

INTEGRATED BIOLOGICAL CONTROL OF ANNUAL BLUEGRASS (*Poa annua*)

Phillip L. Peters and Joseph M. Vargas
Department of Botany and Plant Pathology
Michigan State University

Introduction

The purpose of these studies were to determine the effectiveness of integrating chemical and biological control agents to control annual bluegrass (*Poa annua* ssp. reptans) maintained under fairway conditions. Two field studies were conducted using two concentrations and application rates of *Xanthomonas campestris* alone or with chemical herbicides or plant growth regulators. An additional objective was to assess the ability of *X. campestris* to selectively remove annual bluegrass maintained at greens height.

Methods/Results

Study #1

The first field study included a bacterial treatment of *X. campestris* at a concentration of 3.0×10^8 CFU/ml applied three times per week. Bacteria were applied alone or together with either the herbicide primisulfuron or the plant growth regulator referred to as X factor. An antibiotic treatment (i.e. Mycoshield) was applied as a control. The treatments were as follows:

- Mycoshield 2.5 lbs applied every 14 days
- *Xanthomonas campestris* 3.0×10^8 CFU/ml applied 3 times/week
- Primisulfuron 0.004 oz/1000 sq.ft. applied every 14 days
- X factor 0.05 oz/1000 sq.ft. applied every 28 days
- *Xanthomonas campestris* + Primisulfuron
- *Xanthomonas campestris* + X factor

The following table represents the mean percent control of annual bluegrass at three time points during the growing season.

Treatment	Days After Initial Treatment					
	15		45		92	
Mycoshield	4.5	A	3.0	A	4.8	A
<i>X. campestris</i>	5.6	A	11.4	AB	25.6	AB
Primisulfuron	8.3	A	4.5	A	23.6	AB
X factor	6.7	A	6.8	A	34.2	AB
X factor + <i>X. campestris</i>	6.7	A	18.5	B	45.2	BC
Primisulfuron + <i>X. campestris</i>	11.3	B	10.2	AB	72.8	C

Study #2

The second field study included a lower bacterial treatment of *X. campestris* at a concentration of 2.0×10^7 CFU/ml applied one time per week. Bacteria were applied alone or together with either the herbicide Prograss or plant growth regulators such as X factor or Primo. Mycoshield was again applied as an antibiotic control. The treatments were as follows:

- Mycoshield 2.5 lbs applied every 14 days
- *Xanthomonas campestris* 2.0 X10⁷ CFU/ml applied 1 time/week
- Prograss 1.5 oz/1000 sq.ft. applied every 21 days
- X factor 0.05 oz/1000 sq.ft. applied every 28 days
- Primo 0.25 oz/1000 sq.ft. applied every 28 days
- *Xanthomonas campestris* + Prograss
- *Xanthomonas campestris* + X factor
- *Xanthomonas campestris* + Primo

The following table represents the mean percent control of annual bluegrass at three time points during the growing season.

Treatment	Days After Initial Treatment					
	21		64		99	
Mycoshield	3.7	A	1.5	A	3.8	A
<i>X. campestris</i>	4.9	AB	6.8	B	29.5	ABC
Primo	10.3	B	2.3	A	19.8	AB
Prograss	5.6	AB	2.3	A	16.6	ABC
X factor	9.1	AB	2.3	A	3.0	A
Primo + <i>X. campestris</i>	6.8	AB	6.8	AB	44.0	BC
X factor + <i>X. campestris</i>	9.1	AB	7.9	B	36.6	ABC
Prograss + <i>X. campestris</i>	6.5	AB	5.6	AB	57.0	C

Conclusion

Data from the first study suggest multiple applications of *X. campestris* alone gradually removes annual bluegrass without visible reductions in turf density. The greatest level of control was achieved by integrating *X. campestris* + Primisulfuron. Additionally, integrating *X. campestris* + X factor provides enhanced control. This is the second year of this two year study

Data from the second study suggest a trend in which control is enhanced using an integrated approach. This study will be repeated during the summer 2000.

Interestingly, control of annual bluegrass mowed at greens height was not as effective when a lower concentration and application rate of *X. campestris* was used