

## ANTAGONIST ACTIVITY OF FOSFIMAX® ON *Ralstonia solanacearum*

A. Sarro, E. García, J.M. Lara, C. Fernández  
 Research and Development Department, FUTURECO BIOSCIENCE SL

### INTRODUCTION

*Ralstonia solanacearum* (Smith) Yabuuchi *et al.* (formerly *Pseudomonas solanacearum* (Smith)) is the causal agent of brown rot of potato and bacterial wilt in potato, tomato and other solanaceae species (Hayward, 1991). The plants become withered and produce small fruits of poor quality. As a result, yields are severely affected leading to commercial losses for growers.

Chemical and cultural control of this disease in infested soils is a hard task (Grimau *et al.*, 1993). Crop rotation using resistant varieties was considered as an effective alternative, but the large number of hosts has reduced its effectiveness (Ji *et al.*, 2005). The reduction in availability of authorized fungicides has reactivated the interests on plant resistant stimulators, such as phosphites and other elicitors.

Recently, use of phosphites especially in the form of potassium salts, as control agent of Oomycetes is gaining interest. The plants besides uptake phosphorous and potassium needed for growth are favoured by the biocide or biostatic effect of the products.



Figure 1. Tomato seedlings affected by bacterial wilt

FOSFIMAX® is natural plant defences activator developed by FUTURECO BIOSCIENCE. It consists of a liquid concentrate of phosphorous and potassium, where phosphorous is in the form of phosphite anion. Use of FOSFIMAX® on agricultural crops stimulate the synthesis of phytoalexins (vegetal hormones), which are involved in the natural mechanisms of resistance of plants against fungal and bacterial diseases. FOSFIMAX® has an advanced stability which allows the presence of a considerable amount of free phosphites. In previous *in vitro* tests the efficacy of this product to control other plant pathogenic fungi such as *Fusarium oxysporum*, *Phytophthora* sp. and *Botrytis* sp. has been proved (R+D Laboratories, Futureco Bioscience).

In this study the biocide capacity of FOSFIMAX®, applied at commercial rates, on *R. solanacearum* was assessed through a quick test *in vitro* (Lara *et al.*, 2007) using a strain from the microbial culture collection of FUTURECO BIOSCIENCE.

### MATERIALS AND METHODS

This study consisted of two treatments:

- CONTROL (T<sub>1</sub>): two 250 mL flasks containing 150 mL of nutritive broth inoculated with *R. solanacearum* (initial concentration: 1.0x10<sup>6</sup> CFU/mL)
- FOSFIMAX® (T<sub>2</sub>): two 250 mL flasks containing 150 mL of nutritive broth were inoculated with *R. solanacearum* (initial concentration: 1.0x10<sup>6</sup> CFU/mL) and were immediately dosed with the commercial rate of FOSFIMAX® (0.2% v/v).

Mixtures were prepared under sterile conditions and were incubated in shaker at 120 rpm for 72 hours at 26 °C. At the end of incubation the quantity of biomass produced and viability of pathogen was analysed through:

- Dry weight of mycelium, by separation of biomass from exhausted culture through vacuum filtration (kitasato flask)
- Viability of pathogen through viable counts in plates (CFU/mL)



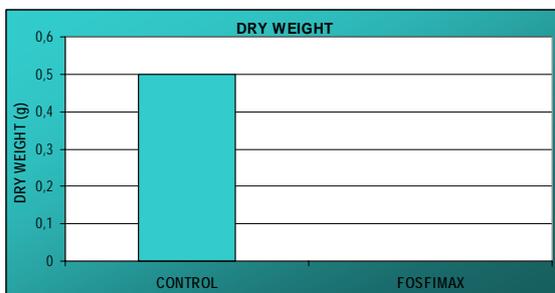
Figure 1. Plate growth of *Ralstonia solanacearum*.



Figure 2. Flasks of control treatment T1 (left) and FOSFIMAX® treatment T2 (right) after 72 hours of incubation in shaker.

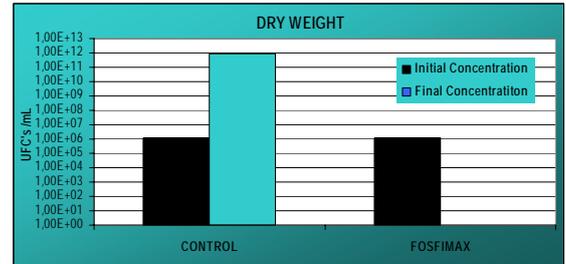
## RESULTS

In the treatment with FOSFIMAX® (T<sub>2</sub>) dry weight showed absence of bacterial growth in medium after 72h when compared to control (t<sub>1</sub>) Graphic 1.



Graphic 1. Dry weight of mycellium in FOSFIMAX® (T<sub>2</sub>) and Control (T<sub>1</sub>) treatments

Viable counts revealed the high biocide capacity of this product. Normal growth of bacterium in control was six logarithmic units higher than initial population while in FOSFIMAX® treatment (T<sub>2</sub>) resulted in 100% mortality. The application of the product not only inhibited the bacterial growth but also revealed complete destruction of bacteria (graphic 2).



Graphic 2. Concentration of CFU/mL of *R. solanacearum* in treatment respect to control.

## CONCLUSIONS

This *in vitro* test suggests that FOSFIMAX® applied at field rates (0.2%) is biocide against *R. solanacearum*

## REFERENCES

Grimault, V., Schmit, J., and Prior, P., 1993. Some characteristics involved in bacterial wilt (*Pseudomonas solanacearum*) resistance in tomato. In: Hartman, G.L. and A.C. Hayward (eds.), Bacterial Wilt. Pp: 112-119. ACIAR Proceedings, N° 45: Australian Centre for International Agricultural Research, Canberra.

Hayward, A.C. 1991. Biology and Epidemiology of bacterial wilt caused by *Pseudomonas solanacearum*. Annual Review of Phytopathology 29, 65-87.

Lara, J.M.; Troytiño, I.; García, E.; and Fernández, C. 2007. Desarrollo de una metodología *in vitro* para la determinación rápida de actividad biocida-bioestática sobre agentes fitopatogénos. Phytoma, 185; 56-58.

Ji, P.; Momol, M.T.; Olson, S.M.; and Pradhanang, P.M. 2005. Evaluation of Thymol as biofumigant for control of bacterial Wilt of Tomato under Field Conditions. Plant Disease, 497-500