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NU-COAT HOPPERBOX COTTONSEED TREATMENT

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Abstract

Recent commercialized developments in cotton production include genetic modification of the cotton plant for herbicide and insecticide resistance, variety improvements for increased yield and quality, improved equipment for on farm cottonseed treatment and new chemical molecules for cotton disease control. The newly registered triazole, strobilin and analine ester chemistries exhibit exceptional control and/or suppression of many cottonseed pathogens. Older chemistries such as TCMTB, 2-thiocyanomethylthiobenzothiazole, and chloroneb, 2-chloromethoxybezene possesses different modes of action as compared to the new chemistries, which allows disease resistant management strategies. Nucoat contains TCMTB and Chloroneb and was recently registered as a cottonseed hopperbox treatment. By combining different chemistries highly efficient and broad-spectrum disease resistant management programs can be prescribed on an as needed basis.

Introduction

For many years the estimated reductions in cotton yield resulting from diseases has been reported in the Beltwide Proceedings. More recently the Beltwide Cottonseed Disease Treatment Program has included the disease ratings and isolation frequency of seedling pathogen groups and the soil populations of selected soilbourne fungi from the various testing sites. These data are reported in the Beltwide Proceedings every year. The major pathogens include *Pythium spps. Rhizoctonia solani, Theilaviopsis basicola* and *Fusarium spps.* Other minor fungi include *Mucor, Aspergillus, Penicillium* and *Macrophomina phaseolina.* The term "Cotton Disease Complex", CDC, is commonly used to describe assortment of pathogens that can influence cotton production. It is highly unlikely that a single chemical molecule possessing sustained activity against all of the pathogens in the CDC will be developed. Therefore combinations of chemistries will be needed to combat the CDC with possible synergistic effects among the various chemistries.

The development of the analine ester chemistry, metalaxyl/mefenoxam has resulted in excellent control of *Pythium spps* and is now a standard commercial cottonseed treatment. The triazole and strobilin chemistries have demonstrated good control of *Rhizoctonia solani* and triazole chemistry has fairly good control of *Theilaviopsis basicola.* This new level of control of the major pathogens however may have opened the door of opportunity for other disease organisms, especially under stress conditions. In addition, some of the new genetically modified cotton varieties may be more susceptible to certain diseases, such as *Fusarium Fov.* The effect of combining several chemistries as a cottonseed treatment to address these issues will be described.

Material and Methods

Nucoat is a water-based formulation containing 9.0% TCMTB (2-thiocyanomethylthiobenzothiazole) and 23.5% chloroneb (1,4-dichloro-2,5-dimethylbenzene). TCMTB is a broad-spectrum biocide possessing excellent contact activity against many disease organisms (Table 1.0). Chloroneb is a systemic product that has excellent activity against *Rhizoctonia solani* with some activity against *Pythium spps.* This formulation was recently registered with the US EPA for use as a hopperbox cottonseed treatment. TCMTB was screened in vitro against several pathogens and the Minimum Inhibitory Concentrations are presented in Table 1. Nucoat has been tested for many years and a summary of results from these trials is presented (Table 2.0). TCMTB was also tested in vivo and in vitro to determine its effectiveness against *Fusarium Fov.* in Australia where this disease has become the most important constraint to sustainable cotton production.

Results and Discussion

The TCMTB (2-thiocyanomethylthiobenzothiazole) component of Nucoat is a highly effective inhibitor of spore germination and hyphal extension. It is generally believed that TCMTB inactivates metal-enzyme complexes and/or reacts with sulfhydryl (-SH) groups on regulatory proteins. It is classified as a contact fungicide with no systemic activity therefore it basically disinfects the cottonseed surface. The Minimum Inhibitory Concentrations of TCMTB against several pathogens are presented in Table 1.

The other active component of Nucoat is chloroneb, (1,4-dichloro-2,5-dimethoxybenzene) and it is a systemic, highly active molecule against *Rhizoctonia solani.* The combination of TCMTB and Chloroneb has been tested for several years across the cotton growing areas of the United States. A list of cottonseed pathogens isolated from testing sites averaged from 1994, 1995 and 1996 is presented in Table 2.

Various universities have screened Nucoat for several years as a cottonseed treatment to determine its effectiveness to increase the number of surviving cotton seedlings under many different environmental conditions. Table 3 lists the surviving cotton counted 45 days after planting averaged over several years from various locations.

It is proposed that the broad spectrum of activity that Nucoat possesses on the Cotton Disease Complex (CDC) pathogens compliments the newer fungicide chemistries recently developed. Not only does using combinations of fungicides increase the efficacy against the pathogens but disease resistant management is also enhanced. The improvement in application technology for on-farm hopperbox cottonseed treatment should assist in enabling growers to apply these types of products uniformly and safely.

References

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Table 1. The Minimum Inhibitory Concentration of TCMTB required for control of the growth of several cottonseed pathogens in a nutrient salt solution and evaluated after 14 days.

Cottonseed Pathogen	Minimum Inhibitory Concentration, ppm
Aspergillus niger	0.25
Fusarium oxysporum	1.00
Mucor spps	1.00
Penicillium spps	1.00
Pythium ultimum	5.00
Rhizoctonia solani	5.00

Table 2. The average percent of pathogen isolation frequency from diseased seedlings from National Cottonseed Treatment Program test sites across the US during 1994, 1995 and 1996.

Location	Pythium	Rhizoctonia	Thielaviopsis	Fusarium
AL	4	31	6	74
AR 1	10	49	--	68
AR 2	14	5	--	88
AR3	26	39	46	72
CA	26	4	--	81
FL	13	23	--	80
GA	10	18	--	81
LA1	18	12	--	73
LA2	4	16	80	40
MS1	20	34	--	66
MS2	6	30	35	86
OK1	22	7	--	92
TN	18	23	66	76
TX1	14	16	--	

Table 3. The effectiveness of Nucoat versus no over treatment of cottonseed on average stand count taken 45 days after planting over various years.

Location	YearsTested	Average Stand Count	
		Nucoat	Control
Alabama	9	57,000	45,000
Arkansas	20	52,500	43,000
Georgia	6	63,500	52,000
Louisiana	18	62,500	48,000
Mississippi	21	68,000	56,500