Large Patch Control Affected by Fungicide and Target Site of Application

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INTRODUCTION

Large patch (*Rhizoctonia solani* Kuhn AG 2-2 LP) is the most severe disease of Japanese lawngrass (JLG) (*Zoysia japonica* Steud.) in the transition zone United States (Green et al., 1993). Symptom development primarily occurs during the fall and spring months as JLG approaches and exits winter dormancy (Fig. 1,2). Due to the persistence of the mycelium in the soil-plant matrix, *R. solani* resumes growth in the same location each season and the disease gets progressively more severe (Spurlock, 2009).

Preventative fungicide sprays are the primary means of reducing large patch severity. However, large patch is difficult to control using traditional fungicide sprays. Much of the fungicide solution does not deposit into the lower plant canopy where infection occurs. Data describing the effect of lower canopy vs. upper canopy fungicide deposition on large patch control is warranted.

Fig. 1. A black water-soaked lesion on individual plants is a common symptom of large patch. An orange firing at the margin of existing patches is an indication of disease activity.

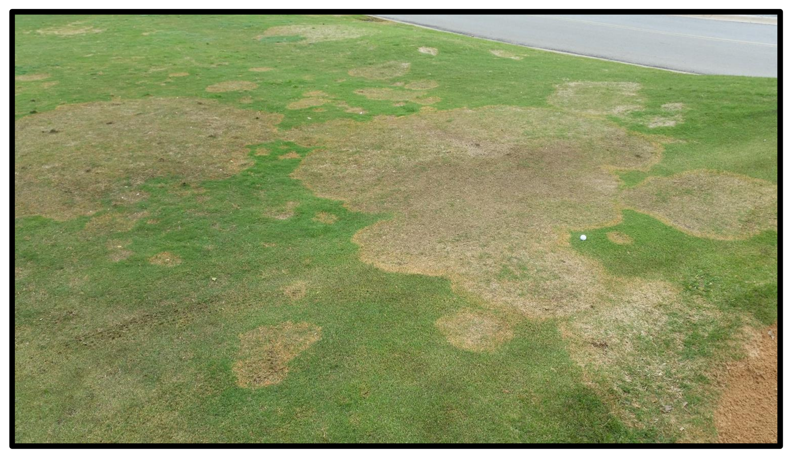

Fig. 2. Patches can range in size from a few cm in diameter to more than 3 m in diameter.

OBJECTIVE

Determine the amount of protection provided by four different fungicides of differing modes of action applied on the leaf, sheath, or stem parts of JLG plants.

MATERIALS AND METHODS

Repeated experiments were conducted in 2015 in Knoxville, TN, to asses large patch control using fungicides deposited on three target sites of JLG (leaf, sheath, and stem). Treatments were a factorial combination of 4 fungicides and 3 application target sites within a randomized complete block design with 5 replications.

Plant culture

- Single stolon JLG plants were established in conetainers under greenhouse conditions and maintained at 2.5 cm.
- After maturation, the plants were trimmed to two tillers of similar size in each conetainer.

Treatments

- Azoxystrobin (0.61 kg ai ha^{-1}), flutolanil (4.69 kg ai ha^{-1}), chlorothalonil (8.05 kg ai ha^{-1}), and tebuconazole (0.83 kg ai ha^{-1}) were applied using a pipette as 2.5µl droplets that were dispensed singly on the leaf, sheath, or stem.

Inoculation

- Plants were inoculated with *R. solani* infested oat grain and kept in a growth chamber under high humidity (Fig. 3). The growth chamber was maintained at 23°C with a 12 hour photoperiod.

Data collection

- Measurements of visual disease severity (0-100%) and photochemical efficiency (F_v/F_m) were collected every 7 days.
- The 1st and 2nd experimental runs were terminated 28 and 14 days after trial initiation, respectively. The termination of the trial period was determined by the decline of the JLG plants that were nontreated and non-inoculated.

Statistical analysis

- Data were subjected to analysis of variance (ANOVA) using PROC MIXED with code generated by the DANDA macro (Saxton, 2010) in SAS.
- Response variable means were separated using Fisher's protected least significant difference (LSD) test at α = 0.05

Fig. 3. Plant culture, treatment application, and inoculation of Japanese lawngrass under growth chamber conditions.

RESULTS

- JLG treated with fungicides applied on the sheath or stem exhibited significantly lower large patch severity and higher Fv/Fm values compared to JLG receiving leaf applications on most rating dates (Fig. 4).
- Large patch control of azoxystrobin treated JLG was most affected by the site of application. At 28 days after treatment, leaf applications of azoxystrobin exhibited 74% disease severity, whereas the sheath and stem applications both exhibited <5% disease severity (Fig. 5,6).
- No significant differences in large patch severity were observed among azoxystrobin, tebuconazole, and flutolanil treated JLG when applied on the sheath or leaf on 28 and 14 days after trial initiation in the 1st and 2nd experimental run, respectively (Fig. 5).

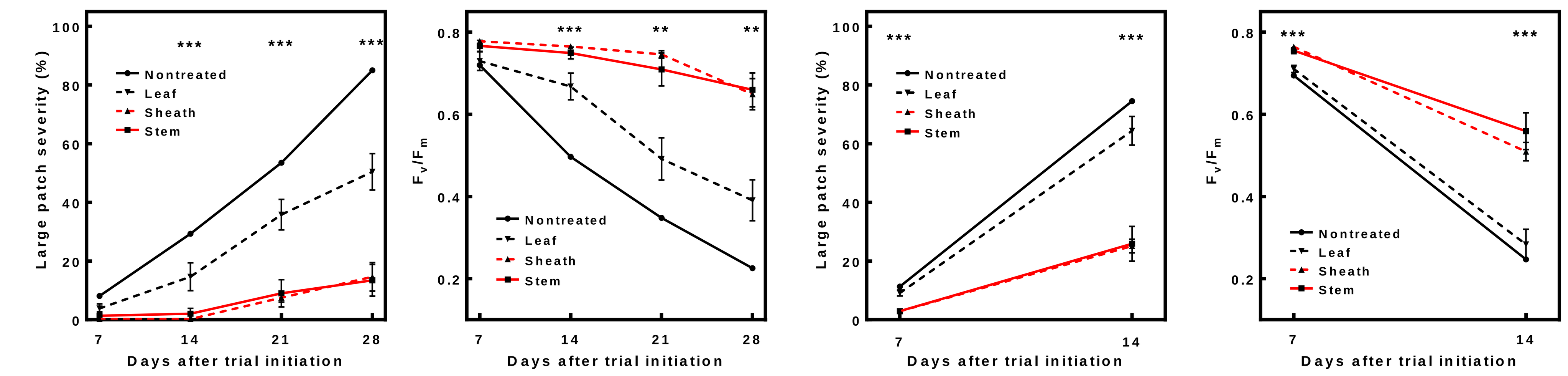

Fig. 4. Effect of application placement (pooled across fungicides) on large patch severity and Fv/Fm. The study was conducted on Japanese lawngrass (Zoysia japonica) under greenhouse conditions in Knoxville, TN. Error bars represent the standard error of the mean. Means were separated using Fisher's protected least significant difference test ($P \leq 0.05$).

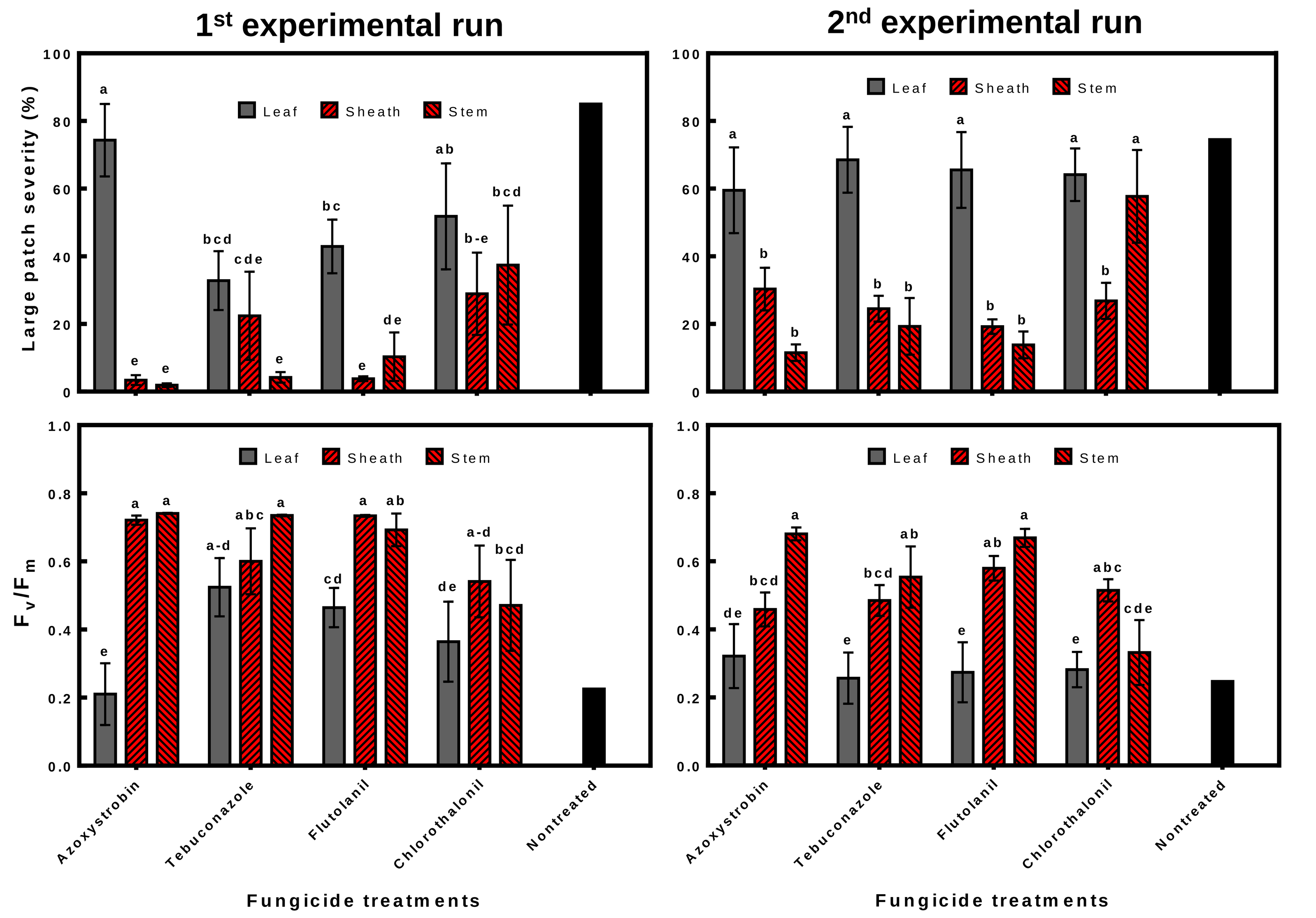

Fig. 5. Effect of fungicide and site of application on large patch severity and Fv/Fm. The study was conducted on Japanese lawngrass (Zoysia japonica) under greenhouse conditions in Knoxville, TN. Error bars represent the standard error of the mean. Means followed by the same letter are not statistical different according to Fisher's protected least significant difference test ($P \leq 0.05$).

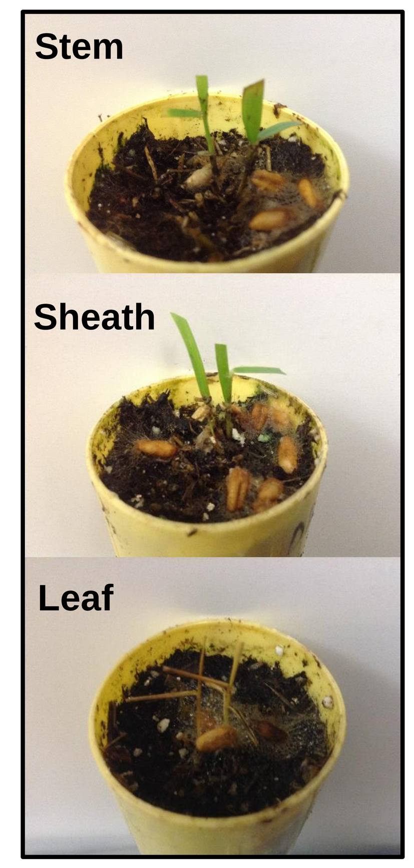

Fig. 6. Differences in large patch severity affected by azoxystrobin applied onto the stem, sheath, or leaf.

FUTURE RESEARCH

- Future research is needed to improve lower canopy fungicide deposition under field conditions.
- Fungicide sprays that incorporate surfactants may help redistribute the fungicide from the leaf blade to the lower plant canopy.

ACKNOWLEDGMENTS

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