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RESEARCH PAPER

Effect of growing condition and spacing on seed quality parameters in hybrid seed production of brinjal (*Solanum melongena* L.) under shade house and open field condition

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Abstract : Present investigation was undertaken in order to know the effect of growing condition and spacing on seed quality parameters in hybrid seed production of brinjal. A field experiment was carried out at the Hi-tech Horticulture Unit, Saidapur Farm, University of Agricultural Sciences, Dharwad during *Kharif* 2012-2013 and seed quality parameters were conducted in the Seed Quality and Research Laboratory, Seed Unit, University of Agricultural Sciences, Dharwad. There were two growing conditions *viz*., open field (G_1) and shade house (G_2) condition with four levels of spacing (S_1 = 60 × 45, S_2 = 60 × 60, S_3 = 60 × 75 and S_4 = 60 × 90 cm) and it comprised of eight treatments with three replications in Randomized Block Design in factorial concept. Between two growing condition, shade house grown condition recorded significantly higher germination (82.8%) and vigour index (1426) as compared to open field condition. Among the spacings better seed quality traits were recorded with 60 × 75 cm spacing.

Key Words : Brinjal, Growing condition, Spacing, Seed germination, Vigour index

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INTRODUCTION

Brinjal (*Solanum melongena* L.) is an important commercial vegetable crop, grown all over the world as an edible vegetable crop and it is a nutritious and highly remunerative crop. It is difficult to obtain higher yields of quality fruits and seeds throughout the year under open field conditions in many parts of India, as it is a delicate crop. Cultivation of brinjal is possible during the off-season under polyhouse and shade house. Agronomical practices play an important role for obtaining higher yields especially under polyhouse condition.

Protected cultivation is gaining a lot of importance in the recent decade to meet the increasing demand of quality fruits and seeds. Due to unfavourable climatic condition and incidence of pest and diseases in the open fields, getting quality fruits and seeds is one of the constraints in reaping high returns, especially during off season. Hence, the cultivation of crop in shade house during the off-season to get high returns is the best alternative. According to private sources, over 51 per

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cent of the producers using protection agriculture prefer shade houses over greenhouses. While there is a slight margin between shade house use and greenhouse use, shade houses are becoming more popular due to lower costs and the use of equivalent technology (Anonymous, 2010). One of the main factors affecting crop productivity is plant population which is mainly governed by the plant architecture, soil fertility, time of planting etc. Maintenance of optimum plant density especially under cover assumes greater importance since it accounts for many fold increase in yield when other factors are non-limiting. So standardization of techniques like spacing under shade house is one of the aspects which may increase the fruit and seed yield.

A shade house is a low-cost temporary to semi-permanent structure made by using 30-75 per cent shade nets or any other woven material to allow required sunlight, moisture and air to pass through the gaps. It creates an appropriate micro climate conducive to the plant growth. It is also referred as shade net house or net house. Since the cover is UV treated, it also blocks harmful UV rays and the 40 per cent shade also helps conserve water when irrigation is needed. The basic purpose of a shade house is to partially block sunlight and heat to protect plants and extend their life. Though the successful cultivation of vegetables under shade houses to increase productivity has been established (Thangam and Thamburaj, 2008) the utilization of such structures for seed production for obtaining higher seed yield with better quality needs to be studied. Few studies carried out in this direction have indicated that seed production can also be organized successfully under net house with higher level of seed yield and quality attributes (Singh *et al*., 2009). Keeping in view all above facts, the present investigation was done to know the effect of growing condition and spacing on seed quality parameters in hybrid seed production of brinjal (*Solanum melongena* L.) under shade house and open field condition.

MATERIAL AND METHODS

Seed quality parameters were conducted in the Seed Quality and Research Laboratory, Seed Unit, University of Agricultural Sciences, Dharwad. Breeder seeds of female and male parental lines of brinjal cv. PUSA HYBRID-9 were obtained from the Plant Scientist (Vegetables), Indian Agricultural Research Institute (IARI) New Delhi. The germination test was carried out as per ISTA procedures (Anonymous, 2007). The dry weight of 10 seedlings was recorded. The seedling vigour index was computed by adopting the method as suggested by Abdul-Baki and Anderson (1973) and expressed in whole number for each treatment by using the following formula:

Seedling vigour index = Germination (%) × [Root length (cm) + shoot length) (cm)]

RESULTS AND DISCUSSION

The present study has revealed significant differences between the two growing condition with respect to seed quality parameters such as seed germination, 1000 seed weight, seedling vigour index and electric conductivity of seed leachate. Whereas root length, shoot length and seedling dry weight did not differed significantly among the growing condition. On an average, higher seed germination (82.80%), 1000 seed weight (2.84 g), seedling vigour index (1426), root length (9.17 cm), shoot length (8.04 cm), seedling dry weight (29.98 mg) and lower EC (0.198) were recorded under shade house as compared to open field condition. This may be due to the better development of seeds and more assimilation and translocation of photosynthates from source to sink in the plant system was more in controlled condition as compared to open field condition and delayed in fruit maturity under shade house proved plenty time to seeds to get well connected with mother seed plant for long time and develop completely with healthy and mature embryo. Hence, higher 1000 seed weight was observed in shade house condition which inturn might have influenced other seed quality parameters (Harish, 2011) (Table 1 and 2).

Spacing had a significant influence on seed quality parameters. All the seed quality parameters *viz*., per cent seed germination, 1000 seed weight and seedling vigour index, seedling dry weight and electric conductivity of seed leachates were significantly influenced due to spacing. Whereas root length, shoot length did not differed significantly. On an average higher 1000 seed weight (2.88 g), seed germination (82.50%), root length (9.30 cm), shoot length (8.17 cm), seedling vigour index (1441), seedling dry weight (32.16 mg) and lower EC (0.178) were recorded with 60 cm × 75 cm spacing. Better seed quality attributes with this spacing might be due to better plants nourishment resulting in proper development of seed, which reflected in higher 1000 seed

Table 1 : Effect of growing condition and spacing on 1000 seed weight, germination percentage, root length and shoot length of seed parent of brinjal hybrid PH-9

Treatments	1000 seed weight (g)	Germination (%)	Root length (cm)	Shoot length (cm)
Growing condition (G)				
G_1- Open field condition	2.41	74.7 (59.5)*	9.08	7.92
G_2- Shade house condition	2.84	82.8 (65.6)	9.17	8.04
S.E. ±	0.05	0.7	0.09	0.08
C.D. (P=0.05)	0.14	2.1	NS	NS
Spacing (S)				
S_1- 60 cm×45 cm	2.41	75.2 (60.2)	8.80	7.77
S_2- 60 cm×60 cm	2.75	79.8 (63.5)	9.26	8.03
S_3- 60 cm×75 cm	2.88	82.5 (65.5)	9.30	8.17
S_4- 60 cm×90 cm	2.48	77.5 (61.7)	9.14	7.94
S.E. ±	0.07	1.0	0.13	0.11
C.D. (P=0.05)	0.20	3.0	NS	NS
Interaction (G × S)				
G_1S_1	2.28	71.0 (57.4)	8.9	7.76
G_1S_2	2.47	76.0 (60.7)	9.24	7.95
G_1S_3	2.56	77.7 (61.8)	9.28	8.15
G_1S_4	2.35	74.0 (59.3)	9.10	7.81
G_2S_1	2.53	79.3 (63.0)	8.91	7.78
G_2S_2	3.03	83.7 (66.2)	9.28	8.11
G_2S_3	3.19	87.3 (69.1)	9.31	8.19
G_2S_4	2.60	81.0 (64.1)	9.18	8.07
S.E. ±	0.09	1.4	0.18	0.16
C.D. (P=0.05)	NS	NS	NS	NS

NS=Non-significant
* Figures in the parenthesis are arcsine transformed values

Table 2 : Effect of growing condition and spacing on seedling vigour index, seedling dry weight and electrical conductivity of seed parent of seed leachate of brinjal hybrid PH-9

Treatments	Seedling vigour index	Seedling dry weight (mg)	Electrical conductivity of seed leachate (dSm^{-1})
Growing condition (G)			
G_1- Open field condition	1269	29.67	0.225
G_2- Shade house condition	1426	29.98	0.198
S.E. ±	13	0.14	0.005
C.D. (P=0.05)	40	NS	0.016
Spacing (S)			
S_1- 60 cm×45 cm	1246	28.22	0.242
S_2- 60 cm×60 cm	1380	30.62	0.197
S_3- 60 cm×75 cm	1441	32.16	0.178
S_4- 60 cm×90 cm	1324	28.29	0.228
S.E. ±	19	0.19	0.008
C.D. (P=0.05)	57	0.58	0.023
Interaction (G × S)			
G_1S_1	1168	28.18	0.257
G_1S_2	1303	30.16	0.207
G_1S_3	1354	32.12	0.190
G_1S_4	1251	28.22	0.247
G_2S_1	1323	28.26	0.227
G_2S_2	1457	31.08	0.185
G_2S_3	1529	32.19	0.166
G_2S_4	1397	28.37	0.210
S.E. ±	27	0.27	0.011
C.D. (P=0.05)	NS	NS	NS

NS=Non-significant

weight and other seed quality parameters. Similar results were reported by Kalappa (1982); Dharmatti and Kulkarni (1988); Sharma and Peshin (1994) in bell pepper, Balaraj *et al*. (2002) in chilli (Table 1 and 2).

Higher seed quality parameters such as seed germination, 1000 seed weight, root length, shoot length, seedling vigour index and dry weight of seedling were recorded with the seeds produced under shade house condition at spacing of 60 cm × 75 cm. This may be due to the better development of seeds and more assimilation and translocation of photosynthates from source to sink. Better seed quality attributes with this spacing might be due to better plants nourishment resulting in proper development of seed, which reflected in higher 1000 seed weight and other seed quality parameters. Similar results were reported by Kalappa (1982); Jarmillov and Marin (1978) in tomato, Catedral and Mamicpic (1986) in bitter gourd and Jayaraj *et al*. (1999) in chilli. The hybrid seed production of brinjal can be taken up under shade house condition with spacing of 60 cm × 75 cm with better seed quality traits as compared to open field condition.

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