Patch Disease Refresher

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The patch diseases in turf refer to a certain group of diseases (summer patch, take-all patch, necrotic ring spot, and spring dead spot) caused by ectotrophic root infecting fungi (ETRI). The fungi that incite these diseases are common soil inhabitants that can colonize root surfaces and can also infect turfgrass roots. Although this group of fungi is soilborne, they are not competitive saprophytes. In other words, they require a competitive advantage over other microbes and the turfgrass plant to initiate an infection. Hence, there are usually very specific conditions under which these fungi attack turfgrass roots.

Figure 1. Characteristic stand symptoms of take-all patch on a creeping bentgrass fairway, note that red fescue is colonizing the center of the patch. (Image Courtesy of B.B. Clarke).

This article will summarize the biology, epidemiology and management of two important patch diseases, summer patch and take-all patch, in creeping bentgrass and annual bluegrass stands.

Take-all patch

Take-all patch is caused by the fungus Gaeumannomyces graminis var. avenae (Gga). This fungus only infects bentgrasses to our knowledge and causes severe rotting of roots and crowns. Gga becomes active during periods of cool, wet weather, specifically when soil temperatures are between 55 and 65oF. The fungus has a high water potential requirement, which probably explains why we see more take-all in years with cool, wet springs. Becoming active during these cooler temperatures probably allows the fungus to outcompete other microbes for nutrients on the surface of the roots and in turn may eventually lead to infection. Although infection takes place when soil temperatures are cooler, take-all patch symptoms are not expressed until bentgrasses are subjected to heat or drought stress.

Once infection occurs then Gga colonizes primary and secondary roots near the crown and eventually the crown itself. I think the confusing thing about patch diseases is to separate the terms infection and colonization. Infection is the initiation of a feeding relationship between a pathogen and its host, whereas colonization is establishment and ramification of the pathogen throughout host tissue. Basically once Gga and other ETRI fungi have colonized turfgrass roots, there is little we can do to suppress disease. This is the reason why preventative chemical and cultural control strategies are so important for patch diseases.

After Gga has colonized the below ground tissue of turfgrass roots and a period of heat or drought stress occurs, symptoms of take-all patch become evident. Stand symptoms initially appear in late spring or early summer and are small, circular, light brown or reddish brown patches (Figure 1). Patches can increase in size throughout the summer months expanding 6 inches per year. Take-all patch can recur in following years and ultimately could reach 3 ft in diameter. As mentioned previously, Gga induces a severe rot of all below ground tissues (roots, crowns, stolons, and rhizomes), but seems to be most apparent on roots and crowns (Figure 2).

Figure 2. Characteristic symptoms of roots and crowns suffering from take-all patch.

Conditions that favor take-all patch development are fumigated soils planted with creeping bentgrass. Take-all patch is also favored by lighter textured soils, manganese fertility and pH's above 6.5. When thinking about pH, the goal is not to reduce bulk pH rather to influence pH around the rhizosphere (area under the influence of the root). Thus the use of ammonium sulfate may limit take-all patch development, but may not impact the bulk soil pH. Manganese fertility was shown to limit take-all development, yet this work was done in New Jersey on a site with pH > 6.2 and with very low manganese concentrations. However, applications of manganese in April or May at 2 lbs Mn/acre may reduce, not eliminate, take-all patch severity.

Fungicides maybe the only recourse for turfgrass managers struggling with take-all patch and there are a number of products that work. Fungicides with the QoIs (Heritage, Insignia, Disarm) and DMIs (Triton FLO, Tourney, Trinity, Torque, Bayleton, Eagle) have all been shown to have some level of efficacy against take-all patch. Applications of fungicides should be conducted when soil temperatures consistently (3 to 5 days in a row) reach 55oF. A follow-up application 21 to 28 days later is suggested as long as soil temperatures have not exceeded 65oF. Keep in mind that the take-all patch fungus lives below the soil surface, so it is imperative to get the fungicides in contact with the pathogen. Watering the product in immediately after application or applying the products in 4 to 5 gal/1000ft2 can accomplish this.

The beauty of take-all patch is the severity of the disease decreases over time. The theory behind this is as the microbial populations grow and shift overtime they become antagonistic towards the take-all patch fungus. This has never been officially documented in turfgrass systems, but many have observed this phenomenon. Depending on the age of your course and the tolerance of your clientele, take-all patch applications may actually not be needed. The beauty of take-all patch control is the application timings and products coincide very well with preventative fairy ring applications.

Summer patch

Summer patch is caused by the fungus Magnaporthe poae, which can infect annual bluegrass, Kentucky bluegrass, fine fescue and to some extent creeping bentgrass. Symptoms typically appear in mid to late summer as circular patches of yellow to orange turf (Figure 3). In mixed stands of annual bluegrass and creeping bentgrass the annual bluegrass will be the primary species affected. In taller cut turf such as Kentucky bluegrass and fine fescues, the symptoms are circular, straw colored, depressed areas ranging from 3 to 12 inches in diameter (Figure 4). Affected roots, rhizomes and crowns have a dark brown appearance.

Infection of roots starts in late spring when soil temperatures stabilize around 65 to 70oF and colonization of the below ground tissue continues until soil temperatures reach 95oF. The summer patch fungus's competitive advantage is it has the ability to grow at high soil temperatures with relatively little soil moisture. Basically the summer patch fungus acts very similar to Gga except that it begins the infection process a bit later in the season.

Figure 3. Stand symptoms of summer patch on an annual bluegrass putting green. Note that creeping bentgrass is surviving in the centers of the patches. (Courtesy of P.H. Dernoeden)

Control of summer patch can be achieved by integrated cultural and chemical means. If summer patch has been a problem, then it is likely that there are issues with drainage and compaction at the site.

Figure 4. Severe summer patch of red fescue, note the orange color with depressed patches. (Courtesy P.H. Dernoeden)

Aerification in the spring and fall is an excellent cultural control method for summer patch. Since summer patch is associated with summer stress, another option is to alternate mowing and rolling. This will alleviate stress on the annual bluegrass plants and protect the limited root systems during the summer months.

Like take-all patch, chemical control methods are typically warranted for summer patch. Largely because of the unpredictability of this disease and that once symptoms develop there is nothing that can be done. Preventative applications for summer patch should be performed when soil temperatures are consistently between 65 and 68oF. Products that work well are the QoI (see above for products), DMI (see above) and benzimidazole (thiophanate methyl). These products should be applied in high volumes of water (4 to 5 gal/1000ft2) or irrigated in with 1/8 inch of water. Summer patch can be suppressed once symptoms develop, but only to a limited degree.

References:

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