>
<tr>
<td>Average Daily Weight gain (g)</td>
<td>63.71a</td>
<td>60.32b</td>
<td>62.68a</td>
<td>55.80c</td>
</tr>
<tr>
<td>Feed Intake (Kg/h/d)</td>
<td>0.956a</td>
<td>0.654b</td>
<td>0.664b</td>
<td>0.480c</td>
</tr>
<tr>
<td>Feed Conversion Ratio</td>
<td>16.49a</td>
<td>11.21b</td>
<td>10.98b</td>
<td>9.04c</td>
</tr>
<tr>
<td>Feed Cost (NGN/Kg gain)</td>
<td>39.01a</td>
<td>20.21b</td>
<td>17.71c</td>
<td>12.55d</td>
</tr>
</tbody>
</table>

In Table 1, it has been shown that there were no significant effects of diets on the final weight the trail animals. The rations, however, had significant effects on Average Daily Gain, Feed Intake, Feed Conversion Ratio and Feed Cost/Kg gain. WUM-S resulted in significantly higher Average Daily Gain than WWM-S and WCM-S diets. The improvements in Average Daily Gain observed for WUM-S was very significant as it raised the value of this ration to the same level observed for WO-M, the control. WCM-S ration was also significantly higher, in terms of Average Daily Gain than WWM-S.

Feed intake was also significantly better for WCM-S and WUM-S than WWM-s. This was however, significantly higher for the control, WO-M.

Feed conversion Ratio was significantly better for WCM-S, WUM-S and for WWM-S than the values obtained for WO-M (control) at P<0.05.

Cost per Kg gain were significantly lower (P<0.05) for all the treatment rations when compared with the control. The lowest cost recorded was for WWM-S, then WUM-S and WCM-S with NGN12.55,
NGN17.71 and NGN20.21 respectively. The control ration, WO-M had the highest cost per Kg gain of NGN39.01.

Thus, the trial has indicated significant effects of the treatments on Average Daily Gains, (ADG) Feed Conversion Ratio and Feed Cost (Nigerian Naira/Kg gain). There was, however, no significant effect on Average Daily Gain between the control feed, (WO-M) and WUM-S. WWM-S and WCM-S had significantly lower ADG. WCM-S treatment, however, was better than WWM-S. This significant in ADG might be as result of improvement in the quality of the rations in terms of improved NFE and/or CP as well as the mineral contents of the WUM-S. The similarities in Feed intakes and Feed Conversion Ratios between WCM-S and WUM-S are a possible reflection of the improvements and the similarities in their NFE and digestibility values.

The results for Feed cost (NGN/Kg gain) manifest significant difference (P<0.05) among the four rations.

4. Conclusions:

This work has established that, in small ruminant nutrition, the voluntary intake and poor nutritional qualities of sawdust, an urban solid waste accumulating in towns and cities of developing countries can be enhanced by treating it as described in this experiment.

Notwithstanding the fact that the wheat offal-based control diet used is a relatively expensive feed and very much unaffordable for most livestock farmers in poor nations who manage animals under extensive systems, the results may still be seen as headway.

Finally, the implications of the results are that livestock farmers, by utilizing sawdust as feed for ruminants may be a segment of the stakeholders in urban solid waste management. Where sawdust is utilized as ruminant feedstuffs, the current and most popular method of disposing the hazardous and environmentally unfriendly sawdust by open air burning, as opined by Ebhodaghe, (1993) may be curtailed. Using sawdust as a ruminant feedstuff can be a safe and profitable system of waste management. This would reduce cost of production, while competition between man and livestock for cereals and their by-products could also be reduced. The marginal increase in meat supply through sawdust utilization could also imply cheaper meat on the dining table.

References

