Research in the Plant Pathology Department University of California Riverside on Statewide Methyl Bromide Alternatives

Mike D. Coffey, Albert O. Paulus
Frank Westerlund (California Strawberry Commission)

Helga Förster, Heidi Krueger, Maria Placentia,
Pele Rich, Alejandra Soto Estrada, Miguel Vilchez

Alternative fumigation methods to replace methyl bromide are urgently required in order to avoid an eventual major economic impact on strawberry production. The methyl bromide/chloropicrin combination has been highly effective for the past 25-30 years in the control of weeds, nematodes and soilborne fungal pathogens. Currently, the best alternatives to methyl bromide use are likely to be other chemical fumigants such as chloropicrin.

A large scale experiment at one field site at the Wesco Ranch in Oxnard was established to assess the efficacy of different soil fumigants to reduce populations of potential fungal pathogens. Chemicals were applied individually or in combination and at different rates one month prior to planting. All treatments were applied in cooperation with the chemical manufacturers using commercial application equipment. Treatments were: 1- Methyl bromide/chloropicrin 67/33 @ 355 lbs/A, 2-Chloropicrin @ 300 lbs/A, 3-Telone II/chloropicrin 70/30 @ 454 lbs/A, 4- Control Not treated, 5- Methyl bromide/chloropicrin 75/25 @ 275 lbs/A.

In this study, populations of *Rhizoctonia, Pythium, Cylindrocarpon, Verticillium, Phytophthora, Colletotrichum, Fusarium* are monitored over time. Strawberry plants of the 'Chandler' variety were sampled at three week intervals to identify fungi associated with roots and crowns of plants from treated and untreated plots to better understand the 'root and crown disease complex'. This complex is known to cause up to fifty percent losses in nonfumigated soils. In the present study a 45 percent loss in fruit production was incurred in the nonfumigated plots.

Characterization of *Pythium* and *Rhizoctonia* groups:

In successive isolations of fungi from crown and roots, *Pythium* and *Rhizoctonia* were consistently recovered in higher numbers from the nonfumigated (control) plots. According to growth pattern and hyphal morphology 230 isolates were tentatively assigned to the genus *Rhizoctonia.* A subsample of 25 isolates was tested and found to be binucleate and of three distinct morphological groups. Random amplified polymorphic DNA (RAPD) analyses are being used to characterize the genetic diversity of these isolates. Different genotypes will then be tested for their pathogenicity towards strawberry.

Among 95 isolates of *Pythium* we have identified six major genetic groups based on RAPD analysis. These six groups were generally morphologically distinct, though not in every case. Three genetic groups were found predominantly in crowns and roots of plants grown in nonfumigated soils. Representatives of these six groups are being tested for their pathogenicity towards strawberry plants.

Future research objectives:

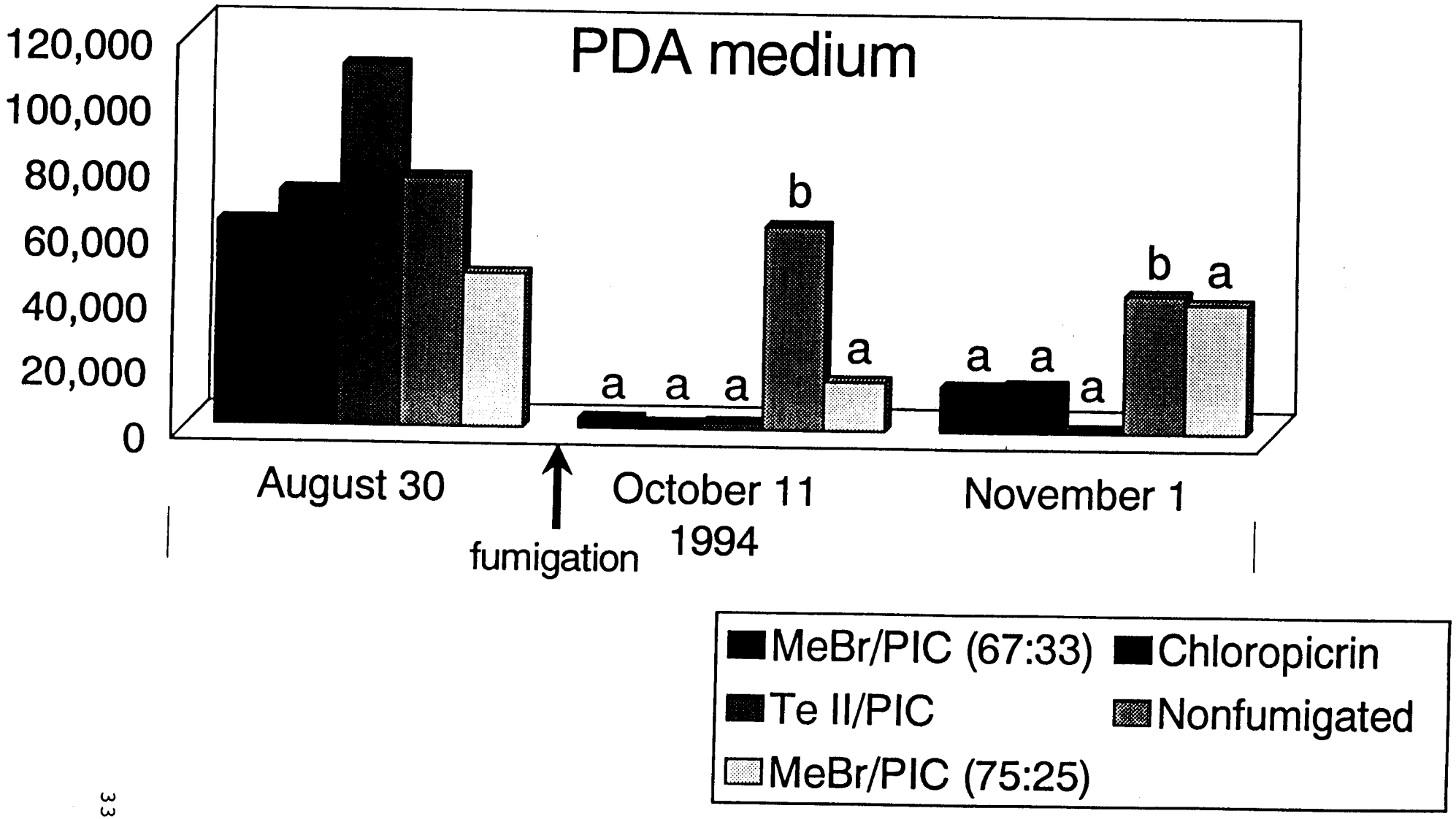
1. To critically analyze the major players in the strawberry black root rot complex.

2. In particular to establish the roles of different *Pythium* and *Rhizoctonia* species in the strawberry black root rot complex.

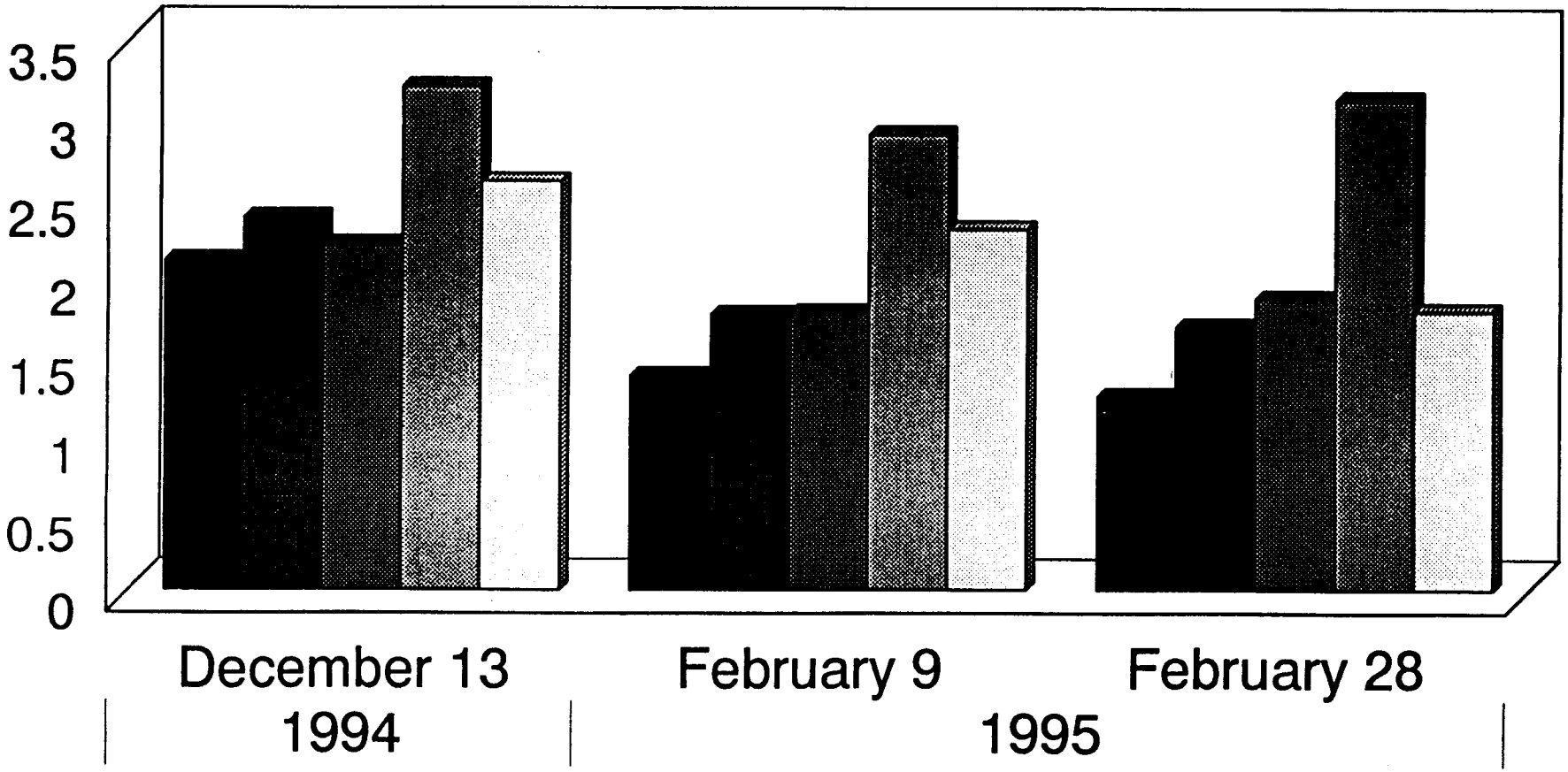
3. To evaluate whether different strawberry varieties respond differently to pathogenic *Pythium* and *Rhizoctonia* species.

4. To evaluate specific fungicides for their efficacy in controlling components of the strawberry black root rot complex.

Soil isolations



VISUAL DATA


3.5
3
2.5
2
1.5
1
0.5
0
December 13
1994
February 9
1995
February 28
1995
MeBr/PIC (67:33)
Chloropicrin
Te II/PIC
Nonfumigated
MeBr/PIC (75:25)