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Varietal variations in flag leaf area and yield in mutant lines of PY 5 rice

In rice, the flag leaf is metabolically active and has been a subject of study by number of investigators. It has been assigned an important role in terms of supply of photosynthates to the grains (Asana, 1968; Ramadas and Rajendrudu, 1977). Flag leaf plays an important role in grain yield (Wan and Shong, 1981; Sheela *et al.,* 1990; Raj and Tripathi, 2000). The grain yield and yield related traits were positively related to flag leaf area (Ashrafuzzaman, *et al*., 2009)

In any crop, the leaves and other green tissues are the original sources of assimilates. The leaf (source) being the organ of photosynthesis is considered to be the important determinant which is characterized for higher photosynthetic capacities. It has been proved that the flag leaf, stem and head are the closest source to the grain. Flag leaf appeared to play a major role in enhancing productivity (Padmaja Rao, 1991). Therefore efforts were made to relate the flag leaf area with yield parameters *viz*., number of panicles, panicle length, number of grains per panicle, 1000 grain weight, grain yield per plant, grain yield per m^2, dry matter per m^2 and yield (t/ha) in order to assess and identify the productive cultures for selection.

For this study, eight superior mutant lines from M2 generation of PY 5 were selected and the M3 generation study was carried out at the Plant Breeding Farm, Department of Agricultural Botany, Faculty of Agriculture, Annamalai University with three replications adopting randomized block design during 2009. Salient features of variety PY 5 were furnished below. Observations were recorded for flag leaf at flowering and maturity, panicle length (cm), panicle number, grains per panicle and other yield observations were recorded at harvest.

Salient features of variety PY 5

Particulars	Characters
Parentage	Swarnadhan x NLR 9674
Season	Sornavari, Navarai & Kuruvai
Duration	110 – 120 days
Plant height	90 – 95 cm.
1000 grain weight	22.65 gm.
Rice grade	Long slender
Yield 6000 kg/ha.	
Special features	Resistant to BPH and RTV, good milling and cooking qualities
Year of Release	1994

Results indicate that the grain yield was positively related with flag leaf area. Roy and Kar (1992), Shanthakumar *et al.* (1998) and Gupta *et al.* (1999) also reported significant positive association between boot leaf length and grain yield per plant. Among the tested cultures, K1- 106 recorded higher flag leaf area, panicle length and yield components (Table 1). Thus cultures with higher flag leaf area correspondingly gave higher grain yield and it was evidenced by positive and significant correlation between these two characters. Hsu and Walton (1971) also suggested relationship between flag leaf and yield rather than the total area.

Anupam Raj and Tripathi, (2000) studied the relationship between flag leaf area and yield-related traits in 4 deep-water rice varieties viz.,Jaisuria, Turahia, Sugapankhi and Singarwa and observations on flag leaf area (recorded at flowering and maturity) and ten yield characters were recorded. The results revealed that grain yield and yield traits were positively related to flag leaf area and among the cultivars tested, Jaisuria recorded the highest values for flag leaf area (51.90 cm), yield (3.49 t/ha) and biomass (264.96 g)

Panicle number per plant was found to be higher in K1- 106 followed by K1-23 and K1-30. Similarly, grains per panicle was also higher in K1-106 followed by K1-23 and K1-30. K1-106 culture has the highest flag leaf area and also recorded maximum grain yield. This might be due to the contribution from increased number of panicles per plant and grains per panicle, even though the 1000 grain weight is lower. Increase in panicle length and number of panicle per plant might have contributed for increased grains per panicle resulting in enhanced grain yield.

In spite of the significant differences realized among the cultures for panicle number per plant and grains per panicle, the positive correlation with high flag leaf area suggested the significance of flag leaf area in grain filling. K1-106 recorded higher dry matter production followed by K1-40 and K1-30 which were positively related with flag leaf area (Table 2).

Table 1. Yield and yield contributing characters of rice mutant cultures

Culture	Flag leaf area (cm^2)	No. of panicles/ plant	Panicle length (cm)	No. of grains/ panicle	1000 grain weight (g)	Grain yield/ plant (g)	Grain yield/ m^2 (g)	Dry matter/m^2 (g)	Yield (t/ha)
K_1-18	97.17	19.14	23.02	106.74	22.39	32.30	807.5	1682.5	8.07
K_1-20	101.47	16.32	23.18	93.26	22.98	29.82	745.5	1495.5	7.45
K_1-23	197.80	14.18	24.60	129.38	22.00	36.86	921.5	1746.5	9.21
K_1-30	197.82	19.44	23.68	134.00	23.28	37.20	930.0	1875.0	9.30
K_1-40	114.07	17.62	24.06	139.00	19.38	34.00	850.0	1999.5	8.50
K_1-66	124.70	17.86	23.30	124.00	20.88	28.50	712.0	1472.0	7.12
K_1-80	108.33	18.84	19.40	114.00	22.65	20.38	509.5	1591.2	5.09
K_1-106	197.84	22.80	24.48	165.00	17.53	37.40	935.0	2074.5	9.35
CD (5%)	3.67	1.65	1.06	14.35	1.32	3.58	89.89	147.98	0.89

Table 2. Correlation coefficient among flag leaf area, yield, yield attributes and dry matter production for rice mutant cultures

Flag leaf area Vs	'r'
Number of panicle	0.366
Panicle length	0.497
Grains per panicle	0.709
1000 grain weight	-0.248
Grain yield per plant	0.617
Grain yield /m2	0.617
Dry matter/m2	0.564
Yield(t/ha)	0.617

It can be concluded that enhanced dry matter production could have been contributed from increased flag leaf area. Increased dry matter could be responsible for enhanced yield. Similar findings, suggesting that biomass play a major role in determining the economic yield in rice has been reported by Venkateswarlu and Prasad (1982). Considering the flag leaf as a target source that respond well to internal changes and also events occurring remote from photosynthetic organs (Sood and Singh, 1984), flag leaf area may be used as a primary index for screening and selection of rice varieties for higher yield.

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