CHEMICAL SUPPRESSION OF PHYMATOTRICHUM ROOT ROT ON COTTON IN SOUTH TEXAS

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Abstract

Phymatotrichopsis omnivora causes substantial losses in cotton lint yields on many soils of the Southwest. Surveys of the soil-plant ecosystems in cotton fields exhibiting Phymatotrichum root rot (PRR) on cotton and those having a history of no disease problem suggested an association between soil particle size distribution and soils being suppressive or supportive of this pathogen. Aerial infrared photography and visual inspections were used to document soils producing PRR affected cotton and trace element nutritional status of grain sorghum crops seeded on identical soils in succeeding years. Results of these aerial and ground observations indicated an association between levels of iron (Fe) deficiency chlorosis and other micronutrient deficiencies on this monocot and the severity of PRR incidence on cotton. Validation of field observations through soil sample analyses indicated that at least two plant nutrients, iron (Fe) and Magnesium (Mg), and possibly others including Zinc (Zn) and Nickel (Ni) may be present in short supply in these problem soils. As a result, field studies were conducted evaluating improved plant nutrition and use of chemical fungicides for singular and combined effects on disease suppression. Research on the influence of sources of nitrogen (N) fertilizer on PRR produced impressive results. Plant mortality data indicated that ammoniacal N such as that present in ammonium sulfate (AS) or urea caused a reduction in PRR especially in the early stages of disease inception. Eighty lb N/acre as AS to 80 lb N/acre (slightly above soil test recommended rate) reduced plant mortalities from 39 to 14 percent at the early and mid-summer counts. Progression of PRR continued rapidly after June 27 and approached 100 percent mortality for the calcium nitrate source. Some of the promising methods in suppressing PRR on cotton included seedrow placement of a synthetic Fe chelate and CGA-64250 (Fungicide). Additional materials evaluated in the field included cyproconazole, elemental sulphur, and Ni. Elemental sulphur reduced soil pH which resulted in slight reduction in PRR intensity, and when accompanied with soil-applied trace elements (chelated Fe) further reductions in disease were measured. Additional research with plant nutrients and a fungicide applied as stem drenches reduced plant mortalities. Those data show marked effects from Fe-chelate, LiCl and CGA-64250 fungicide on disease suppression. Reduction in PRR only in the early season was observed with use of inorganic $FeS0_4$ or copperas as a source of Fe. A controlled release, granular formulation of CGA-64250 applied in the seedrow at planting had a large influence on reducing plant mortalities at both early and late season. This effect was equaled by an application of K-Mg $S0_4$ combined with a foliar spray with nickel (Ni). Lint yields were highest for the Ni treatment combined with K-Mg SO_4 producing a 123 lb/acre lint increase over the Ni control. Evidence from this project, thus far, supports the use of improved host plant nutrition as an aid in disease suppression, but does not identify specific formulations of fungicides for additional disease control. More definitive research on controlled release fungicides is needed.

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