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North Florida Research and Education Center – Suwannee Valley

Efficacy of Monopotassium Phosphate as a Fungicide for Powdery Mildew Control in Squash and Muskmelon During the 1998 Season 98-12

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Introduction

Powdery mildew is a serious disease of squash and muskmelon 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, is being evaluated for control of powdery mildew in several crops. 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 North Florida Research and Education Center - Suwannee Valley near Live Oak, FL. Preplant soil tests (Mechlich-1 extract) showed 108 ppm P, 14 ppm K, 18 ppm Mg, and 439 ppm Ca. Soil pH was 6.3 using a 1:2 (soil:water) solution. The soil was fertilized prior to planting with 400 lbs per acre of 13-4-13 (N-P_2O_5-K_2O) on 18 March 1998. The crop also received an additional 100 lbs per acre of N and K_2O via weekly fertigations during the season. On 18 March, beds were formed on 5-foot centers, fumigated with a methyl bromide:chloropicrin mixture (98:2) at a rate of 400 lbs per acre, and covered with black plastic mulch as irrigation tubing was laid in a 1-inch deep groove in the center of the bed. The final beds were 24 inches wide and 6 inches high.

Plots 20 feet in length were established with one row per bed, and seeded at a 12-inch spacing with the cultivar "Dixie" on 27 March 1998. the experiment consisted of eight treatments replicated four times in a randomized complete-block design. Treatments were applied with a backpack CO_2 sprayer. All treatments were mixed with water and immediately applied to the crop at a rate of 37 gallons per acre. Treatments were applied weekly for 5 weeks, from April 15 to May 15.

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

Fruits were harvested seven times from May 4 to May 18. Fruits were graded as US No. 1, US No. 2, or cull. Fruits in each category were counted and weighed. A powdery mildew, Sphaerotheca fuliginea, rating was made on May 21 and 27. Rating scale was 1 to 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 North Florida Research and Education Center - Suwannee Valley near Live Oak, FL. Preplant soil tests (Mechlich-1 extract) showed 108 ppm P, 14 ppm K, 18 ppm Mg, and 439 ppm Ca. Soil pH was 6.3 using a 1:2 (soil:water) solution. The soil was fertilized prior to planting with 400 lbs per acre of 13-4-13 (N-P_2O_5-K_2O) on 13 March 1998. The crop also received an additional 100 lbs per acre of N and K_2O via weekly fertigations during the season. 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 18 March. Beds were covered with black plastic mulch as irrigation tubing was laid in a 1-inch deep groove in the center of the bed. The final beds were 24 inches wide and 6 inches high.

Plots 20 feet in length were established with 1 row per bed, and seeded at 18-inch spacing with the cultivar 'Quasar' on March 27. The experiment consisted of eight treatments replicated four times in a randomized complete-block design. Treatments were applied with a backpack CO_2 sprayer. All treatments were mixed with water and applied immediately to the crop at a rate of 37 gallons per acre. Treatments were applied weekly for nine weeks, from April 15 to June 15.

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

Fruits were harvested four times from June 9 to June 15. 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, were made on June 12. Rating scale was 1 to 5; 1 = no powdery mildew observed, 5 = severe powdery mildew symptoms observed. The data were subjected to analysis of variance procedures.

Results and Discussion

Squash Trial: Early squash yields (first three harvests) ranged from 136 to 205 bushels per acre with no significant difference among treatments (Table 1). Total season yield ranged from 274 to 352 bushels per acre with no significant differences among treatments. Cull yield ranged from 84 to 124 bushels per acre with no significant

difference among treatments. Powdery mildew infection occurred late in the season and therefore had little time to affect yield.

Powdery mildew ratings were made twice, May 21 and May 27. The May 21 ratings were made early in the establishment of powdery mildew. Untreated control and monopotassium phosphate + surfactant treatments had the highest level of powdery mildew (Table 1). No incidence of powdery mildew was found on May 21 in the following treatments: chlorothalonil, monopotassium phosphate + surfactant alternated weekly with chlorothalonil + monopotassium phosphate, and monopotassium phosphate + chlorothalonil. The level of infection had increased overall by May 27. Again, plants with the untreated control and monopotassium phosphate + surfactant treatments had the highest level of powdery mildew and were not significantly different from each other. The three treatments that had no powdery mildew on May 21 were the lowest again. The lower rate of chlorothalonil (1.5 pts per acre) + monopotassium phosphate at 1% solution in alternation with monopotassium phosphate + surfactant had higher levels of powdery mildew than similar treatments using the 2 pts per acre rate of chlorothalonil.

Muskmelon Trial: The yield of marketable muskmelon fruit ranged from 153 to 266 cwt/A with no significant difference among treatments (Table 2). Cull yield ranged 180 t 296 cwt/A with no significant difference among treatments. The cull fruit were culled mostly due to stem-end cracks. The cultivar 'Quasar' is highly susceptible to these cracks in Florida. This cultivar was used in this trial because it is also more susceptible to powdery mildew than other cultivars grown commercially in northern Florida. Powdery mildew appears in this trial late in the season, therefore had little opportunity to affect yield.

The powdery mildew rating was made in the muskmelon crop on June 12, near the final harvest. The plants with the untreated control and monopotassium phosphate + surfactant treatments had the highest incidence of powdery mildew (Table 2). The lowest incidence was found for plants in the following treatments: monopotassium phosphate + surfactant, alternated weekly with chlorothalonil, and monopotassium phosphate + chlorothalonil.

Summary

Chlorothalonil was the most effective material in controlling powdery mildew in both squash and muskmelon. The rate of chlorothalonil at three pints per acre performed better than chlorothalonil at 1.5 pints per acre plus monopotassium phosphate. Monopotassium phosphate at a 2% solution rate plus a surfactant only was not significantly better than the untreated control.

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

Treatment	Application Rates [w]	Yield (bushels/A)[v]			Powdery Mildew Rating [u] (1-5)	
		Early	Total	Cull	May 21	May 27
Control (water only)	- - - - - - - - - - - -	169	308	86	2.25	4.25
Chlorothalonil [z]	3 pts/A	165	305	84	1.0	2.0
Monopotassium phosphate + surfactant[y]	2% solution	181	321	93	2.25	4.25
Monopotassium phosphate + surfactant[y] alternated weekly with chlorothalonil	2% solution alternated with 3 pts/A	163	274	88	1.25	2.0
Monopotassium phosphate + surfactant[y] alternated with chlorothalonil (on special schedule)[x]	2% solution alternated with 3 pts/A	172	326	99	1.25	2.25
Monopotassium phosphate + surfactant[y] alternated with chlorothalonil + monopotassium phosphate	2% solution alternated with 3 pts/A + 0.5% solution	165	296	124	1.0	2.25
Monopotassium phosphate + surfactant[y] alternated with chlorothalonil + monopotassium phosphate	2% solution alternated with 1.5 pts/A + 1% solution	205	352	91	125	3.25
Monopotassium phosphate + chlorothalonil	2% solution + 3 pts/A	136	287	98	1.0	2.0
Significance [t]		NS	NS	NS	*	**
LSD (p=0.05)[s]					0.9	0.7

[z] Chlorothalonil treatments were Bravo Weather Stik, ISK Biosciences Corp., Mentor, Ohio.
[y] Surfactant was Agridex applied at rate of 8.0 ounces per 100 gallons of spray mix.
[x] Special schedule was monopotassium phosphate + surfactant in week 1, chlorothalonil in week 2, no application in week 3, and repeat schedule.
[w] All treatments were applied at an application spray volume of 37 gallons per acre.
[v] One bushel of squash equals 42 lbs.
[u] Powdery mildew (Sphaerotheca fuliginea) ratings were made on a scale of 1-5; 1 = no powdery mildew observed, 5 = severe infection observed on all leaves.
[t] Significance was either significant at the 1% level (**), 5% level (*), or not significant (NS).
[s] Lease significant difference at the 5% level of probability.

Table 2. Effect of various treatments on muskmelon yield and powdery mildew.

Treatment	Application Rates [w]	Yield (cwt/A)		Powdery Mildew Rating[u] (1-5)
		Marketable	Cull [v]	
Control (water only)	- - - - - - - - - - - - - - - - - -	249	218	4.5
Chlorothalonil [z]	3 pts/A	166	246	1.75
Monopotassium phosphate + surfactant[y]	2% solution	180	233	3.75
Monopotassium phosphate + surfactant[y] alternated weekly with chlorothalonil	2% solution alternated with 3 pts/A	187	211	1.5
Monopotassium phosphate + surfactant[y] alternated with chlorothalonil (on special schedule)[x]	2% solution alternated with 3 pts/A	153	276	2.5
Monopotassium phosphate + surfactant[y] alternated with chlorothalonil + monopotassium phosphate	2% solution alternated with 3 pts/A + 0.5% solution	266	180	2.5
Monopotassium phosphate + surfactant[y] alternated with chlorothalonil + monopotassium phosphate	2% solution alternated with 1.5 pts/A + 1% solution	162	296	3.0
Monopotassium phosphate + chlorothalonil	2% solution + 3 pts/A	163	286	2.0
Significance [t]		NS	NS	**
LSD (p=0.05)[s]				1.0

[z] Chlorothalonil treatments were Bravo Weather Stik, ISK Biosciences Corp., Mentor, Ohio.
[y] Surfactant was Agridex applied at rate of 8.0 ounces per 100 gallons of spray mix.
[x] Special schedule was monopotassium phosphate + surfactant in week 1, chlorothalonil in week 2, no application in week 3, and repeat schedule.
[w] All treatments were applied at an application spray volume of 37 gallons per acre.
[v] Culls were essentially all due to setm end cracking as is typical for the cultivar, 'Quasar' grown in Florida.
[u] Powdery mildew (Sphaerotheca fuliginea) ratings were made on a scale of 1-5; 1 = no powdery mildew observed, 5 = severe infection observed on all leaves.
[t] Significance was either significant at the 1% level (**), 5% level (*), or not significant (NS).
[s] Lease significant difference at the 5% level of probability.