

SRI LANKAN TRADITIONAL RICE VARIETY "SUDUHEENATI" COMPRISES OF MORPHOLOGICALLY DIFFERENT ACCESSIONS

P.D.C. Padukkage¹ and S. Geekiyanage*²

¹*Board of Study in Agriculture, Faculty of Graduate Studies, University of Ruhuna*

²*Department of Agricultural Biology, Faculty of Agriculture, University of Ruhuna*

**Corresponding author (email: sudarshanee@agbio.ruh.ac.lk)*

Introduction

The Sri Lankan traditional rice germplasm exhibits a wider variety of morphological variation which may possess important breeding resources. Several important genes had been identified as resources for breeding through flowering time genetic analysis. It is revealed by recent molecular genetic studies that flowering time in rice is controlled by a complicated gene network.

Sri Lankan traditional rice is not common in present day farmer fields due to incorrect perception that all traditional rice varieties are long aged. Recently several short aged traditional rice had been morphologically characterized which have higher yield potential as well. Such accessions would be important for breeding rice for climate change to meet increasing demand. Sri Lankan traditional rice "*Suduheenati*" is a short aged rice variety with known medicinal and nutritional properties. Identification of morphological diversity among *Suduheenati* accessions can be used for selecting better accessions for breeding after confirmation of their diversity through molecular analysis. Therefore, the present study was carried out to determine the diversity of six *Suduheenati* accessions based on selected 21 morphological characters including days to flowering (DF).

Methodology

This experiment was conducted in a field at Kamburupitiya (WL_{2a} Agric. ecological zone) during short day season (Maha) from November, 2013 to January, 2014. Six *Suduheenati* accessions from PGRC (2088, 2091, 3874, 3993, 4354 and 4355), were grown at 40 cm x 40 cm spacing between plants and between rows in a completely randomized design with four replicates (CRD). Selected 18 morphological and 2 physiological characters (leaf temperature (LETM) and temperature difference between leaf and environment (TD) and DF were measured.

Days to fifth leaf (DFL), seedling height (SH), leaf temperature (LETM) (measured using leaf temperature meter), temperature difference between leaf and environment (TD), culm number (CNFL) and leaf area (LA) were taken at fifth leaf stage. In the reproductive stage (flowering stage), days to flowering (DF), plant height (PH), leaf number (LN), flag leaf length (FLL), flag leaf width (FLW), flag leaf angle (FLA), culm number (CN), culm angle (CA) and culm diameter (CD) were recorded. Number of grains per panicle (NGP), number of secondary branches (NSB), first panicle length (FPL), number of productive tillers/plant (TNP), seed length (GL) and seed width (GW) were measured as the yield characteristics according to the modified descriptors of rice.

Duncan Multiple Range Test was done for Mean Separation using SAS 9.1.3 software, version 9.1, USA. SPSS version 20, USA software was used for Principal Component Analysis (PCA) followed by Hierarchical cluster analysis and correlation analysis.

Results and Discussion

The characters of *Suduheenati*, reflex a wide variation as indicated in the following table which determines that within the variety of *Suduheenati* there's a wide morphological variation among the accessions which leads to a high genetic variation.

Table 1. Variation of some characters of six *Suduheenati* accessions in fifth leaf, flowering and maturity stages

Character	Mean	Range	Standard Deviation
DFL	52	36.00 ± 0.34 - 59.00 ± 0.78	7.49
LETM (°C)	25	24.00 ± 2.56 - 27.00 ± 4.90	0.97
DF	79	71.00 ± 8.76 - 89.00 ± 3.17	5.59
PH (cm)	109	65.20 ± 0.67 - 135.30 ± 0.31	22.99
FLL (cm)	33	23.50 ± 1.04 - 42.30 ± 2.11	6.85
FLW (cm)	1	1.00 ± 0.06 - 1.40 ± 0.08	0.15
NSB	15	7.00 ± 0.89 - 18.00 ± 0.71	4.11
FPL (cm)	25	22.80 ± 3.29 - 30.00 ± 3.61	2.69
TNP	25	18.00 ± 5.52 - 34.00 ± 3.19	5.66
NGP	95	61.00 ± 3.48 - 158.00 ± 6.27	34.88

Grouping of variables through Principal Component Analysis (PCA) resulted in four principal components (PCs), where first PC accounted for 31.73% of the total variation of the characteristics. These four PCs explained more than 95% of the total variation.

Table 2. Variables belonging to four PCs of the Principal component analysis

PC	1 st PC	2 nd PC	3 rd PC	4 th PC
Eigen values	9.550	5.377	3.387	1.753
Characters	DFL, SH, ET, LETM, CN, FLL, FLA, FPL, NSB	DF, PH, CNFL, LN, FLW, GL	LA, CD, NGP	CA, TNP, GW

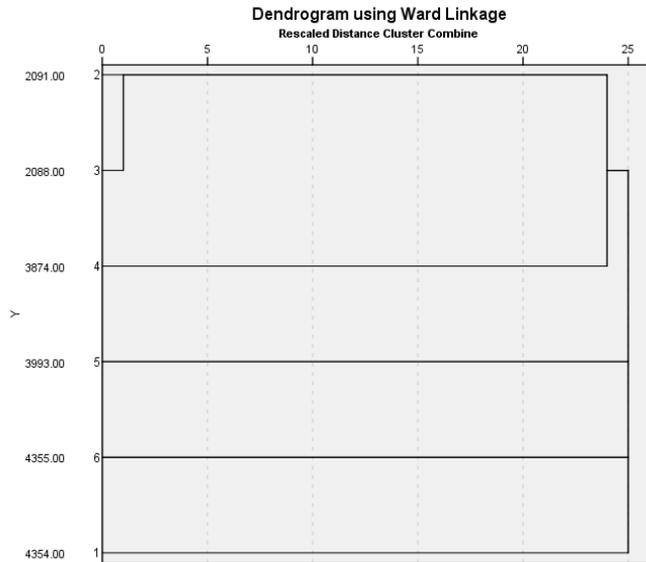


Figure 1. A dendrogram for genetic diversity depicted through morphological and physiological variation during fifth leaf stage, flowering stage and maturity stage.

In Hierarchical cluster analysis; four clusters were obtained at rescaled distance of around 23. Accessions 2088 and 2091 were clustered together at rescaled distance between 0 and 5. Seed morphology of 2 accessions seemed similar and DF values were 71 and 78 respectively. Accession 2088 showed the lowest average values for DF were not significantly different (71 days), CNF (13), CA (25°) and highest GW (0.4 cm). Accession 3993 showed the highest average LA (33.4 cm²), CD (0.6 cm) and NGP (158). Accession 3874 indicated the lowest averages for DFL (36 days), CN (13), FLL (23.8 cm), NGP (61), PH (65.2 cm) and NSB (7).

In the correlation analysis, positive correlations between vegetative characters, physiological characters and yield components could be observed: LA at reproductive stage has positive correlations with CNF (0.880), CD (0.848) and NGP (0.875), DF with LN (0.829) and SH with LETM (0.895), TD (0.895), CNF (0.814) and NSB (0.820).



Figure 2. Variation of seed characters of six *Suduheenati* accessions

Figure 2 shows the variation of the seed shapes, lemma and palea colours, grain length and width of *Suduheenati* accessions which implies the diversity among the six accessions.

Conclusions and Recommendations

Six accessions of *Suduheenati* exhibit a wide morphological variation. Accession number 2088 and 2091 could be genetically similar as they clustered together with similar DF, and seed morphology. LA at reproductive stage has positive correlations with CNF (0.880), CD (0.848) and NGP (0.875), DF with LN (0.829) and SH with LETM (0.895), TD (0.895), CNF (0.814) and NSB (0.820). Lowest days to flowering was given by accession 2088 and it has average total number of panicles per plant as 31 and total number of grains per panicle as 78.

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