



## RESEARCH ARTICLE

### PHYSICAL PROPERTIES OF SELECTED NEWLY RELEASED RICE VARIETIES OF NORTHERN TELANGANA REGION

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#### ABSTRACT

Rice (*Oryza sativa*) grain quality is determined by its physical and physicochemical properties. Physical properties include kernel size, shape, milling recovery, degree of milling and grain appearance (Cruz & Khush, 2000). Physical quality has a great importance in commercial rice production as it highly influences the final output as well as the consumer demand which directly contribute to the economic profitability of the grower and miller. The L/B ratio of rice varieties Anjana (JGL-11118) and Pradhyumna (JGL-17004) were  $3.62 \pm 0.16$  mm and  $3.37 \pm 0.12$  mm. These varieties are classified as short slender grains. Volume expansion was taken as the ratio between volume of cooked rice and initial volume of raw rice. V.E. values of Anjana (JGL-11118) and Pradhyumna (JGL-17004) varieties were 2.7 cm and 2.5 cm. Elongation ratios of Anjana (JGL-11118) and Pradhyumna (JGL-17004) rice varieties are 1.45 and 1.48, therefore they have desirable elongation ratios. Elongation ratio is an important parameter for cooked rice. Rice that expands lengthwise gives a finer appearance while that which expands girthwise gives a coarser appearance on cooking (Dipti *et al.*, 2004). An elongation ratio of less than 1.3 is not desirable (Dipti *et al.*, 2004).

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## INTRODUCTION

Rice is a staple food consumed by more than half of the world population (FAOSTAT, 2014). It provides 20 percent of the world's dietary energy supply, while wheat supplies 19 percent and maize (corn) 5 percent (FAO, 2004). It is the predominant dietary energy source for 17 countries in Asia and the Pacific and 9 countries in North and South Africa. In 59 countries, an average of at least 75g of rice is available per person per day (FAOSTAT, 2014). The total population of these countries is 4.1 billion which indicates that reaching even half of that population would ensure a greater daily nutrient intake among 2 billion people (FFI, 2014). Rice grain quality is of great importance for all people involved in production, processing and consumption because it has direct impact on the commercial value of the produce, consumer preference is based on appearance, milling and cooking processing and nutritional quality positive visual preference of the grain is based on grain size, shape and chalkiness while in addition traders rate recovery of whole milled grains as other crucial quality traits while deciding the price (Shobha *et al.*, 2008).

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Despite numerous studies on different varieties of rice, there is lack of published data on physical properties of newly released rice varieties of Telangana. Hence, the present study is undertaken to assess the Physical properties of the selected newly released rice varieties.

## MATERIALS AND METHODS

**Materials:** One of the new released rice varieties viz Anjana (JGL-11118) and Pradhyumna (JGL-17004) were procured from Regional Agricultural Research Station, Jagityal, Karimnagar.

**Experimental design:** Physical properties like grain hardness, volume expansion, 1000 kernel weight, elongation ratio, kernel length, breadth, L/B ratio and water uptake by the grains were assessed using standard procedures (Sahay and Singh, 2005).

**Grain hardness:** Grain hardness of the samples was determined using grain hardness tester

### Volume expansion

Volume expansion of the samples was assessed by weighing 5g of sample in a test tube containing 15 ml of water and

cooked for 20 minutes. Volume expansion is calculated by taking average of the 3 readings.

### 1000 Kernel weight

1000 Kernel weight was determined by selecting 1000 sound kernels. The samples were weighed and repeated for 3 times and average of 3 readings was taken.

**Elongation ratio** = Length of cooked kernel (mm) (y)/Length of uncooked kernel (mm) (x)

### Kernel length, breadth, L/B ratio

Kernel length, breadth, L/B ratio of the samples were measured using micrometer by placing the kernels horizontally and vertically.

### Water uptake by the grains

Water uptake by the grains was determined by weighing 2 g of sample in 100 ml graduated centrifuge tube containing 100 ml of water and cooked for 45 minutes. The supernatant water was transferred into a graduated cylinder after cooling and water level was noted.

### Statistical Analysis

Mean and standard deviation for three parallel replicates were calculated. Analysis of variance (ANOVA) was used to test the difference between means. (Snedcor and Cochran, 1983)

## RESULTS AND DISCUSSION

The physical parameters like grain hardness, volume expansion, 1000 kernel weight, elongation ratio, kernel length, breadth, L/B ratio and water uptake were assessed and the results are presented in Table 1.

was negatively correlated with grain weight indicating that selection of long grains would result in a negative response of grain weight.

### Kernel length, breadth, L/B ratio

Kernel size, shape and L/B ratio are important features for grain quality assessment. The length and breadth of the rice kernels were measured using digital vernier caliper (Yamayo, Digimatic caliper). Kernel length of Anjana (JGL-11118) and Pradhyumna (JGL-17004) rice varieties was  $5.3 \pm 0.2$  mm and  $4.9 \pm 0.1$  mm. Dipti *et al.*, (2002) reported classified grains whose lengths are greater than 6mm as long, 5mm- 6mm medium and less than 5mm as short. By this classification, two rice samples tested were short slender grains. Breadth of Anjana (JGL-11118) and Pradhyumna (JGL-17004) were  $1.484 \pm 0.04$  mm and  $1.464 \pm 0.05$  mm. And L/B ratios are  $3.62 \pm 0.16$  mm and  $3.37 \pm 0.12$  mm. Bhattacharjee and Kulkarni (2000) analyzed some preferred brands of basmati rice and reported that the L/B ratio ranged from 4.47- 4.81.

### Volume expansion

Volume expansion was taken as the ratio between volume of cooked rice and initial volume of raw rice. Volume expansion values of Anjana (JGL-11118) and Pradhyumna (JGL-17004) varieties were 2.7 cm and 2.5 cm. Shahidullah *et al.* (2009) reported that the volume expansion ratio (VER) in aromatic traditional rice varieties ranged from 2.36-4.10, while in basmati varieties it ranged from 2.73-3.63 and they also observed that lower VER is preferred by the consumers than higher VER, on the other hand, higher elongation ratio (ER) of the cooked rice is preferred than lower ER.

### Elongation ratio

Elongation ratios of Anjana (JGL-11118) and Pradhyumna (JGL-17004) rice varieties are 1.45 and 1.48, therefore they have desirable elongation ratios.

**Table 1. Physical properties of two newly released rice varieties of Northern Telangana region**

Variety Name	Accession No	Grain Hardness	1000 Kernel weight	Kernel Length (mm)	Kernel Breadth (mm)	L/B ratio (mm)	Volume Expansion (cm)	Elongation Ratio (ER)	Water up take ratio (%)
Anjana	JGL-11118	5.40±1.78	10±0.03	5.3±0.22	1.48±0.044	3.62±0.15	2.66±0.055	1.48±0.0	225
Pradhyumna	JGL-17004	3.78±1.63	9.18±0.11	4.9±0.13	1.46±0.05	3.3±0.12	2.5±0.0	1.45±0.0	233

Note: Values are expressed as mean± Standard deviation of three determinations.

### Grain hardness

Grain hardness of the samples was determined using grain hardness tester. Grain hardness values of Anjana (JGL-11118) and Pradhyumna (JGL-17004) was  $5.40 \pm 1.78$  and  $3.78 \pm 1.63$ .

### 1000 Kernel weight

1000 Kernel weight of Anjana (JGL-11118) and Pradhyumna (JGL-17004) was 10.26 g and 9.18 g. Diako *et al.* (2011) found that imported brands had low 1000 grains weight. Values of 1000 grain weight between 20 and 30 g are considered good while those less than 20 g could be indicative of the presence of immature, damaged and unfilled grains. Similar results were reported by Meena *et al.* (2010) who pointed that the 1000 grains weight ranged between 11.36 and 20.18 g. Koutroubas *et al.* (2004) reported that grain length

Elongation ratio is an important parameter for cooked rice. Rice that expands lengthwise gives a finer appearance while that which expands girthwise gives a coarser appearance on cooking (Dipti *et al.*, 2004). An elongation ratio of less than 1.3 is not desirable (Dipti *et al.*, 2004). Grain elongation on cooking is dependent on genetic factors as well as the degree of milling. Highly polished rice tends to have higher elongation ratio due to less restriction by streaks of bran on the expansion of starch granules (Mohapatra and Bal 2006).

### Water up take by the grains

The amount of water uptake during cooking process is associated with the appearance of cooked rice. The water uptake ratio of Anjana (JGL-11118) and Pradhyumna (JGL-17004) rice varieties was 225 percent and 233 percent. (Tan *et al.*, 2000) reported that in basmati varieties, water uptake ratio

ranged from 280-335 and in aromatic traditional rice varieties 250-350.

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