

# Fungicides: an historic perspective

by Christopher Sann

**T**urfgrass managers at highly maintained sites, such as golf courses, large commercial properties, sports facilities, as well as lawn care operators, consider fungicides to be an indispensable tool in their strategy to improve and maintain turf. The number and variety of these essential control materials provides the modern turfgrass manager with a full palette of tools that when properly used can solve a specific problem, while subjecting the environment and those who populate it to little danger. The information system that surrounds the use of modern fungicides and their ease of use allows turfgrass managers to make and carry out disease control decisions with an unprecedented level of confidence.

## The concept of fungicides is not new

From an historic perspective, modern, tightly focused, consistently effective fungicides are a very recent development despite the fact that man's first attempts to control diseases on plants go back centuries.

Early attempts at fungus control can be dated as far back as 800 BC, when Homer, the Greek poet wrote about the use of sulfur to control disease in both of his epic poems, the Iliad and the Odyssey. Roman literature makes note of rust infestations in cereal crops and how the Romans held the annual feast of Robogalia to appease the rust gods.

The first recorded use of a seed protectant fungicide was 1761, when copper sulfate was used to control the disease of bunt in grains. The first foliar fungicide, lime sulfur, was used in 1802 to control powdery mildew on fruit trees.

## 100 years ago: the first prepared fungicide

The first prepared fungicide is generally considered to have been Bordeaux mix. It was discovered in 1882 when a Frenchman, named Millardet, observed that grape vines that had been spattered with a mixture of lime and copper sulfate were free of down mildew. Within three years, through experimentation, he had worked out the classic 3:1:100 mixture ratio of copper sulfate to calcium oxide to water that is still used today.

## 1931: the first manufactured fungicide

The first patented, manufactured fungicide, Thiram,

was developed by DuPont in 1931. In 1932, the first soil fumigant was recognized when the use of chloropicrin (tear gas) resulted in dramatically increased agricultural yields. In 1945, Dow introduced ethylene dibromide as a soil fumigant. Vapam, another soil sterilant, was introduced by Stauffer in 1954.

In 1940, Rohm & Haas developed the dithiocarbamate, EBDC, and its use in field studies in 1941 lead to the issuing of a patent on nabam in 1943. Work on nabam, to reduce some of its undesirable side effects and its weaknesses in control, lead to the introduction of a zinc-based formulation of dithiocarbamate called Zineb in 1948. In 1949, Captan was developed at Rutgers University. Further work on dithiocarbamate fungicides lead to the manganese based formulation, Maneb, and then ultimately to the current reformulation which combines Maneb with zinc and manganese which was introduced as Mancozeb in 1962.

## 1960s: modern fungicides

Modern fungicides first appeared with the introduction of chlorothalonil in 1964 by Diamond Alkali. This was followed by the release of benomyl in 1968 from DuPont and thiophanate methyl by Nippon Soda in 1969.

In 1975, feneramol and triadimefon, two of the very popular sterol inhibitor fungicides were developed, as was propiconazole in 1979.

At around the same time, the two *Pythium* active fungicides, metalaxyl and fosetyl-al, were discovered in 1977.

## More and different fungicides are coming

The near future will see several new and different materials become available. There are already EPA registrations for newly discovered or reformulated fungicides scheduled in the coming years, many in the sterol inhibitor class.

ICI expects to offer the first mitochondrial respiration inhibitor, a bio-rational fungicide, by the turn of the century. This introduction will represent a dramatic shift in emphasis and may ultimately produce a class of materials that provide precise fungus control with virtually no adverse environmental impact. ■