root was only 6.6 cms. Compared with the controls, seedlings growing in the flat painted with copper naphthenate had 50 per cent more secondary roots per unit length of primary root in all three species, as well as substantially more secondary roots on the upper 6 cms of the primary root.

The copper naphthenate in perlite made an impermeable layer that impeded water drainage. This could have accounted for the reduced top growth of the pines and also the smaller number of secondary roots on plants in this treatment. No injurious effects were seen on the top growth of any of the species, although the pines were reduced in top growth by the copper naphthenate.

Better container plants

Painting copper naphthenate on the bottom of the seed flat appears to be a simple and convenient method for chemically pinching roots. This material is normally used in nurseries as a wood preservative and disinfectant. The concentrated 55% copper naphthenate is easily painted onto the bottom of flats or seedbeds, is water-repellent, and does not leach into the soil. The copper naphthenate remains behind when the seedling is transplanted. Plants should be transplanted soon after the primary root is pinched to allow the secondary roots to elongate normally.

Chemically pinching roots of seedlings should prove an important aid in the production of container and field-grown plants having fewer kinked, circled and twisted root systems. Plants so handled will have more fibrous root systems with stronger trunks to support their developing tops.

James J. Nussbaum is Laboratory Technician, Department of Environmental Horticulture. R. W. Harris advised on this study.

A practical aphid trap for field studies

N. F. MC CALLEY · W. H. LANGE

METHODS OF TRAPPING WINGED aphids in the field during studies of the incidence and spread of plant viruses have included sticky board traps, yellow painted open pans of water, and mechanical suction traps. Sticky board traps require the least attention, but collect fewer aphids than the other traps. The suction trap is the most efficient, but requires an electrical power source and is expensive. Although it collects more aphids of certain species which are attracted by yellow, the yellow pan trap has been favored by many researchers for the field survey of aphid vectors of plant viruses because of its overall efficiency in attracting known aphid vectors.

However, there are some disadvantages to the yellow water pan trap. It must be serviced at least once a week under ideal conditions and twice a week in windy weather. Most surveys require frequent collection of the aphids to determine the onset of aphid migrations, which is important in the study of the spread of plant viruses under field conditions. It is known that yellow water pan traps are more efficient when placed on bare soil, and that when they are elevated or placed against a background of vegetation their efficiency is reduced. During the field survey of aphid species, the traps are placed in fields where they are frequently driven over with tractors during cultural operations. Furthermore, winds regularly whip dirt and other debris into the water rendering the trap less attractive to aphids.

These disadvantages have largely been overcome by development of a water pan trap consisting of an open water-filled pan mounted in a stand as shown in the accompanying photograph. The enamelware pan used is 7½ inches in diameter and 3¼ inches in depth. The pan and stand are an integral unit both painted in Visibility Yellow 1524 (W. P. Fuller Co.). Addition of a sufficient amount of a wetting agent such as Vatsol 90 (American Cyanamid Co.) is suggested to break the surface tension of the water and aid capture of the aphids as they alight on the surface.

All parts of the stand other than the legs are made of ½ inch plywood. The specifications and number of pieces are as follows: top—12″×12″ with 8″ pan hole; top side rails—2½″×11½″ (2) and 2½″×12″ (2); lower side rails—3½″×11½″ (2) and 3½″×12″ (2); lower shelf—12″×12″ with corners notched for legs; and legs—2½″×2½″×20½″ (4).

The 21-inch height of this trap painted entirely yellow minimizes the background effect, yet it is not elevated enough to greatly reduce trapping efficiency. The trap's height and color cause it to stand out in fields of most row crops, including sugar beets, and make it easier for tractor drivers to see the trap. The trap is affected less by wind-blown soil and other debris dropping into the pan because it is off the ground.

This unit was developed in 1956 during studies of aphid vectors of lettuce mosaic virus in the Salinas Valley. It has been widely used throughout northern California and the San Joaquin Valley to survey the aphid vectors of the virus yellows complex of sugar beets. The trap has been useful in timing the application of insecticides to control the aphid vectors of sugar beet viruses. It has proven to be both inexpensive and practical.

Norman F. McCalley is Farm Advisor, Monterey County; and W. H. Lange is Professor of Entomology, University of California, Davis.