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RESEARCH PAPER

Evaluation of paddy genotypes for morphological character under upland cultivation

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Abstract : A field trial conducted at MPKV, Rahuri during *Kharif* under upland condition in Randomized Block Design with three replication and twelve treatments . Paddy genotypes namely PBNR 89 II-6, PBNR 89, II-53, PBNR 90 III-64, PBNR 90 III-4, PBNR 90 II-11, PBNR 90 III-10, PBNR 89 I-3, PBNR 93-9, PBNR 93-4 and varieties Sugandha. (check), Parag (check), Basumati-370 (check) significant differences were observed among the genotypes for plant height, number of functional leaves, leaf area index, leaf area duration, dry matter production and grain yield. None of genotypes surplus the grain yield than variety parag and Basumati-370 under upland condition.

Key Words : LAI, LAD, RGR, AGR, Paddy, Genotypes, Morphological character

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INTRODUCTION

Paddy *Oryza sativa* L is the major component of Indian Agricultural and staple food of 65% of the total population and 47% of the total cereal production. (Sahagal, 1999)In Maharashtra paddy is cultivated on an area of 15.43 million hectae. Area under upland paddy cultivation under Mahatma Phule Krishi Vidyapeeth jurisdiction is 0.72 million ha. Most tropical upland varieties have pale green, long and droopy. It is produced comparatively less tiller than low land varieties due to long and well inserted panicles which are known to resistant to shattering and produce completely fertile panicles as well as well filled grains even after mild drought (Jana *et al.*, 1977).

No clear-cut morphological differences could separate numerical paddy varieties in to distant upland and lowland types, In view of above the present study was planned to identify morphological desirable genotypes for the region. Which could helped to increase the average yield of upland paddy.

MATERIAL AND METHODS

A field experiment was conducted at Post Graduate Institute farm MPKV, Rahuri during *Kharif* and was lead out in RBD with three replications and twelve upland genotypes and varieties. (treatments) having plot size of 4.50 into 2.70 m and 30 cm x 10 cm of plant to plant distance.

The dibbling method of sowing was adopted at optimum sowing condition after onset of monsoon in June month.Recommended, package of practices were carried out during the crop period as and when required. The genotypes namely PBNR 89 II-6, PBNR 89, II-53, PBNR 90 III-64, PBNR 90 III-4, PBNR 90 II-11, PBNR 90 III-10, PBNR 89 I-3, PBNR 93-9, PBNR 93-4 and varieties Sugandha. (check), Parag (check), Basumati-370 (check) were used study.for 30 days after sowing and then at an 30 days interval plant samples were collected 30 days The component parts of the plant such as stem, leaves and panicles are separated Leaf area was determined by leaf area meter (model-AAM-7) and expressed dm^2 /plant as well as leaf area index

$$\textbf{Calculated by LAI} = \frac{\textbf{Leaf area / plant}}{\textbf{Landj area / plant}}$$

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Leaf area duration calculated by the formula suggested by Watson (1947) and express in days.

$$LAD = \frac{LAI_1 + LAI_2}{2} X (t_2 - t_1)$$

LAD = leaf area duration

LAI_1 and LAI_2 are Leaf Area Index at the time t_1 and t_2 (days), respectively.

For the dry mater studies were separated into Stem, leaves and panicles and dried in hot air oven at 90^0C for one hour and then at 60^0C till constant weight . Similarly up to the weights of stem leaves and panicles of some plants give the total dry matter per plant. weights of grains per plots inkg was recorded after harvesting and cleaning.

RESULTS AND DISCUSSION

The results of the present study have been presented and discussed under the following headings:

Plant height:

At 30 DAS,Day after sowing the maximum plant height was noticed was in genotypes PBNR 89 II-6 (46.5 cm) followed by PBNR 90 III-64 (45.83cm) as against least height was observed in PBNR 90 III-4 (25.13cm) subsequently the maximum height at60, 90 DAS and at harvest was found in PBNR II-6 genotypes and were 57.16, 121.06, 134.93 c.m., respectively which were significantly superior over the rest of genotypes and varieties lower height at 60, 90 DAS and at minimum harvest was observed in Sugandha variety which 34.43, 56.76 and 74.20cm, respectively.

Functional leaves:

The maximum functional leaves at harvestwas observed in genotypes PBNR 89 II-6 (138.26) followed by PBNR – 89 II -53 (91.80) as against minimum leaves of 61.87 was in variety Basumati rest of genotypes in ranged of 68.47 to 87.71 leaves per plant including tillers.

Leaf area and leaf area index:

Leaf area measured dm2 and at 30,60 and 90 DAS by automatic leaf area meter and LAR calculated 0nWatson (1947) formula Significant differences were found among the genotypes in leaf area and LAI. It is observed that leaf area gradually increased up to 90 days and declined there after in all genotypes. Significantly highest leaf area was noticed in variety Parag at 30, and 90 DASand were 0.74, and 17.26 dm^2, respectively followed genotypes PBNR 93-4 was 16.26 at 90 DAS as against lowest was 8.46 dm^2 leaf area observed in genotypes PBNR 90 III-64.

Trend of leaf area index (LAI) was similar to leaf area in all genotypes and varieties. The area increase steadily up to 90 DAS and observed declined there after significantly LAI observed in variety Parag at 30, 60, 90highest at harvest and was 0.24, 2.97, 5.75 and 2.33, respectively.

Leaf area duration :

leaf area duration was increased up to 60 DAS in all genotypes, however it was declined at 90 DAS except PBNR 89 II-53, Genotypes PBNR 93-4 was significantly higher LAD over rest of genotypes and varieties at 30 and 60 DAS Maximum LAD was in variety Parag (121.14)

Dry matter production:

The total dry matter accumulation was low at initial

Table 1: Influence of morphological characteristics on different genotypes of upland paddy

Sr. No.	Name of cultivar	Plant height (cm)				Mean functional leaves			Mean leaf area (dm^2)		
		Days after sowing			At harvest	Days after sowing			Days after sowing		
		30	60	90		30	60	90	30	60	90
V_1	PBNR 89 II-6	46.50	57.16	121.06	134.93	14.39	37.23	138.26	0.26	4.75	10.25
V_2	PBNR 89 II-53	38.10	43.61	117.43	124.16	16.58	51.70	91.80	0.57	3.94	10.77
V_3	PBNR 90 III-64	45.83	54.54	107.30	120.30	12.43	31.64	68.47	0.29	3.67	8.46
V_4	PBNR 90 III-4	25.13	36.83	74.33	84.76	13.83	59.74	85.29	0.37	4.72	11.76
V_5	PBNR 90 III-11	42.83	53.16	98.40	117.96	14.31	49.09	72.64	0.69	5.74	12.25
V_6	PBNR 90 III -10	41.51	47.73	87.50	105.40	17.27	25.78	68.62	0.68	4.92	9.15
V_7	PBNR 89 I-3	35.40	43.15	80.53	100.03	15.31	48.88	87.71	0.43	4.25	11.51
V_8	PBNR 93-9	37.90	44.23	71.40	104.23	16.88	44.49	76.40	0.51	6.04	14.25
V_9	PBNR 93-4	33.66	54.66	113.16	130.26	11.59	36.80	70.69	0.59	7.26	16.26
V_{10}	Sugandha (c)	25.30	34.43	56.76	74.20	17.92	44.37	70.55	0.38	3.28	8.48
V_{11}	Parag (c)	44.53	46.73	74.76	87.20	21.43	50.68	72.21	0.74	5.96	17.26
V_{12}	Basumati-370 (c)	35.36	38.00	98.23	116.46	15.54	43.12	61.67	0.45	4.36	13.50
	Mean	37.32	46.19	91.74	107.91	15.62	47.79	80.37	0.49	4.91	11.99
	S.E. ±	0.504	0.69	0.52	0.64	0.09	0.24	0.41	0.008	0.008	0.014
	C.D. (P=0.05)	1.47	2.01	1.53	1.88	0.26	0.72	1.20	0.024	0.024	0.042

Table 2: Influence of physiological character (leaf character) on yield of upland paddy

Sr. No.	Name of cultivar	Leaf area index				Leaf area duration (in days)			Mean total dry matter per plant (in g)				Grain yield (q/ha)	Biomass yield (q/ha)
		Days after sowing			At harvest	Days after sowing			Days after sowing			At harvest		
		30	60	90		30	60	90	30	60	90			
V_1	PBNR 89 II-6	0.08	1.58	3.41	1.0	25.00	74.96	67.16	0.64	7.79	15.86	21.19	21.93	98.74
V_2	PBNR 89 II-53	0.19	1.31	3.57	1.4	22.50	73.31	75.00	0.77	7.40	14.29	20.35	12.38	78.08
V_3	PBNR 90 III-64	0.10	1.22	2.82	0.98	19.80	60.71	57.00	0.61	6.24	20.30	20.57	14.94	97.61
V_4	PBNR 90 III-4	0.12	1.56	3.92	1.08	18.63	82.25	74.65	0.47	7.48	12.94	20.19	19.67	94.44
V_5	PBNR 90 III-11	0.23	1.90	4.08	1.3	18.28	90.50	81.80	0.61	7.43	10.40	20.86	18.73	88.79
V_6	PBNR 90 III -10	0.22	1.63	3.05	0.89	27.51	70.47	39.30	0.54	3.70	4.62	15.65	7.74	84.18
V_7	PBNR 89 I-3	0.14	1.41	3.83	1.1	23.83	78.60	75.00	0.37	6.29	11.72	21.13	15.30	79.58
V_8	PBNR 93-9	0.16	2.02	4.74	1.3	32.69	101.87	91.40	0.59	6.05	16.26	18.65	21.12	92.17
V_9	PBNR 93-4	0.19	2.42	5.41	2.0	39.22	117.73	112.45	0.76	7.34	17.18	18.25	8.74	67.12
V_{10}	Sugandha (c)	0.12	1.09	2.82	1.3	18.25	58.78	63.20	0.78	7.40	21.12	18.80	12.84	72.18
V_{11}	Parag (c)	0.24	1.97	5.75	2.3	33.30	116.11	121.14	0.48	5.56	9.01	14.60	29.13	76.31
V_{12}	Basumati-370 (c)	0.14	1.44	4.50	1.0	84.54	89.20	83.65	0.45	3.13	13.18	19.57	25.12	67.18
	Mean	0.16	1.63	3.99	1.3	25.24	84.54	80.14	0.59	6.31	13.96	19.65	17.30	83.36
	S.E. ±	0.14	1.41	3.83	1.1	0.95	0.23	0.20	0.07	0.030	0.088	0.96	0.371	0.44
	C.D. (P=0.05)	0.16	2.02	4.74	1.3	2.78	0.69	0.59	0.020	0.087	0.259	2.82	1.11	1.34

stages in all the genotypes,It was increased linearlly with age up to harvest of the crop. The maximum total dry matter per plant was obtained in genotypes PBNR 90 III-64 (24.57g per plant) followed by PBNR 89 II-6 (21.19g per plant) at harvest. Lowest was found in Parag variety (14.60g per plant).

Yield:

The significant differences in grain yield quintal per hectare was found among the genotypes and varieties. Significantly highest grain yield was harvested from the plot of variety Parag (29.13 qt. per ha.) followed by Basumati 370 (25.12 qt. per ha.) In case of genotypes 21.93 qt. per ha. and 21.12 qt. per ha. yield was obtained from PBNR 89 II-06 and PBNR 93-9, respectively. Lowest yield was obtained from genotypes PBNR 93-10 (7.74 q per ha.). None of the genotypes tested under studywere found superior over the existing varieties Parag and Basumati 370.

Conclusion :

In this investigation, the variation in grain yield was due to variation in leaf area duration (Watson1947 1958) The area of leaf surface intercept solar radiation is most of important factor. As a result, LAI as a determinant of dry matter production and hence the yield was widely recognize. Variety Parag and genotypes PBNR 93-4 and PBNR 93-9 and higher values for these traits at most of the growth stages and simultaneously produced higher dry matter and grain yield, higher LAI in these entries at 60 - 90 DAS. Might have intercepted more light enhancing their photosynthetic rate, which resulted in high dry matter production in grain yield. Higher LAD indicate functional leaf and persistence for longer time during critical growth stages like tillering, panicle emergence and grain filling period of supplying photosynthetic assimilation for insuring sink potential and its better grain filling same result reported by (Chang, etal 1975 and Narja Raddy etal 1996)It is revealed from data that during the early growth stage (30 DAS) Larger portion of total dry matter was shared by the leaves than stem form 60 DASand on wards all the upland genotypes should higher accumulation in the stem and then the leaves. Upland genotypes PBNR 89 II-53 recorded higher dry matter in stem than leaves at 90 DAS upland genotypes PBNR 89 II-53, PBNR 93-11, PBNR 93-III-64, PBNR 93-4 were more efficient in dry matter production and its partitioning by allocating maximum dry matter to panicles leaves is the high TDM in this genotypes was due to constant high values of total tiller, functional leaves. leaf area, LAI and LAD during most of growth stages. Resulting in high grain yield it is positive correlation of grain yield on dry matter accumulation. Similar result supported by Rai.etal. 1978 Gautam and Sharma 1986 and Narsing Rao 1987.

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