‘Tenacity’: A New Herbicide for Turfgrass Establishment

Washington State University
Crop Science Seminar

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Overview

• What is ‘Tenacity’; Formulations available?
• What weeds does ‘Tenacity’ control?
• ‘Tenacity’ and environment Interactions
• How does ‘Tenacity’ work (MOA)?
• How well does ‘Tenacity’ work (Efficacy)?
• How can we best use ‘Tenacity’ in turf?
What is ‘Tenacity’ and what formulations will be available?

• ‘Tenacity’ has the active ingredient mesotrione

• Commercially available 1st quarter of 2008

• Formulations include:
  – Soluble concentrate (SC)
    • Apply with NIS at 0.25% v/v
  – Impregnated fertilizer
Mesotrione Impregnated Fertilizer

(20-27-5)
Mesotrione
Chemical Family: Triketone
Herbicide Family: Callistemone
Group 27
Weeds Present

- Pigweed, *Amaranthus* spp.
- Common lambsquarter, *Chenopodium album*
- Prickly lettuce, *Lactuca serriola*
- Pineappleweed, *Matricaria matricarioides*
- Canada thistle, *Cirsium arvense*
- Mayweed chamomile, *Anthemis cotula*
- Common groundsel, *Senecio vulgaris*
- Common mallow, *Malva neglecta*
- Shepardspurse, *Capsella bursa-pastoris*
- Henbit, *Lamium amplexicaule*
- Redstem filaree, *Erodium cicutarium*
- Witchgrass, *Panicum capillare*
- Barnyardgrass, *Echinochloa crus-galli*.
Weeds Controlled

• More than 50 weed species with >85% control

• Some turf weeds of interest
  – Chickweed
  – Groundsel
  – Dandelion
  – Prostrate knotweed
  – Mallow
  – Black medic
‘Tenacity’ and the environment

- Reduced Risk Pesticide
- Caution
- Degradation
  - Rapidly by microorganisms to CO₂
- Half-life
  - 5-15 days for mesotrione; less than 6 days for each metabolite
- Leaching
  - Low potential
‘Tenacity’ and the environment

- Some movement observed in surface water
- Weak acid
- Adsorption to soil decreases as soil pH increases
  - more movement in alkaline soils
Movement in Surface Runoff
Movement in Surface Runoff
Movement in Surface Runoff
Mode of Action

• Uptake (roots and shoots)

• Xylem and phloem mobile

• Blocks carotenoid biosynthesis

• Chlorosis and necrosis of susceptible plants
  – Bleaching
Mode of Action

Plastoquinone/Tocopherol Synthesis

Mesotrione

4-HPPD

α-Tocopherol

Carotenoids

Plastoquinone
Symptoms

Black medic

Dandelion
‘Tenacity’ Efficacy

• 2006-2007 Research Summary

  – Mesotrione Impregnated Fertilizer (MIF) at planting
  
  – Mesotrione SC at planting
  
  – MIF pre-plant & at planting (Greenhouse)
  
  – Creeping bentgrass removal & overseeding program
Research Overview - MIF

• Location: Pullman, WA Turfgrass and Agronomy Research Center (TARC)

• 5 Turfgrass stands
  – ‘Treazure’ chewings fescue
  – ‘NuDestiny’ Kentucky bluegrass
  – ‘Gallery’ perennial ryegrass
  – Three way mix (2:1:1, KBG:PRG:CF)
  – ‘Inferno’ Tall Fescue*
Research Objectives

• Determine if ‘Tenacity’ is safe to turfgrass at seeding

• Determine rate of ‘Tenacity’ providing best weed control and acceptable turfgrass quality

• Determine if both grass and broadleaf weeds are controlled
Treatments

• ‘Tenacity’ (Mesotrione):
  – 0.144 lb ai/A
  – 0.25 lb ai/A
  – 0.30 lb ai/A
  – 0.50 lb ai/A

• ‘Tupersan’ (Siduron):
  – 5.98 lb ai/A

• Untreated control

20-27-5 only
Application Information

• All Mesotrione Impregnated Fertilizer applied at 180 LB/A (4.13 lb/M; 0.83 lb/M N)

• Tupersan (Siduron) Applied at 193.5 lb/A

• Entire plot watered 0.25 inch within 24 hours
‘NuDestiny’ Kentucky bluegrass, 10 weeks after treatment; 4 weeks after split application

161 g a.i./Ha

282 g a.i./Ha

0.30 lb a.i./A

0.50 lb a.i./A
‘NuDestiny’ Kentucky bluegrass, 10 weeks after treatment; 4 weeks after split application

0.144 lb a.i./A

Siduron 08/08/2007

Control 08/08/2007
‘Treazure’ chewings fescue, 10 weeks after treatment; 4 weeks after split application
‘Treazure’ chewings fescue, 10 weeks after treatment; 4 weeks after split application
'Gallery' perennial ryegrass, 10 weeks after treatment; 4 weeks after split application
‘Gallery’ perennial ryegrass, 10 weeks after treatment; 4 weeks after split application

0.144 lb a.i./A

Siduron

Control

08/08/2007
80% KBG, 13% CF, 7% PRG MIXTURE, 10 weeks after treatment; 4 weeks after split application
0.144 lb a.i./A

80% KBG, 13% CF, 7% PRG MIXTURE, 10 weeks after treatment; 4 weeks after split application
10 weeks after planting; note lighter green color of UTC & Siduron treatments
Results

• Not safe to use on fine fescue

• Rates below 0.25 lb a.i./A appear to be safe to PRG and provide excellent weed control

• Rates below 0.50 lb a.i./A appear to be safe to KBG

• Mix performs similarly to PRG
Results

• Mix turf plots had higher % fescue using low rates of mesotrione

• Fertilizer impregnated with mesotrione provided excellent weed control and turf quality

• Split applications appear to be safe
Tenacity 4SC at Planting

- 0.156, 0.187, 0.25, 0.156 x 2, & 0.187 x 2 lb a.i./A
- 2:1:1 (KBG:PRG:FLF) mixture
- Safety of applications
- Weed control
- Effect on establishment
3 weeks after planting

UTC

0.187 lb a.i./A

0.156 lb a.i./A

0.25 lb a.i./A
Note lighter green color of UTC and siduron plots

8 weeks after planting
Meso @ 0.25 lb ai/A
Meso @ 0.187 lb ai/A
UTC
Siduron

8 weeks after planting
UTC

Meso @ 0.187 lb x 2

Siduron

UTC

8 weeks after planting
Tenacity 4SC at Planting

- Excellent weed control with minimal phytotoxicity on a mixed turfgrass stand

- Mesotrione treatments were darker green in color (chewings fescue?)

- Split applications phytotoxic and did not appear necessary
Greenhouse Study

- Determine if pre-plant applications of MIF reduce phytotoxic effects to perennial ryegrass and chewings fescue
- Determine if MIF affects emergence of perennial ryegrass or chewings fescue
- Four timings; 4, 2, 1, and 0 weeks pre-plant
- Five rates; 0, 0.144, 0.25, 0.30, and 0.50 lb a.i./A
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|          | PRG 4 week pre-plant mesotrione application 35 DAP |

|          | FLF 4 week pre-plant mesotrione application 35 DAP |

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*lb a.i./A*
PRG 1 week pre-plant mesotrione application 35 DAP

0 0.144 0.25 0.30 0.50 lb a.i./A

FLF 1 week pre-plant mesotrione application 35 DAP
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**PRG 0 week pre-plant mesotrione application 35 DAP**

**FLF 0 week pre-plant mesotrione application 35 DAP**
Results

• Chewings fescue biomass reduced with all treatments, at all timings

• Perennial ryegrass biomass not affected

• Unacceptable phytotoxicity to chewings fescue

• Plant number generally not affected, only vigor and size
How can ‘Tenacity’ best be used?

- Use 4SC or MIF at planting of cool-season turfgrass stands (<20% fescue)
- Use on mature turf stands for broadleaf weed control
- IPM rotational herbicide (Group 27)
- Best used on Kentucky bluegrass and perennial ryegrass
- Avoid using in close proximity to stands of bentgrass
‘Tenacity’ Use

• Use SC and MIF at rates of 0.125 – 0.25 lb ai/ha on PRG, KBG, and mixed stands

• Maximum use of 0.50 lb ai/ha/year
  – Lower rates = multiple applications

• Reduce weed competition during turfgrass establishment
Labeling

• Max single application rates:
  – KBG / TF– 280 g a.i./ha
  – PRG/FLF/blends – 175 g a.i./ha
    • Up to 20% FLF in blend
  – FLF not on label for use at seeding