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Effect of Provenance and Seed Treatments on Occurrence of Seed Borne Diseases and Storability of Groundnut (*Arachis hypogaea* L.)

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A B S T R A C T

The laboratory experiment was conducted during 2017-18 to know the effect of provenance and seed treatments on occurrence of seed borne diseases and storability of groundnut (*Arachis hypogaea* L.). Groundnut varieties *viz*., TAG-24, G2-52, collected from different locations of Bagalkot, Dharwad and Belagavi districts, collected seed samples was stored in HDPE bags in Department of Seed Science and Technology, College of Agriculture, Vijayapur. The study exhibited that the untreated seeds lost its viability at a faster rate than the treated seeds. Among the seeds treatments, Captan 70 % + Hexaconazole 5 % (TAQAT 75 WP) @ 3g / kg treated seeds stored better up to ten months as compared to other treatments and control. The per cent infection due to interaction of provenance and seed treatments at the end of the storage was highest (13.06 %) observed in Yedahalli location with control and lowest (5.50 %) was seen in in Budihal location with Captan 70 % + Hexaconazole 5 % (TAQAT 75 WP) @ 3g / kg. The seed germination percentage due to interaction of infection level and seed treatments at the end of the storage was highest (80.00 %) in Budihal location with Captan 70 % + Hexaconazole 5 % (TAQAT 75 WP) @ 3g / kg and lowest (55.30 %) was recorded in Yedahalli location with control. This may be due to load of the pathogens during seed development and maturation consistent high humidity and temperature during storage period. The Other seed quality parameters were also recorded similar trend during the storage.

Introduction

Groundnut (*Arachis hypogaea* L.) is one of the important oilseed crops of the world. It belongs to the family Fabaceae. It is the world's fourth most important source of edible oil and the third important source of vegetable protein. In India groundnut is largely grown in *kharif, rabi* and summer seasons. In India, it is spread in an area of 4.76 million hectares with production of 7.4 million tonnes and average productivity of 1555 kg ha^{-1}. In Karnataka, it is grown in an area of 0.64 million ha with production of 0.51 million tonnes and average productivity of 796 kg ha^{-1} (Anon., 2016).

Location of seed production is one important factor for occurrence of seed borne pathogens. The agro-ecological conditions comprising of edaphic and environmental factor have more

than one effect on the performance of the seed apart from its genetic makeup. The fungi like *Aspergillus niger*, *A. flavus* manifests seed discoloration, rotting, seed necrosis, loss in germination capacity and toxification in oil seeds (Kakde and Chavan, 2011). Quality seed plays a very important role for the production of healthy crop. Healthy and pathogen free seeds are the basic requirements for disease free crop. Seeds are stored for a considerable period of time in order to catch the correct season. Seed treatment with bioagents and fungicides is an economical and viable approach to protect seed and seedlings from attack of the pathogens. Management of seed borne pathogens requires both preventive and curative approaches starting from sowing and harvesting to processing and storage. Seed treatment with fungicide is simple, cheap and effective method for control of seed borne diseases and also, it is a known fact that the choice of chemicals for seed treatment also exerts a positive effect on seed viability and vigour during storage. Hence an attempt has been made to know the effect of provenance and seed treatments on occurrence of seed borne diseases and storability of groundnut.

Materials and Methods

Groundnut varieties *viz*., TAG-24, G2-52 collected from different locations of Bagalkot, Dharwad and Belagavi district. Collected seeds kept for storage up to ten months in HDPE bags. The treatment combinations comprised of T_1: control (Untreated), T_2: Carbendazim 50 WP @ 3gm / kg, T_3: Seed treatment Captan 70 % + Hexaconazole 5 % (TAQAT 75 WP) @ 3g / kg, T_4: Seed treatment *Trichoderma harzianum* @ 10g / kg. The treated seed samples were stored under ambient conditions at Department of Seed Science and Technology, College of Agriculture, Vijayapur. The efficacy of seed treatments were assessed every month during the storage. Monthly observations on the per cent infections and other seed quality parameters were recorded upto ten months by adopting ISTA procedure (Anon., 2014). The per cent infection of seed lots was determined by standard blotter paper method. Ten seeds in four replications were placed equidistantly on three layered sterile blotter paper moistened with 0.2 per cent 2, 4-D solution in sterile petri plates under aseptic condition and incubated at 20 ± 2 ºC for 7 days with alternate cycle of 12 hours in near ultraviolet light range and for the remaining 12 hours in dark. On the eighth day, the seeds were being examined for presence of fungal infection. The number of infected seeds was counted and the mean value was expressed in percentage. The data obtained on effect of seed treatments on seed quality were statistically analyzed by using factorial CRD. The critical differences between the treatments were worked out at one per cent significance (Sundararaj *et al.*, 1972).

Results and Discussion

Effects of provenance

The results of the present investigation indicated that variation in per cent seed infection was observed due to provenance effect and efficacy of different seed treatments (Table 1). The higher seed infection per cent (8.15 %) was recorded with Yedahalli location of Bagalkot district, whereas, lowest was seen in Budihal location (4.25 %) of Belagavi district at the beginning of storage period. At the end of storage period, highest per cent seed infection (11.60 %) was observed in Yedahalli location of Bagalkot district, whereas, lowest infection (7.14 %) was seen in Budihal. Similar findings were reported by Nivedita Roy (2013). The higher seed infection per cent of the seed lots produced at Bagalkot might be due to consistent high temperature (37.1-39.8 ºC) and humid climate (72.4-76.4 % RH) during crop growing period.

Table.1 Influence of provenance and seed treatments on per cent seed infection of groundnut during storage

Treatment	Months of storage										
	Initial	1	2	3	4	5	6	7	8	9	10
Location											
L_1	5.82	6.17	6.04	7.71	7.14	7.53	7.83	8.31	8.64	8.97	9.13
L_2	5.28	5.28	5.13	6.25	6.32	6.70	6.90	7.36	7.77	8.14	8.61
L_3	6.75	6.99	6.97	7.49	8.03	8.43	8.63	8.96	9.22	9.49	9.79
L_4	8.15	8.68	8.57	8.78	9.79	10.21	10.49	10.83	11.17	11.43	11.60
L_5	4.99	5.13	5.01	6.25	5.93	6.33	6.42	6.82	6.99	7.29	7.59
L_6	4.25	4.47	4.14	5.21	5.32	5.74	5.78	6.07	6.44	6.86	7.14
S.Em.±	1.29	1.36	2.19	1.33	1.36	1.37	1.35	1.40	1.40	1.44	1.45
C.D. (0.01)	4.91	5.15	7.04	5.05	5.17	5.20	5.12	5.33	5.31	5.48	5.50
Fungicides											
T_1	13.73	12.70	11.55	12.14	11.96	11.87	11.49	11.12	11.11	11.10	11.09
T_2	2.27	2.95	3.13	5.05	5.17	5.20	5.56	6.39	6.99	7.44	8.05
T_3	1.48	1.88	2.19	2.33	2.44	3.46	4.77	5.36	5.78	6.34	6.96
T_4	6.01	6.94	7.04	3.97	4.34	4.84	8.88	9.36	10.01	10.41	10.94
S.Em.±	1.05	1.11	1.08	0.81	0.85	0.92	1.10	1.14	1.14	1.18	1.32
C.D. (0.01)	4.01	4.21	4.11	3.06	3.24	3.50	4.18	4.35	4.34	4.47	4.99
Interactions											
L_1T_1	13.44	13.00	11.66	12.50	12.28	12.17	11.95	11.55	11.22	10.84	10.44
L_2T_1	12.78	10.38	9.50	10.89	10.72	10.61	10.39	9.94	9.56	9.22	8.83
L_3T_1	15.89	15.78	14.28	14.56	14.34	14.17	13.11	12.61	12.28	11.89	11.56
L_4T_1	17.50	16.72	15.90	15.28	15.06	14.95	15.11	14.45	14.11	13.67	13.06
L_5T_1	11.61	11.34	9.44	9.89	9.72	9.61	9.33	9.61	8.78	8.50	7.94
L_6T_1	11.16	11.22	8.56	9.72	9.67	9.72	9.06	8.56	8.28	8.34	7.89
L_1T_2	2.22	5.45	3.11	3.83	4.11	4.61	5.50	6.56	7.22	7.72	8.50
L_2T_2	1.94	5.22	2.56	3.45	3.67	4.11	4.83	5.56	6.17	6.72	7.39
L_3T_2	2.50	4.11	3.28	4.00	4.39	4.94	5.89	6.83	7.50	7.72	8.22
L_4T_2	3.89	6.62	5.28	6.39	6.95	7.50	8.33	9.22	9.78	10.22	10.84
L_5T_2	1.94	2.45	2.78	3.56	4.00	4.50	4.72	5.45	6.00	6.44	7.06
L_6T_2	1.12	1.61	1.78	2.56	2.89	3.39	4.06	4.72	5.28	5.78	6.28
L_1T_3	1.12	2.22	1.94	2.61	3.17	3.78	4.67	5.61	5.94	6.50	7.06
L_2T_3	1.12	2.22	1.88	2.28	2.89	3.39	4.06	4.83	5.50	6.06	6.95
L_3T_3	1.94	1.89	2.22	3.11	3.94	4.45	5.06	5.50	5.94	6.56	7.06
L_4T_3	3.05	3.22	4.06	5.00	6.11	6.67	7.45	8.11	8.28	8.94	9.50
L_5T_3	1.12	1.61	1.83	2.06	2.78	3.22	3.78	4.00	4.44	4.95	5.72
L_6T_3	0.56	0.78	1.17	1.83	2.56	3.00	3.61	4.11	4.56	5.06	5.50
L_1T_4	6.50	6.62	7.45	8.22	9.00	9.56	9.22	9.50	10.17	10.83	11.39
L_2T_4	5.28	6.16	6.55	7.67	8.00	8.67	8.33	9.11	9.83	10.56	11.28
L_3T_4	6.66	6.50	8.11	9.06	9.44	10.17	10.45	10.89	11.17	11.78	12.34
L_4T_4	8.17	8.01	9.06	10.56	11.06	11.72	11.06	11.56	12.50	12.89	13.00
L_5T_4	5.28	5.67	6.01	6.72	7.22	8.00	7.84	8.22	8.72	9.28	9.61
L_6T_4	4.17	5.12	5.06	5.78	6.17	6.83	6.39	6.89	7.67	8.28	8.89
Mean	5.87	6.39	5.98	6.73	7.09	7.49	7.67	8.06	8.37	8.70	9.01
S.Em.±	2.58	2.71	2.65	2.65	2.72	2.74	2.69	2.80	2.79	2.89	2.89
C.D. (0.01)	9.82	10.31	10.06	10.09	10.34	10.41	10.24	10.66	10.81	10.96	10.99

Note: Locations: L_1= Mulmuttal L_2= Narendra L_3= Ambaljeri L_4=Yedahalli L_5=Belavadi L_6=Budihal
Seed treatments: T_1 = Control T_2= Treated with Carbendazim 50WP @ 2g/kg T_3 = Treated with TAQAT (Captan 70 % + Hexaconazole 5 %) 3gm/kg T_4 = Treated with *Trichoderma* spp. @ 10gm/kg.

Table.2 Influences of provenance and seed treatments on seed germination per cent of groundnut during storage

Treatment	Storage months										
	Initial	1	2	3	4	5	6	7	8	9	10
Location											
L_1	90.00* (71.57)	89.50 (71.09)	88.42 (70.11)	87.25 (69.08)	86.25 (68.23)	84.92 (67.15)	82.02 (64.91)	80.25 (63.61)	77.17 (61.46)	73.58 (59.07)	70.00 (56.79)
L_2	90.33 (71.88)	89.33 (70.93)	88.50 (70.18)	87.17 (69.01)	86.17 (68.17)	84.75 (67.01)	81.21 (64.31)	79.75 (63.26)	77.50 (61.68)	73.83 (59.23)	70.42 (57.05)
L_3	89.42 (71.02)	88.67 (70.33)	87.92 (69.660	86.83 (68.72)	85.83 (67.89)	84.00 (66.42)	80.25 (63.61)	78.67 (62.49)	74.92 (59.95)	71.25 (57.58)	68.75 (56.01)
L_4	88.92 (70.56)	88.25 (69.95)	87.42 (69.23)	86.17 (68.17)	85.08 (67.28)	83.08 (65.71)	79.42 (63.02)	78.00 (62.03)	74.58 (59.72)	70.25 (56.95)	67.42 (55.19)
L_5	91.67 (73.22)	90.50 (72.05)	89.42 (71.02)	88.42 (70.11)	87.42 (69.23)	85.83 (67.89)	83.00 (65.65)	81.42 (64.47)	78.67 (62.49)	75.25 (60.17)	72.25 (58.21)
L_6	92.50 (74.11)	91.33 (72.88)	89.83 (71.40)	88.75 (70.40)	87.42 (69.23)	86.33 (68.30)	84.03 (66.45)	82.92 (65.59)	80.42 (63.74)	76.92 (61.29)	73.75 (59.18)
S.Em.±	0.41	0.25	0.22	0.25	0.29	0.24	0.34	0.43	0.58	0.49	0.63
C.D. (0.01)	1.55	0.95	0.83	0.96	1.10	0.90	1.27	1.65	2.21	1.88	2.39
Fungicides											
T_1	90.28 (71.83)	89.22 (70.83)	87.89 (69.64)	86.61 (68.54)	85.33 (67.48)	83.39 (65.95)	79.70 (63.22)	76.17 (60.78)	69.83 (56.68)	65.56 (54.07)	60.22 (50.90)
T_2	90.44 (71.99)	89.78 (71.36)	88.83 (70.48)	87.61 (69.39)	86.56 (68.49)	85.06 (67.26)	82.03 (64.92)	80.72 (63.95)	79.50 (63.08)	76.78 (61.19)	74.61 (59.74)
T_3	91.06 (72.60)	90.22 (71.78)	88.89 (70.53)	87.72 (69.49)	86.94 (68.81)	85.78 (67.85)	83.67 (66.17)	83.28 (65.86)	81.78 (64.73)	79.94 (63.39)	78.44 (62.33)
T_4	90.11 (71.67)	89.17 (70.79)	88.72 (70.38)	87.78 (69.54)	86.61 (68.54)	85.06 (67.26)	81.22 (64.32)	80.50 (63.79)	77.72 (61.83)	71.78 (57.91)	68.44 (55.82)
S.Em.±	0.33	0.20	0.18	0.21	0.24	0.19	0.27	0.35	0.47	0.40	0.51
C.D. (0.01)	1.26	0.77	0.68	0.78	0.90	0.74	1.04	1.35	1.80	1.54	1.95

Cont…

Interactions											
L_1T_1	89.30 (70.91)	89.00 (70.63)	87.70 (69.47)	86.70 (68.61)	85.70 (67.78)	83.30 (65.88)	80.30 (63.65)	75.30 (60.20)	68.00 (55.55)	64.00 (53.13)	59.30 (50.36)
L_2T_1	90.00 (71.57)	(89.70) (71.28)	88.00 (69.73)	86.70 (68.61)	85.30 (67.46)	83.70 (66.19)	80.30 (63.65)	74.70 (59.80)	70.00 (56.79)	64.70 (53.55)	59.30 (50.36)
L_3T_1	89.00 (70.63)	88.00 (69.73)	87.00 (68.87)	85.30 (67.46)	84.00 (66.42)	82.30 (65.12)	79.00 (62.73)	73.30 (58.89)	65.30 (53.91)	61.30 (51.53)	57.30 (49.20)
L_4T_1	88.70 (70.36)	87.30 (69.12)	86.30 (68.28)	85.00 (67.21)	83.70 (66.19)	81.00 (64.16)	78.00 (62.03)	73.70 (59.15)	65.00 (53.73)	60.70 (51.18)	55.30 (48.04)
L_5T_1	91.30 (72.85)	90.00 (71.57)	89.00 (70.63)	88.00 (69.73)	87.00 (68.87)	85.30 (67.46)	81.30 (64.38)	79.30 (62.94)	74.70 (59.80)	70.70 (57.23)	64.00 (53.13)
L_6T_1	93.30 (75.00)	91.30 (72.85)	89.30 (70.91)	88.00 (69.73)	86.30 (68.28)	84.70 (66.97)	82.30 (65.12)	80.70 (63.94)	76.00 (60.67)	72.00 (58.05)	66.00 (54.33)
L_1T_2	90.70 (72.24)	90.00 (71.57)	89.00 (70.63)	87.30 (69.12)	86.30 (68.28)	85.30 (67.46)	82.30 (65.12)	80.70 (63.94)	80.00 (63.43)	77.70 (61.82)	74.30 (59.54)
L_2T_2	90.70 (72.24)	89.30 (70.91)	88.70 (70.36)	87.00 (68.870	86.00 (68.03)	84.70 (66.97)	82.30 (65.12)	80.70 (63.94)	80.30 (63.65)	77.70 (61.82)	73.70 (59.15)
L_3T_2	89.30 (70.91)	89.00 (70.63)	88.30 (70.00)	87.30 (69.12)	86.30 (68.28)	84.30 (66.66)	81.70 (64.67)	79.30 (62.94)	77.30 (61.55)	74.00 (59.34)	72.30 (58.24)
L_4T_2	88.70 (70.36)	88.30 (70.00)	87.30 (69.12)	86.30 (68.28)	85.00 (67.21)	83.00 (65.65)	80.30 (63.65)	78.30 (62.24)	78.00 (62.03)	73.30 (58.89)	71.30 (57.61)
L_5T_2	92.00 (73.570	90.70 (72.24)	89.70 (71.28)	88.70 (70.36)	87.70 (69.47)	86.00 (68.03)	83.00 (65.65)	82.00 (64.90)	79.70 (63.22)	78.30 (62.24)	77.70 (61.82)
L_6T_2	92.00 (73.57)	91.30 (72.85)	90.00 (71.57)	89.00 (70.63)	88.00 (69.73)	87.00 (68.87)	84.00 (66.42)	83.30 (65.88)	81.70 (64.67)	79.70 (63.22)	78.30 (62.24)
L_1T_3	90.70 (72.24)	90.00 (71.57)	88.70 (70.36)	87.70 (69.47)	86.70 (68.61)	85.70 (67.78)	83.70 (66.19)	83.70 (66.19)	82.30 (65.12)	81.00 (64.16)	79.30 (62.94)
L_2T_3	90.00 (71.57)	89.70 (71.28)	89.00 (70.63)	87.70 (69.47)	87.00 (68.87)	85.70 967.78)	84.00 (66.42)	83.30 (65.88)	82.00 (64.90)	80.70 (63.94)	79.00 (62.73)
L_3T_3	89.70 (71.28)	89.30 (70.91)	88.30 (70.00)	87.70 (69.47)	87.00 (68.87)	85.30 (67.46)	83.30 (65.88)	82.30 (65.12)	80.70 (63.94)	79.00 (62.73)	77.30 (61.55)
L_4T_3	89.30 (70.91)	89.00 (70.63)	88.00 (69.73)	86.30 (68.28)	85.70 (67.78)	84.70 (66.97)	82.30 (65.12)	81.70 (64.67)	80.00 (63.43)	78.30 (62.24)	77.00 (61.34)
L_5T_3	92.70 (74.32)	91.30 (72.85)	89.30 (70.91)	88.30 (70.00)	87.70 (69.47)	86.30 (68.28)	83.70 (66.19)	83.70 (66.19)	82.00 (64.90)	79.30 (62.94)	78.00 (62.03)
L_6T_3	94.00 (75.82)	92.00 (73.57)	90.00 (71.57)	88.70 (70.36)	87.70 (69.47)	87.00 (68.87)	84.70 (66.97)	85.00 (67.21)	83.70 (66.19)	81.30 (64.38)	80.00 (63.43)
L_1T_4	89.30 (70.91)	89.00 (70.63)	88.30 (70.000	87.30 (69.12)	86.30 (68.28)	85.30 (67.46)	83.00 (65.65)	81.30 (64.38)	78.30 (62.24)	71.70 (57.86)	67.00 (54.94)
L_2T_4	90.70 (72.24)	88.70 (70.36)	88.30 (70.00)	87.30 (69.12)	86.30 (68.28)	85.00 (67.21)	81.70 (64.67)	80.30 (63.65)	77.70 (61.82)	72.30 (58.24)	69.70 (56.60)
L_3T_4	89.70 (71.28)	88.30 (70.00)	88.00 (69.73)	87.00 (68.87)	86.00 (68.03)	84.00 (66.42)	81.00 (64.16)	79.70 (63.22)	76.30 (60.87)	70.70 (57.23)	68.00 (55.55)
L_4T_4	89.70 (71.28)	88.30 (70.00)	88.00 (69.73)	87.00 (68.87)	86.00 (68.03)	83.70 (66.19)	81.00 (64.16)	78.30 (62.24)	75.30 (60.20)	68.70 (55.98)	66.00 (54.33)
L_5T_4	90.70 (72.24)	90.00 (71.57)	89.70 (71.28)	88.70 (70.36)	87.30 (69.12)	85.70 (67.78)	82.70 (65.42)	80.70 (63.94)	78.30 (62.24)	72.70 (58.50)	69.30 (56.35)
L_6T_4	90.70 (72.24)	90.70 (72.24)	90.00 (71.57)	89.30 (70.91)	87.70 969.47)	86.70 (68.61)	83.70 (66.19)	82.70 (65.42)	80.30 (63.65)	74.70 (59.80)	70.70 (57.23)
Mean	90.50 (72.05)	89.60 (71.19)	88.60 (70.27)	87.40 (69.21)	86.40 (68.36)	84.80 (67.05)	82.10 (64.97)	80.20 (63.58)	77.20 (61.48)	73.50 (59.02)	70.40 (57.04)
S.Em.±	0.82	0.50	0.44	0.51	0.58	0.47	0.67	0.87	1.16	0.99	1.2
C.D. (0.01	3.10	1.89	1.67	1.92	2.21	1.80	2.55	3.30	4.42	3.76	4.77

*Note: Figures inside parenthesis indicate arcsine values

Table.3 Influence of provenance and seed treatments on test weight (g) of Groundnut during storage

Treatment	Storage months										
	Initial	1	2	3	4	5	6	7	8	9	10
Location											
L_1	43.80	43.70	43.40	43.00	42.20	41.60	40.70	39.60	39.20	38.20	37.60
L_2	43.60	43.80	43.70	42.40	42.20	41.10	40.10	39.70	39.00	38.60	37.70
L_3	43.60	43.20	43.20	42.80	42.30	40.90	40.40	39.50	39.30	37.90	37.70
L_4	43.30	43.20	43.00	42.50	41.70	40.60	40.20	39.50	39.20	38.00	37.50
L_5	43.70	43.40	43.60	42.80	41.80	41.20	40.70	39.90	39.70	38.60	37.80
L_6	44.30	43.40	43.00	42.30	42.00	41.00	40.60	40.00	39.90	38.70	38.40
S.Em.+	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.30	0.20	0.20	0.40
C.D. (0.01)	1.00	1.10	1.10	1.00	1.00	0.90	0.90	0.90	0.80	0.60	1.60
Fungicides											
T_1	43.30	43.20	43.00	42.60	42.00	40.50	39.90	39.10	38.60	37.10	36.20
T_2	43.40	43.50	42.90	42.30	41.90	41.00	40.90	39.50	39.10	37.80	38.20
T_3	44.10	43.70	43.40	42.90	42.40	42.00	40.90	40.40	40.00	39.60	38.90
T_4	43.80	43.50	43.10	42.70	41.80	40.80	40.20	40.10	39.80	38.10	37.30
S.Em.+	0.30	0.40	0.40	0.30	0.30	0.30	0.30	0.30	0.30	0.20	0.50
C.D. (0.01)	1.20	1.30	1.40	1.30	1.20	1.10	1.10	1.20	1.00	0.70	2.00
Interactions											
L_1T_1	43.80	43.00	42.80	42.70	42.20	41.70	40.00	39.00	37.70	37.20	36.30
L_2T_1	43.90	43.60	43.20	42.60	41.30	40.70	40.00	39.40	39.10	38.20	36.60
L_3T_1	44.40	43.10	42.90	41.80	40.80	40.30	39.30	39.10	38.40	37.50	36.60
L_4T_1	43.00	43.10	43.00	42.70	41.80	39.80	39.70	39.10	38.80	37.20	36.00
L_5T_1	45.10	43.90	43.70	43.20	42.20	40.40	40.00	39.00	38.90	38.20	36.50
L_6T_1	44.50	42.90	42.70	41.80	41.70	40.30	40.10	39.60	39.00	38.00	37.00
L_1T_2	44.40	44.10	43.70	43.00	42.00	41.80	40.70	39.30	38.70	37.90	38.00
L_2T_2	43.00	42.90	42.60	42.60	42.30	41.30	40.50	39.60	39.00	38.10	37.80
L_3T_2	43.90	43.00	42.80	41.70	41.90	41.60	41.00	39.20	39.00	37.20	37.90
L_4T_2	43.40	43.00	42.80	42.20	41.30	40.90	40.80	39.60	39.30	37.70	37.60
L_5T_2	43.20	43.10	42.70	42.30	41.30	40.30	41.00	39.70	39.10	38.00	38.70
L_6T_2	43.80	43.20	42.60	42.20	41.30	40.70	40.20	39.60	39.10	38.60	38.00
L_1T_3	44.10	43.40	43.10	42.50	42.20	41.70	40.30	40.80	40.10	39.30	37.90
L_2T_3	43.80	43.20	42.70	42.30	42.10	41.20	40.30	40.00	39.50	39.30	38.90
L_3T_3	44.10	43.70	43.10	42.90	42.50	42.00	41.10	39.80	39.50	39.00	37.60
L_4T_3	43.90	43.50	43.10	42.70	42.00	41.20	40.80	39.20	39.00	38.80	38.30
L_5T_3	44.10	43.80	43.20	42.80	42.40	41.20	41.00	40.60	40.40	40.00	38.70
L_6T_3	45.10	44.20	44.00	42.70	42.20	42.00	41.10	40.50	40.40	40.00	39.50
L_1T_4	44.70	44.20	43.90	43.50	42.00	41.80	41.30	40.00	38.00	37.70	37.20
L_2T_4	44.50	44.80	44.30	42.70	42.20	41.50	39.80	39.40	38.60	38.30	37.40
L_3T_4	43.70	43.40	43.20	43.00	42.80	42.20	41.00	39.70	39.30	37.90	37.30
L_4T_4	43.90	43.20	42.80	42.30	41.70	41.20	39.60	39.30	39.00	38.10	36.80
L_5T_4	43.10	43.00	42.90	42.00	41.30	40.40	40.20	40.70	40.00	38.20	37.20
L_6T_4	43.20	42.70	42.00	41.50	41.00	40.80	40.00	39.70	38.50	38.20	38.00
Mean	43.84	43.38	43.03	42.49	41.85	41.13	40.41	39.66	39.10	38.28	37.58
S.Em.+	0.70	0.70	0.70	0.70	0.70	0.60	0.60	0.60	0.50	0.40	1.10
C.D. (0.01)	2.50	2.70	2.70	2.50	2.50	2.10	2.10	2.30	2.00	1.40	4.00

Note: Locations: L_1= Mulmuttal L_2= Narendra L_3= Ambaljeri L_4=Yedahalli L_5=Belavadi L_6=Budihal
Seed treatments: T_1 = Control T_2= Treated with Carbendazim 50WP @ 2g/kg T_3: Treated with TAQAT (Captan 70 % + Hexaconazole 5 %) 3gm/kg T_4 = Treated with *Trichoderma* spp. @ 10gm/kg.

Table.4 Influence of provenance and seed treatments on seedling vigour index of groundnut during storage

Treatment	Storage months										
	Initial	1	2	3	4	5	6	7	8	9	10
Location											
L_1	2287	2206	2169	2070	1941	1818	1723	1557	1358	1162	1069
L_2	2353	2279	2182	2085	1953	1863	1757	1558	1407	1219	1092
L_3	2197	2111	2054	1995	1832	1741	1607	1492	1218	1115	1057
L_4	2188	2119	1983	1907	1801	1681	1524	1438	1211	1093	1017
L_5	2413	2301	2222	2145	2064	1906	1794	1672	1413	1292	1195
L_6	2505	2352	2259	2197	2050	1941	1850	1696	1425	1357	1259
S.Em.+	38.03	36.23	32.50	28.06	28.74	26.05	30.81	32.00	33.08	16.93	45.83
C.D. (0.01)	108.3	123.3	109.8	80.05	81.99	74.30	87.89	91.28	94.38	48.29	130.72
Fungicides											
T_1	2261	2162	2098	2036	1931	1774	1643	1585	1306	977	867
T_2	2286	2210	2121	2032	1990	1920	1787	1691	1323	1255	1186
T_3	2447	2370	2314	2213	2065	2013	2065	2013	1924	1486	1399
T_4	2261	2162	2098	2036	1931	1774	1643	1585	1306	1126	1036
S.Em.+	31.05	29.58	31.43	22.91	23.47	21.27	25.16	26.13	27.01	13.82	37.42
C.D. (0.01)	86.84	84.39	89.66	97.13	76.12	105.66	71.76	98.53	77.06	102.5	106.73
Interactions											
L_1T_1	2304	2145	2149	2066	1791	1624	1502	1416	1068	966	840
L_2T_1	2322	-2281	2006	1896	1766	1685	1526	1397	1134	996	856
L_3T_1	2154	2050	1931	1837	1638	1566	1454	1314	960	840	756
L_4T_1	2118	2101	1933	1864	1674	1547	1404	1307	988	813	709
L_5T_1	2319	2169	2092	2000	1958	1661	1602	1500	1307	1131	986
L_6T_1	2454	2262	2143	2021	1933	1675	1588	1530	1277	1152	1014
L_1T_2	2258	2214	2118	2031	1959	1862	1753	1646	1296	1228	1157
L_2T_2	2376	2301	2218	2111	1995	1889	1769	1713	1373	1298	1164
L_3T_2	2206	2116	2049	1990	1924	1796	1609	1493	1206	1140	1077
L_4T_2	2129	2078	1999	1910	1828	1735	1534	1458	1201	1136	1067
L_5T_2	2346	2240	2153	2058	2052	1941	1818	1589	1379	1323	1249
L_6T_2	2429	2316	2196	2092	2077	2001	1882	1624	1413	1435	1388
L_1T_3	2449	2346	2306	2052	2107	2003	1861	1685	1440	1369	1309
L_2T_3	2430	2365	2394	2155	2079	1928	1835	1647	1460	1453	1380
L_3T_3	2278	2203	2190	2140	1949	1894	1799	1551	1436	1469	1366
L_4T_3	2268	2243	2059	1991	1894	1827	1712	1585	1408	1441	1361
L_5T_3	2586	2499	2402	2134	2201	2054	1825	1718	1566	1562	1438
L_6T_3	2688	2567	2529	2362	2175	2123	2007	1859	1657	1626	1504
L_1T_4	2134	2118	2093	1993	1916	1703	1627	1477	1198	1111	992
L_2T_4	2286	2167	2110	2008	1976	1791	1675	1454	1220	1157	985
L_3T_4	2144	2072	2042	1984	1823	1652	1531	1480	1221	1053	993
L_4T_4	2153	2056	1927	1888	1823	1685	1547	1474	1175	1031	950
L_5T_4	2394	2298	2234	1931	2043	1851	1712	1560	1292	1170	1086
L_6T_4	2449	2261	2169	2099	2017	1887	1749	1527	1285	1247	1129
Mean	2324	2038	2143	2026	1942	1808	1680	1542	1290	1214	1115
S.Em.+	76.06	72.47	77.00	56.13	57.49	52.09	61.63	64.01	66.17	33.86	91.66
C.D. (0.01)	216.9	206.7	198.66	160.10	163.99	132.44	175.7	182.5	126.2	96.58	261.4

Note: Locations: L_1= Mulmuttal L_2= Narendra L_3= Ambaljeri L_4=Yedahalli L_5=Belavadi L_6=Budihal
Seed treatments: T_1 = Control T_2= Treated with Carbendazim 50WP @ 2g/kg T_3 = Treated with TAQAT (Captan 70 % + Hexaconazole 5 %) 3gm/kg T_4 = Treated with *Trichoderma* spp. @ 10gm/kg.

Among the seed treatments Captan 70 % + Hexaconazole 5 % (TAQAT 75 WP) @ 3 g / kg was found to be most effective and recorded the lowest infection (1.48 % and 6.96 %) from initial and 10 months of storage, respectively, whereas, highest per cent seed infection (13.73 and 11.09 %) was recorded in control. It is in increasing trend with advancement of storage period, due to decrease in efficacy of fungicide with respect to advanced storage period. Similar finding were observed in Nghiep and Gaur (2005). There was a gradual decrease in seed quality parameters like germination, seedling vigour index test weight (Table 2 – 4). At the initial month of storage, higher germination (92.50 %), seedling vigour index (2505), test weight (44.30 g) was observed in Budihal location of belagavi district, while, lower germination (88.92 %), seedling vigour index (2188), test weight (43.30 g) was observed in Yedahalli location of Bagalkot district. At the end of 10 months of storage period higher germination (73.75 %), test weight (38.40 g), seedling vigour index (1259) were seen in Budihal location of Belagavi district, while, lowest germination (67.42 %), test weight (37.50 g), seedling vigour index (1017) was observed in Yedahalli location of Bagalkot district. The gradual decrease in seed quality parameters as advancement of storage. Similar differences in seedling vigour attributes due to storage locations have been reported by Sharma *et al.*, (1998), Sharma and Singh (1997).

Seed treatments

Seed treatments quality parameters were significantly reduced throughout the storage period (Table 2 – 4). Initial months of storage higher seed germination (91.06 %), test weight (44.10 g), seedling vigour index (2447) was observed in Captan 70 % + Hexaconazole 5 % (TAQAT 75 WP) @ 3 g / kg treated seeds, while, lowest germination (90.11 %), seedling vigour (2261), test weight (43.30 g) was seen in control. At the end of 10 months of storage period and higher germination (78.44 %), test weight (38.90 g), high vigour index (1399) was observed in Captan 70 % + Hexaconazole 5 % (TAQAT 75 WP) @ 3 g / kg treated seeds, while, lowest germination (60.22 %), test weight (36.20 g), vigour index (867) was observed in control. Similar findings were observed by Nghiep and Gaur (2005) in paddy. Seed treatment with Captan 70 % + Hexaconazole 5 % (TAQAT 75 WP) @ 3 g / kg was found better to maintain the quality of seed due to its antifungal activity and it also recorded the highest in the maintenance of seed quality attributes as it is a combinations of two fungicides (Captan 70 % + Hexaconazole 5 %). This suggests that TAQAT acts as a protective factor, against seed deterioration due to fungal invasion and physiological ageing. Hence, the seed viability was maintained for comparatively longer period of time due to chemical treatment and kept the seeds intact, as it act as binding material; it covers the minor cracks and aberrations as the seed coat thus blocking the fungal invasion. It may also act as a physical barrier, which reduces the leaching of inhibitors from seed covering and restrict oxygen movement and thus reducing the respiration of embryo further by reducing the ageing effect on the seed. In the present study of combifungicides besides being toxic to fungus might have acted as seed coat barrier inhibiting seed infection. These results are in agreement with findings of Hooda and Singh (1993), Vanagamudi *et al.*, (2003), Anitha *et al.*, (2013).

Interaction effects of provenance and seed treatments

Among the interaction effects the treatment combination Budihal location of Belagavi district treated with Captan 70 % + Hexaconazole 5 % (TAQAT 75 WP) @ 3g / kg recorded the at the end of the storage period with respect to lowest per cent seed infection (0.56 %) and highest seed germination (94.00 %), vigour index (2688) while, the treatment combination of Yedahalli location of Bagalkot district with control recorded higher per cent seed infection (17.50 and lower seed quality attributes *viz*., germination (88.70 %), test weight (43.40 g), vigour index (2118). Gradual

decrease in seed quality parameters were observed At the end of 10 months of storage period, Budihal location of Belagavi district with TAQAT recorded the lowest per cent seed infection (5.50 %) and highest seed germination (80.00 %), test weight (39.50 g), vigour index (1504). While, the treatment combination of Yedahalli location of Bagalkot district with control recorded highest per cent seed infection (13.00 %) and lowest germination (55.30 %), test weight (36.00 g), low vigour index (709) and low seedling dry weight (3.05 g). Similarly the interaction effect between provenance and seed treatments was recorded by Bapurayagouda (2010), Nivedita Roy *et al.*, (2013) lower seedling vigour index might be due to age, fungi and storage pest induced decline in germination, decrease in dry matter accumulation in seedling and decrease in seedling growth. Finally it may be concluded that seed production may organise in Belagavi district and kernals may be treated with TAQAT @ 3gm/kg for disease free, better quality seed and stored up to ten months.

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