CHAPTER 1

GENERAL INTRODUCTION

Cashew (*Anacardium occidentale* L.) is grown commercially mainly for their kernels (Ascenso, 1986). They are considered the third most sold nut (by mass) after hazelnuts and almonds (Masawe, 1993; Gunjate & Patwardhan, 1995; Rickson & Rickson, 1998). Besides the importance of its status as earner of valued foreign exchange, cashew also provides employment thereby stimulating the economy of developing countries, particularly in Asia, Africa and South and Central America (Rickson & Rickson, 1998). In general, every part of the tree is used, amongst others for medicinal purposes (Mitchell & Mori, 1987; Ferrão, 1995) and manufacturing of plastics, paints and varnishes (Mitchell & Mori, 1987). It is also used for clutch facing in the motorcar industry, insulating material (Behrens, 1996; Anon, 1997) and for preservation and protection of timber and crude fiber against insect and fungal attack (Bisanda, 1998).

Cashews are subject to various diseases that affect fruit, foliage, panicles, branches and seedlings resulting in major losses to the industry. These diseases include powdery mildew (*Oidium anacardii* Noack), anthracnose (*Colletotrichum gloeosporioides* Penzig et Saccardo in Penzig.), inflorescence blight (*Phomopsis anacardii* Early & Punit.) and damping-off of seedlings caused by *Fusarium* spp., *Pythium* spp. and *Phytophthora palmivora* Butler (Ohler, 1979; Milheiro & Evaristo, 1994; Nathaniels, 1994; Piteira, 1996). In Mozambique there were no recorded cashew diseases which had any major financial impact until the early 1960's (Silva, 1961). Anthracnose was later the major disease of cashew before the emergence of powdery mildew in 1973 (Milheiro & Evaristo, 1994; Anon, 1999). Today, powdery mildew is the most important disease (Nathaniels, 1996; Uaciquete, 1997; Topper *et al.*, 2000) causing losses of nut yield of between 50 and 70% (Milheiro & Evaristo, 1994). So far total host resistance (immunity) has not been found (Waller *et al.*, 1992; Martin *et al.*, 1997; Sijaona & Mansfield, 1998). Current management of the disease relies primarily on the application of either sulphur powder or water-based organic fungicides, tolerant cultivars (Masawe *et al.*, 1997; Smith *et al.*, 1997; Kasuga *et al.*, 1998; Topper *et al.*, 1998a, Topper *et al.*, 1998b) and cultural practices (Waller *et al.*, 1992; Masawe *et al.*, 1997; Shomari & Kennedy, 1999).

The adverse effects of synthetic chemical residues on human health and the environment (Korsten *et al.*, 1991; Rankovié, 1997; De Jager, 1999), development of pathogen resistance to certain chemicals (Sharma & Sankaran, 1988; Reuveni *et al.*, 1998), limited acceptance of fungicides for the export markets (Korsten *et al.*, 1991) and the desire to reduce pesticide levels on food crops (Reuveni *et al.*, 1998) have led to intensified research efforts worldwide to develop alternative control strategies (Sundheim, 1986; Reuveni *et al.*, 1997; Dik *et al.*, 1998; De Jager, 1999). To meet this goal, the utilisation of beneficial microorganisms to control diseases has been evaluated by various workers. Korsten *et al.* (1997) in three consecutive years, successfully used *Bacillus subtilis* integrated with copper oxychloride or benomyl to reduce severity of avocado black spot caused by *Pseudocercospora purpurea* (Cooke) Deighton. In addition, Dik *et al.* (1998) attained excellent control of cucumber powdery mildew caused by *Sphaerotheca fuliginea* (Schlecht.:Fr.) Palacci) by weekly application of *Sporothrix flocculosa* (Traquair, Shaw & Jarvis). Furthermore, weekly applications of microconidial suspension of *Fusarium proliferatum* G6 (T. Matsushima) Nirenberg, teleomorph *Gibberella fugikuroi* (Sawada) Ito in Ito & K. Kimura, reduced downy mildew [*Plasmopara viticola* (Berk. & M.A. Curtis) Berl. & De Toni in Sacc.] on grape leaves and clusters (Falk *et al.*, 1996). Most of these studies focused on understanding and exploiting the natural microflora of the plant complexities involving the host, pathogen and bioagent (Sundheim, 1986) and how these are influenced by climatic conditions (Dik *et al.*, 1998).

This study was therefore conducted with the aim of understanding the mechanism of infection by the powdery mildew pathogen on various cashew cultivars with a view to identify sources of disease tolerance, understanding the epidemiology of the disease in southern Mozambique, isolating and screening some biocontrol agents as potential alternative disease control agents and evaluating different chemical products to manage the disease.

The work of this dissertation is a series of different topics organised into chapters. The literature review focuses on the taxonomy, origin and economic aspects of the crop as well as distribution and management strategies, including a conclusive analysis on gaps in knowledge. In Chapter 3, host / pathogen relationships and morphology of *O. anacardii* were investigated using scanning and transmission microscopy. The role of climatic parameters such as temperature, relative humidity and dew point in disease epidemic development was

investigated and presented in Chapter 4. In Chapter 5, potential antagonists were isolated and tested *in vivo* and *in vitro* against *O. anacardii* in comparison with commercial antagonists. In Chapter 6, field disease control programs with fungicides were tested. A general discussion with interpretation of results considering other references is presented in Chapter 7.

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