

Effect of soil solarization and biocontrol agents on plant growth and management of anthracnose of sorghum

YOGENDRA SINGH

Dept. of Plant Pathology, G.B. Pant University of Agriculture and Technology, Pantnagar, U.S. NAGAR (U.A.) INDIA

ABSTRACT

In present investigation solarization of soil with transparent polyethylene sheet resulted in average Maximum temperature of 54.6°C at 5 cm. soil depth which was 10°C higher over non solarized soil. The temperatures higher than 45 and 50°C, which are lethal for microorganisms, were recorded for most of the duration of solarization at 5 and 10 cm depths. Solarization completely controlled the population of wild host *S. halepense* and other weeds. Solarized soil alone and when applied with *Trichoderma harzianum* (TH 43 and TH 39) and *Pseudomonas fluorescens* (PSF 27) resulted in increased plant height, collar diameter and reduced disease severity as compared to non solarized soil alone or fortified with biocontrol agents. The results indicated that application of biocontrol agents in solarized soil may be recommended for management of anthracnose of sorghum.

Key words: Colletotrichum graminicola, Plant growth, Pseudomonas fluorescens, Soil solarization, Trichoderma harzianum

INTRODUCTION

Soil solarization is a method of controlling soil borne pests and pathogens by raising the temperature of the soil through application of transparent polyethylene plastic sheet to a moist soil surface. Use of this method has been reported to reduce the population of many soil borne pathogens and weeds (Pullman *et al.*, 1981; Katan *et al.*, 1983; Barbercheck *et al.*, 1986). Improved disease control, delayed inoculum build up and increased plant growth has been achieved by combining antagonists with solarization (Stapleton, 1984; Katan, 1987; Kalomoiras and Tjamos 1992). Anthracnose of sorghum (*Sorghum bicolor*) caused by *Colletotrichum graminicola* is one of the most destructive diseases of the crop in India and Uttaranchal has been identified as hot spot by All India Coordinated Sorghum Improvement project. The disease is reported to survive well on wild host *S. halepense* and other sorghum spp. (Frederiksen, 1986). *S. halepense* grows abundantly in the region and as its roots remain in the soil harbouring the anthracnose pathogen, emergence of infected plants play a role in disease spread in sorghum. Therefore, the present investigation was carried out to study the effect of soil solarization and biocontrol agents on plant growth enhancement and management of anthracnose diseases.

MATERIALS AND METHODS

The experiment was conducted in 24 beds (4.0 x

2.0 M) where sorghum was being grown for last five year. Each bed was irrigated to saturation level and half of the beds (12 Nos.) were solarized by covering with transparent polyethylene sheet (25 mm). Soil temperature of solarized and non solarized beds was recorded at depths of 5, 10 and 20 cm after every 24 hrs. at 2 pm for 5 weeks from May 15 to June 20, 2005. *Trichoderma harzianum* (TH 43 and TH 39) and *Pseudomonas fluorescens* (PSF-27) obtained from Biocontrol laboratory of Plant Pathology Department of GBPUA&T, Pantnagar were used to colonize the compost in separate pits for 4 weeks. TH 43, TH 39 and PSF-27 fortified compost having 10⁹CFU/g was applied @ 8 kg/bed both in solarized and non solarized plots. Observations on height, collar diameter and disease severity were recorded after 70 days of sowing of susceptible sorghum variety PC 23. Population of wild host *S. halepense* was recorded periodically at one month interval up to 3 months. Disease severity was calculated using 1-5 scale proposed by All India Coordinated Sorghum Improvement Project where 1: no symptoms, 2: up to 10% leaf area covered, 3: 11-25% leaf area covered, 4: 26-50% leaf area covered and 5: > 50% leaf area covered. Percent Disease Index (PDI) was calculated as:

$$\text{Disease index (\%)} = \frac{\text{Sum of numerical ratings}}{\text{Number of samples examined} \times \text{Max. rating}} \times 100$$