

Efficacy of Bactericides on *Pseudomonas syringae* on hibiscus

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Purpose: Evaluate some new formulations of bactericides for control of bacterial spot (*Pseudomonas syringae*) on *Hibiscus* 'Lutea'

Treatments:

A. Noninoculated control	---
B. Inoculated control	---
C. BotryStop and Capsil	48 oz/100 gal 4 oz/100 gal
D. Cease	2%
E. GWN-10320 and Capsil	32 oz/100 gal 6 oz/100 gal
F. Triathlon BA	2%
G. Camelot O	2%
H. Kalmor	32 oz/100 gal
I. exp. 1	25 oz/100 gal
J. exp. 2	25 oz/100 gal

Twelve plants per treatment were planted from liners into 4 inch pots on September 5. The peat-based potting medium was amended with Osmocote Plus minors 19-6-12.

Inocula of *Pseudomonas syringae* originally obtained from *Hibiscus* were started on nutrient agar (5 plates) on 10-13-18.

Intermittent mist (2 min/30 min 12 hr/day) started on 10-13-18.

Plants were inoculated and covered with polyethylene for 3 days starting on 10-15-18.

Treatments were applied using a pump action hand sprayed to the point of drip three times on approximately a 10-day interval:

Date	Time	Temperature
10-8-18	8:45-9:10 am	65 F
10-19-18	9:00-9:15 am	74 F
10-29-18	8:45-9:00 am	61 F

The total number spots per plant was recorded on 27 October 2018

Normality Test (Shapiro-Wilk): Failed ($P < 0.050$)

Equal Variance Test (Brown-Forsythe): Failed ($P < 0.050$)

Group Name	N	Missing	Mean	Std Dev	SEM
Col 1	12	0	0.000 a	0.000	0.000
Col 2	12	0	10.000 ab	6.030	1.741
Col 3	12	0	5.833 ab	9.013	2.602
Col 4	12	0	15.667 b	18.671	5.390

Col 5	12	0	8.250 ab	7.759	2.240
Col 6	12	0	7.167 ab	7.930	2.289
Col 7	12	0	8.333 ab	13.560	3.914
Col 8	12	0	1.250 a	1.913	0.552
Col 9	12	0	3.833 ab	3.298	0.952
Col 10	12	0	3.833 ab	6.603	1.906

Source of Variation	DF	SS	MS	F	P
Between Groups	9	2250.667	250.074	3.008	0.003
Residual	110	9144.500	83.132		
Total	119	11395.167			

The differences in the mean values among the treatment groups are greater than would be expected by chance; there is a statistically significant difference ($P = 0.003$).

Power of performed test with $\alpha = 0.050$: 0.832

All Pairwise Multiple Comparison Procedures (Holm-Sidak method):, Overall significance level = 0.05

The number leaves with spots per plant was recorded in November 2, 2018.

Normality Test (Shapiro-Wilk): Failed ($P < 0.050$)

Equal Variance Test (Brown-Forsythe):Failed($P < 0.050$)

Group Name	N	Missing	Mean	Std Dev	SEM
Col 1	12	0	0.000 a	0.000	0.000
Col 2	12	0	2.333 bc	0.888	0.256
Col 3	12	0	0.667 a	1.073	0.310
Col 4	12	0	2.417 bc	2.065	0.596
Col 5	12	0	2.750 c	1.422	0.411
Col 6	12	0	2.250 bc	0.965	0.279
Col 7	12	0	1.083 ab	1.165	0.336
Col 8	12	0	0.333 a	0.492	0.142
Col 9	12	0	1.250 abc	1.215	0.351
Col 10	12	0	1.083 ab	0.996	0.288

Source of Variation	DF	SS	MS	F	P
Between Groups	9	99.667	11.074	8.372	<0.001
Residual	110	145.500	1.323		
Total	119	245.167			

The differences in the mean values among the treatment groups are greater than would be expected by chance; there is a statistically significant difference ($P = <0.001$).

Power of performed test with $\alpha = 0.050$: 1.000

All Pairwise Multiple Comparison Procedures (Holm-Sidak method):
Overall significance level = 0.05

The total number spots per plant was recorded on 2 November 2018

Normality Test (Shapiro-Wilk): Failed ($P < 0.050$)

Equal Variance Test (Brown-Forsythe):Failed($P < 0.050$)

Group Name	N	Missing	Mean	Std Dev	SEM
Col 1	12	0	0.000 a	0.000	0.000
Col 2	12	0	10.917 ab	8.028	2.317
Col 3	12	0	3.000 ab	4.899	1.414

Col 4	12	0	13.500 b	16.262	4.694
Col 5	12	0	9.500 ab	8.208	2.369
Col 6	12	0	10.000 ab	10.505	3.033
Col 7	12	0	5.583 ab	11.131	3.213
Col 8	12	0	0.917 a	1.443	0.417
Col 9	12	0	3.333 ab	3.846	1.110
Col 10	12	0	3.417 ab	5.452	1.574

Source of Variation	DF	SS	MS	F	P
Between Groups	9	2321.633	257.959	3.679	<0.001
Residual	110	7712.333	70.112		
Total	119	10033.967			

The final height to growing tip (cm) was recorded in 2 November 2018

Normality Test (Shapiro-Wilk): Passed(P = 0.088)

Equal Variance Test (Brown-Forsythe):Passed(P = 0.353)

Group Name	N	Missing	Mean	Std Dev	SEM
Col 1	12	0	11.333 a	1.875	0.541
Col 2	12	0	13.250 a	3.621	1.045
Col 3	12	0	12.917 a	3.825	1.104
Col 4	12	0	12.583 a	3.260	0.941
Col 5	12	0	14.083 a	2.968	0.857
Col 6	12	0	12.083 a	4.420	1.276
Col 7	12	0	11.667 a	2.674	0.772
Col 8	12	0	12.583 a	2.575	0.743
Col 9	12	0	11.750 a	3.934	1.136
Col 10	12	0	13.833 a	3.157	0.911

Source of Variation	DF	SS	MS	F	P
Between Groups	9	92.508	10.279	0.939	0.495
Residual	110	1204.083	10.946		not significant
Total	119	1296.592			

Number spots per plant on two dates.

Conclusions:

- The best prevention of Pseudomonas leaf spot in this trial was given by Kalmor closely followed by the biopesticide, BotryStop.
- The biopesticides, GWN-10320, Cease and Triathlon BA were not effective in this trial.
- All other copper products also performed well including Camelot O, and the exp. products.
- None of the products resulted in any phytotoxicity in the trial including possible stunting.

