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EVALUATION OF SEED QUALITY PARAMETERS OF CHILLI CULTIVARS COLLECTED FROM DIFFERENT LOCATIONS OF GUJARAT, INDIA

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Abstract

Chilli seeds of two varieties GVC101 and GVC111 were collected from five different locations *viz*., Anand, Achhaliya, Deesa, Jagudan and Thasara. Seeds were treated with fungicide (Thiram 2.5 g/kg) and sown in nursery and seedling characters were observed. In the nursery experiment, seedling characters were significantly influenced by fungicide treatment, varieties and locations. Seed samples collected from Thasara and Jagudan locations exhibited significantly superior seedling characters, while samples from Achhaliya followed by Anand location manifested poor seedling characters. On the whole, variety GVC111 was better than GVC101 for all the seedling characters. Treatment of seeds with fungicide improved health status of all collected seed samples.

Key words : Seed vigour, seedlings, nursery, fungicide.

Introduction

Chilli is a universal spice of India. India is a major producer, exporter and consumer of chilli. This crop having commercial and therapeutic value, it is grown for its pungent fruits, which are used both green and ripe (in dried form) to impart pungency to the food. Chilli is economically very important for its diverse uses as spice, condiments, vegetables, pickles and sauce. Association of various fungi with seed is certainly harmful causing loss in viability of seed and pre and post-emergence mortality of seedlings. Use of disease free planting material helps in control of seedling mortality in nursery and subsequently maintaining appropriate plant population in field. The seed mycoflora of chilli seeds are responsible for loss in seed viability and seedling mortality in nursery beds. Considering the importance of producing healthy and good quality seedlings, present investigation was carried out.

Materials and Methods

A field experiment was conducted during *kharif* season at the Main Vegetable Research Station, Anand. A total of 500 seed from each sample were sown in nursery beds with fungicide treatment and without fungicide treatment as control in separate nursery beds. Required quantities of seeds were treated with Thiram (2.5 g/kg). Seeds were treated with fungicide just before sowing by mixing the fungicide with seeds manually.

Germination percentage was calculated by simply counting germinated seedlings in each bed. Speed of seedling emergence was calculated by using formula:

$$\text{Speed of seedling emergence} = \frac{\text{No. of seedling (1}^{st}\text{ count)}}{\text{Days to 1}^{st}\text{ count}} + \frac{\text{No. of seedlings (2}^{nd}\text{ count)}}{\text{Days to 2}^{nd}\text{ count}} + \frac{\text{No. of seedlings (3}^{rd}\text{ count)}}{\text{Days to 3}^{rd}\text{ count}}$$

Shoot length (cm) at 35 DAS : Ten normal seedlings were taken randomly from each replication for measuring the shoot length. The length between the collar region and the tip of the shoot was measured in cm and then mean value was calculated.

Root length (cm) at 35 DAS : The same ten seedlings used for shoot length measurement were also used for root length measurement. The length between the collar region and the tip of the primary root was measured in cm. The mean value was then calculated.

Fresh shoot weight of 10 seedlings (g) at 35 DAS : Fresh shoot weight of ten randomly selected seedlings was recorded in gram at 35 days after sowing and mean value was calculated. Weight was taken

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simultaneously so as to prevent moisture loss due to evaporation and transpiration.

Dry shoot weight of 10 seedlings (g) 35 DAS : Ten normal seedlings used for measuring shoot length (cm) and root length (cm) were taken in butter paper and dried in a hot air oven, maintained at 60°C temperature for 24 hour. Then the seedlings were removed and allowed to cool in desiccators for 30 minutes before weighing in an electronic balance. The mean value was calculated and expressed as dry shoot weight in gram.

Vigour index : The vigour index (VI) was calculated by adopting the method suggested by Abdul-Baki and Anderson (1973) and was expressed as number.

Vigour index (VI) = Germination (%) × (root length + shoot length).

Number of transplantable seedlings at 35 DAS: Number of transplantable seedlings was recorded at 35 DAS by counting normal transplantable seedlings. Number of diseased seedlings was measured by counting total number of infected seedlings in each bed. Percent disease incidence was calculated by using formula:

$$\text{PDI} = \frac{\text{No. of infected seedlings}}{\text{Total no. of seedlings observed in each bed}} \times 100$$

Percent disease index of disease was recorded by randomly selected ten seedlings from each bed at the appearance of disease. From each seedlings three leaves were selected. Total 30 leaves were observed from one bed and categorized into different scales on the basis of leaf area affected (Mayee and Datar, 1986). Following rating scale was employed to record the disease index.

Disease rating scale

0 = No disease

1 = < 1 % leaf area affected

3 = 1 to 10% leaf area affected

5 = 11 to 25% leaf area affected

7 = 26 to 50% leaf area affected

9 = >50 % leaf area affected

The PDI was calculated with the above scales using the formula given by Wheeler (1969).

$$\text{Percent Disease Index} = \frac{\text{Sum of all individual ratings}}{\text{Total no. of plants observed} \times \text{Maximum rating scale}} \times 100$$

Results and Discussion

Data exhibited in table1 revealed that fungicide treatment improved germination percentage (50). Among five locations, the highest germination percentage was observed in seed sample of Jagudan location (54.9) followed by seed sample of Thasara location (51.9). Lowest germination percentage was observed in Achhaliya location (25.8). With in the varieties, it was higher in seed sample of GVC111 (47.8%) as compared to GVC101. Significantly higher rate of seedling emergence was noticed in fungicide treated seeds (46.44), variety GVC111 (45.15) and seed sample collected from Jagudan location (53.32), next in order being Thasara location (49.95). The seed borne fungi were found responsible for poor vigour and low seedling emergence in the nursery. The seedling emergence in seed sample might be low due to proliferation of pathogenic fungal species on germinating seedlings and resulting in seed and seedling death. Similar results were earlier reported by Singh and Maheshwari (2002). Shoot length was noticed significantly higher in fungicide treated seeds (8.25cm) and in variety GVC 111 (8.33cm). Seeds from Thasara location exhibited significantly superior quality by recording significantly higher shoot length (9.99 cm) than those from other locations and it was followed by Jagudan location (8.27 cm). Similar findings were noticed by Mathur *et al*. (1975), who reported that sowing seeds infected by fungi, showed shoots appearing highly blighted and shoot length was greatly affected.

Root length in fungicide treated seeds was significantly higher (6.29 cm). Variety GVC111 (6.36 cm) was also found significantly superior to this trait. Seeds from Thasara location, recorded significantly higher root length (8.05 cm) followed by Jagudan location (6.27 cm). Significant interactions were noticed between fungicide treatment and locations. There was less root length in untreated seeds because associated fungi might have affected root elongation by production of toxic substances and this was in confirmation with findings of Adiver *et al*. (1987) and Nishikawa *et al*. (2006). Fresh shoot weight was significantly higher in fungicide treated seeds (4.13 g) and variety GVC111 (4.05 g). Among all five locations, Thasara location exhibited significantly highest fresh shoot weight (4.88 g) followed by Jagudan location (4.37 g). There was significantly highest dry shoot weight in Thasara sample (0.81 g) followed by Jagudan location (0.75 g), but significant differences were not found due to varieties and fungicide treatments. In fungicide treated seeds, vigour index was significantly higher (722.1). It was also significantly higher in variety GVC111 (702.3). Seeds from Thasara location were found to be superior and recorded maximum vigour (937.5) followed by Jagudan location (798.3). There were significant interactions between locations and varieties for seed

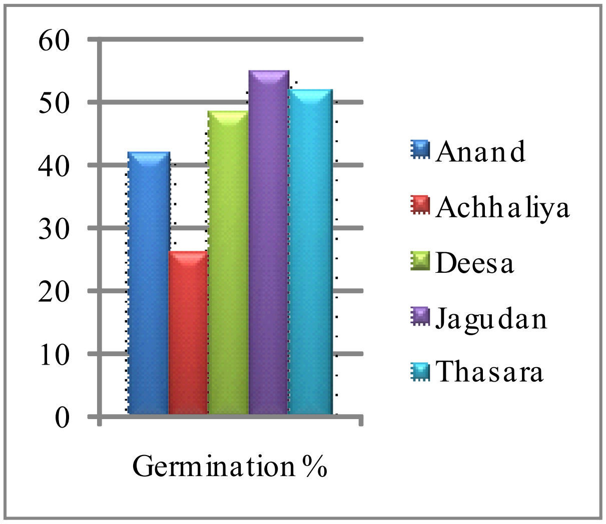

Fig. 1 : Influence of different locations on germination % of chilli seeds.

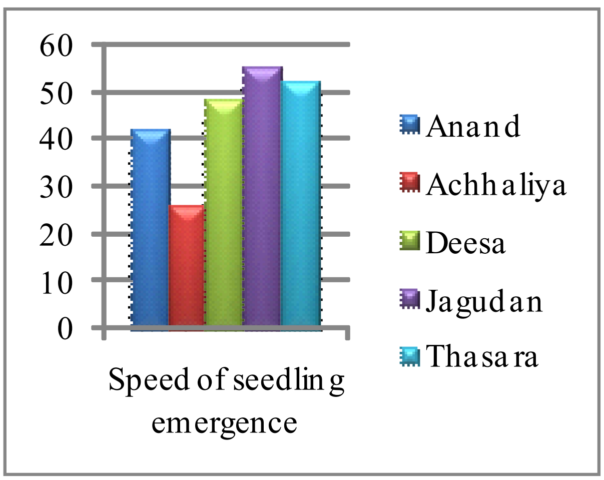

Fig. 2 : Influence of different locations on speed of seedling emergence.

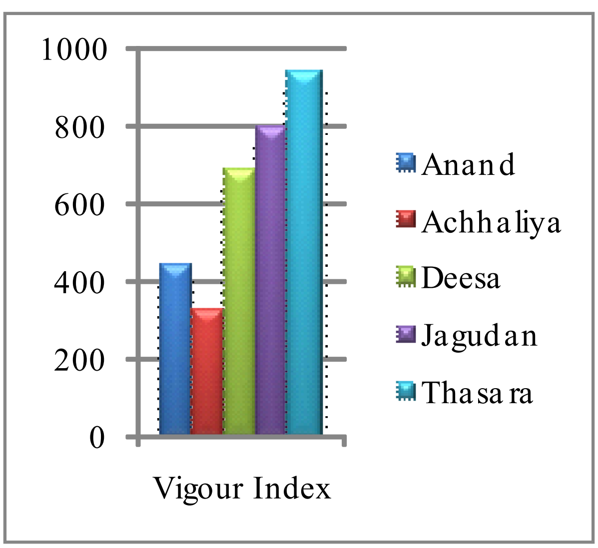

Fig. 3 : Influence of different locations on vigour index of chilli seeds.

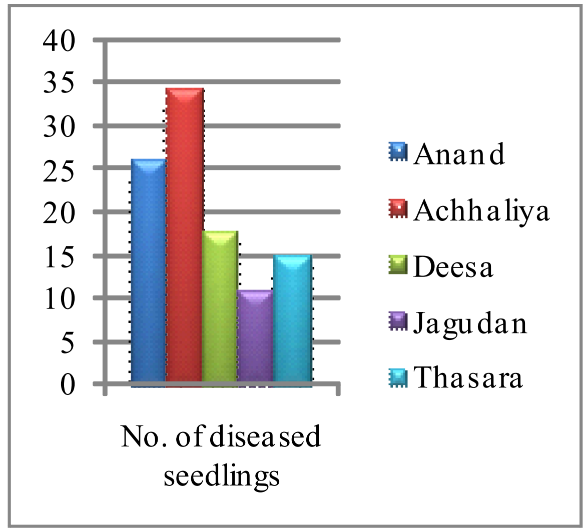

Fig. 4 : Influence of different locations on no. of diseased seedlings

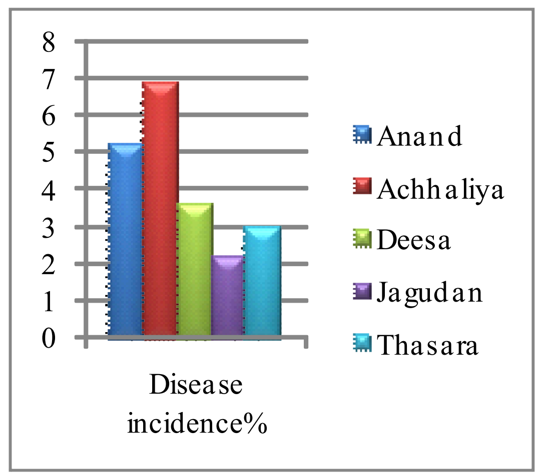

Fig. 5 : Influence of different locations on disease incidence % of chilli seeds.

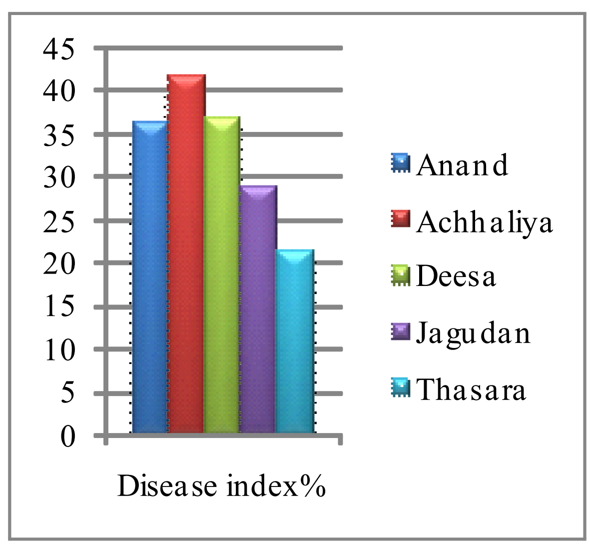

Fig. 6 : Influence of different locations on disease index % of chilli seeds.

Table 1 : Evaluation of seed quality parameters.

Treatments		Germination %	Speed of seedling emergence	Shoot length (cm) at 35 DAS	Root length(cm) at 35 DAS	Fresh shoot weight (g)	Dry shoot weight (g)	Vigour index	No. of transplantable seedlings/ plot	No. of diseased seedlings	Disease incidence (%)	Disease index (%)
Fungicide												
F_0	Untreated	41	38.10	7.76	5.78	3.75	0.65	555.0	199.7	28.60	5.72	41.66
F_1	Treated	50	46.44	8.25	6.29	4.13	0.70	722.1	242.9	12.90	2.58	24.33
S. Em.± 0.70		0.61	0.08	0.03	0.04	0.01	10.09	3.48	0.62	0.12	0.30	
CD (P=0.05)		2.15	1.76	0.24	0.10	1.22	NS	28.91	9.97	1.80	0.36	0.88
Varieties												
V_1	GVC101	43	39.38	7.68	5.71	3.83	0.66	574.8	208.7	208.7	4.74	35.38
V_2	GVC111	47.8	45.15	8.33	6.36	4.05	0.69	702.3	233.9	233.9	3.56	30.61
S. Em.± 0.70		0.61	0.08	0.03	0.04	0.01	10.09	3.48	0.62	0.62	0.30	
CD (P=0.05)		2.15	1.76	0.24	0.10	1.22	NS	28.91	9.97	1.80	1.80	0.88
Locations												
L_1	Anand	41.8	39.80	6.23	4.25	3.22	0.51	438.5	206.6	26.00	5.20	36.34
L_2	Achhaliya	25.8	23.11	7.42	5.46	3.44	0.61	333.5	128.4	34.25	6.85	41.83
L_3	Deesa	48.1	45.16	8.10	6.14	3.78	0.70	684.9	240.5	17.75	3.55	36.72
L_4	Jagudan	54.9	53.32	8.27	6.27	4.37	0.75	798.3	273.2	11.00	2.20	28.79
L_5	Thasara	51.9	49.95	9.99	8.05	4.88	0.81	937.5	257.7	14.75	2.95	21.30
S. Em.± 1.20		0.97	0.13	0.05	0.06	0.02	15.96	5.50	0.99	0.19	0.48	
CD (P=0.05)		3.67	2.78	0.38	0.16	0.19	0.06	45.71	15.77	2.85	0.57	1.39
Significant interactions		-	-	-	F X L VXL	-	-	F X L	-	F X V F X L	F X V F X L	F X L FXVXL
CV % 10.93		7.97	5.87	3.40	5.96	10.93	8.65	8.61	16.61	16.61	5.10	

vigour. The common and dominant seed borne fungi were found to be inhibitory for seed germination and caused great loss in seedling vigour. This was in confirmation with findings of Pathania and Chandel (2004), Singh and Maheshwari (2002) and Telang (2010).Total number of transplantable seedlings were significantly higher in fungicide treated seeds (242.9) and variety GVC111 (233.9). Sample from Jagudan location (273.2) recorded more number of transplantable seedlings, next in order being Thasara location (257.7). There was lower germination in untreated seeds because of the presence of seed borne mycoflora. Similar results were earlier reported by Suraynarayana and Bhombe (1961), Lalithakumari *et al*. (1974) and Dhawale and Kodmelwer (1978). Fungicide treatment improved germination of chilli seeds. This was in confirmation with findings of Solanke *et al.* (2001). It was observed from data exhibited in Table1 that fungicide treated seeds improved seed health and manifested significantly lower number of diseased seedlings (12.90). Between two varieties, GVC111 (17.80) was found better for this trait. Among the locations, sample from Jagudan location showed superior seed health and significantly lowest number of diseased seedlings (11.00) recorded in this location followed by Thasara location (14.75). Interaction effects of varieties and fungicide treatment were found significant. The seed mycoflora of chilli seeds were responsible for loss in seed viability and seedling mortality in nursery beds. This was in confirmation with findings of Singh and Maheshwari (2002). Numbers of diseased seedlings were reduced in fungicide treated seeds. Similar results were earlier reported by Mesta (1996). Disease incidence was significantly lower in fungicide treated seeds (2.58 %) and variety GVC101 (4.74%). Sample from Jagudan location recorded significantly lowest disease incidence (2.20%), followed by Thasara location (2.95). Interaction effect of varieties with fungicide treatment was found significant. Fungicide treatment was effective in control of disease incidence and this was in confirmation with findings of Jharia *et al.* (1977). Disease index was also found significantly lower in fungicide treated seeds (24.33). Between two varieties, it was lower in GVC111 (30.61). Sample from Thasara location recorded significantly lowest disease index (21.30 %) than rest of the locations. This was followed by sample from Jagudan location (28.79). There was significant interaction effect of locations with fungicide treatment. Treatment of chilli seeds with effective fungicide reduced spread of disease. This was in confirmation with findings of Hegde (1998).

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