Evaluation of Efficacy and Application Methods of QGU42 (Zorvec™, oxathiapiprolin) for Management of Black Shank on Tobacco

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Abstract

Black shank caused by *Phytophthora nicotianae* is responsible for serious yield and quality reduction in tobacco production. Application of effective fungicides continues to be a significant component in developing integrated disease management programs. Studies were conducted in 2010-2013 to determine the efficacy and application methods of a new fungicide, QGU42 (Zorvec™, oxathiapiprolin), for management of black shank under field conditions. QGU42 was applied using different methods and application rates ranging from 2.4-38.6 fl oz/acre were evaluated. In the experiment conducted in 2010, application of QGU42 (2.4 fl oz/acre) prior to transplanting in conjunction with applying QGU42 at 19.2 fl oz/acre in transplant water and 2.4 fl oz/acre at 1st cultivation and layby was the most effective in disease reduction. In 2011, the two most effective treatments were: 1) application of QGU42 through transplant water (4.8 fl oz/acre) and at 1st cultivation and layby (38.6 fl oz/acre); 2) application of QGU42 (4.8 fl oz/acre) prior to transplanting in conjunction with applying QGU42 at 19.2 fl oz/acre at 1st cultivation and layby. In 2012, QGU42 applied prior to transplanting (4.8 fl oz/acre) and at 1st cultivation and layby (9.6 fl oz/acre) was among the most effective treatments. In 2013, application of QGU42 through transplant water at 38.6 fl oz/acre, or QGU42 applied through transplant water at 19.2 fl oz/acre and at planting and layby, reduced disease significantly compared with the non-treated control. These treatments also increased tobacco yield significantly compared to the non-treated control. Across the experiments conducted in the 4 years, QGU42 was effective in reduction of black shank at a rate as low as 2.4 fl oz/acre and appeared to be more effective than mefenoxam in managing this important disease.

Fig. 1. Black shank on tobacco caused by *Phytophthora nicotianae*.

Introduction

Black shank, caused by the soilborne pathogen *Phytophthora nicotianae*, is a devastating disease on tobacco in Georgia and many other tobacco producing areas worldwide (2). The pathogen infects roots, stems, and leaves at all growing stages of tobacco plant, resulting in significant yield and quality reduction. The disease is favored by humid weather conditions that are common in the southeastern US.

Black shank is among the most difficult diseases to control. Crop rotation is of limited value due to long-term survival of the pathogen in the soil and is not commonly adopted by growers. There are some tobacco cultivars resistant to race 0 of the pathogen; however, the gradual shift of pathogen populations from race 0 to race 1 (1, 2) makes the cultivars resistant to race 0 ineffective in disease control. Application of fungicides continues to be an effective approach in managing black shank. Products containing metalaxyl or mefenoxam have been the most widely used fungicides for control of *P. nicotianae*. However, field isolates of *P. nicotianae* were variable in sensitivity to metalaxyl and typical field rates may not be sufficient to control isolates with low levels of sensitivity (2). Identifying new active ingredients to be used as alternative or complimentary approaches is highly desirable for increasing disease control efficacy and reducing selection pressure for fungicide resistance development. QGU42 (Zorvec™, oxathiapiprolin) is the first of the new piperidinyl thiazole isoxazoline class of fungicides discovered and developed by DuPont. The objective of this study was to evaluate the efficacy and application methods of QGU42 for managing black shank on tobacco.

Materials and Methods:

Field preparation:

The experiments were conducted at University of Georgia Coastal Plain Experiment Station in Tifton, GA, in 2010-2013. Plots were sub-soiled and bedded after fertilizer application.

Application of QGU42:

Different rates of QGU42 and different application methods were evaluated. Prior to transplanting in the field, tobacco seedlings were sprayed in the greenhouse with QGU42 at 2.4 or 4.8 fl oz/acre (2.4 or 4.8 fl oz/3500 plants). To apply QGU42 through transplant water, the product was applied using a CO2-powered sprayer delivering the chemical directly into transplant water and plant furrow. Additional applications of QGU42 were made 7 days after transplanting, at 1st cultivation and layby.

Experimental design:

Plants were transplanted on 48-inch wide rows with 18-inch plant spacing. A randomized complete block design was employed with 6 replicates.

Disease evaluation:

Plants showing symptoms of black shank disease were counted and disease incidence was quantified as percentage of diseased plants. Three harvests of tobacco were made when the plants were mature. Data were analyzed using GLM procedures of the Statistical Analysis System (SAS) and treatment means were separated by Fisher's protected least significant difference (LSD) test.

Results and Conclusion

In 2010, all the treatments reduced disease significantly compared with the non-treated control (Fig. 2). Application of QGU42 (2.4 fl oz/acre) prior to transplanting in conjunction with applying QGU42 at 19.2 fl oz/acre in transplant water and 2.4 fl oz/acre at 1st cultivation and layby was the most effective in disease reduction.

In 2011, two treatments were shown to be the most effective: 1) application of QGU42 through transplant water (4.8 fl oz/acre) and at 1st cultivation and layby (38.6 fl oz/acre; 2) application of QGU42 (4.8 fl oz/acre) prior to transplanting in conjunction with applying QGU42 at 19.2 fl oz/acre at 1st cultivation and layby (Fig. 3).

In 2012, Ridomil Gold applied through transplant water and at 1st cultivation and layby, QGU42 applied prior to transplanting (4.8 fl oz/acre) and at 1st cultivation and layby (9.6 fl oz/acre), as well as combined use of QGU42 and Ridomil Gold were the three most effective treatments (Fig. 4).

In 2013, application of QGU42 through transplant water at 38.6 fl oz/acre, or QGU42 applied through transplant water at 19.2 fl oz/acre and at planting and layby, reduced disease significantly compared with the non-treated control (data not shown).

Across all the experiments conducted in 2010-2013, QGU42 appeared to be more effective than mefenoxam in reduction of black shank on tobacco. None of the treatments involving QGU42 reduced tobacco plant height or vigor compared to the non-treated control, and no phytotoxicity was observed, indicating the product was safe to tobacco.

Reference

1. Csinos, A. S. 2005. Relationship of isolate origin to pathogenicity of race 0 and 1 of *Phytophthora parasitica* var. *nicotianae* on tobacco cultivars. Plant Dis. 89:332-337.

2. Csinos, A. S., and Bertrand, P. F. 1994. Distribution of *Phytophthora parasitica* var. *nicotianae* races and their sensitivity to metalaxyl in Georgia. Plant Dis. 78:471-474

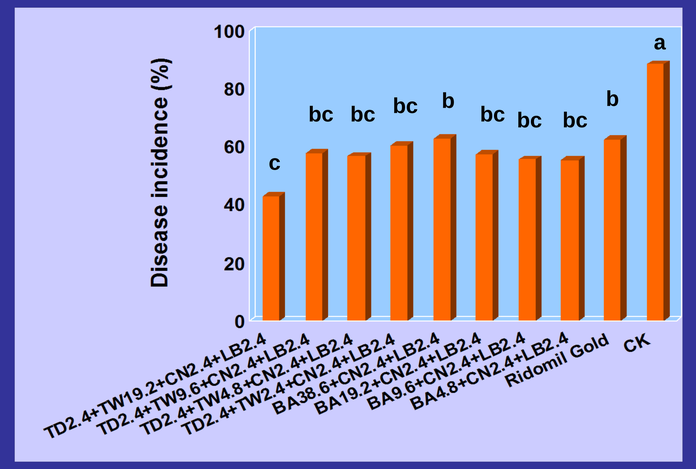

Fig. 2. Efficacy of QGU42 for control of black shank of tobacco (2010). TD = tray drench; TW = transplant water; CN = 1st cultivation; LB = layby. Numbers after TD, TW, CN and LB are rates of QGU42 (fl oz/ acre). Ridomil Gold was applied at 16 fl oz/acre.

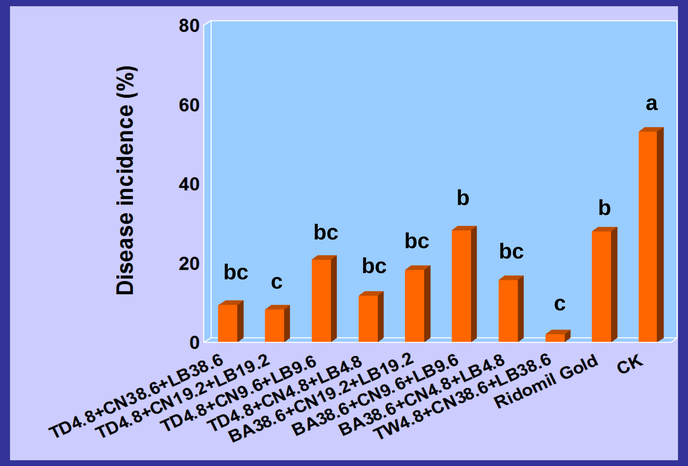

Fig. 3. Efficacy of QGU42 for control of black shank of tobacco (2011). TD, TW, CN, and LB are as described above. BA = band application 7 days after transplanting. Ridomil Gold was applied at 16 fl oz/acre.

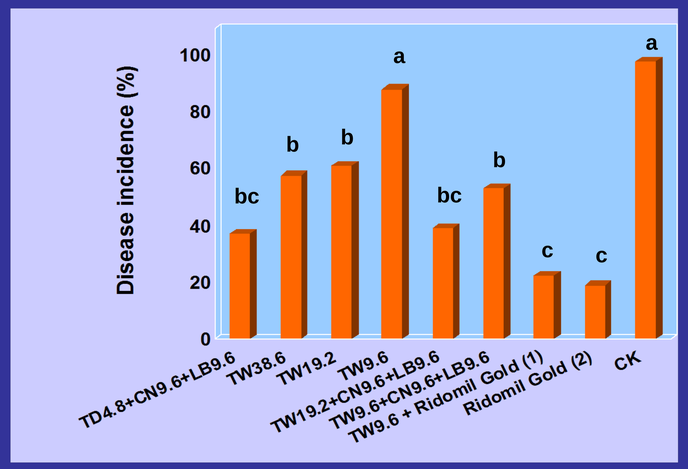

Fig. 4. Efficacy of QGU42 for control of black shank of tobacco (2012). TD, TW, CN, LB are as described above. Ridomil Gold (1) was applied at CN and LB (16 fl oz/acre). Ridomil Gold (2) was applied by TW (8 fl oz/acre) and at CN and LB (16 fl oz/acre).