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RESEARCH PAPER

Effect of NAA, triacontanol and boron on seed viability and vigour in bitter gourd (*Momordica charantia* L.) cv. PUSA VISESH

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Abstract : An investigation was carried out in order to know the influence of NAA, triacontanol and boron viability and vigour level of seed in bitter gourd cv. PUSA VISESH. Resultant seeds were stored in cloth bags under ambient storage condition and seed quality was tested after every month upto end of storage period. Results revealed that NAA 50 ppm recorded highest seed germination and seedling vigour index (83.25% and 1757, respectively). Whereas, boron at 4 ppm recorded higher speed of germination and seedling length (18.23 and 21.16 cm, respectively). Storage study reveled that boron at 4 ppm maintained highest seed viability and vigour quality till the end of twelve months storage period.

Key Words : Bitter gourd, Seed vigour, Cloth bag, Ambient storage condition

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INTRODUCTION

Bitter gourd (*Momordica charantia* L.) is one of the most important Cucurbitaceae vagetable widely cultivated in Karnataka. It belongs to the family Cucurbitaceae and popularly known as balsom pear, karela or bitter melon. The plant growth regulators (PGR's) are considered as a new generation agro-chemicals after fertilizers, pesticides and herbicides. In bitter gourd, it is possible to increase the yield by increasing the fruit sed by using growth regulators. Use of PGR's like GA_3 and NAA have and ability to modify the plant growth, sex ratios and yield contributing characters, while micro nutrient like boron will by a useful alternative to increase crop production (Shantappa *et al.*, 2007). The micronutrient and cations are involved in enzyme systems as cofactors with the exception of Zn, Mn, Cu and B. These are capable of acting as 'electron carriers' in the enzyme systems and are responsible for the oxidative-reduction process in the plant system.

Storage and preservation of quality seed stocks till the next season is as important as producing quality seeds. Farmers and scientists opined that safe storage of seeds is advantages as it reduces the burden of seed production

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every year, besides timely supplying of desired genetic stocks for the use in years following periods of low production. The germination and vigour which can be expected from stored seeds is another matter of great importance. Seed is said to be in storage on plant itself right from its physiological maturity and it continues to be in storage until next sowing or further use or death. Deterioration of seed during storage is inevitable and leads to different changes at different levels viz., impairment or shift in metabolic activity, compositional changes, decline or change in enzyme activities, phenotypic, cytological changes apart from quantitative losses. Being hygroscopic in nature the viability and vigour of seeds under storage are known to be regulated by variations in the physico-chemical factors, initial seed quality, storage structures, packaging materials etc. (Doijode, 1988). A knowledge of proper storage of seeds under ambient conditions at relatively low cost with minimum deterioration in quality for a period of at least one or more seasons will be of immense use to seed industry and farming community. Considering all these, the present investigation was undertaken to study the seed longevity of different growth regulators and micronutrient sprayed bitter gourd seeds.

MATERIAL AND METHODS

A field experiment was conducted at College of Agriculture, Raichur, Karnataka during *Rabi* 2009 with three replications in Randomized Block Design. The healthy and bold seeds were dibbled with a spacing of 120 cm x 80 cm to a depth of 4.0 cm. After germination one seedling per hill was maintained. The gross plot size of the plot was 10.80 x 8.0 = 86.4 m^2 and net plot size: 8.4 x 6.4 m = 76.8 m^2 . The plant protection measures were adopted as and when required. Two growth regulators *viz.,* NAA (25 and 50 ppm), triacontanol (0.5 and 1.0 ppm) and boron (3.0 and 4.0 ppm) were used for foliar application at two concentrations with absolute control and water spray at two to four true leaf stage and then at 60 days after sowing (DAS), 75 DAS and 90 DAS. Precaution was taken to prevent drifting of spray solution from one treatment plot to other.

Fruits were harvested as when they turn orange red colour and seeds were extracted manually. Seed germination percentage, seed speed of germination, seedling length and seedling vigour index were recorded immediately (Initial quality parameters) after harvest and subsequently at monthly intervals (Feb. 10- January 2011).

The germination test was conducted as per ISTA (Inernational Seed Testing Association) procedure by rolled towel method (Anonymous, 1999). From the germination test, ten normal seedlings were selected randomly from each treatment on the day of final count. The seedling length was measured from shoot tip to root tip.

Seed were germinated in paper medium with four replications of 100 seed each. The number of seeds germinated was recorded daily upto the day of final count.Cotyledon slipping out of the seed coat was taken as criteria for emergence of seedling and the speed of germination was calculated by using the formula suggested by Agrawal (1995).

$$\text{Speed of germination} = \frac{X_1}{Y_1} + \frac{X_2 - X_1}{Y_2} + \text{——} + \frac{X_n(X_n - 1)}{Y_n}$$

where,

X_n : Per cent germination on n^{th} dya

Y_n : Number of days from seed sowing.

Ther seedling vigour index (SVI) was computed using the formula as suggested by Abdul-Baki and Anderson (1973) and expressed as whole number.

Seedling vigour index= Germination (%) x mean length of seedlings (cm)

RESULTS AND DISCUSSION

In the present study the growth regulators and chemical had a significant effect on germination. Over all performance, boron treatment showed significantly higher viability and vigour throughout the storage period followed by NAA and triacontanol which were at par with each other. After the harvest of the crop, the resultant seeds were analyzed for various seed quality parameters growth regulators and nutrient sprayed treatments showed beneficial significant influence on seed quality parameters over control.

The seeds harvested from the plant received NAA 50 ppm (Table 1 and 4) showed higher germination and seedling vigour index (83.25 % and 1757, respectively) which was at par with boron 4 ppm (83.00 % and 1756, respectively). While, control recorded lowest (79.50% and 1335, respectively). This increase in seed quality due to spray of growth regulators might be due to adequate supply of food reserves to resume embryo growth and synthesis of hydrolytic enzymes which are secreted and act on starchy endosperm in turn affecting physiology of seed germination and establishment of seedling as reported by Shantappa *et al*. (2007) in bitter gourd. The low seed germination percentage recorded in freshly harvested seeds. Later on as storage proceeds there was gradual increase in seed germination in all the treatments upto third month after storage. From fourth month onwards there was a slightly decrease in seed germination and seed quality parameters indicating the on-set of deterioration which might be due to the combined effects of high temperature, low oxygen and high CO_2 partial pressures (Edelstein *et al.*, 1995) in melon.

Boron 4 ppm treatment (Table 2 and 3), revealed highest speed of germination and seedling length (19.01 and 21.16, respectively) which were at par with NAA at 50 ppm (18.31 and 21.11 cm, respectively). This might be due to adequate supply of food reserves to resume embryo growth and in addition to release enzymes responsible for degradation of macromolecules into micromolecules to be utilized in growth promoting processes (Gedam *et al.*, 1996) in bitter gourd.

Effect of NAA, triacontanol and boron on seed viability and vigour in bitter gourd cv. PUSA VISESH:

Seed in the nucleus of life and is subjected to continuous ageing once it has reached physiological maturity. This phenomenon results in an irreversible change in seed quality ultimately affecting viability. The quantitative deterioration during storage is mainly attributed to period of storage (Delouche and Basking, 1973).

The storage study revealed that the germination percentage (Table 1 and 4) was significantly highest in boron @ 4 ppm (88.50%, 91.00% and 85.50%) followed

Table 1 : Effect of NAA, triacontanol and boron on seed germination (%) of bitter gourd cv. PUSA VISESH during storage

Treatments	Storage period (month)												
	0	1	2	3	4	5	6	7	8	9	10	11	12
T_1 : Absolute control	79.50	81.75	83.25	83.75	82.75	81.25	80.00	79.25	78.50	77.75	76.50	75.75	74.50
	(63.09)	(64.73)	(65.85)	(66.25)	(65.53)	(64.36)	(63.45)	(62.94)	(62.42)	(61.68)	(61.04)	(60.52)	(59.69)
T_2 : Water spray	80.25	82.25	84.50	85.50	84.75	83.50	82.25	81.75	81.00	79.75	78.25	77.00	75.75
	(63.63)	(65.09)	(66.87)	(67.69)	(67.09)	(66.11)	(65.15)	(64.75)	(64.26)	(63.47)	(62.23)	(61.40)	(60.54)
T_3 : Naphthalene acetic acid @25 ppm	82.75	86.25	88.00	88.75	88.50	88.00	87.25	86.75	86.25	86.00	85.25	84.50	83.75
	(65.47)	(68.26)	(69.81)	(70.41)	(70.34)	(69.79)	(69.24)	(68.75)	(68.37)	(68.08)	(67.42)	(67.16)	(66.51)
T_4 : Naphthalene acetic acid @ 50 ppm	83.25	87.75	89.25	90.25	90.25	90.25	89.00	88.50	88.00	87.25	87.00	86.25	85.25
	(65.84)	(69.57)	(70.93)	(71.84)	(71.83)	(71.88)	(70.75)	(70.26)	(69.79)	(69.13)	(69.08)	(68.26)	(67.44)
T_5 : Triacontanol @ 0.5 ppm	80.00	84.00	87.00	87.50	87.25	87.25	86.75	86.50	86.50	86.00	85.50	84.75	83.75
	(63.46)	(66.45)	(68.90)	(69.33)	(69.10)	(69.10)	(68.79)	(68.59)	(68.55)	(68.03)	(67.69)	(67.03)	(66.24)
T_6 : Triacontanol @ 1.0 ppm	80.75	85.00	87.25	88.00	87.75	87.50	86.75	86.75	86.50	86.50	86.00	85.50	84.50
	(63.98)	(67.22)	(69.13)	(69.75)	(69.59)	(69.33)	(68.70)	(68.68)	(68.46)	(68.45)	(68.15)	(67.84)	(67.01)
T_7 : Boron @ 3.0 ppm	82.50	86.75	87.25	89.25	89.00	88.75	88.25	88.00	87.75	87.25	86.50	86.00	85.00
	(65.28)	(68.67)	(69.10)	(70.88)	(70.69)	(70.47)	(70.03)	(69.81)	(69.59)	(69.09)	(68.49)	(68.08)	(67.26)
T_8 : Boron @4.0 ppm	83.00	88.50	90.25	91.00	90.50	90.25	89.25	89.00	88.75	87.50	87.00	86.50	85.50
	(65.65)	(72.22)	(71.84)	(72.61)	(72.18)	(71.94)	(70.93)	(70.78)	(70.59)	(69.37)	(69.01)	(68.48)	(67.65)
S.E. ±	0.68	0.68	0.88	0.74	1.14	0.98	1.15	1.18	1.29	1.09	1.28	1.39	1.31
C.D. (P=0.05)	2.00	1.99	2.56	2.16	3.32	2.86	3.35	3.46	3.76	3.18	3.74	4.05	3.83

Figures in the parenthesis indicate angular transformed values 0- Initial seed quality by NAA @ 50 ppm (87.75%, 89.25% and 85.25%), boron @ 3 ppm (86.75 %, 89.25% and 85.00%) and water spray (82.25%, 85.50% and 75.75%) whereas, lowest germination percentage was observed in absolute control (81.75%, 82.75% and 74.50%) at the end of first, third and twelve month of storage period, respectively,

Table 2 : Effect of NAA, triacontanol and boron on seed of germination of bitter gourd cv. PUSA VISESH during storage

Treatments	Storage period (month)												
	0	1	2	3	4	5	6	7	8	9	10	11	12
T_1 : Absolute control	14.84	15.94	15.89	16.04	15.93	15.90	15.86	15.69	15.67	15.47	15.35	15.31	14.71
T_2 : Water spray	15.48	16.73	16.84	16.73	16.57	16.52	16.48	16.31	16.25	15.99	15.82	15.76	15.55
T_3 : Naphthalene acetic acid @25 ppm	17.16	17.36	17.59	17.73	17.51	17.46	17.41	17.31	17.15	16.77	16.67	16.50	16.43
T_4 : Naphthalene acetic acid @ 50 ppm	18.31	18.91	18.95	19.11	18.93	18.85	18.64	18.63	18.46	18.40	18.33	18.27	18.17
T_5 : Triacontanol @ 0.5 ppm	16.19	16.49	16.59	16.60	16.56	16.38	16.28	16.23	16.17	16.01	15.87	15.83	15.73
T_6 : Triacontanol @ 1.0 ppm	17.41	17.70	17.79	17.97	17.91	17.91	17.78	17.68	17.61	17.41	17.20	17.13	17.03
T_7 : Boron @ 3.0 ppm	18.34	18.84	18.70	19.10	18.82	18.82	18.72	18.63	18.50	18.43	18.37	18.33	18.20
T_8 : Boron @4.0 ppm	19.01	19.17	19.08	19.49	19.17	19.17	18.96	18.76	18.68	18.56	18.43	18.36	18.23
S.E. ±	0.30	0.34	0.29	0.36	0.37	0.55	0.55	0.57	0.52	0.59	0.55	0.56	0.61
C.D. (P=0.05)	0.96	0.98	0.83	1.07	1.12	1.64	1.66	1.71	1.55	1.75	1.66	1.68	1.83

0- Initial seed quality

Table 3 : Effect of NAA, triacontanol and boron on seedling length (cm) of bitter gourd cv. PUSA VISESH during storage

Treatments	Storage period (month)												
	0	1	2	3	4	5	6	7	8	9	10	11	12
T_1 : Absolute control	16.79	17.40	17.69	18.07	18.04	17.87	17.71	17.56	17.49	17.44	17.10	16.55	16.23
T_2 : Water spray	17.79	18.26	18.38	18.85	18.82	18.63	18.53	18.43	18.33	18.21	17.92	17.18	16.94
T_3 : Naphthalene acetic acid @25 ppm	19.93	19.97	20.32	20.91	20.88	20.79	20.69	20.63	20.62	20.58	20.59	20.42	20.19
T_4 : Naphthalene acetic acid @ 50 ppm	21.11	21.15	21.77	22.58	22.55	22.43	22.32	22.11	22.02	22.00	21.81	21.60	21.31
T_5 : Triacontanol @ 0.5 ppm	19.55	19.55	19.93	20.76	20.73	20.63	20.55	20.46	20.40	20.21	20.11	19.91	19.76
T_6 : Triacontanol @ 1.0 ppm	19.80	19.70	20.12	21.04	20.99	20.83	20.73	20.67	20.65	20.57	20.47	20.18	20.07
T_7 : Boron @ 3.0 ppm	19.67	19.94	20.49	21.12	21.09	20.96	20.94	20.84	20.81	20.68	20.51	20.36	20.30
T_8 : Boron @4.0 ppm	21.16	21.27	21.64	22.49	22.47	22.41	22.38	22.28	22.09	22.03	21.94	21.72	21.60
S.E. ±	0.38	0.33	0.35	0.31	0.38	0.35	0.32	0.39	0.42	0.40	0.34	0.36	0.36
C.D. (P=0.05)	1.12	0.96	1.02	0.92	1.10	1.03	0.92	1.14	1.22	1.16	0.98	1.06	1.05

0- Initial seed quality

Table 4 : Effect of NAA, triacontanol and boron on seedling vigour index of bitter gourd cv. PUSA VISESH during storage

Treatments	Storage period (month)												
	0	1	2	3	4	5	6	7	8	9	10	11	12
T_1 : Absolute control	1335	1422	1473	1513	1493	1452	1417	1392	1373	1355	1308	1254	1209
T_2 : Water spray	1428	1502	1533	1612	1595	1556	1524	1507	1485	1452	1402	1323	1283
T_3 : Naphthalene acetic acid @25 ppm	1649	1722	1788	1856	1848	1830	1805	1789	1778	1770	1755	1725	1691
T_4 : Naphthalene acetic acid @ 50 ppm	1757	1856	1943	2038	2035	2024	1986	1957	1938	1920	1897	1863	1817
T_5 : Triacontanol @ 0.5 ppm	1564	1642	1734	1817	1809	1800	1783	1770	1765	1738	1719	1687	1655
T_6 : Triacontanol @ 1.0 ppm	1599	1675	1755	1852	1842	1823	1798	1793	1786	1779	1760	1725	1696
T_7 : Boron @ 3.0 ppm	1623	1730	1788	1885	1877	1860	1848	1834	1826	1804	1774	1751	1726
T_8 : Boron @4.0 ppm	1756	1882	1953	2047	2034	2023	1997	1983	1960	1928	1909	1879	1847
S.E. ±	12.61	26.33	38.76	47.59	36.26	33.62	42.14	38.23	42.62	41.82	49.57	30.60	30.91
C.D. (P=0.05)	68.74	76.86	113.14	138.91	105.82	98.12	123.01	111.59	124.40	122.06	144.67	89.31	90.22

0- Initial seed quality

Similarly seedling length (21.27 cm 22.49 cm and 21.60 cm) was highest in boron at 4.0 ppm (Table 3). Highest seed quality at the end of third month of storage period migth be to the natural breakdown of seed dormancy due to external environmental factors. It might be due to adequate supply of food reserves to resume embryo growth and synthesis of hydrolytic enzymes which are secreted and act on trarchy endosperm in turn affecting physiology of seed germination and establishment of seedling. Effect of boron on seed germination was also earlier reported by (Gedam *et al.*, 1996 and Hilli *et al.*, 2010). in bitter gourd and ridge gourd, respectively. These differences in storability might be due to variations in their effectiveness in combating the seed borne pathogen.

Conclusion:

All the treatments maintained above the minimun seed certification standards of 60 per cent of seed germination upto twelve months of storage.

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