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Title: Influence of Spray Rate Volume and Adjuvant Additives on Fungicidal Control of Large Patch.

Objective: Determine optimal spray rate volumes and adjuvant combinations for enhanced control of large patch.

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Body:

Large patch, *Rhizoctonia solani* AG 2-2 LP, epidemics are common on Japanese lawngrass (JLG; *Zoysia japonica*) landscapes in the transition zone US (Fig. 1). Large patch is primarily managed using fungicide applications on intensively managed turfgrass such as golf course fairways. However, despite the use of fungicides, difficulties in controlling these epidemics have been observed. Experiments were conducted to: (I) identify the optimal fungicide deposition site for large patch control; (II) determine spray application methods that result in optimal deposition; and (III) determine if the optimal spray application methods result in reduced large patch severity under field and greenhouse conditions.

The first experiment evaluated large patch control using four fungicides (Heritage, Torque, Prostar, and Daconil Ultrex) applied on the stem, sheath, or leaf of JLG. Applications were made using a pipette to dispense single droplets of fungicide solution onto the target sites. Results of this experiment suggest that improved large patch control occurs when fungicides are deposited lower in the plant canopy (Fig. 2). All xylem mobile fungicides resulted in a significant reduction of large patch severity when applied on the sheath or stem compared to applications on the leaf.

The second experiment identified spray application methods that result in greater fungicide penetration in JLG canopies. Four spray rate volumes (0.23, 0.92, 1.83, and 3.67 gal/M) were applied with and without an organosilicone surfactant onto JLG maintained in a greenhouse. A fluorescent tracer was included in all treatment combinations and the use of black light illumination aided in identification of spray deposits (Fig. 3). Results suggest that higher spray rate volumes, with or without an organosilicone surfactant, increased the percentage of stems and sheaths that contained spray deposits by as much as 35% compared to the lowest spray rate volume (Fig. 4 . The spray rate volumes of 0.92 and 1.83 gal/M resulted in the most leaf surface coverage.

The third experiment evaluated various spray rate volumes and adjuvants additives on fungicidal control of large patch under field and growth chamber conditions. The four spray rate volumes (0.23, 0.92, 1.83, and 3.67 gal/M) and two adjuvants (organosilicone surfactant and a modified vegetable oil adjuvant) were applied with three fungicides (Heritage, Torque, and Prostar).

Increased spray rate volume resulted in significant decreases in large patch severity under field and growth chamber conditions (Fig. 5). The highest spray rate volume (3.67 gal/M) resulted in a 20% reduction in large patch severity compared to the lowest spray rate volume (0.23 gal/M). Large patch development was less affected by the use of adjuvants compared to spray rate volume.

In conclusion, this research demonstrated that enhanced fungicidal control of large patch occurs when fungicides are deposited lower in the plant canopy. The use of higher spray rate volumes, with or without adjuvant additives, resulted in greater penetration of the spray solution and improved fungicidal control of large patch. Future research is needed on the combination of higher spray rate volumes and adjuvants on turfgrass safety and large patch control under variable environmental conditions.

Bullet points:

- Fungicides applied on the sheath or stem provided greater large patch protection compared to fungicide applied on the leaf
- Increases in spray rate volume resulted in greater penetration of the solution in Japanese lawngrass canopies and improved fungicidal control of large patch.
- Future research is needed on the safeness of adjuvant additives on Japanese lawngrass under variable environmental conditions.

Fig. 1. Large patch, caused by *Rhizoctonia solani* AG 2-2 LP, is a severe disease of Japanese lawngrass in the transition zone United States.

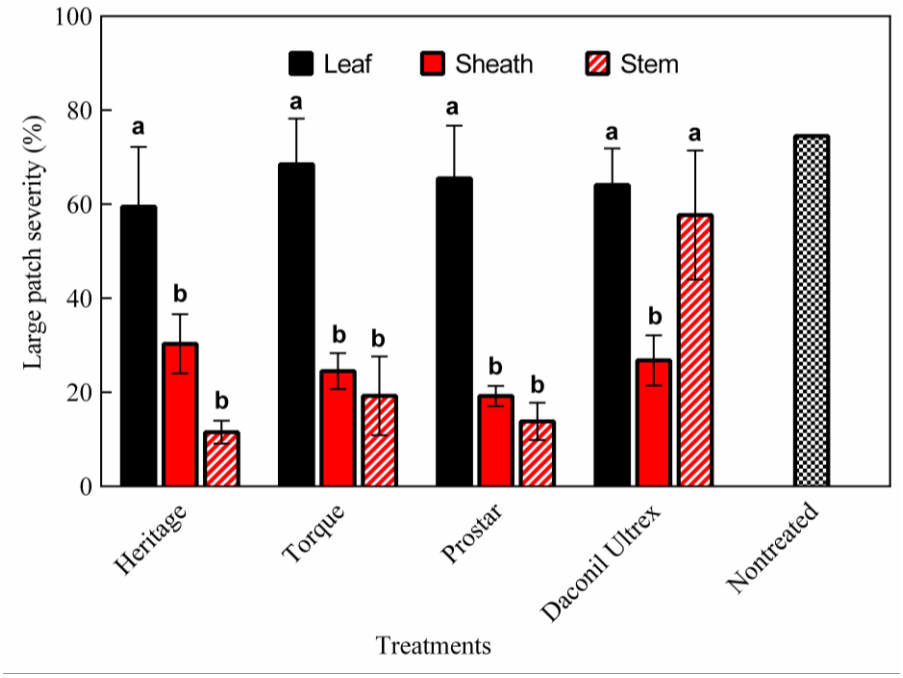

Fig 2. Effect of fungicide application deposition site on large patch severity.

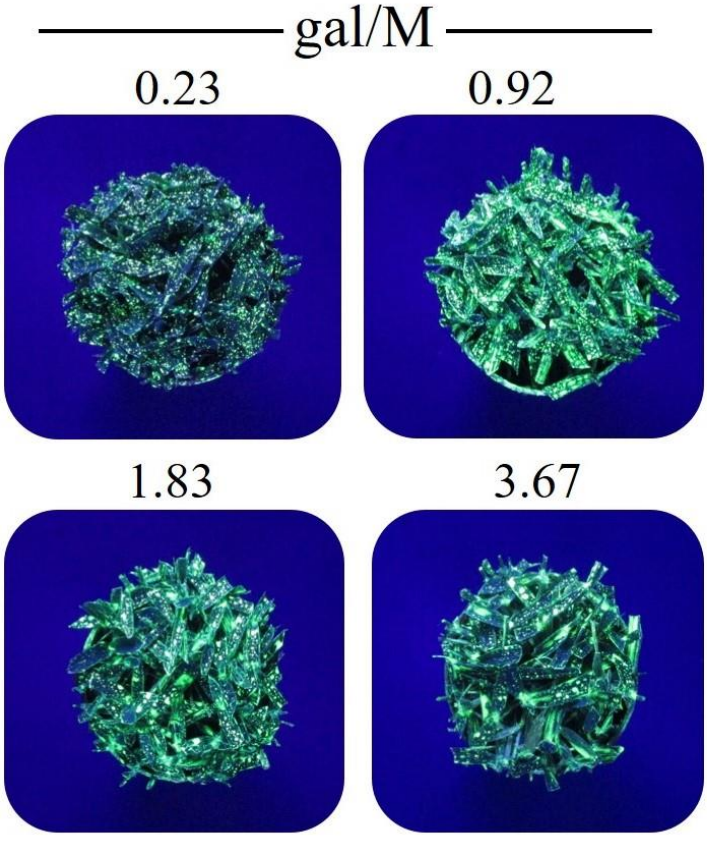

Fig. 3. A fluorescent tracer was used to assess spray deposition characteristics with the aid of black light illumination.

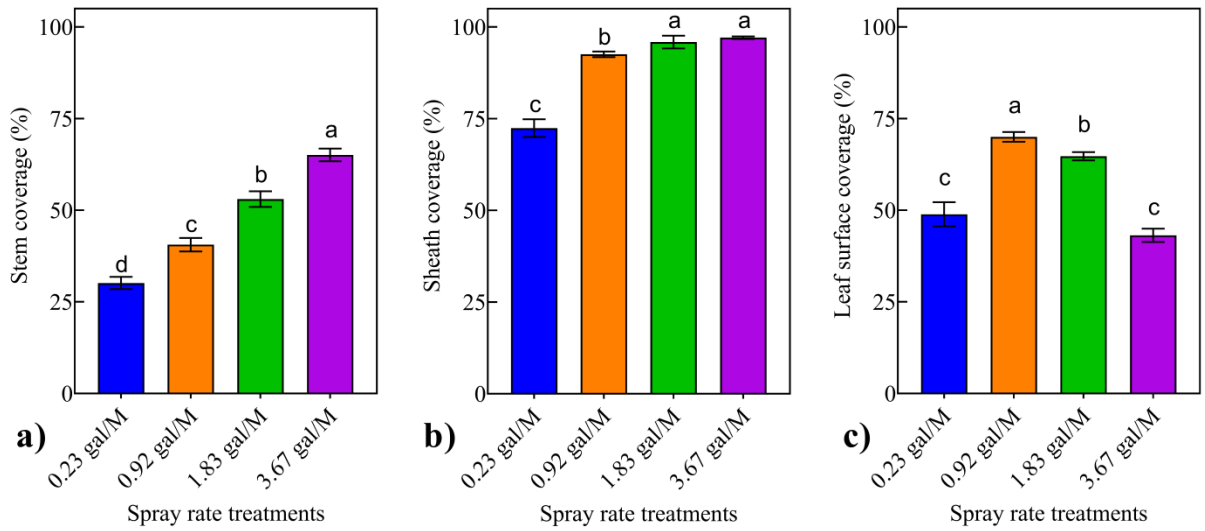

Fig. 4. Spray deposition measurements on Japanese lawngrass stems (a), sheaths (b), and leaf surfaces (c) in response to various spray rate volumes.

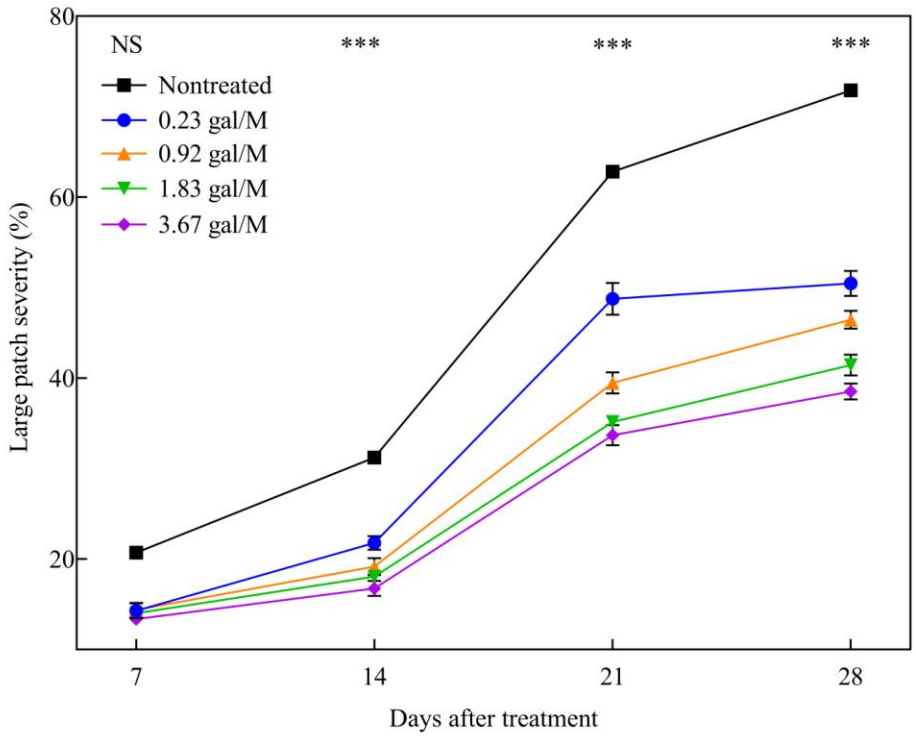

Fig. 5. Large patch severity (pooled across fungicides) in response to various spray rate volumes under growth chamber conditions.