J. Cotton Res. Dev. **33** (2) 297-302 (July, 2019) **ISSN No. 0972-8619**

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

V.V.RAJANI*, D.K. DAVARA AND L.K. DHADUK

Cotton Research Station, Junagadh Agricultural University, Junagadh-362 001

****E-mail : vvrajani@jau.in***

ABSTRACT : 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 increased germination as compared to control. Maximum seed germination per cent was recorded to given seed treatment of Carboxin (37.5%) + Thiram (37.5% DS) @ 4.5 g/kg seed against seedling diseases of cotton caused by *Rhizoctonia solani* and *Fusarium* sp. The pooled mortality per cent was significantly minimum (5.70%) 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 compared to control (17.70%). 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 compared to control (1205 kg/ha). 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 and highest CBR (1:261.3) with net return of Rs 21212/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, 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 affect yield and fibre quality (Hussain and Tahir 1993). Hence, for better management of soil borne diseases the present investigation was conducted.

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. and 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). 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 2012-2013 to 2014-2015 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 m x 4.8 m. and variety G.Cot-18 with spacing of 1.20 x 0.45 m from 2013-2015. All the recommended agronomical practices were followed during experimentation.

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 formula given by CICR, Nagpur (1988). The seed cotton yield was recorded from net plot area. Statistical analysis of the observations was carried out.

Details of Treatment

Treatments (Seed treatment)	g / kg seed
T_1 Thiram (75% WS)	2
T_2 Thiram (75% WS)	3
T_3 Thiram (75% WS)	4
T_4 Carboxin 75% WP	1
T_5 Carboxin 75% WP	2
T_6 Carboxin 75% WP	3
T_7 Carboxin (37.5%) + Thiram (37.5% DS)	2.5
T_8 Carboxin (37.5%) + Thiram (37.5% DS)	3.5
T_9 Carboxin (37.5%) + Thiram (37.5% DS)	4.5
T_{10} Control	—

$$\text{Per cent Disease Incidence (PDI)} = \frac{\text{Total no. of plants infected}}{\text{Total no. of plants assessed}} \times 100$$

Acid-delinted cotton seed was coated with fungicides *viz.*, Thiram (75% WS), Carboxin 75% WP, Carboxin (37.5%) + Thiram (37.5% DS) @ 2 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 per cent as compared to control. The maximum germination per cent (98.60%) was recorded in seed treatment of Carboxin (37.5%) + Thiram (37.5% DS)@ 4.5g/kg seed, followed by T_7 and T_8. It 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 per cent was significantly minimum (5.70%) in treatment

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

Sr. No	Treatment details	Mean germination (%)	Mean mortality per cent				Seed cotton yield (kg/ha)			
			2012-2013	2013-2014	2014-2015	**Pooled**	2012-2013	2013-2014	2014-2015	**Pooled**
T_1	Thiram (75% WS) @ 2 g/kg seed	97.02	3.82#(14.59)	3.61(13.01)	3.50(12.23)	**3.64(13.26)**	1940	1753	843	**1512**
T_2	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_3	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_4	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_5	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_6	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_7	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_8	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)**	2216	1935	987	**1712**
T_9	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)**	**2249**	**1973**	**1042**	**1754**
T_{10}	Control	93.00	4.47(19.95)	4.15(17.19)	4.01(16.05)	**4.21(17.70)**	1576	1356	683	**1205**
S.Em.±	0.13	0.20	0.28	0.11	117.06	**109.36**	62.20	57.29		
C.D. (p=0.05)		0.39	0.59	0.83	0.32	**348**	325	185	162	
C.V.(%)		6.79	10.44	15.41	10.48	**10.05**	10.56	11.92	10.93	
Y										
S.Em.±				0.06	-	-	-	31.38		
C.D. (p=0.05)					0.18	-	-	-	89.02	
Y x T										
S.Em.±				0.20	-	-	-	99.23		
C.D. (p=0.05)					NS	-	-	-	NS	

Table 2. Statement showing Economics of various seed treatment for controlling soil borne diseases of cotton (2014-2015)

Treatment		Yield increased over control (kg/ha)	Additional income (Rs) cost/ha	Quantity of fungicide	Expenditure (Cost) Rs		Total expenditure (Rs)	Net return (Rs)	CBR
					Material g/ha	Labor			
1		2	3	4	5	6	7	8	9
T_1	Thiram (75% WS) @ 2 g/kg seed	307	12894	8	3.60	50	53.60	12840	1:240.5
T_2	Thiram (75% WS) @3g/kg seed	338	14196	12	5.40	50	55.40	14141	1:256.2
T_3	Thiram (75% WS) @ 4g/kg seed	454	19068	16	7.20	50	57.20	19011	1:333.3
T_4	Carboxin (75% WP)@ 1g/kg seed	324	13608	4	10.40	50	60.40	13547	1:225.3
T_5	Carboxin (75% WP) @2g/kg seed	386	16212	8	20.80	50	70.80	16141	1:228.9
T_6	Carboxin (75% WP) @3g/kg seed	408	17136	12	31.20	50	81.20	17055	1:211.0
T_7	Carboxin (37.5%) + Thiram (37.5% DS) @ 2.5g/kg seed	395	16590	10	22.50	50	72.50	16517	1:228.8
T_8	Carboxin (37.5%) + Thiram (37.5% DS) @ 3.5g/kg seed	**507**	**21294**	**14**	**31.50**	**50**	**81.50**	**21212**	**1:261.2**
T_9	Carboxin (37.5%) + Thiram (37.5% DS) @ 4.5g/kg seed	**549**	**23058**	**18**	**40.50**	**50**	**90.50**	**22967**	**1:254.7**
T_{10}	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

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%). Maximum (17.70%) mortality per cent was recorded in control.

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 study are in the agreement with those of some previous studies by Wang and Davis (1997) and Tomar and Shastry (2006).

The economics of data of various seed treatments are presented in Table 2. The seed treatment of Carboxin (37.5%) + Thiram (37.5% DS) (Vitavax power) @ 4.5g /kg seed gave highest net returns (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.

REFERENCES

Arthur, K.S., Hairston W.G. and Graham, C.T. 1991. Utilizing triadimenol as aco-fungicide to enhance disease suppression of *Rhizoctonia* and *Thielaviopsis* in cotton stand establishment. *In proceedings of the Beltwide Cotton Conference of National Cotton Council*, Memphis, Tenn, pp. 169-72.

Butler, L. D., Lawrence D. and Becton, M. 1996. A safe new seed treatment fungicide for the control of cotton seedling disease caused by *Thielaviopsis basicola* and *Rhizoctonia solani.* In *proceedings of the Beltwide Cotton Conference of National Cotton Council*, Memphis, Tenn, pp. 268-69.

DeVay, J.E. El-Zik K.M. Bourland F.M. Garber R. H. Kappleman, A.M. Lyda, S. D. Minton, E. B. Roberts P. A. and Wallace T.P. 1989. Integrated Pest Management System and Cotton Production. In: strategies and tactics for managing plant pathogens and nematodes R. E. Frisbie, K. M.El-Zik and L. T. Wilson (Eds) John Wiley andsons, Inc., New York, pp. 225-66.

Minton, E.B., Garber R. H. Bird, L.S., DeVay, J.E., and Evrard, T. 1986. Effects of fungicide seed treatments that control specific pathogens on stand and yield of cotton. In *proceedings of the Beltwide Cotton Conference of National Cotton Council*, Memphis, Tenn, pp. 20.

Garber, R. H. DeVay J.E., Weinhold A. R. and Matheron D. 1979. Relationship of pathogen inoculum to cotton seedling disease control with fungicides. *Plant Dis. Rep.* **63 :** 246-50.

Heydari A and A Gharedaghli 2007. *Integrated Pest Management on Cotton in Asia and North Africa*. INCANA Press, Tehran, Iran.

Tomar, D. S. and P.P. Shastry 2006. Efficacy of fungicides against recovery of *Myrothecium roridum* in cotton seed*, Intl. J. Agric. Sci.* **2 :** 408-10.

Wang, H. and Davis, R. M. 1997. Susceptibility of selected cotton cultivars to seedling disease pathogens and benefits of chemical seed treatments. *Plant Dis*. **81 :** 1085-88.

Received for publication : November 16, 2018
Accepted for publication : Februrary 19, 2019