

Managing *Phymatotrichopsis* Root Rot in Arizona Alfalfa

Worku Burayu*, Kyle Harrington, Ayman Mostafa, and Gadelhak Ahmed
The University of Arizona, Maricopa County Cooperative Extension

*Corresponding author's e-mail: workuburayu@email.arizona.edu

Background

Phymatotrichopsis root rot (PRR), caused by the fungus *Phymatotrichopsis omnivora*, is one of the most destructive diseases of alfalfa stands that causes significant yield loss in the southwestern United States. PRR reduces the productivity and persistence of alfalfa fields causing heavily affected sites to be taken out of production. There are no known research and reliable methods for PRR management in Arizona's alfalfa production system. Flutriafol (brand name Topguard) fungicide has recently been evaluated as a chemical management option in cotton production. The present study was conducted to evaluate the efficacy of flutriafol for the disease management in PRR infested alfalfa production areas of Arizona.

Objectives

1. Evaluate the efficacy of Topguard® (flutriafol) to manage PRR in Alfalfa,
2. Generate local research-based information on the feasibility of managing PRR using fungicides and determine cost effective application rates,
3. Increase the awareness of stakeholders about the characteristics of PRR and its management mechanisms.

Materials and Methods

Multiyear (2015, 2016, 2017) on-farm replicated trials were conducted in known PRR infested alfalfa production areas of Arizona (Enterprise Ranch, Marana, Pierpoint and Parker). A week after first cut of the year and just before irrigation, flutriafol was applied at different rates (0.56, 1.12 and 2.24 kg ha⁻¹ in 2015; 0.28, 0.53, 1.05 kg ha⁻¹ in 2016 & 2017) using a backpack CO₂ sprayer. An untreated check (UTC) was included. Plot size was 6 meter wide by 6 meter long. To determine yield of alfalfa four to six hay cuts were made approximately at monthly interval. Plot harvest was accomplished using a BCS walk behind tractor with sickle bar mower from an area of 6.87 square meter. Hay yield was calculated from its moisture and dry matter content and expressed in tons per hectare basis. Randomized Complete Block Design (RCBD) was used in all trials. Data analysis was performed using JMP-SAS Ver. 13 Statistical Software and Student's t-test used in mean comparison for each pair.



Figure 1. Effect of PRR on Alfalfa stands in Arlington, AZ in 2017 growing season. Note circular patches and the dead leaves still attached to the plant, the typical character of PRR symptoms.

Results and Discussion

- All application rates provided visible disease symptoms reduction with increased yield in all locations and years.
- Different rates of application exhibited varying results in different years.
- In 2015, the higher two rates (1.12 and 2.24 kg ha⁻¹) resulted in significantly higher yield compared to untreated control.
- In 2016, the highest yield was recorded from plot treated at the lowest rates (0.28 kg ha⁻¹) of application.
- In 2017, the highest hay yield obtained from plots treated twice at 0.28 kg ha⁻¹ application rate.
- Different locations resulted in varying yields across cuttings.
- Significant yield differences recorded between treated and untreated plots towards the last two cuttings.
- There was no significant yield differences among different flutriafol application rates.

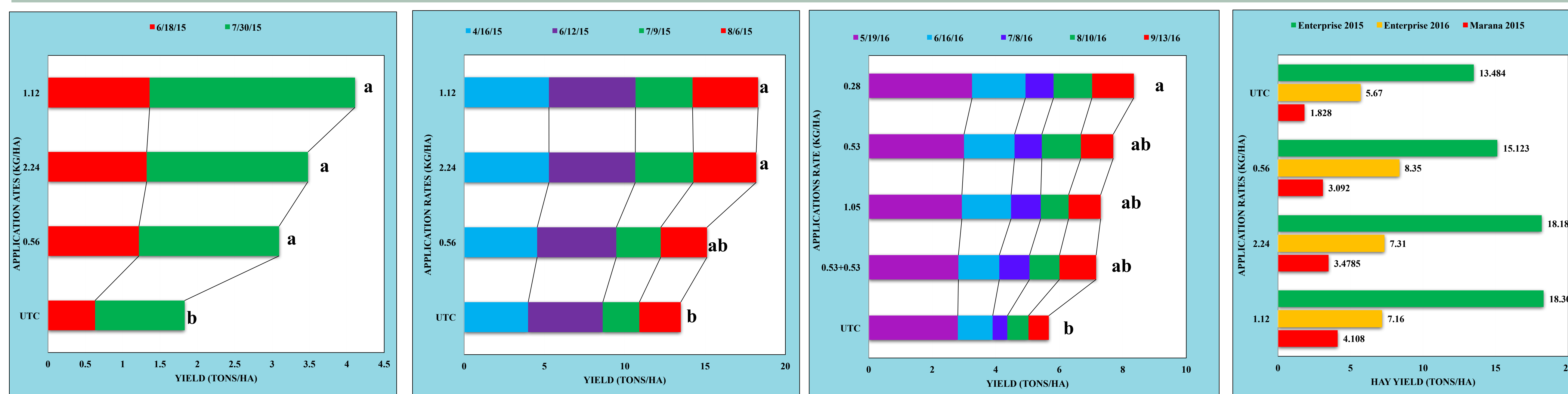


Figure 2. The effect of flutriafol fungicide on alfalfa hay yield in PRR infested alfalfa production areas of Arizona: Marana (left), Enterprise Ranch (middle, 2015 & 2016), and all together (right) in the 2015 & 2016 research conducted at Marana and Arlington, Arizona. Bars not connected by the same letters in the same graph are significantly different using student's t test in mean comparison for each pair at alpha 0.05.



Figure 3. Healthy looking plants on flutriafol fungicide treated plot (left); infested plant from untreated plot (middle); and roots from treated and untreated plot (right); in the 2015 research conducted on PRR at Enterprise ranch in the Arlington, Arizona.

Table 1. Alfalfa hay yield (tons/ha) as affected by rates of flutriafol fungicide across the cutting dates in the 2017 study conducted at Arlington (Pierpoint) and Parker, Arizona.

| Treatment (kg/ha) | Date of Cuttings (Arlington, AZ) | | | | | | Dates of Cuttings (Parker, Arizona) | | | |
|-------------------|----------------------------------|---------------------|---------------------|---------------------|----------|----------|-------------------------------------|-----------------------|-----------------------|-----------------------|
| | 4/5/17 | 5/3/17 | 6/7/17 | 7/6/17 | 8/10/17 | 9/13/17 | 4/5/17 ^{ns} | 5/11/17 ^{ns} | 6/13/17 ^{ns} | 7/18/17 ^{ns} |
| UTC | 16.23 ^{ns} | 17.91 ^{ns} | 21.36 ^{ns} | 15.41 ^{ns} | 9.43 b | 9.23 b | 13.98 | 17.11 | 20.95 | 10.18 b |
| 0.28 | 15.91 | 17.84 | 21.43 | 16.85 | 10.93 ab | 11.58 ab | 14.72 | 17.35 | 21.01 | 11.01 ab |
| 1.05 | 16.95 | 20.00 | 22.49 | 17.61 | 12.26 a | 13.88 ab | 13.00 | 17.23 | 20.78 | 10.17 b |
| 0.53 + 0.53 | 16.26 | 20.05 | 22.67 | 18.46 | 12.72 a | 13.25 a | 14.86 | 17.95 | 21.47 | 12.08 a |

Numbers not connected by the same letters in the column are significantly different using student's t test in mean comparison for each pair at alpha 0.05. ^{ns}-non significant.



Figure 4. Alfalfa hay yield (tons/ha) across two locations in flutriafol fungicide applied plots (left), respective cutting months (middle), and overlaying groups within the cutting months (right) in the 2017 research conducted at Arlington (Pierpoint) and Parker, Arizona.

Conclusion

The results obtained from the four locations through three growing years indicated positive benefit of flutriafol use to reduce PRR induced yield losses. The varying results for the different application rates in each year propose the need for continued applied research in Arizona for refined disease control. It is expected that the information found from these trials will enhance the ability and knowledge of Arizona PCAs and growers and providing them with up-to-date science-based solutions to manage PRR in alfalfa fields.

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