# Effects of Sulfur, Calcium Source and pH on Microdochium Patch
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Research Summary (Year 3)
- Sulfur applications reduced Microdochium patch on an annual bluegrass putting green.
- Sulfur applications resulted in fewer curative fungicide applications when using the development of infection centers as an action threshold to control Microdochium patch.
- Sulfur applications decreased turf color and increased Anthracnose activity when summer fungicides were not applied.

## Introduction

Historically, more money is spent on fungicides to combat Microdochium patch (*Microdochium nivale*) in the Pacific Northwest and Western Canada than any other turfgrass disease. As a result of the financial burden and the potential for development of fungicide resistance associated with frequent fungicide applications, as well as growing pesticide bans and restrictions, turf managers as a whole are looking for methods to mitigate pesticide applications. Therefore, the primary objective of this research is to determine if sulfur applied with and without various calcium sources can reduce the number of annual fungicide applications necessary to manage Microdochium patch on annual bluegrass.

## Year Three Findings

The results in 2016 were very similar to those in 2014. As a reminder, the 2015 results followed the same trends but were muted by the unusually dry winter. In comparison to the control which required 4.1 applications over an 8 month period, plots treated with 3.0 and 6.0 lbs. sulfur per 1,000 $ft^2$ annually required 2.9 and 1.6 fungicides applications, respectively (Table 1). Medium and high rates of sulfur did reduce the number of infection centers in February, but the differences were small.

Sulfur applications of 3 lbs. per 1,000 $ft^2$ annually reduced turf color ratings by 0.5 points in July 2016 as compared to the control, but surprisingly, the 6 lb. annual rate of sulfur was statistically the same as 0 lbs. of Sulfur (Table 2). Percent anthracnose disease was higher in August of 2016 with the medium and high rates of sulfur averaging 4.6 and 5.0 percent disease, respectively, compared to the control which averaged 0.4 percent disease. There were no differences in anthracnose disease from the calcium products. No fungicides were applied for anthracnose, but it is possible the fungicide applications made to control Microdochium patch may have affected the anthracnose disease the following summer.

**Table 1:** Effects of sulfur rate and calcium type on Microdochium patch infections centers observed in March 2016, and the number of fungicide applications made to control Microdochium patch from Oct 1, 2015 to May 31, 2016, Corvallis, OR.

| **Sulfur rate**[z] | Microdochium patch infection centers (per 25 $ft^2$) | Number of Microdochium patch fungicide applications[y] |
|---|---|---|
| 0 lbs | 2.2 a[x] | 4.1 a |
| 3 lbs | 1.5 a | 2.9 b |
| 6 lbs | 0.8 a | 1.6 c |
| **Calcium source**[w] | | |
| None | 0.7 a | 2.6 a |
| Calcium carbonate | 3.2 a | 3.0 a |
| Calcium sulfate | 0.3 a | 2.7 a |
| Calcium phosphate | 1.7 a | 3.1 a |

[z] 0.0, 3.0 and 6.0 lbs. sulfur/1,000 $ft^2$ annually, applied at 0.25 and 0.5 lbs. sulfur/1,000 $ft^2$ per month x 12 months, respectively from Jan 2009 to Dec 2015. From Mar 2005 to Dec 2008, 0.0, 1.5 and 3.0 lbs. sulfur/1,000 $ft^2$ annually, applied at 0.125 and 0.25 lbs. sulfur/1,000 $ft^2$ per month x 12 months, respectively.

[y] Fungicide applications of propiconazole plus PCNB (2.0 fl. oz + 6.0 fl. oz/1,000 $ft^2$) were made on a per plot basis using the following infection threshold, 5 small spots or one spot exceeding 1 inch in diameter, from Oct 1, 2015 to May 31, 2016.

[x] Means followed by the same letter within each factor of S rate and calcium source are not significantly different according to Fishers' Protected LSD ($\alpha$=0.05).

[w] All calcium sources were applied after core cultivation in May and Sep from 2005 to 2015 at a rate of 12.5 lbs product/1,000 $ft^2$, totaling 25.0 lbs. product/1,000 $ft^2$ annually.

**Table 2:** Effects of sulfur rate and calcium source on turf color observed in July 2016 and percent Anthracnose cover (0-100%) observed in August 2016 in Corvallis, OR.

| **Sulfur rate**[z] | Turf color (1-9) | Percent Anthracnose cover (0-100%)[y] |
|---|---|---|
| 0 lbs | 7.6a[x] | 0.4a |
| 3 lbs | 7.1b | 4.6b |
| 6 lbs | 7.3ab | 5.0b |
| **Calcium source**[w] | | |
| None | 7.3a | 3.5a |
| Calcium carbonate | 7.4a | 3.0a |
| Calcium sulfate | 7.3a | 3.7a |
| Calcium phosphate | 7.2a | 3.1a |

[z]0.0, 3.0 and 6.0 lbs. sulfur/1,000 ft2 annually, applied at 0.25 and 0.5 lbs. sulfur/1,000 ft2 per month x 12 months, respectively from Jan 2009 to Dec 2015. From Mar 2005 to Dec 2008, 0.0, 1.5 and 3.0 lbs. sulfur/1,000 ft2 annually, applied at 0.125 and 0.25 lbs. sulfur/1,000 ft2 per month x 12 months, respectively.

[y]No fungicides were applied to these plots after the conclusion of the 1 Oct 2014 to 31 May 2015 Microdochium patch scouting cycle.

[x]Means followed by the same letter within each factor of S rate and calcium source are not significantly different according to Fishers' Protected LSD ($\alpha$=0.05).

[w]All calcium sources were applied after core cultivation in May and Sep from 2005 to 2015 at a rate of 12.5 lbs product/1,000 $ft^2$, totaling 25.0 lbs. product/1,000 $ft^2$ annually.