**Pakistan Vet. J., 2006, 26(4): 190-192.**

# CHEMICAL COMPOSITION OF RICE POLISHING FROM DIFFERENT SOURCES

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## ABSTRACT

The present study was conducted to investigate the chemical composition of rice polishing available in Pakistan used in poultry rations as an energy source. Chemical analysis of 195 samples was done. Overall, 60% samples had either lower or higher percentage of ether extract as compared to reference value (13-16%). Large number of samples (41.54%) showed lower value of ether extract (less than 13%) that indicate oxidative rancidity of fat. Inverse correlation of ether extract was found with crude fiber, calcium and phosphorus. Samples were also adulterated with rice husk, as indicated by presence of sand/silica in the samples.

**Key words:** Rice polishing, chemical composition, poultry feed.

## INTRODUCTION

Rice is one of the most important cereal crops in Pakistan, ranking third in importance. Production of rice was 5.547 million tons during 2005-2006, almost 10.4 percent higher than the last year (Economic Survey of Pakistan, 2005-2006). Rice polishing is a by-product of rice milling 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 polishing has great potential as an ingredient in poultry feed, with inclusion level varying from 25 to 40% (Singh and Panda, 1988). It is a good source of proteins, energy, vitamins and minerals (Saunders, 1990). It also contains better assortment of amino acids, particularly lysine and methionine, compared to other cereal grains, including corn and wheat (Khalique *et al*., 2004). Rice polishing supplies as much total digestible nutrients as maize (Singh and Panda, 1988).

The present study was planned to investigate the chemical composition of rice polishing as a feedstuff in the feed of poultry commercially available in the markets of Pakistan.

## MATERIALS AND METHODS

A total of 195 samples of rice polishing were procured randomly from various poultry feed mills and poultry farms in Rawalpindi and Islamabad area. All the samples were chemically analyzed for the crude protein (CP), crude fiber (CF), total ash (TA), ether extract (EE) and moisture according to methods of Association of Official Analytical Chemists (AOAC, 2000). Acid insoluble ash (sand/silica) was determined by European Community (1971) method. Calcium and phosphorus contents were determined according to procedures described by Allison *et al*. (1954). Thiobarbituric acid (TBA) value was estimated by using the methods recommended by AOCS (2004). Metabolizable energy was calculated by prediction equation described by Janssen (1989). In order to find out any correlation between different parameters, Pearson's correlation test was used (Steel and Torrie, 1981).

## RESULTS AND DISCUSSION

Out of 195 samples, 41.54% had EE value less than 13%, 40.00% in the range of 13-16% and only 18.46% had EE value more than 17%. According to Malik and Chughtai (1979), the range of EE in rice polishing is 13-16%. In our case, 40% samples showed normal range (13-16%), while 60% samples showed either low or high percentage of EE.

The results of chemical composition of rice polishing are given in Table 1. The chemical composition of rice polishing in present study and in different studies can be compared from the values in Table 2.

Digestible protein and crude fiber contents are the major determinants of metabolizable energy contents (Malik *et al.*, 1973). Among the plant protein feedstuffs and mill by-products, the highest gross energy is of corn gluten meal, followed by rice polishing. In rice polishing, the ME calculated was 2237 kcal/kg. Ether extract had an inverse significant correlation with crude fiber ($p<0.01$), calcium ($p<0.01$) and phosphorus ($p<0.05$). High fat content in the rice polishing, which is of unsaturated nature tends to develop rancidity quite readily (Singh and Panda, 1988). TBA values showed

**Table 1: Chemical composition of rice polishing (%)**

| Parameters | Minimum | Maximum | Mean | S. deviation |
|---|---|---|---|---|
| Ether Extract | 4.000 | 21.000 | 13.510 | 3.250 |
| Crude Fiber | 0.000 | 41.000 | 15.150[a] | 6.730 |
| Crude Protein | 8.750 | 21.250 | 13.000 | 3.320 |
| Total Ash | 4.000 | 18.500 | 10.600 | 2.810 |
| Moisture | 3.400 | 11.100 | 7.950 | 1.930 |
| Dry Matter | 88.900 | 96.600 | 92.050 | 2.060 |
| TBA | 0.250 | 0.860 | 0.550 | 0.200 |
| Calcium | 0.400 | 1.000 | 0.650[a] | 0.230 |
| Phosphorus | 0.900 | 1.330 | 1.300[b] | 0.170 |
| Sand/Silica | 2.500 | 11.000 | 5.880 | 3.020 |

[a]Highly significant inverse correlation of ether extract with crude fiber and calcium ($p<0.01$)
[b]Significant inverse correlation of ether extract with phosphorus ($p<0.05$)

**Table 2: Mean reference values of rice polishing recommended by different researchers**

| S. No. | Reference | Crude fat (%) | Crude fiber (%) | Crude protein (%) | Total ash (%) | DM (%) | ME kcal/kg |
|---|---|---|---|---|---|---|---|
| 1 | Malik *et al*. (1979) | 14.65 | 03.85 | 11.45 | 10.80 | 92.60 | - |
| 2 | Choo and sadiq (1982) | 09.50 | 12.00 | 11.00 | 09.80 | - | 2970.00 |
| 3 | Rao and Reddy (1986) | 18.10 | 07.60 | 12.00 | 17.40 | - | - |
| 4 | Ghazi (1992) | 10.71 | 15.71 | 12.97 | 17.15 | 92.75 | 3740.69 |
| 5 | NRC (1994) | 11.00 | 03.58 | 12.20 | - | - | 3090.00 |
| 6 | Nadeem (1998) | 14.07 | 11.86 | 14.97 | 10.75 | 91.38 | 3016.00 |
| 7 | Leeson and Summers (2001) | 15.00 | 02.40 | 11.00 | - | - | 2750.00 |
| 8 | Present study | 13.51 | 15.15 | 13.00 | 10.60 | 92.05 | 2237.00 |

certain level ($0.55 \pm 0.20\%$) of oxidative rancidity of fat which might be the factor for less percentage of EE in 41.54% samples. Present study showed high levels of sand/silica i.e. $5.88 \pm 3.02\%$ (range 2.50-11.00%), indicating adulteration of rice husk or rice bran. The current study also showed high level of calcium in rice polishing ($0.65 \pm 0.23\%$) as compared to NRC (0.05%), however, percentage of phosphorus was in accordance to NRC (1994; 1.30% vs. 1.31%).

The present results showed wide variation of chemical composition of rice polishing. It might be due to the differences of varieties of rice polishing used for feed or processing condition (Rao and Reddy, 1986). It is reported that polishing time and pressure affect the quality characteristics of rice grain. Moreover, adulteration can also affect the results.

It is suggested that rice polishing can be used in poultry feed as an energy source. It is also suggested that all ingredients should be analyzed for their chemical composition prior to feed formulation for better results.

**Acknowledgements**

We gratefully acknowledge Naseem Traders International for the financial support, Mr. Mujahid Hussain and Dr. Abdul Rehman for valuable suggestions and guidance and finally, Mr. Khizar Hayat for help in statistical analysis.

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