Madras agric. J. 62 (8) : 524 — 526, August, 1975.

Leaf Area in Rice as Influenced by Varieties, Nitrogen and Different Growth Stages

Leaf area is considered as a basic factor in plant physiology. Working on barley, Lal and Rao (1950) observed that leaf area can be used as an index of crop growth and that it related to physiological and economic characters such as dry matter accumulation, carbohydrate metabolism, yield and quality of fruits. Photosynthesis which is responsible for growth and grain development takes place in green leaves. Thus it is imperative that leaf area, photosynthesis and grain yield are interlinked. An attempt was therefore made to know as to how leaf area was affected by such factors as varieties, nitrogen and growth stages.

An experiment was conducted with two rice varieties viz., IR 22 and IR 662 and three nitrogen levels namely 0, 60 and 120 kg/ha in randomized complete block design with three replications during 1970 *dry* season at International Rice Research Institute Experimental Farm, Philippines in plots of size 5.60×2.80 m. IR 22 and IR 662 rice varieties mature in 110 and 125 days respectively. Twenty one days old seedlings were planted at one seedling per hill with 20×20 cm spacing. Leaf area measurements were taken at different growth stages commencing 30 days after transplanting (DAT) at regular intervals of 15 days. At each growth stage, 3 hills were selected at random from each plot. These hills were removed from the soil with roots intact and kept immediately in a cool room to avoid curling, drying and shrinkage. As soon as the hills were removed, replanting was done to avoid the effect of missing hills on the subsequent stages for leaf measurements. Area of each leaf was determined immediately with an instrument called Electronic Automatic Leaf Area Meter. A leaf was considered as green when more than 50 per cent of the total leaf surface was found green. The total leaf area for all the leaves from nine hills was computed separately at each growth stage, nitrogen and variety and leaf area index (LAI) calculated. The relationship between LAI and growth stages at each level of variety and nitrogen was studied by fitting quadratic response curves of the type, $y = a + bx - cx^2$ where y = LAI and x = growth stage.

Data in Table 1 indicate that mean number of leaves and LAI increased with DAT and attained its maximum value between flowering and grain development stages and then decreased. (Figs. 1 and 2). Similar results were reported for Peta and 81–B25 rice varieties by Tanaka *et al.* (1966). Variety IR 662 had more LAI than IR 22 at flowering and at grain development stages at 60 and 120 kg/ha N levels indicating LAI was a varietal character. The grain yields recorded were 2.07, 2.19 and 2.21 gm per panicle for 0, 60 and 120 kg/ha N for IR 22 and 2.18, 2.28 and 2.31 per panicle for IR 66 respectively explaining application of N contributed to higher grain production. Regression analysis indicated that grain yield was dependent on LAI at each growth stage and the R^2 values were also significant at 1 per cent level.

TABLE 1. The computed values of LAI at each growth stage and at different N rates and varieties.

Variety	Growth stage (DAT)	Nitrogen (kg/ha) 0	60	120
IR 22	30	0.44 (14.0)	0.29 (10.7)	0.22 (8.2)
	45	1.21 (27.4)	1.69 (37.1)	2.43 (46.3)
	60*	2.21 (42.3)	2.95 (46.3)	4.56 (61.3)
	75	1.13 (23.0)	1.81 (28.6)	2.88 (42.8)
	90**	0.30 (9.3)	0.55 (11.8)	0.82 (13.7)
IR 662	30	0.39 (12.2)	0.23 (8.0)	0.51 (14.6)
	45	1.04 (27.4)	1.08 (27.0)	1.42 (31.7)
	60	1.81 (30.7)	4.63 (67.0)	4.01 (47.7)
	75*	1.69 (31.8)	3.59 (55.8)	4.72 (52.9)
	90	1.00 (17.2)	1.93 (26.8)	3.00 (31.8)
	105**	0.41 (9.9)	0.50 (8.7)	1.01 (13.8)

* Flowering stage.

** Harvest stage

Figures in paranthesis indicate mean number of leaves per hill.

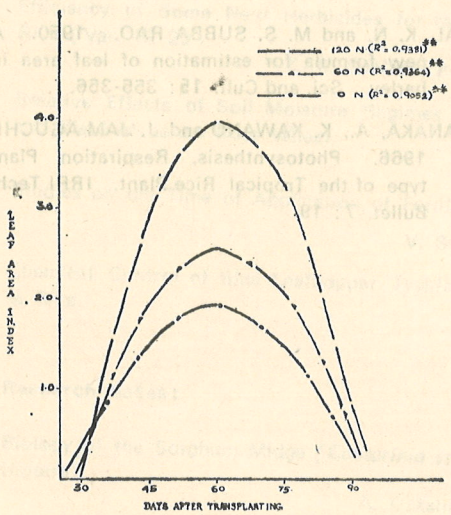

Fig. 1
Relation between LAI and DAT in IR 22 rice variety at different levels of nitrogen.

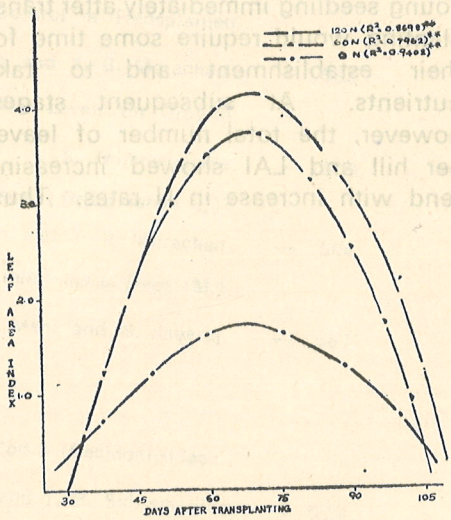

Fig. 2
Relation between LAI and DAT in IR662 rice variety at different levels of nitrogen.

The fitted response curves were as follows:

IR 22	0 kg N/ha	$Y = -4.29 + 0.2068x - 0.001733x^2$	(60.0 & 1.88)
	60 ,,	$Y = -6.52 + 0.2984x - 0.002451x^2$	(61.0 & 2.56)
	120 ,,	$Y = -10.83 + 0.4815x - 0.003921x^2$	(61.4 & 3.95)
IR 662	0 ,,	$Y = -2.69 + 0.1293x - 0.000956x^2$	(67.6 & 1.68)
	60 ,,	$Y = -8.35 + 0.3509x - 0.002559x^2$	(68.6 & 3.68)
	120 ,,	$Y = -8.40 + 0.3552x - 0.002519x^2$	(70.5 & 4.12)

(figures in paranthesis indicate DAT when LAI is maximum and maximum LAI respectively)

The above equations showed that maximum LAI was reached approximately at flowering stage of the crop. This happened due to the reproductive activities of the plant namely filling of the grain mobilized the plant nutrients and also depleted the reminder of the plant of its nutrients thus imposing senescence. Effect of N application on LAI was not seen at 30 DAT as the young seedling immediately after transplanting would require some time for their establishment and to take nutrients. At subsequent stages, however, the total number of leaves per hill and LAI showed increasing rend with increase in N rates. Thus, application of N brought out scope for more LAI and consequently leading to more photosynthesis and grain yield.

K. M. PALANISWAMY

Department of Agronomy,
Statistic Section, Tamil Nadu
Agricultural University, Coimbatore - 641003.

REFERENCES

LAL, K. N. and M. S. SUBBA RAO. 1950. A new formula for estimation of leaf area in barley. Sci. and Cult. **15**: 355-356.

TANAKA, A., K. KAWANO and J. JAM AGUCHI. 1966. Photosynthesis, Respiration Plant type of the Tropical Rice Plant. IRRI Tech. Bullet. 7: 19.