https://doi.org/10.29321/MAJ.10.A02779

Madras agric. J. 69. (11): 724—727 November 1982

Studies on rice bran and rice bran oil IV. Nutritive Value of Rice Bran

V. V. KRISHNAMURTHI[1] and U. S. SREE RAMULU[2]

Regarding the mutrient content of bran, parboiling had a positive significant influence on the crude protein content. The bran was found to contain 29.63 to 43.28 per cent of DDM. Among the varieties, GEB 24 registered better DDM per cent than others. TANU 13253/7/2, TNAU 15869 2 and TNAU 20892 could be considered to be good in terms of oil content and nutritive value.

Rice (*Oryza sativa*) is one of the more widely grown food crops of the world and its production approximately equals to that of wheat. Rice bran is a valuable by-product of paddy milling industry and this is mostly used as cattle fish feed etc. During 1976-77, the rice bran production in India was 25 million tonnes.

Kumar David *et al.* (1964) have indicated that the protein content of raw and parboiled bran varied from 5.7 to 13.5 and 4.4 to 15.5 per cent respectively. According to ISI specifiation (1966) the minimum content of crude protein in the bran should be 11 per cent. However no work has been done to find out the digestible dry matter in rice bran of different varieties and also the effect of parboiling different degrees of polishing on the crude protein content of bran. Hence the following study was undertaken, to find out the crude DDM as well as the infiuence of various factors on the crude protein content of bran of 30 varieties.

MATERIAL AND METHODS

From the thirty paddy varieties collected from the paddy Breeding Station of Tamilnadu Agricultural University, bran were seperated by the normal method of separation and the digestible dry matter content. Crude protein content and oil content of the bran were estimated.

The oil from the rice bran was extracted using hexane (B.P. 75-80°C) and by transfering a known weight of the bran to an extraction thimble of Soxhlet's apparatus. After removal to hexane, the content of oil was determined (A.B.A.C., 1962). The crude protein content was estimated by multiplying the total nitrogen content. (Humphries, 1956) with the factor 6.25.

The nutritive value of the bran was assessed by the following technique described by Goering and Van Soest (1970). One gram of the bran was treated with 100 ml cold neutral detergent solution. Neutral detergent

1. Associate Professor (Soil Sceince) and 2. Professor (Soil Science) Tamil Nadu Agricultural University, Coimbatore.
Formed part of the thesis submitted by the first author for award of M. Sc. (Ag.) degree.

solution was prepared by taking 18.61 g of disodium ethylene diamine tetracetate and 6.81 g of sodium borate dehydrate together in a beaker, dissolved in distilled water by heating then to this a solution containing 30 g of sodium lacuryl sulphate and 10 ml of 2 ethoxy ethanol was added. To this solution containing 4.56 g of disodium hydrogen phosphate was added, the volume was made upto one litre and the pH was adjusted to 7.0. Two ml of deca hydronapthalene and 0.59 of sodium sulphite were added. It was heated to boiling and refluxed for 60 minutes. Then the contents were filtered through sintered glass funnel (G_2) by applying suction. The residue in the funnel was then repeatedly washed with hot water (90-100°C). Then two washings were given with acetone and the residue was dried at 100°C for 8 hours. The residue was weighed and expressed as per cent of cell wall constituent in bran.

The Acid Detergent Fibre (ADF) was estimated by treating one gram of sample with 100 ml of cold acid detergent solution. Acid detergent was prepared by dissolving 20 g of cetyl trimethyl ammonium bromide in one litre of 1*N* sulphuric acid and 2ml of decahydronapthalene was added. The contents were boiled and then refluxed for 1 hour. The contents were filtered through sintered glass tunnel. Repeated washings, first with hot water and then with acetone were given. The residue was dried at 100°C for 8 hours, weighed and expressed as percentage of ADF present in bran.

The prepared ADF in the sintered glass funnel was treated with 72 per cent H_2SO_4 for three hours. The contents were filtered by suction, washed with hot water until free from acid, dried at 100°C and weighed. Then this residue was ignited in the muffle furance at 550°C for 3 hours, cooled and weighed. The loss in weight upon ignition gave the amount of lignin (ADL).

The ashed acid detergent residue was weighed, then enough quantity of 48 per cent hydrobromic acid was added in drops to moisten the entire residue. Then the excess of acid was removed by suction and washed with acetone, dried, ashed at 500°C, cooled and weighed. The loss in weight gave the amount of silca (SiO_2).

The digestibility was calculated by using the following summative equation as outlined by Goering and Van Soese (1970).

$$\% \text{ DDM} = 0.98\ S + WDC - M$$

where,

S = Cellular contents (100-NDF%)

W = % Cell wall contents (NDF%)

Dc = Estimated digestion coefficient of cell walls

M = Estimated Metabolic fecas losses for cattle.

$$DC = 147.3 - 78.9 \log 10 \left(\left(L/ADF \right) \times 100 \right)$$

Where,

L = Lignin content

ADF Acid detergent fibre

$$M = 36.57 - 0.274x$$

X = Estimated true digestibility.

For bran also, correction for the silica was done.

Scheme for using summative equation

Component	Analytical value	Factor*	Digestibe amount
Cellular content	100-NDF%	0.98	Add
Lignification of cell wall	NDF%	Dc	Add
Silica correction nor for legumes	SiO_2%	3	Substract
Estimated true DDM	—	—	Sum
Metabolic fecal matter	—	—	Substract
Estimated apparent DDM	—	—	Difference

*Analytical values were multiplied by the factor to obtain the digestible amount and then the process indicated in this column was performed.

RESULTS AND DISCUSSION

The crude protein content of defatted raw bran ranged from a minimum of 8.75 per cent (TKM -6, CO 35, TNAU 1756 and TNAU 20892) to a maximum of 18.31 per cent (TNAU 15796/4/1). In case of parboiled bran, the crude protein content varied from 8.75 (TKM 6. Ponni and ADT 31) to 19.25 (TNAU 15869/2, TNAU 20892 and TNAU 17005). The crude protein content of the bran varied depending upon the variety. Kumar David *et al.* (1964) also reported a similar trend. A marked increase was observed in crude protein content of bran due to parboiling. This might be due to the translocation of protein from lower to upper stratum of the aleurone layer.

The neutral detergent fibre (NDF) content of raw bran samples of the 30 varieties varied from 60.6 (CO 38) to 69.7 (Ponni), the Acid Detergent Fibre (ADF) from 13.4 (TNAU 20892) to 15.0 (CO.35), the Acid Detergent Lignin (ADL) from 9.8 (CO 38) to 10.9 (CO.35) and Silica (SiO_2) from 3.5 (TNAU 18610) to 5.7 (IET) 5656, TNAU 15869/2 and TNAU 15776/3). The digestible dry matter (DDM) of the bran was found to vary between 29.63 (TNAU 4372) to 43.28 (CO.36) depending upon the variety. Similar to grasses (60-70 per cent DDM) the barn also contains apprciable amount of DDM.

Certain of the varieties IET 5656, TNAU 15869/2 and TNAU 17069 were found to contain high amounts of silica which is not a desirable character as far as the digestibility is concerned Because of this, the DDM in those varieties were low since the SiO_2 content was deducted, and then DDM was arrived at.

Among the varieties studied, oil and crude protein content of the bran were found to be high in varieties GEB 24, TNAU 15776/3, TNAU 4372 and TNAU 13613. Among these varieties, GEB 24 registered better DDM per unit than others. But GEB 24 is poor yielder of paddy when compared to other varieties. Hence the total yield of DDM is likely to be low when considered on area basis. Hence among the other varieties, TNAU 13253/7/2, TNAU 15869/2 and TNAU 20892 were found to have high oil content and DDM per cent, though poor in the crude protein content. Hence the above varieties can be considered good in terms of oil content and nutritive value.

REFERENCES

GOERING, H. K. and P. J. VAN SOEST. 1970. Forage fibre analysis (*Apparatus, reagents and some applications*) *Agric. Hend Book.* 379 U.S.A.

HUMPHRIS, E.C. 1956. Mineral components and Ash analysis. In Modern methods of plant analysis springer Verlag. 1: 468-502.

Indian Standards Institution. 1965. Indian Standerds Spcification for rice bran 18. 3648.

KUMAR DAVID, J.S. D. MRITHYANJAYA RAO S.D. THIRUMALA RAO and K.S. MURTHI 1964. Studies on Rice bran and rice bran oil *Indian Oilseeds J.* 8: 49-58.