Oryza Vol. 44. No.2, 2007 (187-188)

Effect of growth regulators on amylase activity and mobilisation in rice culm node

Ashutosh Debata*, S.K. Nayak and K.S. Murty

Department of Botany, Stewart Science College, Cuttack - 753 001, Orissa, India

ABSTRACT

Application of growth regulators viz. Kinetin, Triacontinol on terminal rice culm node part at 7 days after flowering resulted in higher amylase activity in terminal culm node part which otherwise favours mobilisation of photosynthate from the terminal culm node to the panicle and thereby increas the panicle weight tiller^{-1}. Conversely, application of silicone oil and abscisic acid resulted in lower amylase activity causing slower mobilisation and reduction in panicle weight tiller^{-1} in indica rice cultivars.

Key words: *DAF - Days after flowering; culm node - leaf sheath and elongated internode*

The grain yield was dependent mostly on post flowering mobilisation of photosynthate to the developing grain. Recently, it has been indicated by Japanese scientists that other than leaf, premature senescence of panicle might also be a constraint for mobilisation of photosynthate to the developing panicle and for grain yield in Japonica rice cultivars (Nakayama, 1974, Seok, 1981). It was further found that translocation from source to sink was regulated by growth hormones (Sweet and Wareing, 1966; Ray and Choudhury, 1980). The influence of foliar spray of growth regulators on rice leaves during post flowering stages was studied by several authors (Biswas and Choudhury, 1980; Debata and Murty, 1981).However, no information is available on indica rice genotypes about the relationship between amylase activity of terminal culm node part and mobilisation of photosynthate from culm node to the maturing grain during post flowering stages. The present investigation aims at working out this relationship.

Two early rice cultivars, viz. Ratna and Rasi were grown in porcelain pots (with 6 kg. soil) during dry season of 2006 (February-March). The treatments included spraying of growth promoters [Kinetin (10 ppm.) and Triacontinol (10ppm.)] and growth inhibitors [(Silicone oil (10ppm.) and Abscisic acid (10ppm.)] on terminal culm node part. Four porcelain pots per rice cultivar were taken for each treatment with four plants per pot. The control pots were sprayed with water. Uniform tillers at flowering (with synchronous flowering date) in each pot were tagged and the growth regulators were sprayed on the terminal culm node part (100 ml. pot^{-1}) in a single dose at 7 days after flowering (DAF)with an atomiser. Samples from 4 tillers per pot were drawn at 7,14 and 21 days after spraying of growth regulators (i.e., 14.21 and 28 DAF) respectively for determining total dry weight (g tiller^{-1}), functional leaf area percentage by automatic leaf area meter (Model AAM-5, Japan), total chlorophyll percentage in leaf (Arnon, 1949), amylase activity in terminal culm node part (Nakayama, 1974); mobilisation percentage (Singh and Staskopf, 1971) and panicle weight per tiller at 28 DAF (harvest) were also assessed.

The possession of more functional leaf area, total chlorophyll percentage, higher amylase activity in terminal culm node seemed to favour more mobilisation of photosynthate from top or terminal culm node part to the panicle and thereby increased the grain yield (panicle weight tiller^{-1}). Since the trend of treatment effect was same at different sampling dates, the data are furnished here only for 21 DAF.

The spray of growth promoters i.e., Kinetin and Triacontinol on terminal rice culm node part at 7 days after flowering (DAF) enhanced the mobilisation percentage and eventually increased the panicle weight tiller^{-1} (Table 1).On the other hand, the application of

Table 1. Effect of growth regulators on terminal rice culm node part indicating retention of functional leaf are, a total chlorophyll %, Amylase activity at 21 DAF and Panicle weight tiller^{-1} at 28 DAF in dry season of 2006

Growth Regulators	Functional Leaf Area as % at Flowering			Total Chlorophyll % mg 100^{-1} mg. Fresh Weight			Amylase Activity of Terminal Cum Node Part			Mobilisation (%) (g tiller^{-1})			Panicle Weight		
	Ratna	Rasi	Mean	Ratna	Rasi	Mean	Ratna	Rasi	Mean	Ratna	Rasi	Mean	Ratna	Rasi	Mean
Control(Water)	63.30	58.80	61.05	1.04	1.02	1.03	2.60	2.33	2.47	26.62	18.22	22.42	1.99	1.22	1.61
Kinetin	77.60	68.83	73.21	1.60	1.09	1.35	3.69	2.87	3.28	30.50	25.50	28.00	2.96	2.18	2.57
Triacontino	71.15	61.58	66.37	1.57	1.05	1.31	2.99	2.58	2.79	29.90	25.40	27.65	2.70	2.13	2.42
Silicone Oil	50.64	45.44	48.04	0.44	0.43	0.44	1.43	1.28	1.36	13.66	9.26	11.46	0.52	0.31	0.42
Abscisic Acid	49.77	28.37	39.07	0.43	0.42	0.43	1.41	0.80	1.11	13.43	9.10	11.27	0.51	0.30	0.41
CD (P=0.05) varieties (V)	0.59			0.02			13.20			0.14			0.09		
Treatment (T)	1.56			0.05			5.01			0.39			0.22		
(VXT)	2.21			0.07			N.S			0.25			0.15		

growth inhibitors like Silicone oil and Abscisic acid resulted in decline in mobilisation percentage and panicle weight per tiller over the control in both rice cultivars. However, the changes were less prominent in Rasi in all parameters except mobilisation percentage.

Two rice cultivars treated with Kinetin (growth promoter) possessed the highest functional leaf area (by 23%), total chlorophyll % (by 40%), amylase activity and mobilisation % (by 42%) and visualised 49% increase in panicle weight tiller^{-1} over control.In contrast, Abscisic acid reduced the functional leaf area (by 20%), total chlorophyll % (by 42%) with a concomitant reduction in amylase activity and mobilisation % in culm node (by 45%) and decreased panicle weight tiller^{-1} (by 26%).There was a linear and significant correlation between amylase activity, mobilisation % and panicle weight tiller^{-1} at harvest (28 DAF) in both rice cultivars i.e., Ratna (r=0.919**) and Rasi (r=0.705**).

REFERENCES

Arnon DI 1949. Copper enzymes in isolated chloroplasts in *Beta vulgaris,* plantphysiol 24:1-15

Biswas AK and Choudhuri MA 1980. Occurrence of two physiological stages in isolated leaf senescence of Rice, Indian J Exptl Biol 18-1**:**90-91.

Debata A and Murty KS 1981. Effect of Growth regulators on photosynthetic efficiency, translocation and senescence in Rice, Indian JExptl Biol 19-10 **:** 986-987.

Nakayama H 1974. Panicle senescence in Rice, Plant Bull Hokuriku Natl. Agri Expt Stn 16**:** 15-27

Ray S and Choudhuri MA 1980. Regulation of flag leaf senescence in Rice by nutrients and its impact on yield, ILRI 50

Seok Weon Seo Chamura and Toshiro Haryaka 1981. Panicle senescence and its prevention in Rice plant. Japanese J crop sci 50(2) : 91

Singh ID and Stoskopf NC 1971. Harvest index in cereals, Agron J 63 **:**224-226

Sweet GB and Wareing PF 1966. Role of plant growth hormones in regulating photosynthesis, Nature, 210: 77-79