

THE FUTURE OF TOPSIN® M ON COTTON
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Abstract

Based on the work by several cotton disease specialists and agronomists over the last 3 years, there may be economical benefits for growers to use Topsin M on cotton to reduce hardlock caused by *Fusarium verticillioides* and other diseases. Although hardlock was less severe in the 2003 season, positive yield and leaf area effects were observed in several efficacy trials using Topsin M fungicide. Enough positive results were seen from the last 2 years of research to keep Cerexagri very interested in pursuing a federal registration for Topsin M on cotton.

Background

Foliar fungicide use on cotton has not been a common practice in the Southeastern and Mid South cotton growing areas of the United States. Hardlock has become a significant problem in the more hot and humid areas of cotton production. Until recently, the causal agent(s) of hardlock have not been completely understood. Great progress has been made by Univ. of Florida researchers David L. Wright and James J. Marois located in Quincy, FL. They have identified the fungus *Fusarium verticillioides*, as being associated with hardlock and that applications of Topsin M fungicide can increase yields when disease is present. Fungicide applications made during the bloom period had the most beneficial effect on both yield and incidence of hardlock.

Topsin M, (thiophanate-methyl a.i.), is a broad spectrum, locally systemic fungicide. It was first introduced in the late 1960's and the first agricultural crop labels were granted in 1979. Since then, Topsin has been labeled on over 25 crops.

Mode of action is through inhibition of fungal germ tubes and growth of mycelia (affecting microtubule (β -tubuline)) assembly. It passes through leaf cuticles (transcuticular) and moves locally (intralaminar) throughout the leaf tissue. Once inside the plant TM (thiophanate-methyl) metabolizes into MBC (methyl benzimidazole carbamate), the primary fungitoxic compound. Conversion rate of TM into MBC is dependent on pH, light, temperature and/or moisture present.

Thiophanate-methyl is a relatively stable compound and can be formulated into wettable powders, dry flowables and aqueous flowables. Topsin M formulations can be applied through ground or aerial application equipment. Environmental fate has been thoroughly studied (Table 1).

Topsin M is one of the three original Benzimidazole type fungicides including benomyl (Benlate®) and thiabendazole (Mertect®). All are single-site fungicides that should be rotated or tank mixed with fungicides of different chemistry for maximum disease resistance management.

Several Topsin M crops are sprayed during the bloom period for maximum disease protection and yield enhancement. These include beans (both succulent and dry), soybean, potatoes, apples, stone fruit, strawberries, almonds, and pistachios. Results from Wright and Marois have shown beneficial effects from Topsin applications beginning at first bloom and repeated at one to two week intervals throughout the primary bloom period.

Discussion

Foliar fungicide use on cotton is not currently an accepted grower practice and has to be proven practical for grower acceptance. In order to commercialize Topsin M on cotton, there must be a quantifiable, economical spray program that will benefit cotton growers. In 2003, Cerexagri, Inc. a US based agrichemical company located in King of Prussia, PA supported several efficacy trials based on the initial work done in Florida. They were placed throughout the Southeastern and Mid South cotton belt and were specifically designed to establish an acceptable grower use pattern.

Although hardlock pressure in 2003 was significantly less than in 2002, some beneficial effects of using Topsin M were observed, including higher yields and greater leaf area. All treatments are being evaluated for improved seed quality and germination (Mid Continent Labs in Memphis, TN). Potential quality improvements to the cotton lint are also being evaluated at Cotton, Inc. located in Cary, NC.

Challenges and questions that face the whole concept of using Topsin M on cotton for reduction of hardlock caused by *Fusarium verticillioides* and other diseases are the following:

1. Optimum rate/timing and number of applications
2. Quantifying the other causes of hardlock which may include other diseases, insects and physiological effects.
3. Separating boll rot from hardlock in certain cotton growing areas
4. Being able to predict hardlock (from *Fusarium verticillioides*) pressure based on weather models
5. Being able to quantify the economical benefits of Topsin M applications to cotton growers

Residue trials conducted in 2003 are in the process of being analyzed and will be completed by mid January. Cerexagri will run a new Risk Assessment using these values and determine the likelihood of EPA registering Topsin on cotton. Based on previous work with soybean, wheat, etc, residue levels should be minimal.

Topsin M is in the final stages of the RED (Re-registration Eligibility Document) and is currently waiting for the final review. All initial crops survived the process and several additional crops have been added since the draft RED in September 2001 (canola, grapes, pears, pistachios and potatoes). The maximum rate that will be allowed on any crop appears to be 2.8 lbs a.i. All efficacy trials were done with a maximum rate of 0.7 lb a.i. per application.

Conclusion

Over the last 2 years, Topsin M fungicide has been shown to reduce hardlock in cotton (caused by *Fusarium verticillioides* and other diseases) in research trials done by the University in Florida. Not only were yield increases documented, but other positive effects were seed quality (weight and germination) and improved fiber quality. Results from 2002 created a genuine interest in Topsin M in the university and cotton grower communities and Cerexagri, Inc. Although hardlock was not as severe in 2003, positive indicators were observed as increased yield and leaf surface area. The residue, seed and lint analytical results will be available in 2004 for a more thorough evaluation of the total effects. As long as the residue trial results indicate minimal effect on total risk cup of thiophanate-methyl, Cerexagri, Inc. will continue to pursue a cotton registration for Topsin M fungicide.

Research in 2004 will continue to look at the effects of Topsin M on cotton for disease control, yield and leaf area effects, and improvement in lint and seed (quality and germination). Refinement of rates, timing, and number of applications will also be a major goal to determine the overall economic feasibility of using Topsin M on cotton.

Cerexagri, Inc. is very interested in pursuing a registration for Topsin M on cotton. As long as the thiophanate-methyl risk cup will accept the residue results that cotton might add and the use pattern needed to reduce disease causing hardlock is economically feasible to growers, Topsin M has a bright future in cotton production.

References

Marois, J.J., and D.L. Wright. 2002. Association of *Fusarium* sp. With Hardlock Cotton. Proc. Beltwide Cotton Conference. 7-12 January, 2002. Atlanta, GA.

Wright, D.L., J.J. Marois, M.A. Vargas, and P.J. Wiatrak, 2003. Management of Hardlock in Cotton in the Southeast. Proc. Beltwide Cotton Conference. 6-10 January, 2003. Nashville, TN.

Table 1. Environmental Fate Profile of Topsin M Fungicide.

Environmental Aspect	Effect
Soil	Rapid degradation, low water solubility, binds to soil particles
Water	Undergoes rapid hydrolysis and photodegradation
Air	Non volatile
	Bees – not toxic
Non target organisms	Birds – very low toxicity
	Fish – toxic to fish

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