CALCIUM CHLORIDE AND CALCIUM SILICATE DECREASE WHITE MOLD INTENSITY ON COMMON BEANS

Paula Jr., T.J.[1,3], Vieira, R.F.[1,3], Teixeira, H.[1,4], Carneiro, J.E.S.[2,3], Lima, R.C.[1,4], Lehner, M.S.[1,4] and Santos, J.[1,4]

[1]Epamig, Vila Gianetti 47, 36570-000 Viçosa (MG), Brazil (trazilbo@epamig.br); [2]UFV; [3]Supported by CNPq, Brasília, Brazil; and [4]Supported by Fapemig, Belo Horizonte, Brazil

INTRODUCTION

Practices used to manage white mold (*Sclerotinia sclerotiorum*) on common beans include fungicide application, non-infested seeds, low plant population, upright cultivars, crop rotation, biological control, and reduction of irrigation frequency. In Brazil some farmers use calcium fertilizers with alleged good results for white mold control. Commonly, they apply these fertilizers through center pivot. However, there are only preliminary reports about the benefits of calcium on white mold control (Venette, 1998). It is hypothesized that since calcium plays a role on bean plant defense against white mold, its application would reduce the disease intensity. In this work the efficacy of calcium chloride ($CaCl_2$) and calcium silicate ($CaSiO_3$) was evaluated for white mold control on common beans.

MATERIALS AND METHODS

A study was carried out at an experimental area naturally infested with sclerotia. The cultivar Talismã (type III, carioca class) was sown in rows spaced 0.5 m apart. Plots had seven 3 m-long rows. Both $CaCl_2$ and $CaSiO_3$ were applied at 45 days after emergence (DAE) (early bloom) over the plants with a hand sprayer (800 L ha^{-1}) at 100, 200, 300 and 400 mg L^{-1} or at 45 and 55 DAE at 300 mg L^{-1}. These treatments were compared with water (untreated control) and fluazinam applications (0.5 L ha^{-1}) at 45 and 55 DAE. Treatments were replicated four times in a randomized complete block design. An area of 1.2 m^2 in the plots was harvested separately at 100 DAE for disease evaluation. Plants were rated for disease severity index (DSI) by means of a "quarter scale" (Hall & Phillips, 1996), where 0 = no disease present, 1 = 1 % to 25 % of the plant with symptoms, 2 = 26 % to 50 % of the plant with symptoms, 3 = 51 % to 75 % of the plant with symptoms, and 4 = 76 % to 100 % of the plant with symptoms. DSI was calculated on a percentage basis:

$$DSI(\%) = \frac{\sum(scores\ of\ all\ plants)}{4\ x\ (total\ number\ of\ plants)} \times 100$$

Yield data were estimate based on mass of seeds with 12 % moisture (w/w). Data were subjected to variance analysis. Regression analyses were done to test the effect of rates of $CaCl_2$ and $CaSiO_3$ on white mold intensity and yield. Effect of two applications of fungicide and $CaCl_2$ and $CaSiO_3$ were compared to the untreated control by Dunnett's test.

RESULTS AND DISCUSSION

Both incidence and severity of white mold were significantly reduced by one application of $CaCl_2$ and $CaSiO_3$ at early bloom (Fig. 1), but the level of control was not sufficient to increase yield. Two applications of fluazinam decreased white mold incidence and severity ($P < 0.01$) and increased yield ($P < 0.05$) (Table 1). Reduction of disease with two applications of $CaCl_2$ and $CaSiO_3$ was only significant for DSI ($P < 0.05$). Compared to untreated control, fluazinam reduced disease incidence by 52 %, severity by 73 %, and increased yield by 45 % (Table 1). Venette (1998) found that foliar-applied calcium enhanced both disease control and yield. He suggested that calcium may be a nutritional supplement that increases plant resistance to white mold. Nutritional effect is particularly

noticeable in the case of calcium compounds with high water solubility, like $CaCl_2$. As $CaSiO_3$ has very low water solubility, possible effects of its foliar application may also be explained by the establishment of a physical barrier on the host tissue. Moreover, many modifications may occur in the plant surface after calcium application, including increase of pH and changes in the populations of microorganisms.

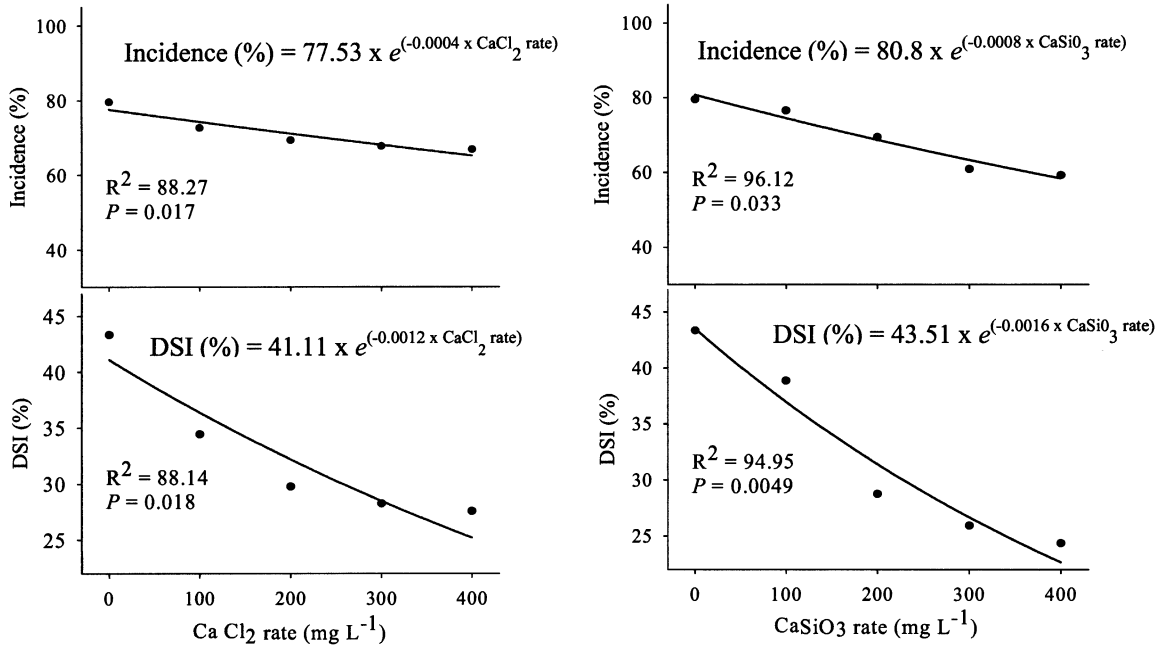

Fig. 1 - White mold incidence and DSI in response to four rates of $CaCl_2$ and $CaSiO_3$ applied at early bloom (45 DAE).

Table 1 – Comparison of untreated control with two applications of fluazinam, $CaCl_2$, and $CaSiO_3$ on white mold intensity and yield.

Treatment[1]	Incidence (%)	DSI (%)	Yield (kg ha^{-1})
Fluazinam	38.4**	11.9**	2253 *
$CaCl_2$ (300 mg L^{-1})	67.9 ns	27.8 *	1505 ns
$CaSiO_3$ (300 mg L^{-1})	72.2 ns	30.4 *	1793 ns
Untreated control	79.5	43.3	1553

Means in the column followed by * and ** are different from untreated control at 5% and 1%, respectively, by Dunnett's test; ns – non-significant. [1]Applied at both early bloom (45 DAE) and ten days later.

REFERENCES

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