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Standardization of Seed Biopriming with Liquid Biofertilizers on Snake Gourd (*Trichosanthes cucumerina*)

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A B S T R A C T

Biopriming is a very important seed invigoration technique for rapid germination. In order to utilize the biopriming influence on seedling growth in snake gourd (*Trichosanthes cucumerina*), this experiment was conducted to study the seed biopriming with liquid biofertilizers on snakegourd cv. CO2 for better germination and seedling growth. The results showed that the effect of biopriming was significant on germination percentage, seedling dry weight and seedling vigour in snakegourd. Seeds bioprimed with Azospirillum20% concentration for 18h was the best and suitable biopriming treatment. This treatment showed a higher speed of germination (5.6), percentage of germination (84%), dry matter production (1.187g 10 seedlings^{1}) and vigour index (3969) compared to other concentrations, durations and over the other treatments.

Introduction

Snake gourd (*Trichosanthes cucumerina*) also known as Chinese cucumber belongs to the family Cucurbitaceae. It is called *potlakaaya* in Telugu, *pudalankaai* in Tamil, *dhundul* in Assamese, *paduvalakaayi* in Kannada and *padavalanga* in Malayalam. It occupies an important place among vegetables in India. It is an annual plant with rapid growth and of climbing habit. The fruits are large and greenish white. They often reach upto 150 cm. in length and 8 cm. in thickness. There is also a short-fruited type. Tender fruits are used as vegetables. Snake gourd is a very nutritious vegetable. An analysis of this vegetable shows it consists of moisture 94.6 percent, protein 0.5 percent, fat 0.3 percent, fibre 0.8 percent and carbohydrate 3.3 percent per 100 grams of edible portion. Snakegourd is cultivated in Tamil Nadu in larger area with an average productivity of 18 tonnes ha^{-1}.

For any crop production, seed is the basic input and if the seed is not having good germination, the optimum population in the field can't be maintained which ultimately affect the crop yield. In snakegourd, normally the germination is below 60 per cent and by any presowing treatment if the germination is

improved it would help in maintaining the required population in the field. Biopriming is one of the presowing treatments that can improve the germination and vigour of the seedling.

Research on biopriming of snakegourd seeds using liquid biofertilizers, particularly their effects on germination and seedling vigour is lacking. Hence the present study was designed to investigate the beneficial effects of biopriming on snake gourd using liquid biofertlizers.

Materials and Methods

Genetically pure seeds of snakegourd cv.CO2, a short duration variety obtained from Susi seeds international, Mylapore, Chennai of Tamil Nadu, formed the base material for this study. The laboratory studies were carried out at the Department of Seed Science and Technology, Tamil Nadu Agricultural University, Coimbatore. Five treatments *viz.*, non-primed seed (control), hydropriming, biopriming with *Azotobactor*, *Azospirillum* and phosphobacteria were taken up in this study. The experiment was carried out with four replications in Completely Randomized Block Design (CRD). In order to standardize the optimum concentration of liquid biofertilizers and duration. Liquid biofertilizers were prepared at 10, 15 and 20 percent concentration. Seeds were soaked in equal volume of solution in different concentrations in each of the biopriming agents. For hydropriming, simple water is used for soaking. The nonprimed seeds formed the control. After soaking, the seeds were removed from the solutions and shade dried at room temperature for assessing the seed quality parameters. The number of seeds germinated on each day was recorded daily upto 14^{th} day. After 14^{th} day of germination, their performance was evaluated for germination (%), dry matter production (g seedlings^{-10}) and vigour index. Then best treatments one each from, *Azotobactor*, *Azospirillum*, phosphobacteria, hydroprimed seed and control were standardized.

Liquid biofertilizers were diluted to 10, 15 and 20% concentrations.

Speed of germination

Four replicates of twenty five seeds each were used to test the speed of germination of seeds in sand medium. The seeds showing radicle protrusion were counted daily from third day after sowing until fourteenth day. From the number of seeds germinated on each day, the speed of germination was calculated using the following formula and the results were expressed in number (Maguire, 1962).

$$\text{Speed of germination} = \frac{X_1}{Y_1} + \frac{X_2 - X_1}{Y_2} + \ldots\ldots\ldots + \frac{X_n - X_{n-1}}{Y_n}$$

X_1- Number of seeds germinated at first count

X_2- Number of seeds germinated at second count

X_n- Number of seeds germinated on n^{th} day

Y_1- Number of days from sowing to first count

Y_2- Number of days from sowing to second count

Y_n- Number of days from sowing to n^{th} count

Germination

The seeds were sown in sand medium prepared as per ISTA procedures (2009) and the seeds were sown in four replications of 100 seeds each and were placed in a germination room maintained at 25 ± 2 °C temperature and 90±3 % relative humidity. After the germination period of 14 days, the seedlings were evaluated as normal and

abnormal seedlings and dead seeds. Based on the normal seedlings, the germination percentage was calculated adopting the following formula.

$$\text{Seed germination (\%)} = \frac{\text{Number of seeds germinated}}{\text{Total number of seeds sown}} \times 100$$

Root length (cm)

At the time of germination count, ten normal seedlings were selected at random from each replication and used for measuring the root length of seedlings. Root length was measured from the point of attachment of seed to the tip of primary root. The mean values were calculated and expressed in centimetre.

Shoot length (cm)

The seedlings used for measuring root length were also used for measuring shoot length. The shoot length was measured from the point of attachment of seed to tip of the leaf and the mean values were expressed in centimetre.

Dry matter production 10 seedlings^{-1} (g)

Ten normal seedlings were placed in a paper cover and dried in shade for 24h and then, they were kept in an oven maintained at 80± 2°C for 24± 1h. The dried seedlings were weighed and the mean values were expressed in mg 10 seedlings^{-1}.

Vigour index

Vigour index values were computed using the following formula and the mean values were expressed in whole number (Abdul-Baki and Anderson, 1973).

Vigour index = Germination (%) x Seedling length (cm).

Statistical analysis

The data obtained from different treatments were analysed for the 'F' test of significance following the methods described by Panse and Sukatme (1985).Wherever necessary, the per cent values were transformed to angular (Arc-sine) values before analysis. The critical differences (CD) were calculated at 5 per cent probability level. The data were tested for statistical significance. If the F test is non-significant, it was indicated by the letters NS.

Results and Discussion

Significant variations were observed in speed of germination, germination, drymatter production, seedling length and vigour index by biopriming treatments, durations of biopriming and their interactions (Tables 1-18).

The interactions effects indicated the best performance of seeds bioprimed with *Azotobact*er 10% for 30h (6.2). The lowest speed of germination of 3.2 was noticed in nonprimed seeds.

The interactions, seeds bioprimed with *Azotobacter* at 20% for 30h recorded higher germination (80 per cent) than nonprimed seeds.

The interactions between the biopriming treatments and durations revealed that *Azotobacter* 20% biopriming for 30h measured the longest root of 19.5cm. The shortest root was observed in nonprimed seeds (14.8cm).

The interactions effects showed that *Azotobacter* 20% for 30h produced the longest shoot of 29.7cm followed by *Azotobacter* 15% for 30h (29.1cm). The shortest root of 23.4 cm was produced in nonprimed seeds.

From the interactions, it was observed that seeds bioprimed with 20% *Azotobacter* for 30h produced higher drymatter production (1.186g 10 seedlings^{-1}) followed by *Azotobacter* 15% for 30h (1.181g 10 seedlings^{-1}). The drymatter production was lower (1.116g 10 seedslings^{-1}) in nonprimed seeds. Regarding the interactions effects, the *Azotobacter* 20% for 30h registered better vigour index (3847) than the nonprimed seeds (2334).

Significant variations was observed in Speed of germination, Germination, Drymatter production, seedling length and vigour index by biopriming treatments, durations of biopriming and their interactions.The interactions effects indicated the better performance of seeds hydroprimed for 18h (6.2). The lowest speed of germination of 3.2 was noticed in nonprimed seeds.

Regarding the interactions, seeds bioprimed with *Azospirillum* 20% for 18h recorded higher germination (84 per cent) than nonprimed seeds (61 per cent). The interactions between the biopriming treatments and durations revealed that *Azospirillum* 20% biopriming for 18h measured the longest root of 20.0cm. The shortest root was observed in nonprimed seeds (14.9cm).

The interactions effects showed that *Azospirillum* 20% for 18h produced the longest shoot of 30.2 cm and the shortest root was with nonprimed seeds (23.8cm).

From the interactions, it was observed that seeds bioprimed with 20% *Azospirillum* for 18h produced higher drymatter production (1.187g 10 seedlings^{-1}) followed by *Azospirillum* 15% for 18h (1.182g 10 seedlings^{-1}).

The drymatter production was lower (1.117g 10 seedlings^{-1}) in nonprimed seeds.

Regarding the interactions effects, the *Azospirillum* biopriming at 20% for 18h registered better vigour index (3969) than nonprimed seeds (2368).

The details on biopriming agents, their concentrations and durations of soaking are given in the table below

Biopriming agents	**Concentrations (%)**	**Durations of soaking (h)**
Nonprimed seed	-	-
Water	-	12, 18 24 and 30
Azotobacter	10	12, 18, 24 and 30
	15	
	20	
Azospirillum	10	12, 18, 24 and 30
	15	
	20	
Phosphobacteria	10	12, 18, 24 and 30
	15	
	20	

Table.1 Standardization of seed biopriming using *Azotobacter* for snakegourd cv. CO_2 – Speed of germination

Biopriming treatments (T)		**Speed of germination**				
		Soaking duration in h (D)				
		12	**18**	**24**	**30**	**Mean**
Nonprimed seed		3.2	3.2	3.2	3.2	**3.2**
Hydropriming		4.3	4.3	4.9	4.2	**4.4**
Azotobacter	10%	4.3	4.3	4.4	6.2	**4.8**
	15%	4.8	4.4	4.7	4.6	**4.6**
	20%	5.0	4.5	5.0	5.6	**5.0**
Mean		**4.3**	**4.2**	**4.4**	**4.8**	
			T	**D**	**T x D**	
SEd			**0.08**	**0.07**	**0.16**	
CD (P=0.05)			**0.16 ****	**0.15 ****	**0.33 ****	

Table.2 Standardization of seed biopriming using *Azotobacter* for snakegourd cv.CO_2- Germination

Biopriming treatments (T)		**Germination (%)**				
		Soaking duration in h (D)				
		12	**18**	**24**	**30**	**Mean**
Nonprimed seed		61 (51.35)	61 (51.35)	61 (51.35)	61 (51.35)	**61 (51.35)**
Hydropriming		71 (57.41)	75 (60.50)	66 (54.33)	61 (51.65)	**68 (55.97)**
Azotobacter	10%	63 (52.53)	67 (55.24)	72 (58.05)	74 (59.83)	**69 (56.41)**
	15%	64 (53.13)	68 (55.55)	73 (58.69)	76 (60.68)	**70 (57.01)**
	20%	65 (53.88)	70 (56.79)	75 (60.00)	80 (63.27)	**73 (58.48)**
Mean		**65 (53.66)**	**68 (55.88)**	**69 (56.48)**	**71 (57.36)**	
			T	**D**	**T x D**	F
SEd			**0.26**	**0.23**	**0.52**	
CD (P=0.05)			**0.52****	**0.47****	**1.05****	

(Figures in parentheses indicate arcsine values)

Table.3 Standardization of seed biopriming using *Azotobacter* for snakegourd cv.CO_2- Root length

Biopriming treatments (T)		Root length (cm)				
		Soaking duration in h (D)				
		12	18	24	30	Mean
Nonprimed seed		14.8	14.8	14.8	14.8	**14.8**
Hydropriming		15.3	16.8	17.7	18.8	**17.1**
Azotobacter	10%	16.3	17.2	18.3	19.1	**18.0**
	15%	15.8	16.9	17.9	18.9	**17.3**
	20%	16.7	17.7	18.6	19.5	**18.1**
Mean		**15.7**	**16.6**	**17.4**	**18.2**	
			T	**D**	**T x D**	
SEd			**0.02**	**0.02**	**0.04**	
CD (P=0.05)			**0.04****	**0.04****	**0.09****	

Table.4 Standardization of seed biopriming using *Azotobacter* for snakegourd cv. CO_2 – Shoot length

Biopriming treatments (T)		Shoot length (cm)				
		Soaking duration in h (D)				
		12	18	24	30	Mean
Nonprimed seed		23.4	23.4	23.4	23.4	**23.4**
Hydropriming		23.9	29.0	27.1	28.6	**27.1**
Azotobacter	10%	24.4	26.0	27.5	28.7	**26.6**
	15%	24.9	26.3	27.9	29.1	**27.0**
	20%	25.3	25.7	28.3	29.7	**27.2**
Mean		**24.3**	**26.0**	**26.8**	**27.9**	
			T	**D**	**T x D**	
SEd			**0.03**	**0.02**	**0.06**	
CD (P=0.05)			**0.06****	**0.05****	**0.12****	

Table.5 Standardization of seed biopriming using *Azotobacter* for snakegourd cv.CO_2 - drymatter production

Biopriming treatments (T)		Drymatter production (g 10 seedlings^{-1})				
		Soaking duration in h (D)				
		12	18	24	30	Mean
Nonprimed seed		1.116	1.116	1.116	1.116	**1.116**
Hydropriming		1.156	1.171	1.142	1.121	**1.147**
Azotobacter	10%	1.123	1.151	1.147	1.160	**1.145**
	15%	1.129	1.152	1.163	1.181	**1.156**
	20%	1.156	1.154	1.166	1.186	**1.165**
Mean		**1.136**	**1.148**	**1.146**	**1.152**	
			T	**D**	**T x D**	
SEd			**0.001**	**0.001**	**0.002**	
CD (P=0.05)			**0.002****	**0.002****	**0.004****	

Table.6 Standardization of seed biopriming using *Azotobacter* for snakegourd cv. CO_2 – Vigour index

Biopriming treatments (T)		Vigour index (Germination x Seedling length)				
		Soaking duration in h (D)				
		12	18	24	30	Mean
Nonprimed seed		2334	2334	2334	2334	**2334**
Hydropriming		2787	3469	2958	2915	**3082**
Azotobacter	10%	2570	2919	3298	3583	**3168**
	15%	2611	2941	3349	3655	**3226**
	20%	2747	3043	3474	3847	**3390**
Mean		**2610**	**2941**	**3083**	**3267**	
			T	**D**	**T x D**	
SEd			**11.6**	**10.4**	**23.3**	
CD (P=0.05)			**23.3****	**20.8****	**46.6****	

Table.7 Standardization of seed biopriming using *Azospirillum* for snakegourd cv. CO_2 – Speed of germination

Biopriming treatments (T)		Speed of germination				
		Soaking duration in h (D)				
		12	18	24	30	Mean
Nonprimed seed		3.2	3.2	3.2	3.2	**3.2**
Hydropriming		4.3	6.2	4.9	4.3	**4.9**
Azospirillum	10%	4.3	4.7	4.5	4.4	**4.5**
	15%	5.1	4.2	5.1	4.4	**4.7**
	20%	4.8	5.6	4.8	4.4	**4.9**
Mean		**4.3**	**4.6**	**4.5**	**4.1**	
			T	**D**	**T x D**	
SEd			**0.08**	**0.07**	**0.17**	
CD (P=0.05)			**0.17 ****	**0.15 ****	**0.35 ****	

Table.8 Standardization of seed biopriming using *Azospirillum* for snakegourd cv.CO_2 – Germination

Biopriming treatments (T)		Germination (%)				
		Soaking duration in h (D)				
		12	18	24	30	Mean
Nonprimed seed		61 (51.35)	61 (51.35)	61 (51.35)	61 (51.35)	**61 (51.35)**
Hydropriming		72 (58.05)	76 (61.17)	67 (54.94)	63 (52.53)	**69 (56.67)**
Azospirillum	10%	73 (58.69)	76 (60.50)	68 (55.86)	64 (53.13)	**70 (57.04)**
	15%	74 (59.34)	78 (62.02)	70 (56.79)	65 (53.88)	**72 (58.00)**
	20%	80 (63.43)	84 (66.42)	72 (58.57)	66 (54.48)	**76 (60.73)**
Mean		**72 (58.17)**	**75 (60.29)**	**68 (55.50)**	**64 (53.07)**	
			T	**D**	**T x D**	
SEd			**0.29**	**0.26**	**0.58**	
CD (P=0.05)			**0.58****	**0.52****	**1.16****	

(Figures in parentheses indicate arcsine values)

Table.9 Standardization of seed biopriming using *Azospirillum* for snakegourd cv.CO_2 – Root length

Biopriming treatments (T)		Root length (cm)				
		Soaking duration in h (D)				
		12	18	24	30	Mean
Nonprimed seed		14.9	14.9	14.9	14.9	**14.9**
Hydropriming		18.0	19.0	16.8	15.3	**17.2**
Azospirillum	10%	18.5	19.6	17.5	16.5	**18.0**
	15%	18.1	19.3	17.1	15.8	**17.5**
	20%	18.7	20.0	17.8	16.8	**18.3**
Mean		**17.6**	**18.5**	**16.8**	**15.8**	
			T	**D**	**T x D**	
SEd			**0.03**	**0.02**	**0.06**	
CD (P=0.05)			**0.06****	**0.05****	**0.12****	

Table.10 Standardization of seed biopriming using *Azospirillum* for snakegourd cv.CO_2 – Shoot length

Biopriming treatments (T)		Shoot length (cm)				
		Soaking duration in h (D)				
		12	18	24	30	Mean
Nonprimed seed		23.8	23.8	23.8	23.8	**23.8**
Hydropriming		27.4	29.0	26.0	24.2	**26.6**
Azospirillum	10%	27.1	29.7	25.6	24.7	**26.7**
	15%	27.8	29.2	26.3	25.0	**27.0**
	20%	28.5	30.2	26.0	24.2	**27.2**
Mean		**26.9**	**28.3**	**25.5**	**24.4**	
			T	**D**	**T x D**	
SEd			**0.04**	**0.04**	**0.09**	
CD (P=0.05)			**0.09****	**0.08****	**0.18****	

Table.11 Standardization of seed biopriming using *Azospirillum* for snakegourd cv. CO_2 - drymatter production

Biopriming treatments (T)		Drymatter production (g 10 seedlings^{-1})				
		Soaking duration in h (D)				
		12	18	24	30	Mean
Nonprimed seed		1.117	1.117	1.117	1.117	**1.117**
Hydropriming		1.157	1.172	1.143	1.122	**1.148**
Azospirillum	10%	1.161	1.152	1.148	1.124	**1.146**
	15%	1.164	1.182	1.153	1.130	**1.157**
	20%	1.167	1.187	1.155	1.135	**1.161**
Mean		**1.153**	**1.162**	**1.143**	**1.125**	
			T	**D**	**T x D**	
SEd			**0.001**	**0.001**	**0.002**	
CD (P=0.05)			**0.002****	**0.002****	**0.004****	

Table.12 Standardization of seed biopriming using *Azospirillum* for snake gourd cv.CO_2 - Vigour index

Biopriming treatments (T)	Vigour index (Germination x Seedling length)				
	Soaking duration in h (D)				
	12	18	24	30	Mean
Nonprimed seed	2368	2368	2368	2368	**2368**
Hydropriming	3276	3684	2874	2495	**3082**
Azospirillum 10%	3332	3742	2959	2641	**3168**
15%	3405	3787	3046	2668	**3226**
20%	3544	3969	3250	2799	**3390**
Mean	**3185**	**3510**	**2899**	**2594**	
		T	**D**	**T x D**	
SEd		**13.5**	**12.0**	**27.0**	
CD (P=0.05)		**27.0****	**24.1****	**54.0****	

Table.13 Standardization of seed biopriming using phosphobacteria for snakegourd cv. CO_2 – Speed of germination

Biopriming treatments (T)	Speed of germination				
	Soaking duration in h (D)				
	12	18	24	30	Mean
Nonprimed seed	3.2	3.2	3.2	3.2	**3.2**
Hydropriming	4.3	4.2	4.9	4.3	**4.4**
phosphobacteria 10%	4.3	4.6	4.4	4.3	**4.4**
15%	4.8	5.6	4.7	4.4	**4.9**
20%	5.0	5.5	4.6	4.5	**4.9**
Mean	**4.3**	**4.6**	**4.3**	**4.1**	
		T	**D**	**T x D**	
SEd		**0.08**	**0.07**	**0.16**	
CD (P=0.05)		**0.16 ****	**0.15 ****	**0.33 ****	

Table.14 Standardization of seed biopriming using phosphobacteria for snakegourd cv. CO_2 – Germination

Biopriming treatments (T)	Germination (%)				
	Soaking duration in h (D)				
	12	18	24	30	Mean
Nonprimed seed	61 (51.35)	61 (51.35)	61 (51.35)	61 (51.35)	**61 (51.35)**
Hydropriming	71 (57.41)	75 (60.50)	66 (54.33)	61 (51.65)	**68 (55.97)**
phosphobacteria 10%	64 (53.13)	68 (55.55)	73 (58.69)	76 (60.68)	**70 (57.01)**
15%	65 (53.88)	78 (62.02)	74 (59.34)	70 (56.79)	**72 (58.00)**
20%	63 (52.53)	67 (55.24)	72 (58.05)	74 (59.83)	**69 (56.41)**
Mean	**65 (53.66)**	**70 (56.93)**	**69 (56.35)**	**68 (56.06)**	
		T	**D**	**T x D**	
SEd		**0.24**	**0.21**	**0.48**	
CD (P=0.05)		**0.48****	**0.43****	**0.97****	

(Figures in parentheses indicate arcsine values)

Table.15 Standardization of seed biopriming using phosphobacteria for snakegourd cv. CO_2 - Root length

Biopriming treatments (T)	Root length (cm)				
	Soaking duration in h (D)				
	12	18	24	30	Mean
Nonprimed seed	12.7	12.7	12.7	12.7	**12.7**
Hydropriming	13.3	18.1	17.4	15.4	**16.0**
phosphobacteria 10%	13.8	18.5	17.1	15.8	**16.3**
15%	14.6	19.8	17.6	16.5	**17.1**
20%	14.2	18.8	17.6	16.2	**16.7**
Mean	**13.7**	**17.5**	**16.4**	**15.3**	
		T	**D**	**T x D**	
SEd		**0.02**	**0.02**	**0.05**	
CD (P=0.05)		**0.05****	**0.04****	**0.10****	

Table.16 Standardization of seed biopriming using phosphobacteria for snakegourd cv. CO_2 - Shoot length

Biopriming treatments (T)	Shoot length (cm)				
	Soaking duration in h (D)				
	12	18	24	30	Mean
Nonprimed seed	21.6	21.6	21.6	21.6	**21.6**
Hydropriming	23.1	28.7	27.3	25.5	**26.1**
phosphobacteria 10%	23.7	29.2	27.8	25.8	**26.6**
15%	24.7	29.7	28.5	26.7	**27.4**
20%	24.2	29.5	28.2	26.3	**27.0**
Mean	**23.4**	**27.7**	**26.6**	**25.1**	
		T	**D**	**T x D**	
SEd		**0.03**	**0.03**	**0.07**	
CD (P=0.05)		**0.07****	**0.06****	**0.15****	

Table.17 Standardization of seed biopriming using phosphobacteria for snakegourd CO_2- Drymatter production

Biopriming treatments (T)	Drymatter production (g 10 seedlings^{-1})				
	Soaking duration in h (D)				
	12	18	24	30	Mean
Nonprimed seed	1.033	1.033	1.033	1.033	**1.033**
Hydropriming	1.043	1.218	1.088	1.067	**1.104**
phosphobacteria 10%	1.051	1.236	1.097	1.073	**1.114**
15%	1.063	1.247	1.108	1.078	**1.124**
20%	1.057	1.093	1.059	1.083	**1.073**
Mean	**1.049**	**1.165**	**1.077**	**1.066**	
		T	**D**	**T x D**	
SEd		**0.011**	**0.011**	**0.024**	
CD (P=0.05)		**0.022****	**0.022****	**0.045****	

Table.18 Standardization of seed biopriming using phosphobacteria for Snakegourd cv. CO_2 - Vigour index

Biopriming treatments (T)	Vigour index (Germination x Seedling length)				
	Soaking duration in h (D)				
	12	18	24	30	Mean
Nonprimed seed	2284	2284	2284	2284	**2284**
Hydropriming	2497	3542	3277	3035	**3088**
phosphobacteria 10%	2624	3778	3433	3202	**3259**
15%	2833	3964	3687	3271	**3438**
20%	2803	3777	3412	3318	**3327**
Mean	**2608**	**3469**	**3218**	**3022**	
		T	**D**	**T x D**	
SEd		**10.2**	**9.2**	**20.5**	
CD (P=0.05)		**20.5****	**18.4****	**41.1****	

Ramamoorthy *et al.,* (2000) reported that seed biofortification with *Azospirillum* enhanced seedling vigour encompassing speed of germination, seedling length and dry weight of high and low vigour seed lots in rice.

Thamizh Vendan and Thangaraju (2007) inoculated the tomato seeds with liquid formulation of *Azospirillum* which enhanced the plant height, biomass, nitrogen uptake of plants, available nitrogen content of soil and yield of tomato.

Kavitha (2011) reported that rice ADT 43 seeds bioprimed with liquid *Azospirillum* 20% for 12h expressed high values for speed of germination and vigour based on dry matter production accounted for 32 and 7 per cent increase over nonprimed seed. However, the seeds bioprimed with *Azospirillum* 20% for 6h showed increased germination and vigour based on seedling growth accounted for 11 and 18 per cent increase over nonprimed seed.

Significant variations were observed in Speed of germination, Germination, Drymatter production, seedling length and vigour index by biopriming treatments, durations of biopriming and their interactions. The interactions between the biopriming treatments and durations of biopriming expressed that the seeds bioprimed using phosphobacteria 15% for 18h registered high speed of germination (5.6) followed by phosphobacteria 20% for 18h (5.5). The speed of germination of nonprimed seeds was 3.2. The interactions effects indicated that seeds bioprimed with phosphobacteria at 15% for 18h registered higher germination of 78 per cent as compared to nonprimed seeds which was 61 per cent.

Seeds bioprimed with phosphobacteria 15% for 18h measured longer root (19.8cm) than nonprimed seeds (12.7cm). The interactions between biopriming treatments and durations of biopriming showed that phosphobacteria 20% for 18h recorded the longest shoot of 29.7cm. The shortest shoot of 21.6cm was in nonprimed seeds.

The interactions between biopriming treatments and durations of biopriming expressed that the biopriming involving phosphobacteria 15% for 18h registered more drymatter production (1.247g 10 seedlings^{-1}).

The less drymatter production of nonprimed seeds was 1.033g 10 seedlings^{-1}. Phosphobacteria biopriming at 15% for 12h registered more vigour (3964) when compared to nonprimed seeds (2284).

Gomathy *et al.,* (2009) reported that 1% inoculum showed better results followed by 1.5% inoculum for the optimization of liquid phosphobacteria required for maize seeds.

Mariselvam (2012) reported that bhendi seed bioprimed with liquid phosphobacteria 20% for 12h was found to be the best seed treatment to improve the seed quality. Seeds bioprimed with *Azotobacter* 20% for 30h was the best and suitable biopriming treatment. This treatment showed a higher per centage of increase over the nonprimed seeds and they were 93, 19, 32, 27, 6 and 65 per cent for speed of germination, germination, root length, shoot length, drymatter production and vigour index respectively.

Seeds bioprimed with liquid *Azospirillum* 20% for 18h expressed high values for speed of germination and vigour index which accounted for 75 and 68 per cent increase over nonprimed seed. The increase in germination, root length, shoot length and drymatter production accounted for 23, 34, 27 and 63 per cent over nonprimed seed.

Seeds bioprimed with phosphobacteria 15% for 18h was found to improve the speed of germination, germination, root length, shoot length, drymatter production and vigour index. The increases over nonprimed seeds for these parameters were 75, 17, 56, 38, 21 and 74 per cent respectively.

Among the different treatments, concentrations and durations of *Azotobacter* 20% for 30h or liquid *Azospirillum* 20% for 18h or liquid phosphobacteria 15%. Seed biopriming treatments with *Azospirillum* 20% for 18h was the best and suitable biopriming treatment to enhance the germination rate, total germination percentage, seedling growth and vigour.

References

Abdul-Baki, A.A. and J.D. Anderson. 1973. Vigour deterioration of soybean seeds by multiple criteria. Crop Sci., 13: 630-633.

Gomathy, M., M. Thangaraju and C. Sarathambal. 2009. Optimization of liquid phosphobacteria required for maize seeds. Asian Journal of Bio. Sci., 4(1): 53-55.

ISTA, 2009. International Rules for Seed Testing. International Seed Testing Association, Bassersdorf, Switzerland.

Kavitha, S. 2011. Biopriming with biocontrol agents and liquid biofertilizers for rice seed cv. ADT 43. M.Sc. (Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore.

Maguire, J.D. 1962. Speed of germination - Aid in selection and evaluation of seedling emergence and vigour. Crop Sci., 2: 176-177.

Mariselvam, D. 2012. Biopriming with biocontrol agents and liquid biofertilizers for bhendi seed cv. ADT 43. M.Sc. (Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore.

Panse, V.G. and P.V. Sukatme. 1985. Statistical methods for agricultural workers. ICAR publication, New Delhi, 359.

Natarajan K.N., and A. Lakshmanan. 2000. Seed biofortification with *Azospirillum* spp. for improvement of seedling vigour and productivity in rice (*Oryza sativa* L.). Seed Sci. Technol., 28: 809-815.

Ramamoorthy, K., N. Natarajan and A. Lakshmanan. 2000. Seed biofortification with *Azospirillum* spp. for improvement of seedling vigour and productivity in rice (*Oryza sativa* L.). Seed Sci. Technol., 28: 809-815.

Thamizh Vendan, R.T. and M. Thangaraju. 2007. Influence of liquid and cyst formulations of *Azospirillum* with inorganic fertilizers on the growth and yield of tomato. Afr. J. Biotech., 6(19): 30-35.

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