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Influence of Seed Treatment on Growth and Yield of Finger Millet (*Eleusine coracana* L.)

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Abstract: An experiment was conducted at Millet Breeding Station, Tamil Nadu Agricultural University, Coimbatore to study the effect of pre sowing seed treatment on the growth and yield of finger millet. There were five treatments Viz., control, seed treatment of 1% calcium chloride ($CaCl_2$), 2% Polyethylene glycol (PEG 6000), 1% Potassium dihydrogen phosphate (KH_2PO_4) and 0.1 ppm Brassinosteroid (BR). The experiment was laid out in a randomized block design replicated four times. All the seed treatments increased the grain yield over control. BR 0.1 ppm recorded higher grain yield of 1990.29 Kg ha^{-1} while control recorded a yield of 1636.15 Kg ha^{-1}. The yield increment due to BR was 21.64 percent followed by KH_2PO_4 (14.26 %) and $CaCl_2$ (9.36 %). Among the treatments, BR edged over other treatments and recorded higher values for all the components, thus leading to an ultimate yield increase.

Key words: *Brassinosteroid, grain protein, grain yield, finger millet.*

INTRODUCTION

Finger millet is an important food crop next to rice, wheat and maize. It is predominantly grown as a dry land crop in the Peninsular Indian states of Karnataka, andhra Pradesh and Tamil Nadu. In India, there are two main seasons of finger millet. In high rainfall zones, sowing is done with early varieties during May in order to harvest the crop by September or October. Most of the other areas are sown with late varieties between July and August, in order to harvest the crop by November or December. Late sown crop is normally affected by water stress during seedling stage, which affects the yield. Hence, an attempt was made to find out the influence of presowing seed treatment on finger millet in rainfed upland conditions.

MATERIALS AND METHODS

An experiment was conducted at Millet Breeding Station, Tamil Nadu Agricultural University, Coimbatore to find out the effect of pre sowing seed treatment on the growth and yield of finger millet under rainfed upland conditions. The soil type was clay loam. Finger millet variety CO 13 was used in this experiment. The experiment was laid out in a Randomized block design replicated four times. There were five treatments viz., control, seed treatment with 1% Calcium chloride ($CaCl_2$), 2% Polyethylene glycol (PEG 6000), 1% Potassium dihydrogen phosphate (KH_2PO_4), 0.1 ppm Brassinosteroid (BR).

For seed treatment, the seeds were soaked for 8 hours in the respective solution and shade dried to bring their original moisture content. Leaf area index was calculated by employing the formula of Williams [7]. Leaf area duration was determined by using the formula of Power *et al.* [4]. Specific leaf weight was calculated by using the formula of Pearce *et al.* [3]. The protein content of grain was estimated by the method given by Ali-khan and Young [1].

RESULTS AND DISCUSSIONS

Leaf Area: Seed treatment of chemicals and growth regulators significantly increased the leaf area over control. Maximum leaf area was recorded by brassinosteroid seed treatment (760.5 cm^2) at flowering followed by KH_2PO_4 (724.5 cm^2) and $CaCl_2$ (697.5 cm^2) (Table 1). Leaf area increased from vegetative to flowering stage and showed slow decline at maturity stage due to the senescence of leaves. BR showed favourable influence on leaf area due to its relation with phytochrome, which mediated regulation of growth and induced the cell enlargement [6]. BR had positive effect on cell division and cell elongation leading to enhanced leaf expansion [5].

Leaf area index and leaf area duration: Significant increase in leaf area index was observed by seed treatment with growth regulators and chemicals compared to control (Table 1). The treatments also minimized the reduction on

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Table 1: Effect of seed treatment of plant growth regulator and chemicals on leaf area, leaf area index and leaf area duration of finger millet at different stages.

	Leaf area (cm^2)				Leaf area index				Leaf area duration (days)		
Treatments	30 DAS	40 DAS	50 DAS	90 DAS	30 DAS	40 DAS	50 DAS	90 DAS	30-40 DAS	40-50 DAS	50-90 DAS
Control	368.1	518.9	594.0	445.5	1.6	2.3	2.6	2.0	29.40	37.05	34.65
1% $CaCl_2$	421.8	551.7	697.5	544.5	1.9	2.6	3.1	2.4	33.75	42.90	41.40
2%PEG 6000	402.4	588.2	652.5	481.5	1.8	2.5	2.9	2.1	31.80	40.20	37.81
1%KH_2PO_4	478.0	639.9	724.5	567.0	2.1	2.8	3.2	2.5	37.35	45.45	43.05
0.1 ppm BR	560.1	675.6	760.5	621.0	2.5	3.0	3.4	2.8	41.40	48.30	46.05
Mean	446.1	594.9	685.8	531.9	2.0	2.7	3.1	2.4	34.74	42.78	40.59
CD (P=0.05)	6.0	5.6	5.8	6.5	0.03	0.03	0.03	NS	0.38	0.38	0.41

Table 2: Effect of seed treatment of plant growth regulator and chemicals on specific leaf Weight, TDMP, Grain yield and Grain protein of finger millet.

	Specific leaf Weight (mg cm^{-2})				TDMP (g $plant^{-1}$)					
Treatments	30 DAS	40 DAS	50 DAS	90 DAS	30 DAS	40 DAS	50 DAS	90 DAS	Grain yield (Kg ha^{-1})	Grain protein content(%)
Control	6.85	9.05	14.98	12.74	9.1	13.4	19.07	24.18	1636	8.31
1% $CaCl_2$	7.91	9.43	17.66	15.85	9.3	14.03	21.5	26.36	1789	8.6
2%PEG 6000	7.99	9.34	15.99	14.96	9.22	13.84	20.48	25.52	1745	8.35
1%KH_2PO_4	8.69	10.67	19.01	16.55	9.38	14.54	22.3	26.77	1869	8.65
0.1 ppm BR	9.15	11.9	20.75	17.31	9.57	15.12	23.5	29.94	1990	8.92
Mean	8.11	10.08	17.68	15.48	9.31	14.18	21.37	26.54	1806	8.57
CD (P=0.05)	0.07	0.08	0.16	0.12	0.03	0.03	0.1	NS	23	0.04

LAI even at maturity stage due to reduction in leaf area by abscission of lower leaves. BR recorded higher LAI of 3.4 at flowering stage, followed by KH_2PO_4 (3.2) and $CaCl_2$ (3.1). The similar trend was also noticed in the case of leaf area duration. All the treatments promoted longer LAD which is an essential factor for contribute to grain filling. Seed treatment with BR 0.1 ppm recorded higher LAD (48.3 days) at active tillering to flowering stage, followed by KH_2PO_4 (45.5days) and $CaCl_2$ (42.9 days).

Specific leaf weight: Specific leaf weight increased linearly until flowering stage and thereafter declined at maturity. This might be attributed to the rapid translocation of assimilates to the developing grains. Seed treatment with BR 0.1 ppm recorded higher SLW (20.8 mg cm^{-2}) at flowering. This was followed by KH_2PO_4 (19.0 mg cm^{-2}) and $CaCl_2$ (17.7 mg cm^{-2}) (Table 2). Higher specific leaf weight by brassinosteroid is also highly correlated with enhancement of phloem transport and its possible role in membrane permeability[5].

Total dry matter production: Higher total dry matter production (29.9 g) was noticed at harvest stage due to seed treatment of 0.1 ppm BR compared to control (24.2 g) (Table 2). The TDMP was observed to increase as growth progressed. Increased TDMP due to BR treatment might be attributed to increased tiller number [2] and increased rate of photosynthesis, nitrate assimilation, nutrient uptake that in turn increased the plant dry weight [6].

Protein content: Seed treatment with BR 0.1 ppm recorded higher grain protein (8.92%), followed by KH_2PO_4 (8.65%) and $CaCl_2$ (8.60%) when compared to control (8.31%) (Table 2). The increase in grain protein due to BR treatment might be due to increased nitrogen uptake as reported by Sairam in wheat [5].

Grain yield: All the seed treatments increased the grain yield over control. BR 0.1 ppm recorded higher grain yield of 1990 Kg ha^{-1} while control recorded 1636 Kg ha^{-1}. The yield increase due to BR was 21.64 percent followed by KH_2PO_4 (14.26 %) and $CaCl_2$ (9.36 %).

Conclusion: The study revealed that all the seed treatments increased the grain yield over control. BR 0.1 ppm recorded higher grain yield of 1990 Kg ha^{-1}. The yield increase due to BR was 21.64 percent followed by KH_2PO_4 (14.26 %) and $CaCl_2$ (9.36 %).

BR treatment recorded higher values for all the components, thus leading to ultimate yield increase.

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