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Efficacy of Monopotassium Phosphate as a Fungicide for Powdery Mildew Control in Squash and Muskmelon 97-13

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Introduction

Powdery mildew is a serious disease of squash and cantaloupe grown in Florida. Plant disease tolerance and fungicide applications are both necessary to reduce crop loss. Monopotassium phosphate, a product of LidoChem, Inc., Hazlet, NJ, was reported to have some control of powdery mildew on grape in California. This trial was conducted to determine the efficacy of monopotassium phosphate for powdery mildew control in squash and muskmelon in Florida.

Materials and Methods

Squash Trial: Plots were established in a Lakeland fine sand at the Suwannee Valley Research and Education Center near Live Oak, FL. Preplant soil tests (Mechlich-1 extract) showed 48 ppm P, 22 ppm K, 32 ppm Mg, and 403 ppm Ca. Soil pH was 6.5 using a 1:2 (soil:water) solution. The soil was fertilized prior to planting with 500 lbs/A of 13-4-13 (N-P_2O_5-K_2O) on March 13, 1997. The crop also received an additional 75 lbs/A of N and K_2O via weekly fertigations from April 7 to May 18. Beds were formed on 5 foot centers, fumigated with a methyl bromide:chloropicrin mixture (98:2) at a rate of 400 lbs per acre on March 13, 1997, covered with black plastic mulch, and irrigation tubing was laid in a 1-inch deep groove in the center of the bed. The final beds were 36 inches wide and 6 inches high.

Plots 20 feet in length were established with 1 row per bed, 18-inch seed spacing, and seeded with the cultivar "Dixie" on March 27, 1997. The experiment consisted of 6 treatments replicated 4 times in a randomized complete block design. Treatments were applied with a backpack CO_2 sprayer. All treatments were mixed with water and applied to the crop at a rate of 37 gallons per acre. The first treatment was a check treated with water only. The second treatment consisted of monopotassium phosphate (MKP) as a 1% solution in water. The third was MKP as a 3% solution in water. The fourth was chlorothalonil (Bravo 720). The fifth was triadimefon (Bayleton 50 DF). The

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sixth treatment had alternate sprays of MKP as a 3% solution in water and triadimefon. Treatments were applied weekly for 5 weeks, from April 21 to May 19.

Plots were irrigated by drip irrigation using a tensiometer as a scheduling aid. Water was applied to maintain a soil moisture level of -8 to -12 centibars at a 12-inch depth. No other pesticide applications were made to the crop.

Fruits were harvested 10 times from May 6 to May 30. Fruits were graded as marketable or cull. Fruits in each category were counted and weighed. A powdery mildew, *Sphaerotheca fuliginea*, rating was made on May 23. Rating scale was 1-5; 1=no powdery mildew observed, 5=severe powdery mildew symptoms observed. The data were subjected to analysis of variance procedures.

Muskmelon Trial: Plots were established in a Lakeland fine sand at the Suwannee Valley Research and Education Center near Live Oak, FL. Preplant soil tests (Mechlich-1 extract) showed 52 ppm P, 33 ppm K, 42 ppm Mg, and 523 ppm Ca. Soil pH was 6.5 using a 1:2 (soil:water) solution. The soil was fertilized prior to planting with 500 lbs/A of 13-4-13 (N-P_2O_5-K_2O) on March 13, 1997. The crop also received an additional 90 lbs/A of N and K_2O via weekly fertigations from April 7 to May 30. Beds were formed on 7.5 foot centers, fumigated with a methyl bromide:chloropicrin mixture (98:2) at a rate of 400 lbs per acre on March 13, 1997. Beds were covered with black plastic mulch, and irrigation tubing was laid in a 1-inch deep groove in the center of the bed. The final beds were 36 inches wide and 6 inches high.

Plots 20 feet in length were established with 1 row per bed, 18-inch seed spacing, and seeded with the cultivar "Quasar" on March 27, 1997. The experiment consisted of 6 treatments replicated 4 times in a randomized complete block design. Treatments were applied with a backpack CO_2 sprayer. All treatments were mixed with water and applied to the crop at a rate of 37 gallons per acre. The first treatment was a check treated with water only. The second treatment consisted of monopotassium phosphate (MKP) as a 1% solution in water. The third was MKP as a 3% solution in water. The fourth was chlorothalonil (Bravo 720). The fifth was triadimefon (Bayleton 50 DF). The sixth treatment had alternate sprays of MKP as a 3% solution in water and triadimefon. Treatments were applied weekly for 7 weeks, from April 21 to June 3.

Plots were irrigated by drip irrigation using a tensiometer as a scheduling aid. Water was applied to maintain a soil moisture level of -8 to -12 centibars at a 12-inch depth. No other pesticide applications were made to the crop.

Fruits were harvested two times on June 9 and June 13. Fruits were graded into USDA categories US No. 1, US No. 2, or Cull. Fruits in each category were counted and

weighed. Disease ratings for powdery mildew, *Sphaerotheca fuliginea* and downy mildew, *Pseudoperonospora cubensis* were made on May 28 and June 3. Rating scale was 1-5; 1=no disease symptoms observed, 5=severe symptoms observed. Data were subjected to analysis of variance procedures.

Results and Discussion

Squash Trial: Early squash yields (first three harvests) ranged from 182 to 204 bushels per acre with no significant differences among treatments (Table 1). Total seasonal yields (ten harvests) ranged from 679 to 746 bushels per acre with no significant difference between treatments. Total season cull yield was very low 30 to 47 bushels per acre, also with no significant differences.

Powdery mildew (*Sphaerotheca fuliginea*) was not detected in any plots until late in the season. Very low powdery mildew infection was found in plants with the chlorothalonil treatment, significantly lower than any other treatment. No significant difference was detected between any other treatments; untreated check, monopotassium phosphate at 1% or 3%, triadimefon, or alternate sprays of monopotassium phosphate at 3% and triadimefon. Infection occurred late in the season and as a result no reduction in yield could be expected.

In summary, powdery mildew was controlled in this trial only by applications of chlorothalonil. Monopotassium phosphate alone, triadimefon, or alternate sprays of both did not reduce powdery mildew symptoms compared to symptoms in the check.

Muskmelon Trial: The muskmelon trial had high disease incidence of both powdery mildew (*Sphaerotheca fuliginea*) and downy mildew (*Pseudoperonospora cubensis*). Disease incidence of these diseases was so high, total defoliation had occurred in all plots, except in chlorothalonil treated plots. This terminated normal harvests at the second harvest; therefore harvest data was not presented.

Disease severity ratings were taken on May 28 and June 3, 1997 for both powdery and downy mildew (Table 2). Significantly lower incidence of powdery mildew was found in the chlorothalonil treated plots than any other treatments on both dates, May 28 and June 3. All other treatments were similar to the check on both dates. Significantly lower incidence of downy mildew was found in plants with the chlorothalonil treatment than any other treatments on both dates. All other treatments were not significantly different from the check for downy mildew.

In summary, acceptable control of either powdery mildew or downy mildew in this trial was achieved with applications of chlorothalonil. All other treatments failed to control either disease at acceptable levels. Total defoliation of plants resulted in all

treatments except chlorothalonil. University of Florida, Plant Disease Control Guide SP-52 indicated triadimefon will control powdery mildew species (*Erysiphe cichoracearum* but not *Sphaerotheca fuliginea*. Chlorothalonil on the other hand, controls *Sphaerotheca*, but not *Erysiphe*.

Table 1. Effect of various foliar applied treatments on squash yield and powdery mildew.

Treatment	Application Rate[z]	Yield (bu/A)[y]		Powdery Mildew Rating[x] (1-5)
		Early	Total	
Check (water only)	- - -	182	679	4.0
Monopotassium phosphate	1% solution	199	732	4.0
Monopotassium phosphate	3% solution	204	746	3.3
Chlorothalonil (Bravo 720)	2 pints/A	187	711	2.0
Triadimefon (Bayleton 50 DF)	2 oz/A	203	684	3.5
Monopotassium phosphate and triadimefon (alternately)[w]	3% solution or 2 oz/A	214	728	3.5
LSD (P=0.05)		NS	NS	1.0

[z] All treatments were mixed in water and applied weekly at an application volume of 37 gallons per acre.
[y] One bushel of squash equals 42 pounds
[x] Powdery mildew (*Sphaerotheca fuliginea*) ratings were made on a scale of 1-5; 1=no powdery mildew observed, 5=severe infection on all leaves of plant.
[w] Applications of monopotassium phosphate and triadimefon were alternated each week.

Table 2. Effect of various foliar applied treatments on powdery mildew and downy mildew in muskmelon.

Treatment	Application Rate[z]	Powdery Mildew Rating (1-5)[y]		Downy Mildew Rating (1-5)[y]	
		May 28	June 3	May 28	June 3
Check (water only)	- - -	3.8	4.5	3.5	4.3
Monopotassium phosphate	1% solution	4.0	4.3	2.8	4.0
Monopotassium phosphate	3% solution	3.5	4.3	3.3	3.5
Chlorothalonil (Bravo 720)	2 pints/A	1.3	1.3	1.0	1.0
Triadimefon (Bayleton 50 DF)	2 oz/A	4.0	4.5	4.3	4.5
Monopotassium phosphate and triadimefon (alternately)[w]	3% solution or 2 oz/A	3.3	4.0	4.0	4.3
LSD (P=0.05)		0.8	0.8	1.0	1.0

[z] All treatments were mixed in water and applied weekly at an application volume of 37 gallons per acre.
[y] Disease ratings were made on a scale of 1 to 5; 1=no disease observed, 5=severe infection of disease on most or all leaves.
[x] Applications of monopotassium phosphate and triadimefon were alternated each wee.