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Pre-sowing seed Bio-priming in Okra (*Abelmoschus esculentus* L.)

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ABSTRACT

Bio-priming is a process of biological seed treatment that refers to combination of seed hydration and inoculation of seed with beneficial organism to protect seed. It is an ecological approach using selected fungal antagonists against the soil and seed-borne pathogens. Biological seed treatments provide an alternative to chemical control. Seed priming as one of the most important developments to help rapid and uniform germination and emergence of seeds, and to increase seed tolerance to adverse environmental conditions. Seed priming is now a widely used commercial process that accelerates the germination rate and improves seedling uniformity in many crops. Krishi Vigyan Kendra, Kollam during 2017-18, conducted On farm testing on pre-sowing seed bio-priming in okra and the trial was conducted with twelve treatments and three replications. The main objective of the experiment was to assess the effect of different bio agents in seed germination, growth , yield and disease incidence in okra. Response of different okra varieties towards seed bio priming was also noted. Pre-sowing bio- priming of okra seeds with *Psuedomonas* at the rate of 8 g per liter was found to increase seed germination percentage, plant height, number of nodes per plant and number of branches per plant in okra. It was also found to increase number of pods per plant, pod length, diameter and pod weight. Bio priming of okra seeds with Psuedomonas increased total vegetable yield per plant and also resulted in lower pest and disease incidence in okra. Lowest vegetable yield per plant, pod yield , pod weight were reported from untreated okra seeds. Among different okra varieties tested, seed bio-priming of variety Arka Anamika gave better growth , highest yield and less disease incidence.

Key Words : Okra , bio-priming, Psuedomonas, Trichoderma.

INTRODUCTION

Okra (*Abelmoschus esculentus)* is one of the most important vegetable crops grown in Kerala. It is grown widely throughout the state. Bio-priming is a new technique of seed treatment that integrates biological and physiological aspects of disease control. Some bacteria and fungi prevent diseases and enhance plant growth. Beneficial free-living soil bacteria enhancing plant growth are generally referred to as plant growth-promoting bacteria and found in association with the roots of various plants (Sajjad *et al*, 2001). Seed treated with *Trichoderma spp*. check the growth of fungal diseases and improve the seed quality (Meena *et al*, 2017). This has evolved multiple mechanisms resulting in improvements in plant resistance to diseases, plant growth as well as productivity (Vinale *et al*, 2008). The increased growth response induced by *Psuedomonas sp.* has been reported for many crops such as cucumber, pepper, maize, okra and wheat (Modi *et al*, 2019). Role of plant growth promoting bacteria in crop production is well known phenomenon (Dalpat *et al*, 2017) . Most of the strains of plant growth promoting rhizobacteria are from *Pseudomonas sp*. particularly *Pseudomonas fluorescens* strains. Nowa days importance has been given for the combined use of bio-control agents for plant growth promotion (Manjarekar *et al*, 2015). So the experiment had been conducted in Krishi Vigyan Kendra, Kollam during 2017-18,

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with an objective of finding out the the best pre-sowing seed bio-priming technique in okra.

MATERIALS AND METHODS

The present experiment was carried out at Krishi Vigyan Kendra, Kollam during 2017-18 . The experiment also aimed to find out the best seed bio-priming technique in okra. Different varieties (V_1-Susthira, V_2- Arka Anamika, V_3- Aruna and V_4- Salkeerthi) were used for the trial. Two bio-priming agents were used in the experiment *i.e* P_1- *Psuedomonas. fluorescens* (8 g/l) and P_2 -*Trichoderma viride* (4 g/l) and P_{3-} untreated seeds. Number of treatments were 12 and replications were three. Different treatment combinations used were T_{1-} V_1P_1, T_{2-} V_1P_2, T_{3-} V_1P_3, T_{4-} V_2P_1, T_{5-} V_2P_2, T_{6-} V_2P_3, T_{7-} V_3P_1, T_{8-} V_3P_2, T_{9-} V_3P_3, T_{10-} V_4P_1, T_{11-} V_4P_2 and T_{12-} V_4P_3. Design followed was Randomized Block Design. Seeds of the selected varieties were first soaked for two hours in suspension of *Trichoderma viride* and *Psuedomonas. fluorescens* and then shade drying was done. Bio- primed seeds along with un-primed control seeds were sown in field with 60 × 60 cm spacing and thereafter recommended package of practices of Kerala Agricultural University were followed throughout the growing period. Observations noted during the study period were seed germination percent, plant height, number of branches per plant, number of nodes per plant, number of pods per plant, pod length, pod diameter, pod weight and vegetable yield per plant, pest and disease incidence (Bharad and Kamlesh, 2005).

RESULTS AND DISCUSSION

Biometric Characters

The results of the experiment revealed that highest seed germination (95%) was seen in variety Arka Anamika (T_4) (Table1.). This was followed by 92% in variety Susthira (T_1) and Aruna (T_7). The lowest seed germination (68%) was noticed in variety Susthira, without any seed treatment (T_3). Pravisya and Jayaram (2015) also got similar result, when seeds of okra variety Arka Anamika were treated with Psuedomonas. The highest plant height (144.32 cm) was reported from variety Arka Anamika (T_4). This was followed by 136.51 cm in variety Salkeerthi (T_{10}) . The lowest plant height

Table 1. Effect of pre-sowing seed bio-priming on plant height, number of nodes per plant and number of branches per plant in okra.

Treatment	Seed germination (%)	Plant height (cm)	Number of nodes per plant	Number of branches per plant
T_{1-} V_1P_1	92	112.64	16.42	3.14
T_{2-} V_1P_2	80	126.72	14.68	2.50
T_{3-} V_1P_3	68	83.26	16.82	3.01
T_{4-} V_2P_1	95	144.32	20.24	4.32
T_{5-} V_2P_2	80	132.14	15.17	2.86
T_{6-} V_2P_3	72	97.68	12.38	2.73
T_{7-} V_3P_1	92	122.60	13.94	3.28
T_{8-} V_3P_2	69	116.40	11.86	2.62
T_{9-} V_3P_3	75	88.21	14.82	2.00
T_{10-} V_4P_1	90	136.51	18.86	3.66
T_{11-} V_4P_2	93	102.70	16.20	2.44
T_{12-} V_4P_3	72	93.6	10.08	2.21
CD (0.05)	1.742	0.138	0.023	0.005

was reported from variety Susthira (83.26 cm) with untreated seeds (T_3). This finding has been supported by Rahman *et al* (2012) and Ahmad *et al* (2012) who reported that *Pseudomonas spp*. increase the growth of plants. The highest number of nodes per plant (20.24) was seen in variety Arka Anamika (T_4). This was followed by 18.86 in variety Salkeerthi (T_{10}). The lowest number of nodes per plant (10.08) was seen in variety Sal keerthi, with untreated seeds (T_{12}). The highest number of branches per plant (4.32) was reported from variety Arka Anamika (T_4). This was followed by 3.66 variety Salkeerthi (T_{10}). The lowest number of branches per plant (2.0) was reported from variety Aruna with untreated seeds (T_9).

Yield Characters

The number of pods per plant was highest (21.62) was noticed in variety Arka Anamika (T_4) (Table 2.). This was followed by 19.26 in variety Susthira (T_1). According to Shaban *et al* (2011), Pseudomonas application significantly enhanced the number of pods in okra. The lowest number of pods per plant was reported from variety Aruna (12.64) with untreated seeds (T_9). The pod length was highest (19.78 cm) in variety Arka Anamika (T_4). This was followed by 18.49 cm in variety Aruna (T_7). The lowest pod length was reported from variety Salkeerthi (9.25 cm) with untreated seeds (T_{12}). The pod diameter was highest (15.63 mm) in variety Arka Anamika (T_4). This was followed by15.0 mm in variety Aruna (T_{11}). The lowest pod diameter was noticed with variety Salkeerthi (10.23 mm) with untreated seeds (T_{12}). The pod weight was highest (24.02g) in variety Arka Anamika (T_4). This was followed by 20.61g in variety Arka Anamika (T_5) . The lowest pod weight (12.24g) was noticed with variety Salkeerthi with untreated seeds (T_{12}). The total vegetable yield per plant was highest (519.31g) was reported in variety Arka Anamika (T_4) (Table 3.). This was followed by 391.62g in variety Arka Anamika (T_5). Same findings was obtained by Rai and Basu (2014) in okra. The lowest total vegetable yield per plant was reported from variety Salkeerthi (175.39) with untreated seeds (T_{12}).

Table 2. Effect of pre-sowing seed bio-priming on number of pods per plant , pod length, pod diameter and pod weight in okra.

Treatment	Number of pods per plant	Pod length (cm)	Pod diameter (mm)	Pod weight (g)
$T_{1-}V_1P_1$	19.26	17.08	13.33	19.69
$T_{2-}V_1P_2$	18.54	13.12	12.21	16.36
$T_{3-}V_1P_3$	17.32	9.94	11.07	15.23
$T_{4-}V_2P_1$	21.62	19.78	15.63	24.02
$T_{5-}V_2P_2$	18.98	16.68	12.65	20.61
$T_{6-}V_2P_3$	16.78	15.61	11.48	15.76
$T_{7-}V_3P_1$	16.06	18.49	11.16	19.22
$T_{8-}V_3P_2$	15.41	15.02	14.80	17.26
$T_{9-}V_3P_3$	12.64	12.36	10.94	14.18
$T_{10-}V_4P_1$	16.85	18.22	12.42	18.24
$T_{11-}V_4P_2$	15.96	16.28	15.00	14.62
$T_{12-}V_4P_3$	14.33	9.25	10.23	12.24
CD (0.05)	0.025		0.007	0.006

Table 3. Effect of pre-sowing seed bio-priming on total vegetable yield per plant, Disease incidence and Pest incidence in okra.

Treatment	Total vegetable yield per plant (g)	Disease incidence (%)	Pest incidence (%)
$T_{1-}V_1P_1$	379.22	9.3	6.4
$T_{2-}V_1P_2$	303.31	4.9	11.2
$T_{3-}V_1P_3$	263.78	15.5	5.80
$T_{4-}V_2P_1$	519.31	3.90	4.20
$T_{5-}V_2P_2$	391.62	13.6	14.9
$T_{6-}V_2P_3$	264.45	17.3	5.30
$T_{7-}V_3P_1$	308.67	14.2	16.8
$T_{8-}V_3P_2$	265.97	15.0	4.90
$T_{9-}V_3P_3$	179.23	14.8	16.9
$T_{10-}V_4P_1$	307.34	4.30	15.6
$T_{11-}V_4P_2$	233.33	5.60	10.6
$T_{12-}V_4P_3$	175.39	15.8	22.1
CD (0.05)	0.169	0.237	0.167

Disease and Pest incidence

The lowest disease incidence (3.9 %) was reported in variety Arka Anamika (T_4). This was followed by 4.3 % in variety Salkeerthi (T_{10}). The highest disease incidence (17.3%) was reported from variety Arka Anamika with untreated seeds (T_6). The lowest pest incidence (4.2 %) was reported in variety Arka Anamika (T_4). This was followed by 4.9 % in variety Aruna (T_8). The highest pest incidence (16.9 %) was reported from variety Aruna with untreated seeds (T_9). Similar result was reported by Kumar and Jain (2010), who noticed that okra seeds treated with Pseudomonas had less pest incidence compared to untreated control plants.

CONCLUSION

It was concluded that pre-sowing bio- priming of okra seeds with *Psuedomonas* at the rate of 8 g/ l was found to increase seed germination percentage, plant height, number of nodes per plant and number of branches per plant in okra. It was also found to increase number of pods per plant, pod length, diameter and pod weight. Bio priming of okra seeds with Psuedomonas increased total vegetable yield per plant and it also resulted in lower pest and disease incidence in okra. Lowest vegetable yield per plant, pod yield , pod weight were reported from untreated okra seeds. So pre sowing bio-priming of seeds with Pseudomonas is recommended as an adoption practice for growth and yield enhancement in okra.

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