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NUTRITIVE VALUE OF RICE POLISH

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ABSTRACT: *The present study was undertaken to observe the chemical composition of different types of rice polish available in different areas of Chittagong, Bangladesh. Twenty different types of rice polishes were collected from study areas. Chemical analyses of the samples were carried out in triplicate for moisture, dry matter (DM), crude protein (CP), crude fiber (CF), nitrogen free extract (NFE), ether extract (EE) and total ash (TA) in the animal nutrition laboratory, Chittagong Veterinary and Animal Sciences University, Chittagong, Bangladesh. Metabolizable energy (ME) was calculated mathematically for all samples by using standard formula. Results indicated that, there were no marked variations (P>0.05) in the moisture, DM and TA contents of the samples. However, ME, CP, CF, NFE and EE content significantly differed (P<0.01) from one sample to another. Moisture content varied from 4.0 to 11.4 g/100g, DM content varied from 88.6 to 96.0 g/100g, ME content varied from 1321.8 to 3086.9, CP content varied from 4.7 to 14.9 g/100g, CF content varied from 6.4 to 41.5 g/100g, EE content varied from 1.0 to 18.0 g/100g, NFE content varied from 25.1 to 52.9 g/100g and TA content varied from 7.1 to 17.6. It could therefore, be inferred that, the chemical composition rice polish currently available in the local market are widely variable.*

ORIGINAL ARTICLE

Key words: *Rice Polish, Moisture, Dry Matter, Crude Protein, Crude Fiber, Nitrogen Free Extract, Ether Extract and Total Ash*

INTRODUCTION

Rice polish is derived from the outer layers of the rice caryopsis during milling and consists of pericap, seed coat, nucleus, aleurone layer, germ and part of sub-aleurone layer of starchy endosperm (Juliano, 1988). Rice polish is a byproduct of rice milling industry and is the cheapest source of energy and protein for poultry feeding. It constitutes about 10% of paddy and is available in large quantities in major rice growing areas of the world (Houston and Kohler, 1970).

Rice polish supplies total digestible nutrients almost close to maize (Singh and Panda, 1988). Use of rice polish in poultry industry may reduce feed cost per kilogram weight gain (Khalil et al., 1997a; Shih, 2003). Rice polish is a major cereal by-product available for animal feeding in rice-growing countries. It is a good source of protein (13.2 to 17.1%), fat (14.0 to 22.9%), carbohydrate (16.1%), fiber (9.5 to 13.2%), vitamins and minerals (Vargasgonzalez, 1995; Aljasser and Mustafa, 1996; Ambashankar and Chandrasekaran, 1998).

Nutritive value of rice polish is comparable to other cereals like maize, wheat, and sorghum. It is also a rich source of phosphorus, potassium, iron, copper and zinc, and the amino acid profile of the rice bran protein is generally superior to that of cereal grains. The fiber contents range from 10-15% (Farrell, 1994).

Rice polish has better assortment of amino acids, particularly lysine and methionine, compared to other cereal grains, including corn and wheat (Khalique et al., 2004). In addition to macronutrients, vitamins, minerals, medicinally important antioxidant and γ-oryzanol content of rice polish has recognized it as a potential feed (Iqbal et al., 2005; Moldenhauer et al., 2003; Chatha et al., 2006). Research conducted during the last two decades has shown that rice polish is a unique complex of naturally occurring antioxidant compounds (Iqbal et al., 2005; Moldenhauer et al., 2003).

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Inclusion of rice polish in the diet does not affect the health of chickens (Mahbub et al., 1989). In experiments with chicks, cereal grains have been replaced with rice polish, and it was found promising in certain stitutions (Khalil et al., 1997a).

Despite wide range of advantages, the quality of rice polish available in the local market is questioned. Because, rice husk and saw dusts are frequently incorporated into it to make it cheap. Therefore, the present study was aimed to investigate the chemical composition of rice polish used as poultry feed available in the local market.

MATERIALS AND METHODS

Study area

Livestock and poultry feeds are mostly available in Pahartali, Khatungonja and Karnaphuli markets of Chittagong division. Almost all farmers collect their poultry feeds from these markets Therefore, local markets available in those areas were selected as the study are for collection of sample.

Collection of sample

Samples were collected by using simple random sampling technique. Twenty feed shops were selected randomly. Approximately 500 grams of rice polish was purchased from each shop. Samples were wrapped up by polythene bag and preserved in the laboratory for chemical analysis.

Preparation of sample

Samples were subjected to grinder to make it homogenous powder. Later on, it was mixed properly and exposed to shade to cool down for sampling. Individual samples were identified by marker and subjected to chemical analyses.

Analysis of sample

Chemical analyses of the samples were carried out in triplicate for moisture, DM, CP, CF, NFE, EE and TA in the animal nutrition laboratory, Chittagong Veterinary and Animal Sciences University, Chittagong, Bangladesh as per AOAC (1994).

Calculation of ME

ME was calculated separately for all 20 different rice polish samples. Calculation was performed by mathematical formula as per Ludhi et al. (1976).

Statistical analysis

Data related to chemical composition of rice polish were compiled by using Microsoft Excel 2007. One sample t-test was performed to analyze the data by using Stata 11C. For each t-test, reference value for the relative component was obtained (Banerjee, 1995) to use as the test value for that particular component. Statistical significance was accepted at 5% level ($P<0.05$).

RESULTS AND DISCUSSION

Moisture content did not differ significantly ($P>0.05$). Minimum, maximum and mean values for moisture content were 4.0, 11.4 and 8.0 respectively. In present study, mean value for moisture in rice polish was 8.0 g/100g. The result is in agreement with Banerjee (1995) who found 8.2 g/100g moisture in rice polish. Malik et al. (1979) also obtained 7.4 g/100g moisture in rice polish. Other investigators (Anjum et al., 2007; Hamid el al., 2007; Sharif et al., 2005; Sirikul et al., 2009) also found closely similar results. However, the result of the current study is contradictory with Rao and Reddy (1986) who found 18.10 g/100g moisture in rice polish.

Similar to moisture, DM content did not differ ($P>0.05$). Minimum, maximum and mean values for DM content were 88.6, 96.0 and 92.0 respectively. Mean value for DM in rice polish was 92.0 g/100g. The result is in agreement with Banerjee (1995) who found 91.8 g/100g DM in rice polish. Malik et al. (1979) also obtained 92.6 g/100g DM in another study. Anjum et al. (2007), Hamid el al. (2007), Sharif et al. (2005) and Sirikul et al. (2009) also found similar results. However, the result of the current study is inconsistent with Rao and Reddy (1986) who found 81.9 g/100g DM in rice polish.

Unlike moisture and DM, CP content differed significantly ($P<0.01$). Minimum, maximum and mean values for CP content were 4.7, 14.9 and 8.8 respectively. In present study, mean value for CP was 8.8 g/100g. The result is consistent with other investigators (Anjum et al., 2007; Hamid el al., 2007; Sirikul et al., 2009) also found closely similar results. However, it differs with Rao and Reddy (1986) who found 12.7 g/100g CP in rice polish. Banerjee (1995) found 12.0 g/100g CP and Malik et al. (1979) found 11.45 g/100g CP. Similarly, result of the current study is inconsistent with other investigators (Alencar and Alvarenger, 1991; Gnanasambandam and Hetiarachchy, 1995; Kahlon and Smith, 2004; Saunder, 1990; Sekhon et al., 1997; Sharif et al., 2005; Sikka, 1990).

Similar to CP, CF content differed significantly ($P<0.01$). Minimum, maximum and mean values for CF content were 6.4, 41.5 and 25.2 respectively. In present study, mean value for CF was 25.2 g/100g. The result is contradictory with Rao and Reddy (1986) who found 7.60 g/100g CF in the rice polish. Similarly Banerjee (1995) also found 11.2 g/100g CF and Malik et al. (1979) found 3.85 g/100g CF in the rice polish. Other researchers (Gnanasambandam and Hetiarachchy, 1995; Hamid el al., 2007; Saunder, 1990; Sekhon et al., 1997; Sharif et al., 2005; Sikka, 1990; Kahlon and Smith, 2004) also found similar results.

Table 1 - Chemical composition (g/100g) of individual rice polish

Sample No.	Nutritive value (g/100g)							
	Moist.	DM	ME	CP	CF	NFE	EE	Ash
1	11.4	88.6	2562.3	14.5	8.0	52.9	5.0	8.2
2	8.0	92.0	1321.8	6.5	36.0	25.5	4.0	20.0
3	9.6	90.4	3071.1	13.3	8.5	47.0	15.0	6.6
4	8.2	91.8	1496.4	6.3	34.5	31.0	4.0	16.0
5	9.4	90.6	3086.9	13.7	6.4	49.4	14.0	7.1
6	7.6	92.4	1353.1	5.6	40.6	25.1	5.0	16.1
7	10	90.0	2524.4	12.8	12.0	46.7	8.0	10.5
8	10.2	89.8	2516.2	11.9	12.8	47.4	8.0	9.8
9	6.8	93.2	1568.9	6.3	33.5	37.7	2.0	13.7
10	5.2	94.8	1886.2	4.7	30.7	44.4	4.0	11.0
11	9	91.0	1518.8	6.1	31.4	38.6	1.0	13.9
12	7.2	92.8	1542.5	6.3	34.6	32.4	4.0	15.5
13	9.2	90.8	2947.8	12.4	9.2	44.2	15.0	10.0
14	4.8	95.2	1649.6	5.3	34.6	32.2	6.0	17.2
15	5.8	94.2	1801.2	5.2	32.8	39.1	5.0	12.1
16	5.4	94.6	1501.3	6.1	36.8	29.1	5.0	17.6
17	4	96.0	1740.2	5.8	41.5	25.4	10.0	13.3
18	8.6	91.4	2969.3	14.9	10.2	35.6	18.0	12.7
19	9.6	90.4	1664.4	6.7	35.8	31.2	6.0	10.7
20	9.6	90.4	3037.5	10.8	11.6	41.8	18.0	8.2

DM Dry matter; CP Crude protein, CF Crude fibre, NFE Nitrogen free extract, EE Ether extract

NFE content differed significantly (P<0.01). Minimum, maximum and mean values for NFE content were 25.1, 52.9 and 37.8 respectively. The mean value obtained in present study is in agreement with (Anjum et al., 2007; Farrel, 1994; Hamid el al., 2007; Kahlon and Smith, 2004; Sharif et al., 2005).

EE content did not differ significantly (P>0.05). Minimum, maximum and mean values for EE content were 1.0, 18.0 and 7.85 respectively. In present study, mean value for EE was 7.85 g/100g. The result is in agreement with Choo and Sadiq (1982) who found 9.5 g/100g EE in rice polish. Similarly, Hamid el al. (2007) also found 8.7-18.9 g/100g EE in rice polish. Anjum et al. (2007) also obtained 9.72 g/100g ether EE in rice polish. However, the result of the current study is contradictory with Banerjee (1995) who found 13.9 g/100g EE in the rice polish. Malik et al. (1979) found 13.65 g/100g EE in rice polish. Findings of other investigators (Kahlon and Smith, 2004; Saunder, 1990; Sharif et al., 2005; Sikka, 1990; Sirikul et al., 2009) are also inconsistent with present study.

Table 2 - Mean values for chemical composition (g/100g) of rice polish

Parameters	Minimum	Maximum	Mean	SD	SE	Sig.
Moisture (g/100g)	4.0	11.4	7.98	2.1	0.46	NS
DM (g/100g)	88.6	96.0	92.0	2.1	0.46	NS
ME (kcal/kg)	1321.8	3086.9	2088.0	661.3	147.9	**
CP (g/100g)	4.7	14.9	8.8	3.7	0.83	**
CF (g/100g)	6.4	41.5	25.2	13.2	2.96	**
NFE (g/100g)	25.1	52.9	37.8	8.6	1.93	**
EE (g/100g)	1.0	18.0	7.85	5.3	1.18	**
Ash (g/100g)	7.1	17.6	12.5	3.7	0.84	NS

DM Dry matter; CP Crude protein, CF Crude fibre, NFE Nitrogen free extract, EE Ether extract; SD Standard deviation, SE Standard error; NS Non-significant (P>0.05); **Significant at 1% level (P<0.01)

Ash content did not differ significantly (P>0.05). In present study, mean value for Ash was 12.5 g/100g. The result is in agreement with Banerjee (1995) who found 13.6 g/100g ash in rice polish. Similarly Malik et al. (1979) obtained 10.80 g/100g ash in rice polish. Other investigators (Anjum et al., 2007; Gnanasambandam and Hetiarachchy, 1995; Kahlon and Smith, 2004; Saunder, 1990; Sekhon et al., 1997; Sirikul et al., 2009) found similar results. The result of the current study is contradictory with Rao and Reddy (1986) who found 17.4 g/100g ash in rice polish. Similarly Ghazi (1992) also who found 17.15 g/100g ash in rice polish. Anjum et al. (2007) obtained only 5.9 g/100g ash in rice polish.

CONCLUSION

Rice polish is a vital component of the traditional maize soybean based broiler and layer diet. In developing countries, out of all the crop residues, this is one of the cheapest and largest sources of metabolizable energy as

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well as crude protein. There is no doubt that, inclusion of rice polish will substantially minimize cost of production for livestock and poultry. However, current study indicates that the quality of rice polish is widely variable. Therefore, to formulate least cost balanced ration, rice polish must be analyzed first in the laboratory and then incorporate it into the practical ration.

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