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CHEMICAL COMPOSITION OF KITCHEN WASTE FOR PIG FEEDING

P. Ravi[1] and Saikia[2]
[1]Assistant Professor, Veterinary University Training and Research Centre, Bretts Road, Near Collectorate Office, Veterinary Hospital Campus, Salem-636 001
[2]Assistant Professor, Department of Livestock Production and Management, Central Agricultural University, Mizoram
E-mail: lpmravi0071@rediffmail.com

Abstract: The chemical composition of kitchen waste for pig feeding was characterised through the analysis of dry matter (DM), crude protein (CP), ether extract (EE), crude fibre (CF), ash and nitrogen free extract (NFE) of 180 samples obtained throughout five months at hostels of Indian Veterinary Research Institute, Izatnagar, Utter Pradesh. The overall mean were 19.51%, 93.91%, 4.31%, 19.02%, 11.03%, 59.54%, 63.87% and 6.06% for DM, Organic matter, CF, CP, EE, NFE and total carbohydrate and ash, respectively. DM content of kitchen wastes was varied between 18.85 and 20.94%. CP content of the kitchen waste thus could be comparable with the standard of NRC. The EE content of the kitchen waste was much more and CF content was lower than the standard ration. It is suggested that kitchen waste could be utilized as an alternative economic feed for pigs without neglecting sanitary measures involved.
Keywords: Kitchen waste, Crude protein, Dry matter, Ether extract, Proximate analysis.

Introduction

Pigs are mono-gastric animals like human beings and are usually reared on conventional high energy and protein rich feeds for faster growth. In most of the pig enterprises, feeding concentrate accounts for nearly 80% of the total cost of production and is found to be not economical at farmers level. The overall scare supply of grains coupled with ever increasing human consumption leaves little scope for cereal utilization in pig ration. Judicious replacement of cereal completely or partially with vegetable waste and human leftover is expected to solve the problem to a great extent (Danteravanich et al., 2002 and Scholten et al., 1996). Hence there is urgent need for replacing this grain based ration with locally available unconventional feeds without affecting the overall performance of the animals and their carcass quality. Kitchen waste can be described as an edible waste obtained from food production, and consumption like house hold, hostels, mess waste etc. These wastes from hostels and restaurants can be collected at minimum or no cost. The food/ kitchen waste are nutrient rich surplus materials, which have higher CP and energy value (Westendorf and

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Myer, 2004) and can be used for regular feeds for pigs (Moon *et al*, 2004). However, utmost care is necessary while evolving and using these rations to meet the nutritional requirements for growth, reproduction and carcass quality of pigs. Therefore, the present study was conducted to find out the nutritive composition of kitchen waste for feeding of pigs.

MATERIALS AND METHODS

The daily fresh kitchen waste was collected from hostel messes at Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh throughout five months. Samples of feeds were analyzed for proximate principles as per the methods described by AOAC (1995). The dry matter (DM) content was estimated at weekly intervals and proximate principles of kitchen waste was estimated on pooled sample at monthly intervals.

Dry matter (DM)

A known quantity of ground samples of feed was taken in previously weighed dry moisture cup and kept overnight in hot air oven at 100±2 oC. Loss of weight was calculated as moisture and the remaining was the dry matter of the sample.

Nitrogen (N) and crude protein (CP)

The Kjeldahl nitrogen method is the most frequently used procedure for measuring nitrogen and in turn the protein content in biological materials. In this method the amino (-NH2) nitrogen is oxidised by sulfuric acid in the presence of catalyst to (NH4)2) SO4. The ammonium ion is converted to NH3 by NaOH and collected by distillation. The NH3 is then quantitatively titrated against standard acid (HCl or H2SO4) of known strength and nitrogen in the sample is computed. The crude protein is obtained by multiplying the nitrogen content with a factor 6.25 (16%) nitrogen in protein for most of the feeds in general).

Ether extracts (EE)

The ether soluble portion of feeds, residues and faeces were determined by extracting weighed samples with petroleum ether (BP 60-80o) for 6 hours in Soxhlet apparatus and the ether extract was expressed as per cent on dry matter basis.

Crude fiber (CF)

The moisture and fat extracted samples of feeds, residues and faeces were refluxed with 2.04 N sulphuric acid for 30 minutes and washed with hot water to make the sample acid free. This was followed by refluxing with 2.04 N sodium hydroxide for 30 minutes and again washed with hot water to make the sample alkali free. The sample left on refluxing was strained in a muslin cloth. The residue left after washing was crude fibre and ash. It was then dried in pre weighed silica basin, weighed and ashed in muffle furnace. Crude fibre was calculated by deducing ash from the weight of dried residue.

Total ash

A known quantity of moisture free sample was taken in a previously weighed silica crucible and was decarbonised in electric heater. Then the crucible along with decarbonised sample was kept in muffle furnace and ignited at 550oC for 3 hours. The residue left in the crucible was reported as total ash. The amount of ash was expressed on dry matter basis.

Nitrogen free extract (NFE)

Nitrogen free extract in samples of feed, residue and faeces was obtained by deducing the sum of percentages of CP, EE, CF and total ash on DM basis from 100.

Organic matter (OM)

Organic matter was calculated by subtracting the total ash percentage from 100.

Total carbohydrate (TCHO)

Total carbohydrate content of feeds, residues and faeces was calculated by addition of CF and NFE.

The data obtained from experiment were analysed as per the standard method of statistical analysis (Snedecor and Cochran, 1985)

Results and Discussion

The DM content and chemical compositions of kitchen wastes (KW) are presented in Tables (1&2). DM content of kitchen wastes was estimated on weekly intervals during experimental period, which varied between 18.85 and 20.94%. Similar DM content in kitchen waste was also reported by Saikia (2004). Gloridoss and Das (1985) and Majid et al. (1995) reported that kitchen waste contained 19.6 % DM. On the other hand, Vadeii et al. (2000) reported 30.61% DM of garbage and 27% DM as reported by Westendorf and Myer (2004). The differences in DM content might be attributed to the diet patterns place to place (Chae et al., 2000). The overall OM, CP, EE, CF, NFE,T-CHO and ash contents of the kitchen waste was 93.91, 19.02, 11.03, 4.31, 59.54, 63.87 and 6.06 per cent, respectively. The chemical composition between different months with respect to OM and CP did not vary much, but CF and EE ranged from 2.14 to 6.10 and 8.7 to 13.42 per cent. The CP content in the present study was ranged from 17.59% to 21.43%. CP content of the kitchen waste thus could be comparable with the standard of NRC. However, Ranjan (2003) observed 35 per cent dry matter and 26.3 per cent crude protein in the hotel waste whereas Harikumar (2001) observed a crude protein per cent of 10.25 for hotel waste and low CP per cent of hotel waste may be due to presence of cooked rice as the major ingredient of hotel waste. Rivas et al. (1996) also reported a high CP of 22.4 per cent for dehydrated edible restaurant waste which is in agreement with the present study. The EE content of the kitchen waste was much more and CF content was lower than the standard ration. Harikumar (2001) reported (EE) of 30.9 per cent for chicken offal and 18.34 per cent for hotel waste. But Ranjan (2003) reported 7.63 per cent of EE for hotel waste. The monthly variation in chemical composition may be due to seasonal variability of food served in the hostel. Gloridoss and Das (1985) reported lower value of CP (18.5%) in kitchen waste and 59.9% NFE. Baird et al. (1973) reported 16.78% CP, 9.7% EE, 8.05% CF, 4.46% ash and 55.25% NFE on DM basis. Singh et al. (1994) reported lower values for CP and EE (13.07% and 6.06% respectively) in their study. Westendorf and Dong (1997) reported average composition for CP and EE of food plate waste as 20.8% (ranging between 13.6 and 37.7) and 26.3% (ranging between 9.1 and 46.9). The variation with feeding food waste might be due to variation in sources, resulting in variation in nutrient composition (Kornegay et al., 1965; Soliman et al., 1978; Lipstein, 1984; Pond and Manner et al., 1984; Myer et al., 1999; Yang, 1999). Therefore it is suggested that kitchen waste can be interesting alternative for pigs, without neglecting the sanitary aspects involved.

The result of the present study revealed that the crude protein (CP) content of the different source varied significantly. The chicken waste had maximum CP, while the hotel and vegetable waste had similar rates crude protein. The pooled feed sample had a CP of 14.8%. Based on these results, it was concluded that the pigs may be fed with the swill feed consisting combination of different sources for better growth.

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Table 1: Dry matter content (as such) of kitchen waste on monthly basis

Months	Kitchen waste (%)
1	18.85±1.93
2	19.42±1.28
3	20.94±1.15
4	19.10±0.21
5	19.21±0.20
Overall	19.51±0.42

Table 2: Chemical composition of pooled (monthly) kitchen waste (%) on DM basis

Attributes	1st month	2nd month	3rd month	4th month	5th month	Over all mean
Moisture (M)	81.15	80.58	79.06	80.90	80.79	80.49±0.45
Organic Matter (OM)	94.46	94.01	94.08	94.21	92.81	93.91±0.32
Crude fibre (CF)	6.01	4.21	3.11	2.14	6.1	4.31±0.88
Crude protein (CP)	18.28	21.42	17.59	19.04	18.78	19.02±0.72
Ether extract	13.42	11.10	8.70	10.23	11.67	11.03±0.87
Nitrogen free extract (NFE)	56.75	57.28	64.68	62.80	56.26	59.54±2.32
Total carbohydrate (TCHO)	62.76	61.49	67.79	64.64	62.36	63.87±1.27
Ash	5.54	5.99	5.92	5.79	7.19	6.06±0.31