

# Efficacy of seed dressing chemicals against seed and soil borne diseases of cotton (*Gossypium hirsutum* L.)

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## ABSTRACT

The effect of seed dressing chemicals on cotton seedling stand establishment against soil borne diseases and yield were assessed in field experiment conducted at Cotton Research Station Junagadh Agricultural University Junagadh during 2013, 2014 and 2015. Results of three years pooled data indicated that all fungicidal treatments increase the germination as compare to control. Maximum seed germination percent was recorded to given seed treatment of carboxin 37.5% + thiram 37.5% DS @ 4.5 g/kg seed against seedling diseases of cotton *Rhizoctonia solani* and *Fusarium* sp. The pooled mortality percent was significantly minimum (5.70%) recorded in treatment Carboxin 37.5% + Thiram 37.5% DS, 4.5g/kg seed, followed by Carboxin 37.5% + Thiram 37.5% DS, 3.5g/kg seed (7.02%) as compare to control(17.70%). The significantly maximum seed cotton yield of 1754 kg/ha was recorded in treatment of Carboxin 37.5% + Thiram 37.5% DS, 4.5g/kg seed, followed by Carboxin 37.5% + Thiram 37.5% DS, 3.5g/kg seed (1712kg/ha) as compare to control1205 kg/ha seed cotton yield. Economical point of view the seed treatment of Carboxin 37.5% + Thiram 37.5% DS(Vitavax power) @ 3.5g/kg seed was found effective in reducing the mortality percent of soil borne diseases & highest CBR (1:261.3) with net return of Rs. 21,212/ha. The most important variable in these experiments was maximum germination percent so that farmer can maintain plant population of cotton.

**Key words:** Cotton, seedling, seed dressing chemicals, seedling rot, root rot and wilt.

Cotton is an important commercial cash crop of India. It plays a key role in national economy in terms of activities, employment and foreign exchange earnings. Among the different soil borne diseases viz., seedling rot, root rot and wilt are the most serious diseases which occurs more or less in all the cotton growing areas and affects yield and fibre quality (Hussain & Tahir 1993). Hence, for better management of soil borne diseases the present investigation was proposed. The complex of pathogens associated with cotton seedling diseases, including *Pythium* spp., *Rhizoctonia solani* Kühn (teleomorph: *Thanatephorus cucumeris* (A.B. Frank) Donk), and *Thielaviopsis basicola* (Berk. & Broome) Ferraris, confound seedling disease control (DeVay *et al.*, 1989). Generally, appropriate fungicide seed treatments are the most effective control of seedling diseases (Minton *et al.*, 1986). In California, virtually all cotton seeds are treated with at least 2 fungicides for protection from seedling diseases caused by *Pythium* spp. and *R. solani* (Garber *et al.*,

1979). Deivamani and Muthamilan, (2016) reported that the spreading of diseases depends on climatic condition. Recently, fungicides have been registered that reduce black root rot caused by *T.basicola*, and many acres are now planted with seeds treated with 3 or more fungicides. Resistance is potentially the most economical method to manage seedling diseases because fungicide seed treatments could then be reduced or eliminated. The control of black root rot with these fungicide seed treatments is limited. Myclobutanil (Butler *et al.*, 1996) and triadimenol (Arthur *et al.*, 1991) have been shown to have some efficacy for the control of black root rot. However, they are generally not used at rates thought to be sufficient to provide significant control. The present investigation was undertaken at Cotton Research Station, Junagadh Agricultural University, Junagadh to study the efficacy of seed dressing chemicals against seed and soil borne diseases of cotton and to suggest the control measures. The

experiment was conducted during 2012-13, 2013-14 & 2014-15 in replicated trial.

## MATERIALS AND METHODS

The field trial was conducted at Cotton Research Station, Junagadh Agricultural University, Junagadh in Randomized block design (RBD) with 10 treatments along with three replications having plot size of 6.30 x 4.8 m. and variety G.Cot-18 with spacing of 1.20 x 0.45 m. All the recommended agronomical practices were followed during experimentation.

S No.	Treatments (Seed treatment)	g / kg seed
T <sub>1</sub>	Thiram 75% WS	2
T <sub>2</sub>	Thiram 75% WS	3
T <sub>3</sub>	Thiram 75% WS	4
T <sub>4</sub>	Carboxin 75% WP	1
T <sub>5</sub>	Carboxin 75% WP	2
T <sub>6</sub>	Carboxin 75% WP	3
T <sub>7</sub>	Carboxin 37.5% + Thiram 37.5% DS	2.5
T <sub>8</sub>	Carboxin 37.5% + Thiram 37.5% DS	3.5
T <sub>9</sub>	Carboxin 37.5% + Thiram 37.5% DS	4.5
T <sub>10</sub>	Control	--

The incidence of seedling rot, root rot and wilt in each treatment was counted out of total plants assessed and per cent disease incidence (PDI) was worked out by following formula. (CICR, Nagpur 1988). The seed cotton yield will be recorded from net plot area. Statistical analysis of the observations will be carried out.

$$\text{Per cent Disease Incidence (PDI)} = \frac{\text{Total no. of plant infected}}{\text{Total no. of plant assessed}}$$

Acid-delinted cotton seed was coated with fungicides *viz.*, Thiram 75% WS, Carboxin 75% WP, Carboxin 37.5% + Thiram 37.5% DS range between 2g to 4.5g kg/seeds to different treatments. These were shaken thoroughly for 5 min and allowed to dry before being planted.

## RESULTS AND DISCUSSION

The three years pooled data presented in Table 1 revealed that all the fungicidal treatments increased the germination percent as compared to

control. The maximum germination percent (98.60%) was recorded in seed treatment of Carboxin 37.5% + Thiram 37.5% DS@ 4.5g/kg seed and followed by T<sub>7</sub> and T<sub>8</sub>. It's indicated that it may be possible to enhance and promote the health and growth of cotton through the application of Carboxin 37.5% + Thiram 37.5% DS.

The pooled mortality percent indicated in Table 1. The pooled mortality percent was significantly minimum (5.70%) recorded in treatment Carboxin 37.5% + Thiram 37.5% DS@ 4.5g/kg seed, followed by Carboxin 37.5% + Thiram 37.5% DS@ 3.5g/kg seed (7.02%). The maximum of 17.70% mortality percent was recorded in control.

The pooled seed cotton yield data presented in Table 1. The significantly maximum seed cotton yield of 1754 kg/ha was recorded in treatment of Carboxin 37.5% + Thiram 37.5% DS@ 4.5g/kg seed, followed by Carboxin 37.5% + Thiram 37.5% DS@ 3.5g/kg seed (1712kg/ha) and Thiram 75% WS@ 4g/kg seed (1659kg/ha). The minimum of 1205 kg/ha seed cotton yield was recorded in control. The results obtained in this part of the study are in the agreement with those of some previous studies by Wang and Davis (1997) and Tomar and Shastry (2006). The economics data of various seed treatments were presented in Table 2. The seed treatment of Carboxin 37.5% + Thiram 37.5% DS (Vitavax power) @ 4.5g /kg seed gave highest net returned (Rs 22967 / ha) followed by Carboxin 37.5% + Thiram 37.5% DS) @ 3.5g/kg (Rs 21212/ha. While considering the cost benefit ratio(CBR), the maximum CBR was obtained in seed treatment of Carboxin 37.5%+Thiram 37.5% DS @ 3.5g /kg (1:261.2) followed by Carboxin 37.5% + Thiram 37.5% DS @ 4.5g /kg seed(1:254.7).

## CONCLUSION

The farmers of south Saurashtra are advised to treat the cotton seeds with a ready mixture of carboxin 37.5% + thiram 37.5% DS @ 3.5 g/kg seeds before sowing for economical and effective control of wilt and root rot complex and to improve seed cotton yield.

**Table 1: Effect of seed dressing chemicals on germination per cent, mortality per cent and seed cotton yield of cotton (pooled)**

S No.	Treatment details	Mean Germination (%)	Mean Mortality per cent				Seed cotton yield (kg/ha)			
			2012-13	2013-14	2014-15	Pooled	2012-13	2013-14	2014-15	Pooled
T <sub>1</sub>	Thiram 75% WS @ 2 g/kg seed	97.02	3.82 <sup>#</sup> (14.59)	3.61 (13.01)	3.50 (12.23)	3.64 (13.26)	1940	1753	843	1512
T <sub>2</sub>	Thiram 75% WS @3g/kg seed	95.80	3.48 (12.11)	3.44 (11.81)	3.27 (10.67)	3.39 (11.52)	1962	1764	904	1543
T <sub>3</sub>	Thiram 75% WS @ 4g/kg seed	95.80	3.05 (9.32)	2.98 (8.86)	3.27 (10.67)	3.10 (9.60)	2105	1918	953	1659
T <sub>4</sub>	Carboxin 75% WP @ 1g/kg seed	93.25	3.93 (15.44)	3.26 (10.65)	3.33 (11.09)	3.51 (12.30)	1951	1775	860	1529
T <sub>5</sub>	Carboxin 75% WP @2g/kg seed	95.60	3.50 (12.27)	3.68 (13.54)	3.21 (10.30)	3.46 (12.00)	2083	1797	893	1591
T <sub>6</sub>	Carboxin 75% WP @3g/kg seed	97.02	3.08 (9.51)	3.43 (11.79)	3.17 (10.07)	3.23 (10.43)	2039	1835	965	1613
T <sub>7</sub>	Carboxin 37.5% + Thiram 37.5% DS @ 2.5g/kg seed	97.22	2.89 (8.37)	3.07 (9.42)	3.07 (9.40)	3.01 (9.06)	2050	1841	909	1600
T <sub>8</sub>	Carboxin 37.5% + Thiram 37.5% DS @ 3.5g/kg seed	97.22	2.77 (7.69)	2.88 (8.31)	2.29 (5.24)	2.65 (7.02)	<b>2216</b>	<b>1935</b>	<b>987</b>	<b>1712</b>
T <sub>9</sub>	Carboxin 37.5% + Thiram 37.5% DS @ 4.5g/kg seed	98.60	2.58 (6.64)	2.42 (5.84)	2.17 (4.71)	2.39 (5.70)	<b>2249</b>	<b>1973</b>	<b>1042</b>	<b>1754</b>
T <sub>10</sub>	Control	93.00	4.47 (19.95)	4.15 (17.19)	4.01 (16.05)	4.21 (17.70)	1576	1356	683	1205
<b>S.Em.±</b>			<b>0.13</b>	<b>0.20</b>	<b>0.28</b>	<b>0.11</b>	<b>117.06</b>	<b>109.36</b>	<b>62.20</b>	<b>57.29</b>
<b>C.D.at 5%</b>			<b>0.39</b>	<b>0.59</b>	<b>0.83</b>	<b>0.32</b>	<b>348</b>	<b>325</b>	<b>185</b>	<b>162</b>
<b>C.V.%</b>			<b>6.79</b>	<b>10.44</b>	<b>15.41</b>	<b>10.48</b>	<b>10.05</b>	<b>10.56</b>	<b>11.92</b>	<b>10.93</b>
<b>S.Em.±</b>						<b>0.06</b>	-	-	-	<b>31.38</b>
<b>C.D.at 5%</b>						<b>0.18</b>	-	-	-	<b>89.02</b>
<b>Y x T</b>										
<b>S.Em.±</b>						<b>0.20</b>	-	-	-	<b>99.23</b>
<b>C.D.at 5%</b>						<b>NS</b>	-	-	-	<b>NS</b>

**Table 2: Statement showing Economics of various seed treatment for controlling soil borne diseases of cotton (2014-15)**

SrNo	Treatment	Yield Increased over control (kg/ha)	Additional Income (Rs.)	Quantity of Fungicide g/ha	Expenditure (Rs.)		Total Expenditure (Rs.)	Net Return (Rs.)	CBR
					Material cost/ha	Labor			
1	2	3	4	5	6	7	8	9	10
T <sub>1</sub>	Thiram 75% WS @ 2 g/kg seed	307	12894	8	3.60	50	53.60	12840	1:240.5
T <sub>2</sub>	Thiram 75% WS @3g/kg seed	338	14196	12	5.40	50	55.40	14141	1:256.2
T <sub>3</sub>	Thiram 75% WS @ 4g/kg seed	454	19068	16	7.20	50	57.20	19011	1:333.3
T <sub>4</sub>	Carboxin 75% WP @ 1g/kg seed	324	13608	4	10.40	50	60.40	13547	1:225.3
T <sub>5</sub>	Carboxin 75% WP @2g/kg seed	386	16212	8	20.80	50	70.80	16141	1:228.9
T <sub>6</sub>	Carboxin 75% WP @3g/kg seed	408	17136	12	31.20	50	81.20	17055	1:211.0
T <sub>7</sub>	Carboxin 37.5% + Thiram 37.5% DS @ 2.5g/kg seed	395	16590	10	22.50	50	72.50	16517	1:228.8
T <sub>8</sub>	<b>Carboxin 37.5% + Thiram 37.5% DS @ 3.5g/kg seed</b>	<b>507</b>	<b>21294</b>	<b>14</b>	<b>31.50</b>	<b>50</b>	<b>81.50</b>	<b>21212</b>	<b>1:261.2</b>
T <sub>9</sub>	<b>Carboxin 37.5% + Thiram 37.5% DS @ 4.5g/kg seed</b>	<b>549</b>	<b>23058</b>	<b>18</b>	<b>40.50</b>	<b>50</b>	<b>90.50</b>	<b>22967</b>	<b>1:254.7</b>
T <sub>10</sub>	Control	--	--	--	--	--	--	--	--

1. Price of seed cotton: Rs 42/kg
2. Labor charge for seed treatment/ha : Rs 50/ 4kg seed
3. Picking charge: Rs 110/20 kg seed cotton

4. Thiram 75% WS : Rs 45/100g
5. Carboxin 75% WP (Vitavax): Rs 1300 /500g
6. Vitavax power: Rs 225/100g

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