

2009 GCSAA EDUCATION CONFERENCE AND THE GOLF INDUSTRY SHOW

Moss Control on Putting Greens

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Moss Control in Putting Greens




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Moss Control in Putting Greens

- What is Moss?
- What species are present in turf?
- What chemicals are available for moss control?
- Do moss species respond differently to control measures?
- Developing a moss control program.
- Potential injury with an effective control measure



Bryophytes




- Three Classes
 - Marchantiophyta- liverworts
 - Anthocerotophyta - Hornworts
 - Bryophyta - Mosses
 - Non-vascular plants
 - Lack root systems
 - » Rhizoids-anchors
 - Ectohydric – can absorb water and minerals throughout there entire body
- Can survive long periods of drought
 - Symbiosis with blue-green algae
 - Blue-green algae can be a precursor to moss
- Reproduce sexually and asexually
 - Spores
 - Vegetative

Problems associated with Moss

- Create a non-uniform putting green surface
 - Clumps can disrupt ball roll
 - Bentgrass Competition
- Not aesthetically pleasing
 - Green to brown patches
 - Dead spots

Moss- An increasing problem in putting greens and lawn and landscape areas



Potential contributing factors

- Low nitrogen
- Organic matter build up
- Poor wound recovery
- Over-worked turf
- Other factors?
- Shade

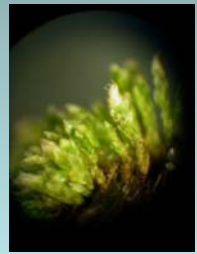


Moss invades a problem, then creates a problem.







Environmental considerations

- Moss creates an environment of its own.
- High organic matter layer.


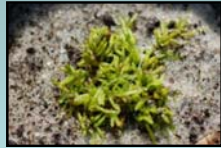





Environmental considerations

- Highly competitive for resources.
- Gradually thins down the existing turf stand.







Moss Species in Turf









Moss Species

- Primary species:
Silvery-thread moss (*Bryum argenteum*)
- Other *Bryum* spp.
- Carpet mosses:
Entodon seductrix
Amblystegium serpens

Entodon and *Amblystegium*

Entodon and *Amblystegium*

- Not as common as silvery-thread on putting greens.
- Seem to be secondary moss species.
- Truly problematic putting greens.



Silvery-Thread Moss (*Bryum argenteum*)



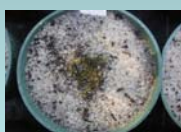
Moss Control Agents

Copper Hydroxide + Mancozeb (Junction)

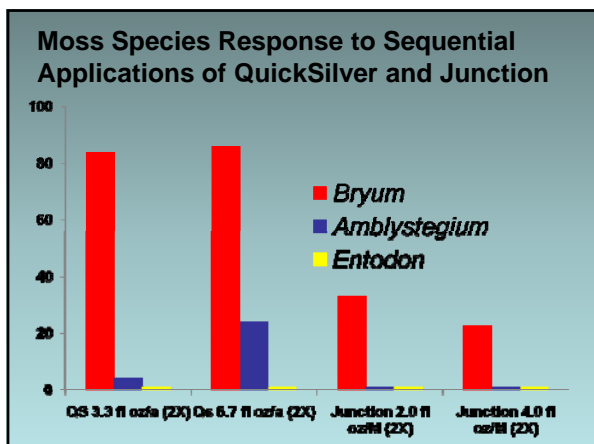
- Fungicide/Bactericide
- Labeled for Moss Control
- Chemical Family: ethylenebisdithiocarbamate (EBDC)
- Contact Fungicide
- Rates: 4 oz wt. /1000ft² (multiple applications)

Carfentrazone-ethyl (Quicksilver)

- Recently labeled for control of Silvery-thread moss (*Bryum argenteum*)
- Chemical family: Aryl triazinone
- Mode of Action: Disrupts cell membranes
- Rate: 6.7 fl oz/acre



Variation in Moss Species Response to Junction and QuickSilver



Moss Species Response

- Could variation amongst courses be attributed to different species?

Developing a Moss Control Program

Moss Control Program

- Quicksilver 6.7 fl oz/a
 - 2 applications 2 to 3 weeks apart
- Moss will comeback from these applications
 - One application is even worse

Moss Control Program

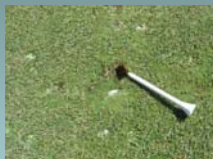
- Research
 - Quicksilver alone
 - Topdressing
 - Increased Nitrogen
 - Compared to Junction

Materials and Methods

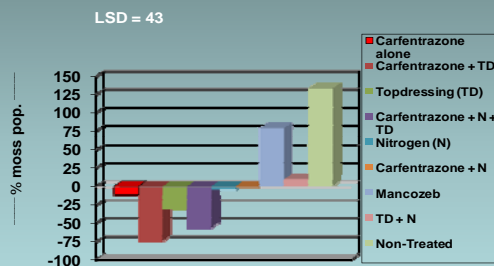
- Spray applications
 - Carfentrazone
 - Applied at 6.7 fl oz/a
 - Two application, two weeks apart
 - Mancozeb
 - Applied at 4.0 fl oz/a
- Cultural applications
 - Applied biweekly
 - Ammonium Sulfate
 - Granular
 - 0.25 lb N/M
 - Topdressing
 - Brushed into canopy
 - 200 lb/M

Materials and Methods

- QuickSilver 6.7 fl oz/a, applied twice, 2 week intervals
- QS, followed by TD 4 apps
- Topdressing alone, 4 apps
- QS, followed by TD and N 4 apps
- Nitrogen alone, 4 apps
- QS, followed by N 4 apps
- Junction 4 fl oz/a, 4 apps, 2 week intervals
- TD plus N, 4 apps, 2 week intervals
- Non-treated



The Honors Course



Initiated: May 12, 2007; Rated Sept 20.

Quicksilver+ TD

21 DAIT

Sept 20



Quicksilver + TD + N

21 DAIT

Sept 20



Junction

21 DAIT

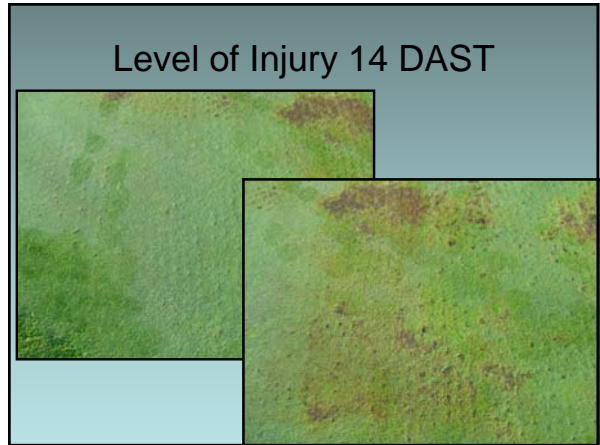
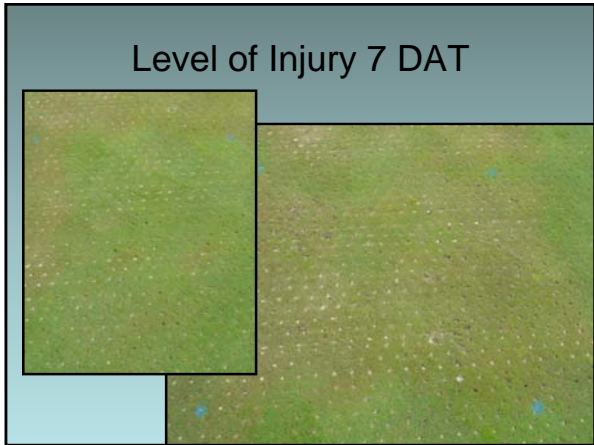
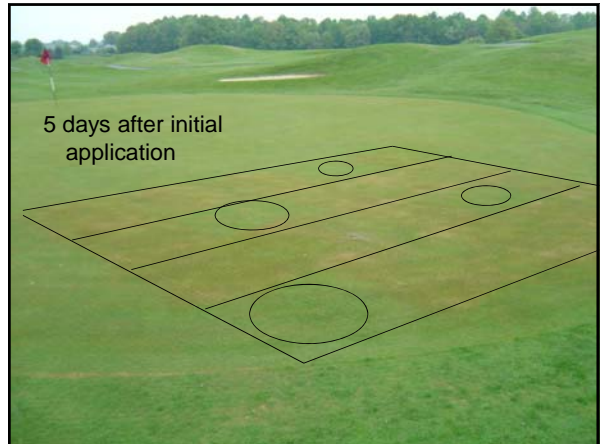
Sept 20



Moss Control Program

- Two Quicksilver Applications
 - 6.7 fl oz/a
 - Two weeks apart
- Topdress, Topdress, Topdress
- Aerification will help
- Junction?
 - Better preventative than topical control agent

Potential for Injury with QuickSilver?



Five other locations- No Injury!

- UT Golf Practice Facility (Penncross/Crenshaw)
- Little Course- SR 1020, Cato, Crenshaw
- Little Course- Core aerify, topdress, then apply QS at 0, 3, 7, 14 days after- No injury. Plus- Sprayed at 24 oz/a (4X rate).

*So why did we observe injury at The Crossings?
Injury observed in similar study in NC*

Injury at The Crossings

- Greens were very dry and under stress at time of application.
 - Not a temp issue though.
- Lots of moss underlying the turf canopy.
- **Bensumec sprayed one month prior to QuickSilver treatment**



Injury correlation

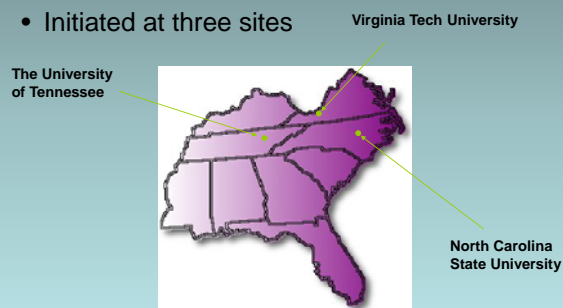
- Both golf courses applied bensulide
 - Bensumec – preemergence herbicide for annual bluegrass and crabgrass control
 - Applied prior to carfentrazone applications

Bentgrass injury



Materials and Methods

- Initiated at three sites

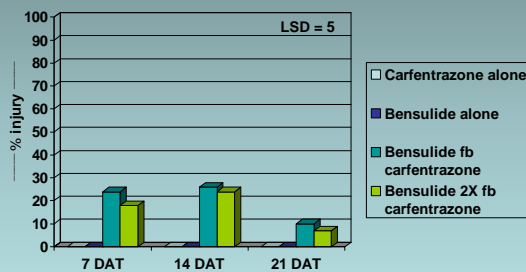


Experiment Design

Bensulide	Carfentrazone (days after 2 nd bensulide app)							
	NT	0 d	1 d	3 d	7 d	14 d	21 d	28 d
No Bensulide	1	2	3	4	5	6	7	8
Sequential Bensulide 14 days apart	9	10	11	12	13	14	15	16
Single Bensulide	17	18	19	20	21	22	23	24

- NC State and Tennessee – 2nd bensulide application Mar. 6
- Virginia Tech 2nd bensulide application May 16

Tennessee - carfentrazone applied 28D after 2nd bensulide application



Most Severe injury observed

Virginia Tech



NC State



Tennessee



Potential Injury from QuickSilver

- Highly correlated with Bensumec
 - Bensumec is an OP
- Two applications, 6.2 oz/a, 2-3 weeks apart.
- If you see injury, delay second app for 6 to 8 weeks.



Final thoughts

- Moss not only invades a problem, it creates a problem.
- There is more than one species out there.
- Quicksilver must be used in an integrated program.
- Quicksilver applied after a Bensumec application can induce injury.

Questions and Comments