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EFFECT OF CERTAIN GROWTH REGULATORS ON GROWTH, YIELD AND QUALITY OF RICE (*ORYZA SATIVA* L.)

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ABSTRACT

Effect of five growth regulators each in two concentrations *viz*; IAA @ 25 and 50ppm, CCC @ 2000 and 4000ppm, Miraculan @ 5 and 10ppm, Cytokinin @ 5 and 10ppm and Alar @ 2000 and 3000ppm with one unsprayed control on growth, yield and quality of rice variety Sarju-52 under field conditions, was studied. Plant height was significantly reduced by higher concentrations of both CCC and Alar. Higher dose of IAA @ 50ppm significantly increased plant height and produced highest grain yield of 5533 kg/ha, as against 4720 kg/ha in the control. The increase in grain yield were contributed largely by increased chlorpophyll content, panicles per plant, grains per panicle, grain weight per plant, 1000 grain weight and high harvest index. Cytokinin hastened the flowering and maturity, whereas CCC delayed it. Higher protein content in mature grains was also recorded under the higher dose of cytokinin.

INTRODUCTION

Rice is one of the most important food crops in the world occupying nearly 135 million/ha and yielding roughly 307 million tonnes. In India, rice is cultivated in about 38 million hectare which is about 37 per cent of the total area under all types of cereals and 28 per cent of the total world area. The average production of rice in India is very low in comparison to other rice producing countries. The introduction of chemical growth regulators has added a new dimension to the possibility for modifying plant growth. In principle, the availability of exogenous bio-regulators to modify plant growth offers great opportunity. The potential uses of effective growth retardants are almost as numerous and valuable as those for growth promoters. Besides affecting plant growth substantial increases in yield of cereals by the application of these substances have been reported by Humphries (1968), Samant Asinhar and Sahu (1990). The yield increments have generally been brought about by regulation of growth and metabolic processes in such a way that there is increased production of photosynthates and more efficient translocation of assimilates from the photosynthesizing plant parts to the organs of economic yield. Therefore, the present experiment was planned to study the effect of certain bio-regulators on growth, yield and quality of rice (*Oryza sativa* L.).

MATERIAL AND METHODS

A field experiment was conducted at Research Farm Block 'A', C.S. Azad University of Agriculture and Technology, Kanpur in a Randomized Block Design with three replications. The treatments consisted of control, Indole acetic acid (IAA) @ 25 and 50ppm, 2-chloroethyl trimethyl ammonium chloride (CCC) @ 2000 and 4000 ppm, Miraculan @ 5 and 10ppm, Cytokinin @ 5 and 10ppm and N-dimethylamine succinic acid (Alar) @ 2000 and 3000ppm. All the treatments were applied as foliar sprays twice, at tillering and pre-anthesis stages. The rice seedling were transplanted in experimental plots in the second week of July and fertilized with 60kg N, 40kg P_2O_5 and 30kg K_2O/ha in the form of urea, super phosphate and muriate of potash, respectively.

Total chlorophyll content in leaves at pre-anthesis stage was determined as per method described by Arnon (1949). Nitrogen conten in mature grains was estimated in pooled replications by modified Kjeldhal's method of A.O.A.C. (1965) and protein con-

Table 1. Effect of growth regulators on growth, yield and quality of rice

Treatments	Plant height (cm)	No. of panicles/ plant	Panicle length (cm)	Chlorophyll content (mg/g fresh weight)	Grain weight per plant (g)	1000 grain weight (g)	Grain yield (kg/ha)	Harvest index (%)	Grain productivity (kg/day/ha^{-1})	Grain protein (%)
Control	86.0	7.0	19.53	2.10	17.0	20.70	4720	37.14	36.21	6.50
IAA 25ppm	90.3	9.3	22.42	2.42	25.1	22.84	5340	40.48	40.87	7.80
IAA 50ppm	96.1	11.0	24.47	2.50	27.1	24.80	5533	39.93	41.79	8.20
CCC 2000ppm	84.0	8.0	22.23	2.40	20.7	22.00	5166	37.92	39.54	7.55
CCC 4000ppm	81.9	7.6	21.17	2.42	23.3	21.70	5300	40.44	40.98	7.60
Miraculan 5ppm	85.1	7.0	20.80	2.38	19.5	21.40	5066	39.81	39.07	7.20
Miraculan 10ppm	83.9	7.3	21.62	2.27	20.0	20.80	5133	40.81	39.49	7.30
Cytokinin 5ppm	88.4	8.3	21.03	2.44	23.0	20.80	5313	38.61	41.51	7.80
Cytokinin 10ppm	86.6	8.0	21.82	2.38	32.3	22.30	5266	40.06	40.51	8.70
Alar 2000ppm	84.2	8.6	23.05	2.44	24.4	22.80	5346	39.48	40.71	7.60
Alar 3000ppm	81.9	9.6	23.75	2.46	25.7	23.70	5386	40.36	40.30	8.00
S.E.(M)±	0.87	0.47	0.86	0.023	0.51	0.43	78.67			
C.D. at 5%	2.57	1.39	2.54	0.678	1.50	1.27	232.0			

tent was evaluated by multiplying the nitrogen percentage by the coefficient 6.25. Observations on some growth and yield attributes were also recorded at the time of harvest.

RESULTS AND DISCUSSION

Significantly maximum reduction in plant height was recorded both by the applicaiton of CCC @ 4000ppm and Alar @ 3000ppm. A similar reduction in plant height due to applicaion of CCC in rice plant was reported by Kujel (1976) and Bishnoi *et al.* (1994). The reduction in plant height may be attributed to restriction in cell division activity resulting in shortening of internodal length. IAA @ 50ppm followed by Alar @ 3000ppm produced significantly maximum grain yield/plant, 1000 grain weight and yield kg/ha (Table 1). These were significantly superior to all other treatments. The enhanced yield under IAA may be due to increase in panicle length, number of panicle per plant and number of grains per panicle. The other possible reason for the best yield recorded in IAA treatment would be the capability of this treatment in efficiently channelising the assimilates to the grains.

Further, the high values of grain productivity exhibited foliar applied IAA @ 50ppm (41.39) and Cytokinin @ 5ppm (41.5) over control (36.21) demonstrated that IAA allows the plant to remain under active reproductive phase for a longer time that facilitates better efficiency of transport mechanisms. Similar findings were also reported by Tripathi and Singh (1989). High amount of chlorophyll content was recorded in IAA treated plants as compared to other treatments at pre-anthesis stage (Table 1). The increase in chlorophyll content in rice leaves may be either due to its increased production or due to protective actions of growth substances against the destruction of chlorophyll. These findings are in full agreement with those of Tripathi (1978); Murumkar and Chavan (1988).

Growth regulators also improved the per cent protein content of rice grain. It was significantly higher under Cytokinin @ 10ppm followed by IAA @ 50ppm and minimum in Miraculan and control. These findings are quite in agreement with those of Tripathi (1978) and Kalita *et al.* (1995).

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