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ABSTRACT

The botanical composition, chemical composition and *in vitro* digestibility (IVD) of two rice straw varieties, MR 84 and MR 77, from three locations, Bumbung Lima, Tanjung Karang and Kota Baru was investigated over two seasons, the main (October/November 1987) and off (July/August 1988) cultivation seasons, to determine the environmental factors affecting the nutritive value of rice straw. Although the effects of season and location were small, the main season produced straw of better quality due probably to the higher availability of rainfall. Locational differences were attributed to differences in the proportion and quality of botanical fractions. Stem was more digestible than leaf and contained less ash and silica. Varietal differences were small.

The *in vivo* feeding value of whole straw of varieties MR 84, MR 71 and MR 1, and the leaf and stem fractions of MR 84 and MR 71 were studied with goats who also received supplements of either a 3:1 and 1:1 pelleted mixture of dehydrated palm oil mill effluent (POME) and palm kernel cake (PKC). There were no significant differences ($P>0.05$) in chemical composition, straw intake and dry matter digestibility (DMD) between straw varieties. The voluntary intake of leaves was higher than stems despite a lower DMD of the leaf diets. A 52-week growth study to compare the 3:1 and 1:1 supplement ratios showed that both were equally good supplements for rice straw.

Exploratory studies on the composition and IVD of one indeterminate and four released varieties (MR 84, MR 27, MR 1 and MR 71) before and after chemical treatment were carried out to identify indicators of nutritive value, to assemble the statistical procedures required to screen a large number of straw varieties and to ascertain if varietal selection could be an alternative method to chemical treatment for improving straw quality. The indicators identified were IVD, neutral detergent fibre (NDF), crude protein (CP) and insoluble ash; multivariate statistical procedures were very effective in discriminating between varieties and botanical fractions. Sodium hydroxide treatment substantially increased straw quality, the increase being greatest for the variety of poorest quality. Urea treatment made only marginal increases in quality and did not alter the ranking of varieties before and after treatment.

The mean proportion of leaf blade, leaf sheath and stem (including inflorescence) of 32 varieties of rice straw harvested from the same location, year and season, was 32.4%, 25.5% and 41.0%, respectively in whole straw. Stem had a significantly higher IVD (58.9%), lower insoluble ash (6.9%) and lower total ash (18.9%) but a higher NDF (62.7%) and lower crude protein, CP (3.4%) than blade or sheath. Canonical correlation analysis showed that varietal differences in whole straw were significantly correlated ($P<0.001$) with differences in the composition and IVD of the blade, sheath and stem fractions but not with differences in their relative proportions. Varietal differences were also independent of agronomic characteristics. Total ash content and IVD were important indicators of varietal differences in rice straw. The genetic distance between the best and poorest varieties, ranked on the basis of their principal component scores, was small. The best varieties, Y 818, YTK 34 and YTK 108, may be selected for feeding to ruminants. There is potential for breeding and selecting rice varieties combining good straw and agronomic characteristics.

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INTRODUCTION

Rice straw is an abundant but unutilised crop residue in Malaysia. In common with other cereal straws, rice straw is low in nitrogen and available energy and hence limited in use as an animal feed.

Measures to improve the feed quality of straw have been by chemical and physical treatment. These procedures tend to be expensive and impractical under farm conditions. Biological methods of improvement, of which varietal selection is one, have not been well explored.

Varietal or genotypic differences in the nutritional value of straw have been reported for all cereal species including rice. The prospect of stabilising these differences through selection and breeding are promising as indices of straw nutritive value appear independent of agronomic characteristics.

Malaysia's rice breeding programme dates back to at least 1966 when the high yielding variety, IR 8, developed by the International Rice Research Institute, was released under the local name Ria. In 1978, the Malaysian Agricultural Research and Development Institute (MARDI) implemented a three-prong rice breeding programme to produce varieties (i) suitable for single and double cropping (ii) resistant to pests and diseases and (iii) tolerant to adverse environmental situations. Although this programme has released many useful rice varieties to Malaysian farmers, the breeding programme has not incorporated improvement in straw quality as an objective nor addressed the question of straw utilisation after harvest. Hence in Malaysia, rice straw is burnt, a practise which only contributes to environmental pollution.

The objectives of this research were :

1. To determine the environmental factors affecting the nutritive value of rice straw varieties.
2. To compare the feeding value with goats of rice straw varieties.
3. To screen straw varieties for their nutritive value and to identify varieties suitable for feeding.

The research was carried out from 1988 - 1990 at the Institute of Advanced Studies, University of Malaya and from 1992 - 1994 at Institut Teknologi MARA.