Please revise the main title to use more specific and standardized terms such as 'crude fibre', 'crude protein' and 'ash' (e.g., 'total ash' or 'acid-insoluble ash'), as appropriate. Also, ensure that all references are formatted according to the journal’s latest guidelines—refer to recent publications for consistency. Kindly follow the journal’s instructions carefully. Additional related points have been mentioned in the main text for your reference.

Table .4.3.1 Continued

**EVALUATION OF PROXIMATE COMPOSITION AND THEIR ASSOCIATION STUDIES IN POPULAR RICE VARIETIES OF ANDHRA PRADESH**

**ABSTRACT**

**Twenty popular rice varieties developed by ANGRAU were screened for proximate composition at different polishing levels. Analysis of variance has revealed a significant difference (p=<0.05) between nutrients among all varieties. There is no significant difference observed among different polishing levels on the nutrient concentration among all the varieties. The results showed that proximate composition ranged between 8.4 to 11%, 6.1 to 8.7, 1.1 to 3.4%, 0.8-1.6%, 79 to 82% and 363 k.cal for moisture, protein, fat, ash, fiber, carbohydrate and energy respectively. Carbohydrate content is elevated as the polishing level increases. Varieties such as Pushyami, Chandra, Swarna, and Sravani have recorded desirable proximate composition of high protein, ash, crude fiber and low fat. There is a positive significant relation between ash and iron, zinc (r = 0.105, r = 0.103). Carbohydrate has a positive significant relation with iron (r = 0.504) and ash (r = 0.221) significant and negative correlation with moisture (r = -0.547), fat (r = - 0.747) and crude fiber (r= - 0.539).**

**Keywords**: Rice Varieties, Proximate Composition, Grain Quality

Introduction

 Rice symbolizes life and prosperity for billions of people and plays a fundamental role in the world's food security and socio-economic development. Genetic diversity in Oryza species exceeds far more than other crops with thousands of varieties growing and spread across the globe. Approximately 140,000 different cultivars of rice ranging from traditional rice varieties to commercially bred elite cultivars are reported (Hijam *et al.,*2025)

Rice is regarded as an essential energy source because of its high concentration of carbohydrates and proteins. Characteristic milled rice grain is mainly composed of up to 80–90% of carbohydrates, with a range of 6–8% proteins and some trace amounts of dietary fiber (Alhambra *et al.,* 2019). The same variety of rice may show variations in the composition due to different climatic and soil conditions (Bhattacharya, 2017).

Nowadays, consumers are becoming extra conscious of the quality of the rice varieties. So, it is essential to focus on the quality characteristics along with rice production. When farmers become conscious of their rice quality, they are driven to produce better-quality rice. Awareness of nutritional composition and rice health aid is necessary to enhance rice consumption in people's daily diet. Therefore, more attention should be paid to nutritive values' accessions (Verma and Srivastav 2017).

Food and nutritional security envisage the identification of rice varieties with high nutritional value. Rice lines with higher nutrient profiles need to be identified so that people consuming rice in their diets are supplied with adequate minerals, proteins, carbohydrates and other health-promoting agents (Ashraf *et al.,* 2017). Keeping the importance of the nutritional profile of rice into consideration, the present study is intended to study the nutritional composition of the popular rice varieties, which will facilitate for the commercial cultivation of rice varieties with desirable nutritional composition.

**MATERIAL AND METHODS**

The experiment material used for the study was 20 popular rice varieties which were collected from Regional Agricultural Research Station (RARS), Maruteru and West Godavari District. The genotypes included in the study were Amara (MTU1064), Badava Mahsuri (PLA 1100), Bhavapuri Sannalu (BPT 2270), Chandra (MTU 1153, Cottondora Sannalu (MTU 1010)), Indra (MTU1061), Ksheera (MTU 1172), Nellore Mahsuri (NLR34449), Pushyami (MTU1075), Samba Mahsuri (BPT 5204), Sri Dhruthi (MTU 1121), Srikakulam Sannalu (RGL 2537), Swarna (MTU 7029), Tarangini (MTU 1156), Varam (MTU 1190), Vijetha (MTU 1001), MTU 1210 (Sujatha), MTU 1224 (Maruteru Samba), MTU 1239 (Sravani) and MTU 1262 (Maruteru Mahsuri). After threshing and cleaning, the seed from individual varieties were dried under shade until moisture content reaches to 14%. A random sample of 250 g paddy was subjected to dehusking using ‘Satake’ laboratory huller (Type THU 35A) followed by polishing the dehusked brown rice (0% polishing) at two levels *i.e* 5% and 10% polishing. A sample of 150 g of dehusked brown rice was subjected to polishing using ‘Satake’ rice polisher (Type TM05) for a period of 60 sec to get 5% polishing and 1min 25 sec for 10% polishing. The proximate analysis is a quantitative method to determine different macronutrients present in rice seed**.** Basically, it is the partition of seed compounds into various categories such as moisture (g %), crude ash (g %), crude protein (g %), fats (g %), crude fiber was estimated as per standard AOAC 2006 method. Analysis of variance was computed based on completely randomized design for each of the character separately. Correlation between two characters was determined by using variance and covariance components as suggested by Al-Jibourie *et al.* (1958).

**RESULTS AND DISCUSSION**

Proximate components such as moisture, protein, fat, ash, crude fiber, carbohydrate and energy were analyzed in all 20 rice varieties.

Analysis of variance has revealed a significant difference (p=<0.05) between the nutrients among all the varieties. No significant difference was observed among different polishing levels on the nutrient concentration among all the varieties.

***Study of Means***

Moisture varied from 8.4 to 11%, 8.2 to 10.6% and 7.8 to 10.9% with general mean of 9.8, 9.6 and 9.3 at 0%, 5% and 10% polishing levels, respectively. Protein content ranged between 6.1-8.7%, 6.0-10.0%, 6.0-9.2% with general mean 7.3, 7.4 and 7.2 at 0%, 5% and 10% polishing levels. Fat content was recorded as 1.1 to 3.4%, 0.7-1.8% and 0.3-1.1% with general mean values of 1.9, 1.1 and 0.7 at 0%, 5% and 10% polishing levels, respectively. Ash per cent ranged between 0.8-1.6%, 0.4-1.0%, 0.2-0.7% with 1.1, 0.7 and 0.5 general mean at 0%, 5% and 10% polishing levels. The general mean for crude fiber were recorded as 0.5, 0.3 and 0.1 at 0%, 5% and 10% polishing levels. The general mean of carbohydrate and energy were 79, 81, 82% and 363, 362, 362 K.cals at 0%, 5% and 10% polishing levels.

***Protein***

The nutritional quality of rice depends on the protein content, the second principal component in grain next to starch. In India, rice contributes 24.1% of dietary protein out of 208 grams of rice consumed per person (Ratna *et al*. 2019). The rice protein is of better-quality because of its distinctive composition of essential amino acids Kalaivani *et al.*, (2018). The protein content ranges from 6.11 (MTU 1239) to 8.71 per cent (Pushyami) at 0 per cent polishing level, whereas 5.96 (MTU 1239) to 9.98 (Pushyami) at 5 per cent level and 6.00 (MTU 1239) to 9.17 % (Pushyami) at 10 per cent polishing level in the samples studied. Similarly, many reports on variability in protein content in rice are available (Reddy *et al.* (2017), Cherie and Dagnaw (2019), Ahmed *et al.* (2020).

***Total Fat***

The mean total fat content was 1.95 per cent, 1.05 per cent and 0.66 per cent at 0, 5 and 10 per cent polishing level with the range of 1.10 to 3.36 per cent, 0.73 to 1.75 per cent and 0.32 to 1.08 per cent. The highest fat per cent was seen in Vijetha at 0 per cent (3.36%) and 10 per cent (1.08%) and MTU 1239 at 5 per cent (1.75%) have the highest per centage of fat among all the varieties. A lower per centage of fat was observed in Pushyami at 0 per cent (1.10%) and Chandra at 5 per cent (0.73%), 10 per cent (0.32%). This study's results agree with an earlier report by Reddy *et al.* (2017), who also gave the fat range of 0.2 to 3.3% in different milling fractions. However, this range is lower than the range obtained by Liu *et al.* (2017), between 1.15 – 2.83 g/100g. The differences in fat content among the aromatic and non-aromatic rice varieties might be accounted for by the milling degree differences since most of the fat in rice is concentrated in the aleurone layer of the kernel (Verma and Srivastav 2017).

***Ash***

The ash content of a food sample gives an idea of the mineral elements present in the food sample. Ash content plays an essential role in determining essential minerals (Debnath *et al*., 2018). Ash values were revealed to be considerably different amongst all the varieties studied. Ash content was low in most of the samples. The ash content ranged from 0.77 - 1.56 per cent, 0.35 -1.00 per cent and 0.24 - 0.70 per cent, with an available mean of 1.13, 0.74 and 0.51 at 0, 5 and 10 per cent polishing levels. Swarna, Nellore Mahsuri and variety MTU 1210 were the highest ash containing varieties. Srikakulam Sannalu andvariety MTU 1262 had the lowest ash per cent between all the varieties. India's indigenous cultivars showed crude fiber contents ranging from 0.3 to 0.84 per cent and total ash contents from 0.84 to 1.8 per cent (Devi *et al.,* 2008; Thongbam *et al.,* 2011).

***Crude Fiber***

The crude fiber (g %) varied from 0.36 - 0.81 per cent, 0.19 - 0.61 per cent and 0.07 - 0.40 per cent at 0, 5 and 10 per cent polishing levels. Although the range obtained in our report is lesser than the range (8.60 to 9.57 g %) obtained by Liu *et al.* (2017) an investigation on brown rice varieties *japonica* Xinfeng 2 and *indica* T-You 15. Nevertheless, it is related to the mean value obtained by Ashraf *et al.* (2017), Weriko-manu and Amamoo (2017) Ahmed *et al.* (2020). The higher crude fiber content in rice varieties can be attributed to the grains' bran portion (Debnath *et al,* 2018).

***Carbohydrate***

The mean of carbohydrates in the 20 samples studied was 76 to 80 per cent at 0 per cent polishing, 80 to 83 per cent at 5 per cent level and 81 to 84 per cent at 10 per cent polishing level. Carbohydrate content is elevated as the polishing level increased. The high per cent carbohydrate contents of the rice varieties prove that rice is a good source of energy. Amara, Ksheera, Sri Dhruthi and MTU 1210 at 0 per cent (80%) and Swarna at 5 per cent (83%) and 10 per cent (84%) showed the highest per cent of carbohydrate, whereas Vijetha (76%) at 0 per cent, Badavapuri Sannalu, Cottondora Sannalu, Srikakulam Sannalu and MTU 1239 at 5 per cent (80%), Badava Mahsuri, Indra, MTU 1210 and MTU 1239 at 10 per cent (81%) showed the lowest per centage of carbohydrate. However, most of the samples recorded more than 80 per cent of the carbohydrates.

***Energy***

The general mean value for energy for the rice varieties ranged between 362 to 363 K.cal at different polishing levels. The total energy content of 20 rice varieties is not significantly different in the present study, following Cherie and Dagnaw (2019) study. In Verma and Srivastav (2017) study, Food energy values were appreciably different among all the aromatic and non-aromatic rice accessions. Moreover, the range of energy values was seen to be between 365-371 k.cal.

***Correlation coefficients of quality traits and nutritional traits***

From correlation analysis protein is negatively significant with moisture (r = -0.678) and positively significant relation was noticed with zinc (r = 0.032). Fat has a significant negative correlation with protein. In denial of our study, Thongbam *et al.* (2011) found a positive correlation between protein and fat content in their study of grain quality of eighteen indigenous Indian rice cultivars.

There is positive significant relation between ash and iron, zinc (r = 0.105, r = 0.103). Carbohydrate has positive significant relation with iron (r = 0.504) and ash (r = 0.221). However, carbohydrates have a significant and negative correlation with moisture (r = -0.547), fat (r = - 0.747) and crude fiber per cent (r= - 0.539), which are under the investigations of Thongbam *et al*. (2011) and Oko *et al.* (2012).

The negative correlation between moisture and energy (r = - 0.495) was similar to the investigation of 22 Joha rice varieties studied by Lahkar *et al.* (2018). Selection for ash per cent will ultimately select for high iron and zinc. The correlation of zinc with protein and ash was positive and strong. Therefore, rice selection made for high protein will indirectly select rice with less fat and high zinc, which correlates with iron content.

**CONCLUSION**

Findings from the present study justifies significant correlations were found among grain quality traits and proximate composition. Selection for the significant positively associated characters will improve the overall quality trait of the grain. Indirect selection is one of the possible breeding programmes for simultaneously improving the mineral elements concentration, grain quality and protein content.

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