

## Evaluation of the product Soleo<sup>®</sup> for control of powdery mildew in strawberry

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### Abstract

Soleo<sup>®</sup>, a product based on plant extracts and certified to be used in organic agriculture, was tested for its capability to control the development of powdery mildew in strawberry, *Sphaerotheca macularis*. Field test was conducted in a 'Camarosa' cultivar in Moguer, Huelva (Spain). Four applications were made at 14 days intervals. The regular dosage of Soleo<sup>®</sup> that is used on strawberry, 1 L/ha, was compared with the application of triadimenol (Triadimenol 25%EC) with a dose of 0,05% and a spray volume of 1.000 L/ha. Both treatments were highly effective, with no statistical differences in the incidence and severity on leaves. These results indicate that similar efficacy levels can be achieved with natural origin products, like Soleo, and widely used regular fungicides like triadimenol for the control of strawberry powdery mildew.

**Keywords:** strawberry, powdery mildew, *Sphaerotheca macularis*, Soleo

### Introduction

One of the main strawberry phytosanitary problems in the Huelva (Spain) cropping area is powdery mildew, *S. macularis*. About organic agriculture, the only substance that was used for its control was sulphur. This leads to several problems, the absence of alternatives and specially the low efficacy when it is compared with conventional fungicides.

Soleo<sup>®</sup> is a product of Daymsa's phytoprotectants range. It can be applied at any time of the cycle, even on harvest time. It is certified to be used in Organic Agriculture by CERTICAAE, according to EC Regulation n° 834/2007, and by ECOCERT under NOP (USA), JAS (Japan) and EC Reg. N° 834/2007.

Soleo<sup>®</sup> contributes to the crop active protecting substances against the development of different crop disease of fungus and bacterial origin. The present report was carried out to determine the efficacy of Soleo<sup>®</sup> for control of powdery mildew in strawberry, caused by the fungal pathogen *S. macularis*.

### Materials and Methods

Soleo is a natural product based on plant extracts from Rutaceae.

Field trial was conducted in a greenhouse in Moguer, Huelva (Spain) to determine efficacy of Soleo<sup>®</sup> on the control of *S. macularis* in comparison with the standard Triadimenol 25% EC in 'Camarosa' cultivar grown under macrotunnel, in BBCH 89 phenological stage. Plant density was 50.000 plants/ha.

The trial design was set up as a randomized block in 4 replications per treatment (E.P.P.O N° 1/104(2)). The row spacing was 1,20 m. The plots had 4m long, with 2 lines per plot.

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The products were sprayed with compressed air sprayers with a lance with cone nozzles and the pressure was 3,5 bar. Four applications were made at 14 day intervals (T1 =04/17, T2=05/02, T3=05/19 and T4=06/03) with and a spray volume of 1.000 L/ha. Soleo<sup>®</sup> was sprayed at 1 L/ha and Triadimenol 25% was applied at 0,05 %.

Incidence, severity and phytotoxicity were assessed on the following dates: T3+0, T4+0 and T4+10. In previous dates (T1+0, T2+0) not enough disease development was observed in order to make the evaluation.

Powdery mildew incidence was evaluated with the percentage of affected leaves, assessing 50 leaves per replication. The degree of foliar damage was calculated in accordance with Townsend and Heuberger's formula. For this, severity was evaluated on 50 leaves per replication. Efficacy was calculated using Abbot's formula, based on the degree of damage. Phytotoxicity was assessed with a 0-10 range.

Statistical analyses were assessed using Newman-Keuls Test.

### Results and Discussion

Control plots, on T3+0 assessment, show a mean of 21% of affected leaves with a mean degree of damage of a 3,2%, belonging to group A. Soleo<sup>®</sup> belongs to group B with an efficacy value of 71,4%. Triadimenol 25% efficacy was 84,1%, with no statistically significant differences between both treatments.

On T4+0, control reaches a mean of 29% of affected leaves (group A) with a degree of damage of 9% (group A), while Soleo<sup>®</sup> belongs to group B, with an efficacy value of 87,7%.

On T4+10 evaluation, infection in untreated plots reached the 39% of damaged leaves with a mean degree of damage of 9% (group A). Soleo<sup>®</sup> efficacy was 90,7% and Triadimenol 25% efficacy was 94,7%. However, there were no statistically significant differences between Soleo<sup>®</sup> and Triadimenol 25%.

Table 1: % of damaged leaves

| TREATMENT          | DOSAGE    | T3+0   | T4+0   | T4+10  |
|--------------------|-----------|--------|--------|--------|
| Control            | -         | 21,5 A | 29,0 A | 39,0 A |
| Soleo              | 1,0 L/Ha  | 7,5 B  | 7,5 B  | 7,0 B  |
| Triadimenol 25% EC | 0,05% v/v | 5,0 B  | 3,0 B  | 4,5 B  |

Mean values with same letter are not significantly different according (P = 0,05 n Student-Newman-Keuls).

Table 2: Degree of damage

| TREATMENT          | DOSAGE    | T3+0  | T4+0  | T4+10  |
|--------------------|-----------|-------|-------|--------|
| Control            | -         | 3,2 A | 9,0 A | 13,7 A |
| Soleo              | 1,0 L/Ha  | 0,9 B | 1,1 B | 1,3 B  |
| Triadimenol 25% EC | 0,05% v/v | 0,5 B | 0,3 B | 0,7 B  |

Mean values with same letter are not significantly different according (P = 0,05 n Student-Newman-Keuls).

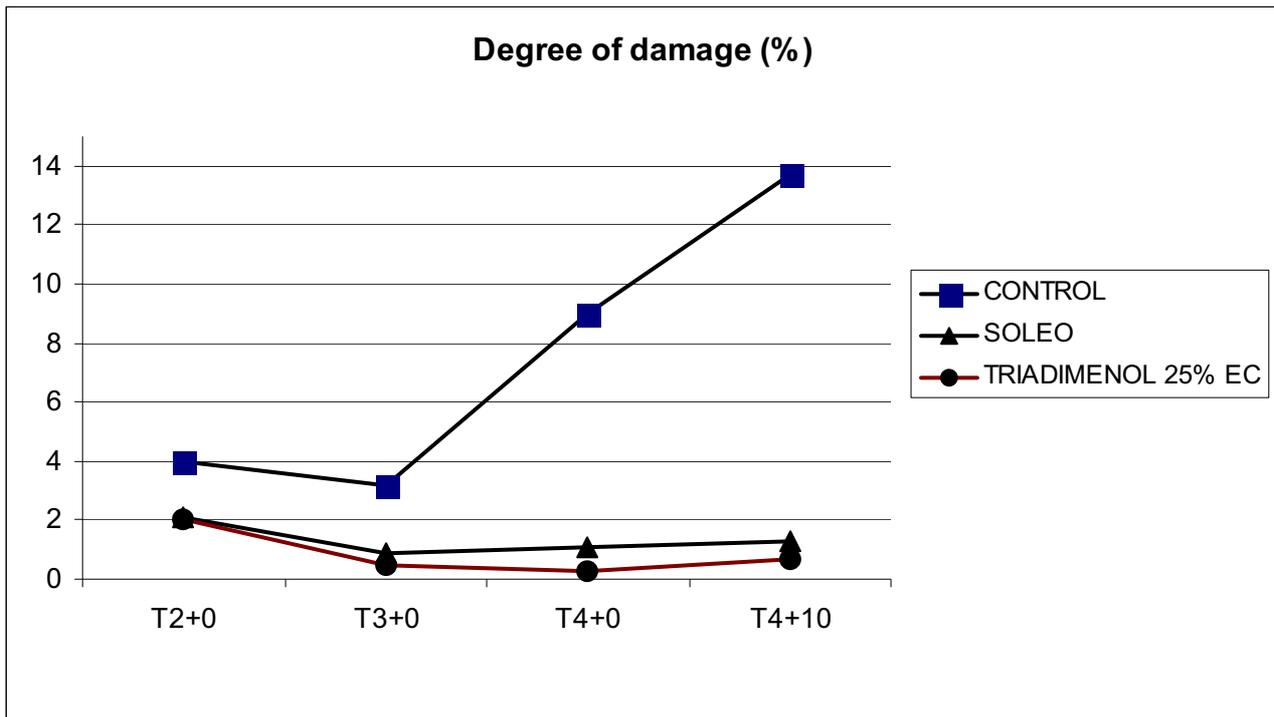


Figure 1: Evolution of Degree of damage

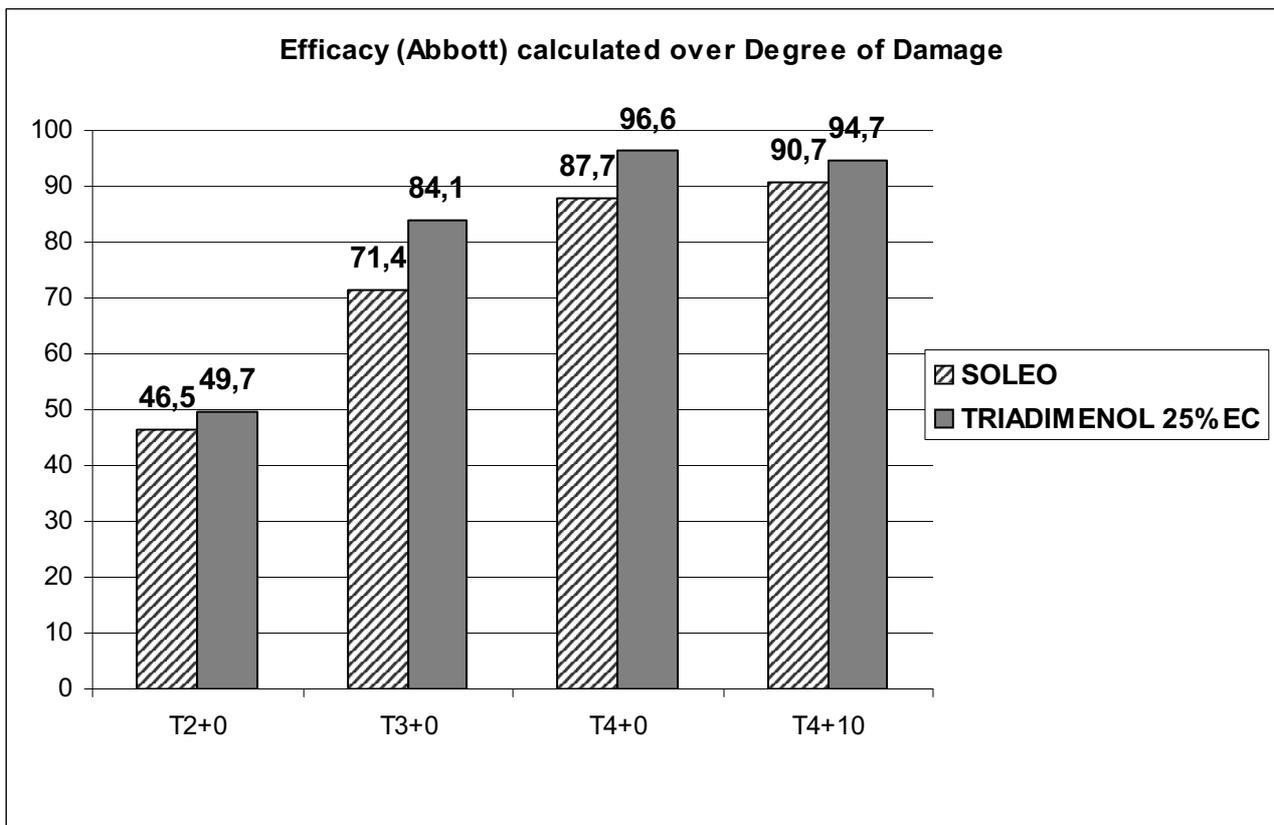


Figure 2: Evolution of Efficacy (Abbott) calculated over Degree of Damage (%).

Table 3: % Efficacy (Abbott)

| TREATMENT          | DOSAGE    | T3+0 | T4+0 | T4+10 |
|--------------------|-----------|------|------|-------|
| Soleo              | 1,0 L/Ha  | 71,4 | 87,7 | 90,7  |
| Triadimenol 25% EC | 0,05% v/v | 84,1 | 96,6 | 94,7  |

No phytotoxicity symptoms were observed.

### Conclusions

There are no significant statistical differences between both treatments, Soleo and Triadimenol 25%EC, in terms of incidence of powdery mildew infestation and efficacy of the treatments.

We can conclude that Soleo has obtained good efficacy results at any evaluation time, reaching in almost all of them 70%. Although the statistical analysis doesn't show differences, still slightly better results can be achieved with Triadimenol 25%EC.

The present trial results have shown that Soleo<sup>®</sup> is an effective product for controlling powdery mildew in organic strawberry.

### References

Townsend, G. R., Heuberger, J. W. (1943). Methods for estimating losses caused by diseases in fungicide experiments. *Plant Dis. Rep.* **27**, 340-343.