AMENDMENT OF SOIL WITH GYPSUM OR LIME AND ITS EFFECT ON THE INCIDENCE OF CAVITY SPOT DISEASE OF CARROTS CAUSED BY *PYTHIUM COLORATUM*.

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INTRODUCTION

Cavity spot is a major soil-borne disease of carrots worldwide (1). It reduces the quality of carrots so that they become unmarketable resulting in substantial economic losses to the grower.

Cavity spot disease of carrots is caused by different species of the genus *Pythium* [1,2]. In Western Australia, *P. coloratum* and *P. sulcatum* are the causal agents of cavity spot disease with *P. coloratum* causing more severe cavity spot than *P. sulcatum* [3].

The application of lime has been reported to reduce the incidence and severity of cavity spot disease in Western Australia [4].

The objectives of this investigation were to study the effect of lime or gypsum on the development of cavity spot disease of carrots in soil artificially infested with *P. coloratum* and attempt to discriminate between the effects of pH and calcium on disease development.

MATERIALS AND METHODS

Soil treatments A grey sandy soil (pH 5.1; in 0.01M $CaCl_2$) which had never been amended with lime or gypsum was collected from Sun City Farms, Western Australia, it was air dried and steam-pasteurised at 60°C for 30 min. The soil treatments consisted of infested and uninfested (a) non-amended soil, (b) soil amended with gypsum at two rates:- 4000 kg ha^{-1} (pH 5.2) and 8000 kg ha^{-1} (pH 5.2) and (c) soil amended with lime at two rates:- 4000 kg ha^{-1} (pH 6.8) and 8000 kg ha^{-1} (pH 7.1).

Inoculum production and soil infestation A highly virulent isolate of *P. coloratum* (IMI 366699) previously isolated from cavity spot lesions on diseased carrots [3] was used. It was grown on potato carrot agar (PCA) [5] at 25°C ± 2°C for 7 days in the dark. Three weeks after the addition of the chemical amendments to the soil, millet seeds colonised with *P. coloratum* were thoroughly dispersed through the soil by mixing in a cement mixer (0.5% weight of colonised millet seed-based inoculum/weight of air dry steam-pasteurised soil). This inoculum density had previously been shown to be the optimum level required to cause cavity spot disease under glasshouse conditions [3]. Carrot seeds were sown into the soil and after 16 weeks the carrots were harvested and numbers of cavity spot lesions per carrot were counted.

Analysis of tissue calcium Carrots were selected at random, washed in deionised water and then sliced into small pieces and oven dried for 3 days at 70°C. One gram of each dried sample was digested with nitric acid. Digests were analysed for calcium concentration by using (ICPAES) as described by [6].

RESULTS AND CONCLUSION

- The addition of lime at 4000 kg ha^{-1} (pH 6.8) and 8000 kg ha^{-1} (pH 7.1) significantly reduced the incidence of cavity spot disease compared to unamended soils (pH 5.1) with the largest reduction at 8000 kg ha^{-1}.
- The incidence of cavity spot disease decreased as the pH and exchangeable calcium increased with lime application.
- The addition of gypsum at 4000 kg ha^{-1} (pH 5.2) and 8000 kg ha^{-1} (pH 5.2) did not reduce the incidence of cavity spot disease.
- There were no significant differences in the calcium concentration of carrot roots grown in unamended, lime or gypsum amended soil with or without the pathogen.
- Calcium did not appear to play a direct role in the reduction of cavity spot disease. Reduction of the incidence of cavity spot appeared to be related to the increase in soil pH associated with the application of lime.
- The present work is the first study on the direct effect of pH and calcium on the development of cavity spot in carrots grown in soil artificially infested with *P. coloratum*.

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