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# The role of magnesium in plant disease

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## Abstract

**Background** Magnesium (Mg), as an essential mineral element for plants and microbes, can have both indirect as well as direct effects on disease. Balanced nutrition is critical for the expression of disease resistance since nutrition is part of a delicately balanced interdependent system influenced by the plant's genetics and the environment. A deficiency or excess of Mg can influence a wide range of physiologic functions because of these interrelated processes.

**Scope** There are fewer reports of direct effects of Mg deficiency or excess on plant disease than for many elements because of its participation in a wide spectrum of general physiological functions so that individual activities involved in defense, virulence, or pathogenesis are not as easily characterized. The ability of Mg to compliment or antagonize other minerals can result in different disease responses to Mg under varying environmental conditions. Fusarium wilt pathogens tend to be less severe when adequate Mg is available, and Mg increases resistance of tissues to

degradation by some pectolytic enzymes of macerating or soft rotting pathogens. In contrast, high rates of Mg that interfere with Ca uptake may increase the incidence of diseases such as bacterial spot of tomato and pepper or peanut pod rot.

**Conclusions** The more general physiological benefits of Mg for active growth often obscure specific mechanisms involved in resistance to disease, although Mg is an important contributor to over-all plant health. A specific mechanism of defense to diseases enhanced by Mg includes increased resistance of tissues to degradation by pectolytic enzymes of bacterial soft rotting pathogens. Management of Mg nutrition to reduce disease, in balance with other minerals, is an underutilized tool for disease control.

**Keywords** Magnesium · Disease · Pathogens · Pathogenesis · Disease resistance

## Introduction

Although this chapter discusses the interactions between Mg and plant disease, it should be recognized that agriculture is the management of an ecological system comprised of major and secondary interacting components. The major components consist of the plant, the abiotic environment, and the biotic environment (Fig. 1). Each of these major components is comprised of various factors that favor or inhibit plant disease. It is the interaction of these various components

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