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Influence of Seed Priming, Sowing Methods and Nutrient Management on Growth and Seed Yield of Finger Millet (*Eleusine coracana* L. Gaertn)

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ABSTRACT

A field experiment was carried out at Seed Technology Research Unit, NSP, GKVK, UAS, Bengaluru, during *kharif*, 2015. The experiment was laid under split plot design with two replications and 32 treatment combinations. The results indicated that transplanting method of sowing (S_2) showed superiority in seed yield (41.25 q/ha) over direct method of sowing (35.26 q/ha) and which was found economical for finger millet seed production. Among the four nutrient treatments, application of N_4 (125 kg Neem + 1250 kg vermin-compost per ha + 50 kg Urea + 50 kg SSP and 50 kg MOP per ha + Top dressing urea at 3-4 weeks after transplanting + 2 % Borax spray) followed by N_3 (50 kg Urea + 50 kg SSP and 50 kg MOP per ha + Top dressing urea at 3-4 weeks after transplanting + 2 % Borax spray) showed superiority with respect to all the recorded growth, yield and its contributing characters over rest of the nutrient management treatments both in case of direct sown and transplanted crop. Among different priming treatments, seed priming with 2 per cent KH_2PO_4 for 6h alone or in combination with N_4 recorded higher seed yield followed by seed priming with 20 per cent liquid *Pseudomonas fluorescence* in combination with N_3 under both direct and transplanted conditions.

Keywords : Seed priming, nutrient management, *pseudomonas fluorescence*

FINGER millet (*Elucine coracana* L. Gaertn*)* (locally called as *ragi*) is the third most important millet in India, next only to sorghum and pearl millet. It is the major food crop of the semi-arid tropics of Asia and Africa and has been an indispensable component of dry land farming systems. In India, it is widely grown in states like Andhra Pradesh, Karnataka, Uttarakhand, Orissa, Maharastra and Tamil Nadu. Today finger millet has dual importance, as a source of food grain as well as straw. It is grown in area of 1.6 million ha with production of 1.76 million tonnes and productivity of 1.3 million tonnes per hectare (Anon, 2015). Karnataka state alone shares 60.80 per cent of area and two third production (68.4 %). It is an annual plant adapted to a wide range of environments and can be grown in a variety of soils with medium or low water holding capacity. The crop is remarkably free from pests and diseases as compared to other grains with easy storage.

The lower productivity is largely due to poor fertility of soils and non-adoption of improved cultivation practices. Nevertheless, these crops do have large hidden production potential, which could be exploited by judicial blending of varietal, production and protection technologies. These crops respond very well even to small doses of inorganic fertilizers and other crop management inputs. Hence, there is a scope for improving the production potential of this crop by use of organic, inorganic and bio-fertilizers. Although, chemical fertilizers are playing a crucial role to meet the nutrient requirement of the crop. Persistent nutrient depletion is posing a greater threat to the sustainable agriculture. Therefore, there is an urgent need to reduce the usage of chemical fertilizers and in turn increase in the usage of organics which needed to check the yield and quality levels. Use of organics alone does not result in spectacular increase in crop yield, due to their low nutrient status. In view of such circumstances systemic research efforts are to be integrated to find out an optimum combination of organic nutrients *viz.,* FYM, vermicompost, Neem with different doses of chemical inorganic fertilizers.

Appropriate sowing method is also an important non-monetary input in crop production, which affects the crop growth, yield and quality to a greater extent. Method of establishment play an important role to fully exploit all available resources for growth as it provides optimum growing condition (Gavit *et al.,* 2017).

Different methods of sowing like broadcasting, transplanting and line sowing are usually followed in finger millet production. In the present investigation, transplanting has been tried by raising of nursery beds and pulling out the seedlings at 21 days to transplant in the main field at a spacing of 30 x 10 cm at 5 cm depth. Seed priming is one among the seed quality enhancement technique, in which seeds are partially hydrated until the germination process begins, but radicle emergence does not occur. This technique is used for improvement of germination speed, germination vigour, seedling establishment and yield.

During priming, seeds are permitted to enter the lag stage of germination (stage with little or no fresh weight increase prior to radical emergence), but are then desiccated back to approximately the original moisture content before the radical emerges. Upon subsequent rehydration, seeds show improved germination characteristics which include (1) reduced time to radical emergence, (2) synchronization of germination within a seed lot, (3) greater percentage germination, and (4) improved seed vigour in deteriorated seed lots. Integrated farming can reduce chemical fertilizers usage and save the ecosystem. In recent days, integrated approach of combined use of inorganic fertilizers with manures has become an established agro-technique for sustaining yield levels, enhancing nutrient quality of food and restoring soil physical, chemical and biological health. Therefore, an integrated approach for recycling the organic sources is aimed now in the larger interest of farming community. Application of organic manures, bio-priming in conjugation with chemical fertilizers improves the physico-chemical properties of soil and maintains a feasible plant growth condition, thus augment the seed yield and quality. In this context a field experiment was carried out at Seed Technology Research Unit, NSP, GKVK, UAS, Bengaluru, during *kharif*, 2015 to know the influence of integrated approach on enhancing plant growth, seed yield and quality in finger millet (*Eleusine coracana* L. Gaertn).

Material and Methods

A field experiment was carried out at Seed Technology Research Unit, NSP, GKVK, UAS, Bengaluru, during *kharif*, 2015. The experiment was laid under split plot design with two replications and 32 treatment combinations. The treatments comprised of two different sowing methods as main treatments; [S_1-direct sowing with spacing of 30 x 10 cm] and [S_2- Transplanting 21 days old seedlings]. Four different levels of fertilizers as sub treatments, N_1-control (without fertilizers); N_2- organic fertilizers 125 kg Neem+1250 kg vermi compost per ha; N_3-chemical fertilizers (RDF-100:50:50 NPK kg/ha) with (50%) of Urea, (100%) SSP and MOP in basal application + top dressing remaining (50%) Urea at 3-4 weeks after transplanting+(2%) Borax spray at flowering stage and N_4-Organic and Inorganic fertilizers (Integrated) with 125kg Neem+1250kg vermi–compost per ha+(RDF-100:50:50 NPK kg/ha) with 50 per cent of Urea in basal application + top dressing remaining 50 per cent Urea at 3-4 weeks after transplanting +2 per cent Borax spray at flowering.

Four methods of priming as sub-sub treatments, P_1- without priming (control); P_2 - Hydro priming for 6 hours; P_3 - Chemo priming with 2 per cent KH_2PO_4 for 6 hours and P_4- Bio priming with (20%) liquid *Pseudomonas flourecense* (2ml broth+8ml sterile water) in 1:1 ratio with seeds. After imposition of treatment, the crop was raised as per the standard cultural practices. Five plants were selected randomly and tagged in each treatment for recording plant growth and yield parameters. The research data was statistically analyzed for interpretation. Cultural operations, plant protection, harvesting, threshing and cleaning were carried out as per the package of practice. Chlorophyll estimation was done using the method of spectroscopy where in 100mg plant sample was weighed and incubated in acetone 80 per cent : DMSO (1:1) solution 10ml in dark for 24 hours. Then the supernatant was collected and the OD values were recorded at 652 nm using spectrophotometer and the values were substituted (Luna *et al.,* 2000). The total chlorophyll content was estimated as per the below mentioned formula

$$\text{Total chlorophyll content (mg g}^{-1}\text{ FW)} = \frac{A_{652}}{34.50} \times \frac{V}{\text{Fresh weight}}$$

Results and Discussion

Effect of sowing methods on plant growth, seed yield and quality of ragi *cv.* ML-365

The sowing methods had a significant effect on the yield parameters *viz.,* seed yield per plant and seed recovery percentage (Table I). Significant highest yield per plant (44.27g) and seed recovery (92.71 %) was recorded with S_2 (transplanted method with 30 x 10 cm spacing) as compared to direct sowing with a spacing of 30 x 10 cm. However, the sowing method did not have any effect on field emergence, days to first flowering, chlorophyll content, plant height, number of tillers, panicle weight per plot, seed yield per plot and seed yield per hectare. These results are in accordance with Aslam *et al.* (2008) who reported highest number of panicles in transplanted method due to maximum number of productive tillers. Though non-significant, highest field emergence (85.03%), chlorophyll content (1.287mg g^{-1} FW), maximum number of tillers/plant (8.93), panicle yield (6.435 kg per plot) and seed yield (2.475kg per plot; 41.25q per ha) were recorded among transplanted method of sowing These findings are similar to that of Tahir *et al.* (2007), who reported that 1000 grain weight and all yield parameters were higher in transplanted rice as compared to other methods of sowing where seeds are often not properly buried in direct sown plots which might have depressed the seed germination and thereby affected the crop establishment due to less root-soil contact to exploit the soil resources fully (Oyewole and Attah, 2007).

The plant height (101.02 cm) was highest among S_1 (direct method of sowing) compared to S_2 (transplanted method of sowing). This might be due to transplanting shock experienced during uprooting from the nursery in the S_2 treatment (Agbaje *et al.,* 2002).

Effect of nutrient management on plant growth, seed yield and quality attributes of ragi *cv.* ML-365

The nutrient management treatments had significant effect on plant growth, seed yield and quality of ragi *cv.* ML-365 (Table I). The field emergence (90.06%), chlorophyll content (1.356 mg.g^{-1} FW), plant height (103.78cm) tillers/plant (10.43), panicle weight (7.414 kg per plot), seed yield (49.45g per plant; 2.535 kg per plot ; 42.25q per ha) and seed recovery (93.62 %) were found to be highest in N_4 (Organic and Inorganic fertilizers (Integrated) with 125 kg Neem+1250 kg vermi compost per ha+(RDF-100:50:50 NPK kg/ha) +50 per cent of Urea in basal application + top dressing remaining 50 per cent Urea at 3-4 weeks after transplanting +2 per cent Borax spray at flowering). This was followed by N_3 purely chemical fertilizers (RDF-100:50:50 NPK kg/ha) with (50%) of Urea, (100%) SSP and MOP in basal application + top dressing remaining (50%) Urea at 3-4 weeks after transplanting + (2%) Borax spray at flowering stage) with field emergence (86.75%), chlorophyll content (1.280 mg. g^{-1} FW), plant height (101.71cm), tillers (8.81), panicle weight (6.339 kg per plot), seed yield (40.48 g/plant; 2.499 kg/plot; 41.65 q/ha) and seed recovery (92.37%). The lowest of all was recorded among control N_1 (80.31%, 1.165 mgg^{-1} FW, 97.85cm, 5.56, 3.776 kg/ plot, 31.55 g/ plant, 1.900 kg/plot, 31.66 q/ha and 91.66%, respectively). This might be due to the fact that inorganic sources readily provide nutrients to the growing plants. Besides, organic sources release organic acid on decomposition which in turn might have mobilised the native or non-exchangeable forms of NPK and charge the soil NPK ions, thus making it readily available (Yaduvanshi *et al.,* 2013 and Ahiwale *et al.,* 2013). The nutrient management treatments did not significantly affect days to first flowering. However, lowest number of days to first flowering (68.81) was recorded in N_4.

Effect of priming on plant growth, seed yield and quality attributes on ragi *cv.* ML-365

The priming treatments caused significant effect on plant growth**,** seed yield and quality attributes of ragi *cv.* ML-365 (Table I). The field emergence (89.62%), chlorophyll content (1.589 mg. g^{-1} FW), tillers/plant (9.9), panicle weight (7.172 kg/plot), seed yield (46.43 g/plant: 2.757 kg/plot; 45.95q/ha) and seed recovery (94.83%), were significantly highest among P_3 *(*priming of seeds with 2% KH_2PO_4 for 6h). This was followed by P_4 (priming of seeds with 20 % liquid *Pseudomonas florescence* for 6h) which recorded field emergence (87.56%), chlorophyll content (1.467 mg. g^{-1} FW), tillers (8.8/plant), panicle weight (6.159 kg per plot), seed yield (43.75 g/plant; 2.614 kg/plot

TABLE I

Effect of seed priming, sowing method and nutrient management on the growth and seed yield parameters of ragi cv.ML-365

Treatment	Field emergence (%)	Days to 1st flowering	Chlorophy II content (mg.g^{-1} FW)	Plant height (cm)	No. of tillers	Panicle weight (kg/plot)	Seed yield (g/plant)	Seed yield (kg/plot)	Seed yield (q/ha)	Seed recovery (%)
S_1	84.34	69.09	1.233	101.02	7.18	5.001	35.83	2.116	35.26	91.99
S_2	85.03	69.12	1.287	100.60	8.93	6.435	44.27	2.475	41.25	92.71
SEm±	0.68	0.02	0.02	0.38	0.26	0.08	0.14	0.072	1.20	0.008
CD(0.05P)	NS	NS	NS	NS	NS	NS	2.60	1.29	NS	0.16
N_1	80.31	69.87	1.165	97.85	5.562	3.776	31.55	1.900	31.66	91.66
N_2	82.81	69.06	1.272	99.92	7.437	5.344	38.70	2.240	37.48	91.76
N_3	86.75	68.68	1.280	101.71	8.812	6.339	40.48	2.499	41.65	92.37
N_4	90.06	68.81	1.356	103.78	10.43	7.414	49.45	2.532	42.25	93.62
SEm±	1.01	0.31	0.02	0.84	0.42	0.21	1.14	0.05	0.78	0.44
CD(0.05P)	3.48	NS	0.08	2.91	1.47	0.72	3.94	0.16	2.71	1.52
P_1	78.31	69.12	0.906	93.73	5.5	4.093	31.26	1.723	28.73	89.24
P_2	84.44	69.37	1.111	101.20	8.0	5.449	38.75	2.087	34.79	91.44
P_3	89.62	68.93	1.589	103.73	9.9	7.172	46.43	2.757	45.95	94.83
P_4	87.56	69.00	1.467	104.60	8.8	6.159	43.75	2.614	43.57	93.90
SEm±	0.62	0.30	0.04	0.81	0.27	0.22	0.95	0.06	1.03	0.45
CD(0.05P)	1.80	NS	0.12	2.30	0.70	0.65	2.79	0.18	3.00	1.32

NS: Non significant

and 43.57q/ha) and seed recovery (93.90 %) and the lowest of all were recorded by control P_1 (78.31 %, 0.906 mgg^{-1} FW, 5.5, 4.093 kg/plot, 31.26 g/plot, 1.723 kg/plot, 28.73q/ha, and 89.24%, respectively). The increased plant growth and seed yield might be due to better physicochemical triggering, the biosynthesis of nucleic acids, proteins and consequential enhancement of cell division besides enhanced metabolic activity of the plants resulting on better uptake of nutrients. The better seedling establishment, field stand, higher photosynthetic activity and eventually superior source to sink ratio might have resulted in increased seed yield subsequent to pre-soaking seed treatment with KH_2PO_4 (1%). These results are inconformity with the findings of Nithila *et al.* (2007) in finger millet.

Among the two way interactions, sowing method (S) x nutrient management (N) was found significant for most of the plant growth and yield parameters (Table II). The interaction showed superiority in terms of field emergence (90.25%), tillers/plant (11.62), panicle weight per plot (8.143 kg), seed yield per plant (55.62 g), seed yield per plot (2.693 kg) and seed yield per ha (44.88 q/ha) among S_2 x N_4. The next best combination was S_2N_3 with seed yield (46.18 g per plant; 2.667 kg per plot and 44.46 q per ha). While the interaction S_1 x N_1, showed poor performance in terms of growth and yield (30.42 g/plant; 1.732 kg/plot and 28.88 q/ha).

Interaction effect of sowing method, nutrient management and priming on plant growth, seed yield and quality attributes of ragi *cv.* ML-365

The interaction of priming treatments (P) with nutrient management treatments (N) had significant effect on plant growth, seed yield and quality attributes of ragi *cv.* ML-365 (Table II). Maximum number of tillers (13.0), highest panicle weight per plot (8.817 kg), seed yield per plot (3.079 kg) and seed yield per ha (51.31q) was noted among the interaction P_3 x N_4 (priming of seeds with 2 per cent KH_2PO_4 and supply of inorganic and organic fertilizers along with borax spray). This was followed by P_4 x N_4 with tillers (11.5), panicle weight (8.075 kg/plot) and seed yield (2.861 kg/plot; 47.68 q/ha) and lowest of all was recorded by P_1 x N_1 (3.5, 2.370 kg/plot 1.202 kg/plot and 20.04 q/ha, respectively). This may be due to significant increase in hydrophilic property of protoplasmic colloids (viscosity and elasticity), increased phosphorylation activity in mitochondria. Reduction in solute leakage by regaining cell membrane integrity as reported by Simon and Raja Harun (1972).

The interaction of sowing method (S), Nutrient management (N) and Priming (P) had significant influence on most of the growth and the yield traits recorded (Table III). The seed yield parameters *viz.,* tillers (14.0), panicle weight per plot (9.535 kg), seed yield per plant (61.50g), seed yield per plot (3.312 kg) and seed yield per ha (55.20 q) were recorded highest among $S_2N_4P_3$ followed by $S_2N_4P_4$ with tillers (13.5), panicle yield (8.485 kg/plot), seed yield (59.40 g/plant; 3.153 kg/plot & 52.55 q/ha). The lowest number of tillers (2.5), panicle weight per plot (2.050kg), seed yield per plant (24.80g), seed yield per plot (1.202 kg) and seed yield per ha (20.04q) were recorded among $S_1N_1P_1$. Among the various treatments tried in the experiment integrated approach of transplanting method of sowing (S_2) with combination of organic and inorganic fertilizers (N_3) and chemo priming (P_2) with KH_2PO_4 performed better. Their synergistic effect with varying levels resulted in increasing the plant growth, seed yield and quality parameters in finger millet variety ML-365 for seed production. Present study is also consistent with the findings of Maman *et al*. (2000) who found that animal manure/compost together with modest amount of mineral fertilizer maximized yields of pearl millet in semi-arid region of Senegal and Niger.

The method of sowing differed significantly and transplanted sowing method (S_2) showed superiority in seed yield (41.25q/ha) and its contributing components over the direct method (S_1). Application of N_4 (125 kg Neem + 1250 kg vermicompost per ha + 50 kg Urea + 50 kg SSP and 50 kg MOP per ha + Top dressing urea at 3-4 weeks after transplanting + 2 % Borax) followed by N_3 (50 Kg Urea + 50 Kg SSP and 50 Kg MOP per ha + Top dressing urea at 3-4 weeks after transplanting + 2% Borax) showed superiority with respect to all the recorded growth, yield and contributing characters over the rest of the nutrient management treatments Among different priming treatments, P_3 (seed priming with 2 per cent KH_2PO_4 for 6h) alone or in combination with N_4

TABLE II

Interaction effect of seed priming, sowing method and nutrient management on plant growth, seed yield and quality parameters of finger millet cv ML-365

Interaction	Field emergence (%)	Days to 1st flowering	Chlorophyll (mg.g-1FW)	Plant height (Cm)	No. of tillers	Panicle weight (kg/plot	Seed yield (g/plant)	Seed yield (kg/plot)	Seed yield (q/ha)	Seed Recovery (%)
$S_1 \times N_1$	75.75	68.75	1.071	98.27	5.37	3.007	30.42	1.732	28.88	91.61
$S_1 \times N_2$	85.00	68.75	1.252	99.51	6.37	4.625	34.83	2.023	33.73	90.02
$S_1 \times N_3$	86.75	68.75	1.314	102.02	7.75	5.688	34.78	2.330	38.84	92.52
$S_1 \times N_4$	89.87	70.12	1.360	104.30	9.25	6.685	43.27	2.377	39.62	93.82
$S_2 \times N_1$	82.50	69.62	1.259	97.43	5.75	4.546	32.68	2.067	34.45	91.91
$S_2 \times N_2$	80.62	69.37	1.293	100.33	8.50	6.063	42.58	2.473	41.23	93.30
$S_2 \times N_3$	86.75	68.62	1.246	101.40	9.87	6.990	46.18	2.667	44.46	92.22
$S_2 \times N_4$	90.25	68.87	1.352	103.26	11.62	8.143	55.62	2.693	44.88	93.43
S.Em±	1.42	0.44	0.03	1.18	0.60	0.29	1.61	0.06	1.11	0.62
CD(0.05P)	4.93	NS	0.12	4.11	2.08	1.02	5.58	0.23	3.84	2.16
$S_1 \times P_1$	77.12	69.12	0.937	92.45	4.75	3.443	28.65	1.614	26.91	87.77
$S_1 \times P_2$	84.25	69.12	1.103	101.21	7.5	4.796	34.21	1.898	31.64	91.60
$S_1 \times P_3$	90.12	69.00	1.595	104.52	9.0	6.388	40.46	2.531	42.18	94.42
$S_1 \times P_4$	85.87	69.12	1.361	105.92	7.5	5.377	40.00	2.420	40.34	94.17
$S_2 \times P_1$	77.12	69.12	0.874	95.01	6.25	4.743	33.87	1.833	30.55	90.72
$S_2 \times P_2$	84.62	69.62	1.120	101.20	8.5	6.102	43.29	2.276	37.95	91.28
$S_2 \times P_3$	89.12	68.89	1.583	102.95	10.87	7.956	52.41	2.982	49.71	95.23
$S_2 \times P_4$	89.25	68.87	1.573	103.27	10.12	6.941	47.50	2.808	46.81	93.63
S.Em±	0.88	0.43	0.05	1.15	0.38	0.31	1.35	0.08	1.46	0.64
CD(0.05P)	2.57	NS	0.17	3.35	1.11	0.91	3.95	0.25	4.27	1.87
$P_1 \times N_1$	75.25	70.25	0.901	85.00	3.5	2.370	26.65	1.248	20.80	90.72
$P_1 \times N_2$	76.50	69.25	0.917	93.50	5.0	3.572	27.90	2.115	35.26	91.06
$P_1 \times N_3$	78.50	68.25	0.807	98.35	5.75	4.717	32.52	1.710	28.50	93.50
$P_1 \times N_4$	83.00	68.75	0.998	98.07	7.75	5.715	37.97	1.821	30.35	91.78
$P_2 \times N_1$	78.50	70.00	0.912	101.10	5.5	3.760	32.95	1.564	26.08	86.72
$P_2 \times N_2$	80.75	69.50	1.230	99.17	7.5	4.932	33.28	1.838	30.64	90.50
$P_2 \times N_3$	86.75	69.00	1.153	101.05	9.5	6.055	38.60	2.568	42.80	95.57
$P_2 \times N_4$	91.75	69.00	1.151	103.50	9.5	7.050	50.17	2.379	39.66	93.85
$P_3 \times N_1$	86.25	69.50	1.465	103.70	6.75	4.885	34.77	2.368	39.47	87.59
$P_3 \times N_2$	86.50	68.50	1.650	103.40	9.0	7.227	50.65	2.640	44.00	91.13
$P_3 \times N_3$	91.50	69.00	1.441	104.75	11.0	7.760	49.17	2.940	49.00	95.56
$P_3 \times N_4$	94.25	68.75	1.802	103.10	13.0	8.817	51.15	3.079	51.31	95.20
$P_4 \times N_1$	80.00	69.75	1.383	101.62	6.5	4.092	31.85	2.418	40.30	91.95
$P_4 \times N_2$	88.75	69.00	1.293	103.62	8.25	5.645	43.00	2.400	40.01	93.07
$P_4 \times N_3$	90.25	68.50	1.718	102.70	9.0	6.825	41.65	2.777	46.30	94.69
$P_4 \times N_4$	91.25	68.75	1.474	110.45	11.5	8.075	58.50	2.861	47.68	94.76
S.Em±	1.25	0.43	0.07	1.62	0.54	0.44	1.91	0.12	2.07	0.90
CD (0.05P)	3.64	NS	0.22	4.70	1.50	1.29	5.60	0.36	6.04	2.64

NS: Non significant

TABLE III

Interaction effect of seed priming, sowing method and nutrient management on plant growth and seed yield parameters of ragi cv.ML-365

Interaction	Field emergence (%)	Days to 1st flowering	Chlorophyll (mg.g-1FW)	Plant height (Cm)	No. of tillers	Panicle weight (kg/plot	Seed yield (g/plant)	Seed yield (kg/plot)	Seed yield (q/ha)	Seed Recovery (%)
$S_1N_1P_1$	71.0	71.0	0.713	83.2	2.5	2.050	24.80	1.202	20.04	90.98
$S_1N_1P_2$	73.5	70.0	0.941	100.6	6.0	3.120	32.10	1.257	20.96	90.87
$S_1N_1P_3$	83.0	69.5	1.378	106.1	6.0	3.495	34.30	2.197	33.62	92.83
$S_1N_1P_4$	75.5	70.0	1.081	103.2	7.0	3.365	30.50	2.273	37.88	91.77
$S_1N_2P_1$	77.0	68.5	0.922	92.0	4.5	2.880	26.60	2.223	37.06	82.58
$S_1N_2P_2$	85.0	69.0	1.055	96.55	6.0	4.060	31.54	1.370	22.83	89.75
$S_1N_2P_3$	91.0	69.5	1.624	106.4	8.0	6.770	47.80	2.280	38.00	93.70
$S_1N_2P_4$	87.0	69.0	1.407	103.1	7.0	4.790	33.40	2.221	37.02	94.05
$S_1N_3P_1$	79.0	68.5	0.902	96.6	5.0	3.980	29.50	1.315	21.92	85.14
$S_1N_3P_2$	87.5	69.0	1.316	101.5	9.5	5.895	32.20	2.588	43.13	92.32
$S_1N_3P_3$	91.0	69.0	1.526	104.6	10.0	7.190	38.95	2.801	46.69	97.30
$S_1N_3P_4$	89.5	68.5	1.511	105.4	6.5	5.690	38.50	2.618	43.63	95.33
$S_1N_4P_1$	81.5	68.5	1.042	98.0	7.0	4.865	33.70	1.716	28.60	92.40
$S_1N_4P_2$	91.0	68.5	1.101	106.2	8.5	6.110	41.00	2.378	39.63	93.48
$S_1N_4P_3$	95.5	69.0	1.855	101.0	12.0	8.10	40.80	2.845	47.42	93.87
$S_1N_4P_4$	91.5	69.0	1.444	112.0	9.5	7.665	57.60	2.569	42.82	95.52
$S_2N_1P_1$	72.5	69.5	0.918	86.80	4.5	2.69	28.50	1.294	21.57	90.46
$S_2N_1P_2$	83.5	70.0	0.882	101.6	5.0	4.400	33.80	1.871	31.19	91.25
$S_2N_1P_3$	89.5	69.5	1.552	101.3	7.5	6.275	35.25	2.540	42.33	94.16
$S_2N_1P_4$	84.5	69.5	1.686	100.0	6.0	4.820	33.20	2.563	42.71	91.79
$S_2N_2P_1$	73.5	70.0	0.911	95.00	5.5	4.265	29.20	2.007	33.46	90.86
$S_2N_2P_2$	76.5	70.0	1.406	101.8	9.0	5.805	35.02	2.306	38.44	91.25
$S_2N_2P_3$	82.0	68.5	1.676	100.4	10	7.685	53.50	3.000	50.00	97.44
$S_2N_2P_4$	90.5	69.0	1.179	104.1	9.5	6.500	52.60	2.580	43.00	93.66
$S_2N_3P_1$	78.0	68.0	0.884	100.1	6.5	5.455	35.55	2.105	35.09	90.05
$S_2N_3P_2$	86.0	69.0	0.990	100.6	9.5	6.215	45.00	2.548	42.46	89.95
$S_2N_3P_3$	92.0	69.0	1.357	104.9	12.0	8.33	59.40	3.078	42.46	89.95
$S_2N_3P_4$	91.0	68.5	1.749	100.0	11.5	7.960	44.80	2.937	48.96	95.07
$S_2N_4P_1$	84.5	69.0	0.955	98.15	8.5	6.565	42.25	1.925	32.09	91.51
$S_2N_4P_2$	92.5	69.5	1.201	100.8	10.5	7.990	59.35	2.381	39.69	92.67
$S_2N_4P_3$	93.0	68.5	1.924	105.2	14.0	9.535	61.50	3.312	55.20	95.52
$S_2N_4P_4$	91.0	68.5	1.503	108.9	13.5	8.485	59.40	3.153	52.55	94.0
S.Em±	1.76	0.86	0.12	2.30	0.76	0.63	2.71	0.18	2.93	1.28
CD(0.05P)	5.14	NS	0.34	6.71	2.22	1.83	7.91	0.51	8.54	3.74
CV(%)	3.00	1.76	13.10	3.20	13.39	15.53	9.5	10.80	10.82	1.96

NS: Non significant

showed superiority in growth and seed yield followed by seed priming with 20 per cent liquid *Pseudomonas fluorescence*. Hence, these treatments could be advocated and practically used to enhance the seed yield and quality in finger millet.

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