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Short Communication

Effect of Seedling Treatment on Plant Growth and Chlorophyll Content in Rice

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Initial seedling vigor is an important criteria for successful crop establishment and growth particularly in transplanted crop like rice. Seed and seedling treatment with chemicals, growth promoters and various bio formulations have been found to improve seedling emergence, seedling vigour and yield in various crop plants. Plant growth promoters increase yield by increasing production of photosynthates and more efficient mobilization of assimilates from source to sink. Total chlorophyll content and leaf area are some of the important parameters in deciding the rate of photosynthesis and mobilization of assimilate. Mobilization of seed reserves is crucial during growth process because it supplies substrates for the proper functioning of different metabolic processes that are essential for growth. Application of growth regulators like GA_3 has been found widely practiced in hybrid rice seed production to increase the seed yield [1,2]. Kalisena which is a bio-formulation of fungus *Aspergillus niger* has been found to have positive effect on plant growth, vigour and resistance to sheath blight disease in rice [3]. Seed treatment with GA_3 increased the seedling emergence and vigour of rice under low temperature [4].

In the present study, the effect of seedling treatment with GA_3 and Kalisena on growth parameters and chlorophyll content was studied in the CMS line Pusa 6A of rice under normal field conditions. The treatments included were T_1 (control) T_2 (50 ppm GA_3 seedling dip for 2 hrs), T_3 (0.8% Kalisena seedling dip for 2 hrs), T_4 (50 ppm GA_3 seedling dip + foliar spray), T_5 (0.8% Kalisena seedling dip + 50 ppm GA_3 foliar spray) and T_6 (0.4% Kalisena overnight seedling dip). These treatments were given at the time of transplanting. The 30 days old seedlings were uprooted from the nursery and washed thoroughly to remove the soil and then the root portion was kept immersed in respective solutions for the respective treatment duration before transplanting. Foliar spray of GA_3 was done at 15 days after transplanting, total chlorophyll content of leaves was determined in the young leaves by acetone method [5]. Leaf from samples collected starting from 15 days after transplanting at fortnightly intervals upto maturity and the plant characters were recorded at maturity.

The total chlorophyll content (mg/g tissue) at different intervals of plant growth is shown in Table 1 and Fig. 1. The effect of seedling dip treatment was evident immediately after the treatment in case of Kalisena overnight treatment. With other treatment it was evident only after 15 days. The Kalisena treated seedlings transplanted in the field appeared darker green and GA_3 treated seedling appeared pale green as compared to control. Kalisena (0.4%) over night seedling dip recorded significantly higher chlorophyll content (19.50 mg/g tissue) than other treatments at 52 days after seeding (DAS). Also Kalisena (0.4%) overnight seedling dip and Kalisena (0.8%) seedling dip for 2h recorded significantly higher chlorophyll content than other treatments at 66 DAS and 82 DAS. Highest mean total chlorophyll

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Table 1. Effect of seedling treatment on morphological traits in Pusa 6A

Treatments	Plant height (cm)	Flag leaf length (cm)	Flag leaf width (mm)
Control (T_1)	76.35	31.20	14.47
GA_3 50 ppm seedling dp (T_2)	83.60	32.47	14.20
0.8% Kalisena seedling dip (T_3)	82.65	32.53	15.07
T_2 + GA_3 50 ppm foliar spray (T_4)	91.70	33.13	14.33
T_3 + GA_3 50 ppm foliar spray (T_5)	89.70	32.73	14.33
0.4% Kalisena over night seedling dip (T_6)	83.90	32.33	15.13
C.D. (P = 0.05)	2.51	1.39	0.62

content (10.36 mg/gm tissue) was obtained with Kalisena (0.4%) overnight seedling dip. On the contrary, application of GA_3 had negative effect on total chlorophyll content at all the stages of crop growth and similar observations were made by Singh and Ram [6] also. There was significant reduction in chlorophyll content with GA_3 application at all the stages of crop growth. Such reduction in chlorophyll content could be attributed to its greater use towards the biomass production which was enhanced by GA_3 application [7]. Irrespective of treatments there was progressive decline in chlorophyll content as the age of plant advanced and at 120 DAS the difference between treatments narrowed down. There was no significant difference in total chlorophyll content between Kalisena treated and control at maturity. Chlorophyll content in plants has direct relationship with rate of photosynthesis [7] and several workers have reported positive correlation between chlorophyll content and seed yield [8,9].

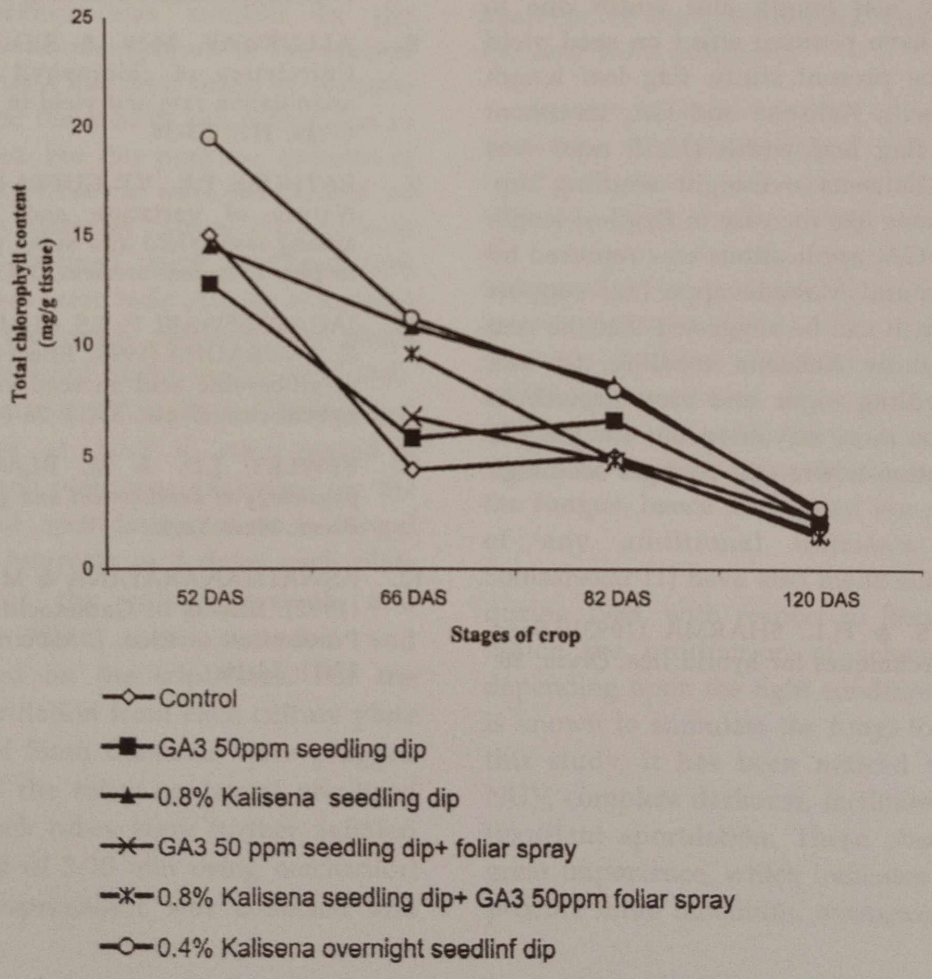

Fig. 1. Chlorophyll content of leaves as affected by different seedling treatments in rice

The increase in chlorophyll content with Kalisena treatment could perhaps increase the supply of assimilates at the time of grain filling which in turn may possibly result in increased seed yield.

The effect of growth promoters on growth parameters like plant height, flag leaf length and width are presented in Table 1. All the treatments significantly increased the plant height compared to control (76.35 cm) and maximum (91.70 cm) was recorded with 50 ppm GA_3 seedling dip combined with foliar spray. The flag leaf length and width also increased with treatments and was significant in T_4 and T_3 for width and length respectively. Increase in plant height with GA_3 application may be due to increased rate of cell elongation. Foliar application of GA_3 significantly increased plant height, panicle exsertion and number of filed grain per panicle in rice [10]. In rice, net photosynthesis in flag leaf and penultimate leaf is relatively high and contribute more in supplying assimilates for grain filling [11]. Hence increase in flag leaf length and width due to treatment may have positive effect on seed yield per plant. In the present study, flag leaf length was increased with Kalisena and GA_3 treatment and maximum flag leaf width (15.15 mm) was observed with Kalisena overnight seedling dip. Similar observations like increase in flag leaf length and width with GA_3 applications was reported by Aswathnarayana and Mahadevappa [12] support the present study. It can be suggested that the cost effective eco-friendly Kalisena seedling dip can improve the seedling vigor and crop growth in rice and it will be more advantageous for the SRI system of cultivation where still younger seedlings are used.

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