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RESEARCH PAPER

Effect of pre-sowing treatments on seed quality and field performance of brinjal hybrid cv. ARKA NAVNEET (*Solanum melongena* L.)

SATISHKUMAR*, BASAVEGOWDA AND SHARNKUMAR
Department of Seed Science and Technology, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA

Abstract : A field experiment was conducted at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad during *Rabi* 2004 to study the effect of different pre-sowing treatments on seed quality and field performance in brinjal hybrid. The field experiments were laid out in a Randomized Complete Block Design. All pre-sowing treatments recorded significantly higher seed quality, growth and yield parameters over control. However, GA3 (200ppm) recorded significantly higher fruit yield (15.76t/ha) than the other pre-sowing treatments except KNO_3 (2%), cytozyme (0.5%) and PEG 6000(-1.0MPa). Similarly initial seed quality, growth and yield components were significantly higher in GA_3 (200ppm) whereas control recorded significantly lower seed quality, growth and yield parameters.

Key Words : Brinjal, Seed treatment, Quality, Yield, Pre-sowing, Germination

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INTRODUCTION

Brinjal (*Solanum melongeena* L.) commonly know as egg plant, belongs to the family Solanaceae and referred by different names, *viz*., egg plant, aubergine, garden egg (French), baigan (Hindi), badanekai (Kannada), vangi (Marathi) and vankaya (Telugu). Brinjal is an important vegetable crop grown in India throughout the year. India is regarded as the center of origin of brinjal (Vavilov, 1931). Contrary to the common belief, it is quite high in nutritive value and can be well compared with tomato. Brinjal fruit contains high amount of carbohydrates (6.4%), protein (1.3%), fat (0.3%), calcium (0.02%), phosphorus (0.02%), iron (0.0013%) and other mineral matters. Apart from this, it also contains β-carotene (34 mg), riboflavin (0.05 mg), thiamine (0.05 mg), niacin (0.5 mg) and ascorbic acid (0.9 mg) per 100 g fruit (Choudhary, 1976). The brinjal plant contains an alkaloid called "solanine" found in roots and leaves. Some medicinal use of egg plant tissues and extract include treatment of diabetes, asthma, cholera, bronchitis and diarrhea, its fruits and leaves are reported to lower blood cholesterol levels.

In India, major brinjal producing states are Orissa, Bihar, Karnataka, West Bengal, Andhra Pradesh, Maharashtra and Uttar Pradesh (Anonymous, 2004). Major brinjal producing districts of Karnataka are Belgaum, Dharwad, Gadag, Bijapur and Mysore (Anonymous, 1999b). There is tremendous scope for improving yield of brinjal in our country. The productivity of brinjal could be improved by improving the per cent field emergence. The time from planting to seedling establishment is a crucial phase in the production cycle. The period of imbibition is extremely sensitive to changes in the environment, and slight or sudden changes appear to profound effect on seedling emergence (Khan *et al.,* 1978). High quality seed is the key to successful agriculture. Modern agriculture with its bias for technology and precision demands that each and every seed should readily germinate and produce a vigorous seedling ensuring high yield. As such only need of high quality genetically pure and morphologically, pathologically and physiologically sound is needed to increase the productivity. In dryland agriculture,

*** Author for correspondence**

drought resistance of plant is one of the very important factors to get the higher yield. Though, this is largely depends on genetic make up of the variety, pre-sowing treatments like hardening also practiced to defy the ill effects of drought on emergence and growth of crop. Pre-sowing treatments have done in order to impart resistance against stress conditions *viz*., drought and cold to the emerging seedlings (Balamurugan *et al.*, 2003).

MATERIAL AND METHODS

The field experiment was conducted at the Main Agricultural Research Station, University of Agricultural Science, Dharwad during *Rabi* 2004, which is situated in transitional belt of Karnataka state at 15°26' North latitude and 76°27' East longitude and with an altitude of 678 m above mean sea level. The present experiments were conducted with brinjal hybrid (Arka Navneet), which was developed from Indian Institute of Horticultural Research Bangalore and released in the year 1984. It is a cross between IIHR 22- 1 x Supreme. The experiment consisted of 10 treatments involving one control (without pre-sowing treatment). The details of the treatments are given below.

T_1 : PEG 6000 (-1.0 MPa)
T_2 : GA_3 (200 ppm)
T_3 : Cytozyme (0.5%)
T_4 : KNO_3 (2%)
T_5 : $CaCl_2$ (2%)
T_6: KH_2PO_4 (0.5%)
T_7 : Na_2HPO_4 (0.5%)
T_8 : Cow urine (10%)
T_9 : Soaking-drying of seeds
T_{10} : Control.

Design and plan of layout:

The experiment was laid out in a Randomize Complete Block Design.

Gross plot -3.0 m x 3.0 m
Net plot -1.8 m x 1.8 m.

Procedure of pre sowing treatments:

Freshly harvested seeds were soaked in water with required quantity of chemicals and allowed to absorb moisture up to 35 per cent of their weight and kept in imbibed condition for about six hours at about 25°C. These were then spread out in a thin layer for drying under shade for two to three days, during this period the seeds get dried almost to the original weight, then taken for nursery sowing. Samples were drawn at random from all the treatments for taking seed quality parameters, germination (%), speed of germination, root length (cm), shoot length (cm), seedling vigour index, seedling dry weight (mg), electrical conductivity (dSm^{-1}) of seed leachate and also data were collected on field emergence (%), plant height (cm), number of leaves per plant, number of branches per plant, days to 50% flowering, Fruit length (cm), fruit girth (cm), fresh fruit yield per plant (g), Fruit yield per plot (kg/plot), fruit yield (t/ha).

The mean experimental data were analysed by Fisher's method of analysis of variance (Sundararaj *et al.,* 1972). All the observations recorded were subjected to 'F' test, wherever 'F' test found significant 't' test was carried out and level of significance used for 't' test was P = 0.05. The data on germination percentage and field emergence were transformed into arc sine root percentage and transformed data were used for the statistical analysis.

RESULTS AND DISCUSSION

In the present study fresh seeds of brinjal hybrid seeds (cv. Arka Navneet) was given pre-sowing treatment with PEG-6000 (-1.0 MPa), (GA_3 200 ppm), KNO_3 (2%), cytozyme (0.5%), $CaCl_2$ (2%), KH_2PO_4 (0.5%), Na_2HPO_4 (0.5%), cow urine (10%), soaking-drying in addition to various concentration. The treated seeds were evaluated for field performance. The results are discussed here under.

Among the pre-sowing treatments, seeds of brinjal hybrid (cv. Aka Navneet) soaked in GA_3 200 ppm for 6 hours recorded significantly higher germination percentage, speed of germination, root length, shoot length, seedling vigour index, seedling dry weight, field emergence and lower EC followed by KNO_3 (2%), cytozyme (0.5%) and PEG-6000 (-1.0MPa) (Table 1). Increase in seed quality parameters may be due to enlarged embryos, higher rate of metabolic activity and respiration, better utilization and mobilization of metabolites to growing points and higher activity of enzymes. GA_3 act as œ-denovo synthesis and also helps in dormancy breaking action. The growth regulator treatments through enzymatic and hormonal mechanism stimulated metabolic processes such as sugar mobilization, protein hydrolysis, oxidation etc. (Jagadish, 1993). The increase in seedling vigour index and seedling dry weight was due to increased germination percentage, root length and shoot length of seedling. The lower EC of seed leachate for GA_3 treated seeds may be due to beneficial effect of growth regulator in strengthening the cell membrane integrity and permeability (Kurdikeri, 1991). These results are in line with the findings of Jagadish *et al.* (1994) who also reported the improvement in germination and seedling vigour index of seeds treated with GA_3 200 ppm over untreated control in tomato capsicum and onion. These results are also in agreement with findings of Yogananda *et al.* (2004) in bell pepper, Tewari (2001) in onion and Kalavathi and Renganayaki (1993) in cardamom, Kanaujia *et al.* (2002) in onion and Solanki and Joshi (1985) in tomato, who reported the beneficial effects of GA_3 as pre-sowing treatments. Similarly the beneficial effects of KNO_3 (2%) were attributed to ionic strength and increase in cytochrome oxidase activity. The presence of nitrated in KNO_3 provides additional substrate for accelerated ageing

Table 1 : Effect of pre-sowing seed treatment on initial seed quality parameters of brinjal hybrid cv. ARKA NAVNEET

Treatments	Germination (%)	Root Length (cm)	Shoot Length (cm)	Seedling Vigour index	Seedling dry weight (mg/10)	Speed of germination	EC (dSm?[1])	Field Emergence (%)
T_0- Control	92.10 (73.65)	4.85	2.39	667	216	13.14	0.022	80.00 (63.43)*
T_1-PEG 6000 (-1.0 MPa)	99.20 (84.75)	5.91	2.89	872	295	14.14	0.015	87.10 (68.88)
T_2- GA3 (200 ppm)	100 (88.13)	5.99	3.10	909	300	14.28	0.010	90.10 (71.62)
T_3- Cytozyme (0.5%)	100 (88.13)	5.94	2.99	893	296	14.28	0.013	88.10 (69.78)
T_4- KNO_3 (2%)	100 (88.13)	5.95	3.00	895	298	14.28	0.012	89.00 (70.61)
T_5- $CaCl_2$ (2%)	98.10 (82.05)	5.64	2.77	825	240	13.93	0.017	86.10 (66.45)
T_6- KH_2PO_4(0.5%)	96.20 (78.72)	5.50	2.76	795	238	13.71	0.018	84.10 (66.45)
T_7- Na_2HPO_4 (0.5%)	96.20 (78.72)	5.45	2.68	782	235	13.71	0019	84.10 (66.45)
T_8- Cow urine (10%)	94.10(75.95)	5.09	2.45	710	226	13.42	0.021	82.10 (68.06)
T_9- Soaking-drying	96.10(78.52)	5.40	2.69	777	228	13.71	0.020	83.10 (65.71)
Mean	97.90 (81.68)	5.60	2.77	813	252	13.87	0.017	85.50 (67.60)
S.E.±	1.23	0.13	0.10	24	1.94	0.11	0.001	0.85
C.D. (P=0.05)	3.61	0.40	0.30	70	5.70	0.32	0.003	2.65

Table 2 : Effect of pre- sowing seed treatment on plant height and number of leaves in brinjal hybrid cv. ARKA NAVNEET

Treatments	Plant height (cm)				Number of leaves/plant			
	30 DAT	60 DAT	90 DAT	At harvest	30 DAT	60 DAT	90 DAT	At harvest
T_0- Control	15.13	34.60	84.06	116.70	3.30	36.10	82.16	89.20
T_1-PEG 6000 (-1.0 MPa)	16.75	39.40	90.53	143.50	4.38	42.00	94.98	104.00
T_2- GA3 (200 ppm)	17.75	42.13	94.13	148.00	4.63	45.13	97.20	107.26
T_3- Cytozyme (0.5%)	16.96	40.46	92.26	145.00	4.40	42.90	95.66	104.89
T_4- KNO_3 (2%)	17.31	41.80	95.26	146.50	4.53	43.50	96.11	105.14
T_5- $CaCl_2$ (2%)	16.00	38.13	89.60	121.20	4.06	39.13	88.86	95.53
T_6- KH_2PO_4 (0.5%)	15.99	37.80	89.40	120.00	4.06	38.60	87.86	93.30
T_7- Na_2HPO_4 (0.5%)	15.88	36.33	87.33	119.80	3.93	38.16	85.26	90.86
T_8- Cow urine (10%)	15.49	35.10	85.40	119.30	3.73	38.20	84.16	89.66
T_9- Soaking-drying	15.88	36.20	86.80	119.33	3.93	38.50	83.50	90.13
Mean	16.31	38.19	89.47	129.93	4.09	40.22	89.57	96.99
S.E.±	0.54	1.07	1.40	1.73	0.15	1.45	2.36	2.77
C.D. (P=0.05)	1.61	3.17	4.16	5.15	0.44	4.31	6.76	8.25

DAT- Days After Transplanting

Table 3 : Effect of pre-sowing seed treatments on number of branches per plant, days to 50 per cent flowering, and fruit Yield parameters in brinjal hybrid cv. ARKA NAVNEET

Treatments	Number of branches per plant				Days to 50 Per cent flowering	Fruit length (cm)	Fruit Girth (cm)	Fruit Yield Plant(g)	Fruit yield (kg/plot)	Fruit yield (t/ha)
	30 DAT	60 DAT	90 DAT	At harvest						
T_0- Control	3.00	13.20	33.03	42.00	67.33	7.35	18.08	450.20	11.25	12.500
T_1-PEG 6000 (-1.0 MPa)	3.50	16.10	36.93	49.93	62.10	9.81	23.98	560.34	14.01	15.566
T_2- GA3 (200 ppm)	3.60	17.03	39.27	52.93	60.31	10.77	25.70	567.90	14.19	15.766
T_3- Cytozyme (0.5%)	3.53	16.56	38.01	50.26	61.73	9.87	24.74	562.87	14.07	15.633
T_4- KNO_3(2%)	3.60	16.89	38.40	51.40	61.56	10.37	24.89	564.23	14.11	15.678
T_5- $CaCl_2$ (2%)	3.01	14.00	35.73	45.46	63.70	7.74	19.00	524.15	13.10	14.555
T_6- KH_2PO_4(0.5%)	3.00	13.66	35.66	45.40	64.00	7.70	18.98	518.39	12.95	14.388
T_7- Na_2HPO_4 (0.5%)	3.00	13.60	35.66	44.46	64.03	7.68	18.76	515.39	12.89	14.322
T_8- Cow urine (10%)	3.00	13.16	33.47	44.06	64.43	7.41	18.10	507.40	12.69	14.099
T_9- Soaking-drying	3.00	13.30	34.06	44.53	64.33	7.46	18.62	511.35	12.78	14.200
Mean	3.22	14.75	36.01	47.04	63.35	8.62	21.09	528.30	13.20	14.671
S.E.±	0.12	0.73	1.10	1.82	0.77	0.80	0.95	4.47	0.58	0.648
C.D. (P=0.05)	0.37	2.17	3.26	5.41	2.29	2.39	2.81	13.26	1.73	1.924

DAT- Days After Transplanting

and protein synthesis for enchancement of germination during priming and it also helps in membrane repair mechanism (Khan *et al*. 1978). Similar results of higher quality parameters of seeds treated with KNO_3 (2%) were reported by Vanpijlen *et al.* (1995) in tomato, Jagadish *et al.* (1994) in tomato, chilli and onion, Gayathri (2001) in tomato, Renukadevi *et al.* (1994) in bitter gourd, Yoganada *et al.* (2004) in bell pepper.

Pre-sowing treatments significantly influenced the growth parameters such as plant height, number of leaves, number of branches and days to 50 per cent flowering. All the pre-sowing treatments records significantly higher growth parameters over control. Among the per-sowing treatments, GA_3 200 ppm records significantly higher plant height (148 cm), number of leaves (107.26) (Table 2) and number of branches (52.93) at harvest stage followed by KNO_3 (2%), cytozyme (0.5%) and PEG-6000 (-1.0 MPa). The results are in agreement with Omran *et al.* (1980) in okra, Jagadish (1993) in tomato and chilli and Tewari *et al.* (2001) in onion. The increased plant height, number of leaves and number of branches may be due to cell division, cell number due to multiplication in various plant tissue, auxin metabolism, cell wall plasticity and permeability of cell membrane, RNA synthesis, increasing photosynthates, cell enlargement and rapid cell elongation (Sadavarthe and Guptha, 1963).

Yield parameters also significantly influenced by pre-sowing treatments (Table 3). Among the fruit yield attributes, fruit length, fruit girth and fruit yield per plant seem to the important components closely related with fruit yield per ha. The fruit yield per ha found significantly higher in GA_3 200 ppm (15.76 t) followed by KNO_3 (15.67 t) cytozyme (15.63 t)and PEG.-6000 (15.56 t).The similar results of higher fruit yield due to pre-sowing treatment with GA_3 200 ppm were reported by Jagadish (1993) in tomato, chilli, and onion and Tewari *et al.* (2001) in onion. The higher fruit yield in pre-sowing treatment with GA_3 200 ppm may be ascribed to the fact that the plants remained physiologically more active, source to sink relationship in the plant parts and build up sufficient food reserve for developing flowers and fruits. Thus the plants that gave higher fruit yield resulted in higher fruit yield per unit area (Veerabhadra, 2002).

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