Australasian Plant Pathol. (2011) 40:309–314
DOI 10.1007/s13313-011-0032-3

OBITUARY

Dr Ross E Beever

MSc (Hons I), PhD, FRSNZ, FNZIAHS, FAPPS (1946–2010)

Dr Ross Beever died prematurely on 3 June, 2010, after a short, severe illness. His death brings sadness to all who knew and worked with him, and marks a severe loss for New Zealand science. Nevertheless, his life as a highly intelligent and productive scientist, as a personable and collaborative colleague and mentor, and as a good and loyal friend, will be remembered with great admiration and respect by all with whom he was associated. A recent comment succinctly epitomises Ross Beever: "Ross was among the nicest and smartest people I ever knew. He was an amazing empirical scientist and naturalist who represented the best of New Zealand." (GJ Samuels, personal communication).

Ross Beever began university education at the University of Auckland, where he completed a BSc in 1966, as Senior Scholar in botany and chemistry. He then graduated MSc (Hons I) in 1969 after completing thesis research in fungal physiology. He joined Plant Diseases Division of New Zealand's Department of Scientific & Industrial Research in 1968, and then attended Leeds University, United Kingdom, after receipt of a Sir Walter Mulholland Fellowship for postgraduate studies in fungal genetics. He was awarded a PhD in 1972, and returned to continue his career in plant pathology at Plant Diseases Division in Auckland. With the re-organisation of science in New Zealand in 1992 he joined Landcare Research, and continued research as a plant pathologist and biologist in that institution.

Dr Beever's achievements made him New Zealand's most renowned plant pathologist/mycologist. His research spanned a wide range of topics and sub-disciplines related to plant pathology, mycology, botany and plant biology, and was distinguished both by excellence in creation of basic knowledge and for development of solutions for practical plant disease problems. A particular characteristic of his work has been the productive collaboration he has fostered across several plant science disciplines. His achievements have been recognised by numerous distinctions and prestigious awards, and he maintained very high levels of research output throughout his 42-year career, publishing over 170 refereed research papers.

Awards and distinctions

2009	Fellow of the Australasian Plant Pathology Society
2007	Honorary Life Member, Auckland Botanical Society
2007	Science Excellence Award (Landcare Research)
2005	Fellow of the New Zealand Institute of Agricultural and Horticultural Science
2004	Fellow of the Royal Society of New Zealand
2004	Keynote speaker, 13th International *Botrytis* Symposium, Turkey
2003	Marsden Fund award 'Why fungi like sex'
2003–2008	Senior Editor *Australasian Plant Pathology*
2003-	International Board Member, The *Botrytis* Genome Project (INRA, Paris)

2003	Invited speaker at 8th Int. Congress of Plant Pathology, Christchurch
2001	New Zealand Science and Technology Bronze Medal
2000	Tennant Lecturer (University of Otago)
2000	Marsden Fund award 'Phytoplasma genome'
1997	Marsden Fund award 'Fungal hydrophobins'
1994	USNZ Cooperative Science Program (USDA, Corvallis, USA)
1989	USNZ Cooperative Science Program (USDA, Corvallis, USA)
1987–94	Member, Fungicide Task Group (New Zealand Committee on Pesticide Resistance)
1983	Trimble Fellowship
1980–81	Department of Scientific & Industrial Research Study Award
1980	Trimble Fellowship
1972–73	Department of Scientific & Industrial Research Study Award
1969–72	Sir Walter Mulholland Fellowship
1966	Senior Scholar Botany and Chemistry (Auckland University)
1963	University Junior Scholarship

Services to the Australasian Plant Pathology Society

Dr Beever became a member of Australasian Plant Pathology Society in 1985. At that time he and other Auckland members of the Society were heavily involved with organisation of the 5th Biennial Australasian Plant Pathology Conference, held at Auckland University. Since then he continued membership of the Society, making particular contribution as a Senior Editor of *Australasian Plant Pathology* from 2003 to 2008.

Research achievements

Fungal physiology

Dr Beever made fundamental contributions to knowledge of fungal physiology, particularly including phosphorus nutrition, culminating in a major review of this field relevant to plant pathology and mycorrhizal research (Beever & Burns 1980). He also completed a pioneering study of hydrophobins, proteins which polymerise into sheets (rodlets) on fungal surfaces facilitating many fungal processes including dispersal of dry-spored species (Beever & Dempsey 1978). These rodlet layers, which are amphipathic with the hydrophilic inner surface facing the fungal cell wall and the hydrophobic outer surface facing the exterior (fungal GORE-TEX®), are one of the hallmark characteristics of filamentous fungi, facilitating hyphal growth and spore dispersal.

Fungicide resistance: field studies, genetics and mode of action

Dr Beever developed understanding and effective management of fungicide resistance in plant pathogens, particularly in *Botrytis cinerea*. He documented levels of resistance in New Zealand, developing an hypothesis explaining field behaviour of pathogens. This emphasised the balance between fitness gain associated with resistance acquisition and fitness loss associated with the genetic changes leading to resistance (Beever *et al*. 1991). He helped establish industry guidelines for reducing the development of fungicide resistance in plant pathogens in New Zealand. He also initiated studies to understand the genetics and physiology of fungicide resistance in plant pathogens, to explain field observations. He discovered that acquisition of resistance to dicarboximide fungicides results in a loss of fitness linked with increased sensitivity to high osmotic stress (Beever 1983). As well as discovering and characterising the gene associated with dicarboximide resistance (Cui *et al.* 2002), these studies resulted in a major paper demonstrating, at the genetic level, how pathogen strains in the field have continue to evolve in the face of ongoing fungicide usage (Cui *et al.* 2004).

Genetics of fungal pathogens

Dr Beever initiated studies of the genetics of fungal plant pathogens to help understand their field behaviour. Emphasis of this research was on *Botrytis cinerea*, a major pathogen notorious for its variability. He developed protocols to define vegetative compatibility groups in this species (Beever & Parkes 2003), and provided a definitive review of the taxonomy and genetics of *Botrytis* species (Beever & Weeds 2004). Coupled with this work, he explored the potential of 'low pathogenesis' or 'mild' strains of pathogens as novel biocontrol agents (Weeds *et al.* 2000, Beever *et al*. 2005). He also recognised that nitrogen non-utilising mutants retain high fitness and thus can be used as 'marked' strains for ecological studies such as those helping to define infection periods in the field.

Mycoviruses

Dr Beever initiated (with plant virologist colleagues) a programme exploring the potential of mycoviruses as biocontrol agents against fungal plant pathogens. This 'over the horizon' approach was initiated in light of the increasing limitations on chemical control of plant pathogens. Two remarkable viruses in *Botrytis cinerea* have been discovered which show sequence similarity to plant viruses infecting *Allium* spp., hinting at possible common ancestry (Howitt *et al.* 2006). A major impediment in the practical application of mycoviruses for biocontrol is the restriction of virus transmission by vegetative incompatibility, and this phenomenon was explored in parallel studies, especially in *Botrytis cinerea*.

Phytoplasma diseases

The pathology of plants native to New Zealand has traditionally received little attention, except for a phase of intensive work immediately after World War II on a Phormium yellows disease of New Zealand flax (*Phormium tenax*), a plant cultivated at that time for fibre. This situation changed in the late 1980s, when the highly distinctive New Zealand cabbage trees *Cordyline australis* (ti kouka) began dying in large numbers throughout northern New Zealand. This was of much concern to the New Zealand public, who regard cabbage tree as a national icon, and a special Cabinet grant was provided for research to understand the cause of "sudden decline" of cabbage trees. Dr Beever led a team charged with finding the cause of the disease. After much investigative plant pathology (Beever *et al.* 1996), the cause was identified as the phytoplasma "Ca. Phytoplasma australiense" (Andersen *et al.* 2001). Identification of this pathogen was hampered by rapid host death and the low titre of the pathogen in most parts of affected plants, except for some apices of underground rhizomes. Genetic studies have indicated a number of different lineages in this pathogen, which is also the cause of Phormium yellows disease and diseases of strawberry and other crops, both in Australia and New Zealand. Phylogeographic analysis, a technique seldom used in plant pathology, suggested that there are both ancient (pre-human) and modern populations of the pathogen in New Zealand (Andersen *et al.* 2006). Phytoplasmas are insect transmitted, and symptomatology suggested that cabbage tree and strawberry were both terminal hosts. Ecological studies indicated that an unrelated wild plant, *Coprosma robusta* (karamu), acts as a reservoir in the environment of the pathogen (Beever *et al.* 2004), and led to the proposal that one of the triggers of the disease epidemic in cabbage trees may have been the widespread planting of karamu in restoration plantings. Recently, it has been found that a native plant hopper *Zeoliarus* (*Oliarus*) *oppositus* is a (perhaps the major) vector of the phytoplasma to strawberry and cabbage trees (Beever *et al.* 2008). In complementary research the team sequenced the genome of a New Zealand isolate of "Ca. Phytoplasma australiense" and its associated plasmids (Liefting *et al.* 2006). Sustained research over more than a decade, combining field and laboratory research, has resulted in detailed understanding of the ecology of phytoplasmas in a seminatural situation.

Phytophthora diseases

Dr Beever recognised *Phytophthora* as a genus of major biosecurity importance and of potential significance to the health of native ecosystems. He helped to clarify the role of *Phytophthora cinnamomi* in native forests (Johnston *et al.* 2003) and restoration planting. He led a Ministry of Agriculture and Forestry-funded project clarifying the species of *Phytophthora* occurring in New Zealand using DNA sequencing techniques (Beever *et al.* 2006). This recognised the presence of *P. kernoviae* in New Zealand, a pathogen of significant biosecurity importance previously known only from Cornwall in England (Ramsfield *et al.* 2009). More recently he recognised that species of *Phytophthora*, including an undescribed species tag named *Phytophthora* Taxon Agathis, pose a threat to kauri (*Agathis australis*), an iconic tree of northern New Zealand (Beever *et al.* 2009).

Taxonomic mycology and plant biology

Dr Beever had continuing interests in the taxonomy and biology of New Zealand native truffles and puffballs (Castellano & Beever 1994; Bridge *et al.* 2008), and he identified novel plant pathogens affecting native New Zealand flora (Johnston & Beever 1994; Beever 2007). He also studied the botany of native New Zealand plants in collaboration with botanists in Landcare Research. This included research on the genetics of *Cordyline* (Beever 1981), and study of adaptation in *Cordyline australis* (Harris *et al.* 2001, 2003, 2004), work which demonstrated the scientific basis for eco-sourcing of plants in restoration.

Key publications

Fungal physiology

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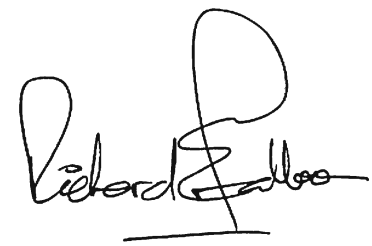

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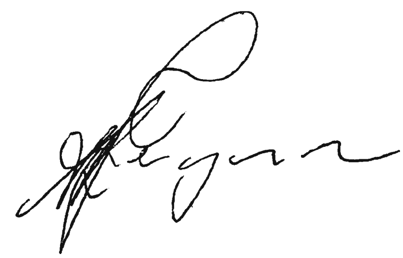

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