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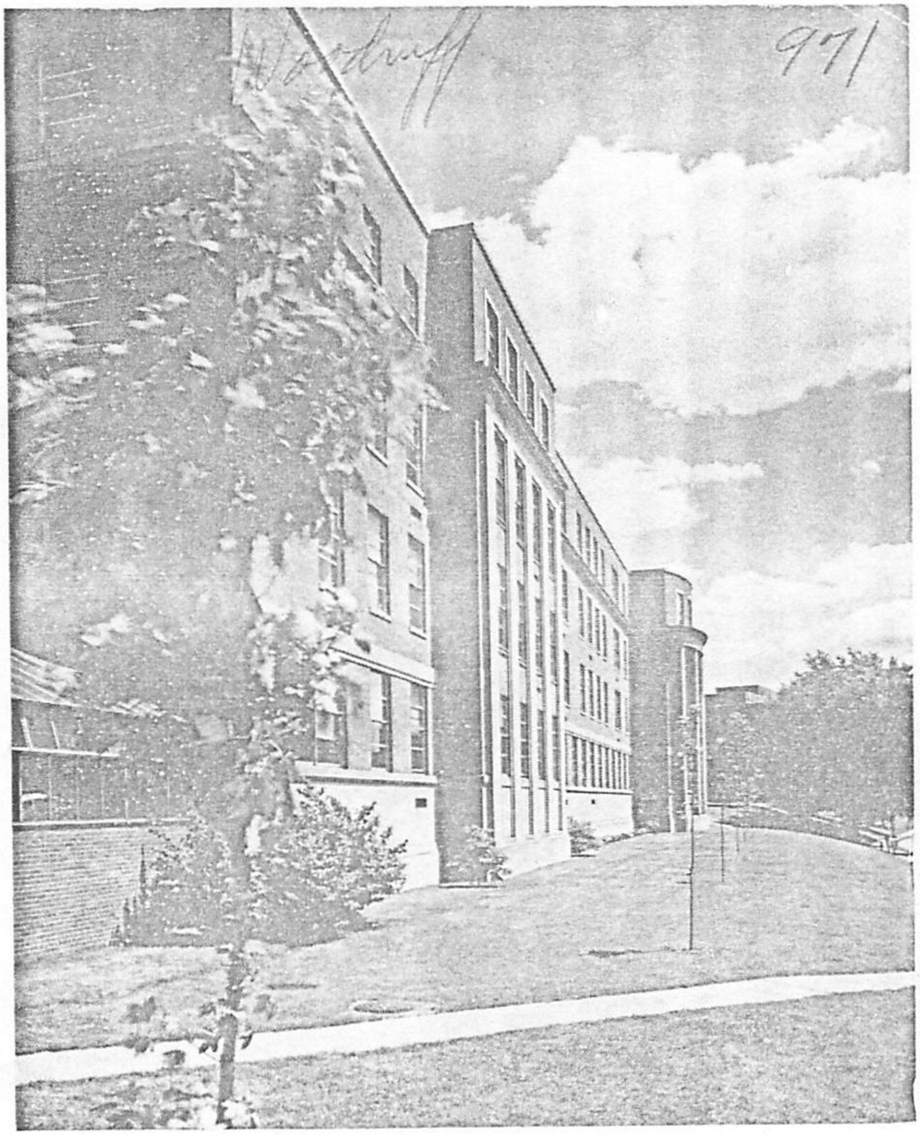

A Practical Means of

REDUCING STORAGE ROTS OF APPLE AND POST-HARVEST ROTS OF PEACH

WEST VIRGINIA UNIVERSITY AGRICULTURAL EXPERIMENT STATION

THE AUTHORS

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ON THE COVER

Brooks Hall, home of the West Virginia University Department of Plant Pathology, Bacteriology, and Entomology. Photograph by David R. Creel, Agricultural Experiment Station Photographer.

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A Practical Means of Reducing Storage Rots of Apple and Post-Harvest Rots of Peach

ROBERT E. ADAMS and S. E. TAMBURO

STORAGE rots of apples[1] frequently cause the loss of 10 per cent or more of the crop held in refrigerated storage. The apples in storage generally are the "Cream of the Crop." The cost of growing, harvesting, and storing these apples is high. Their decay in storage is a direct loss.

With peaches, the problem is even more serious. Because of the likelihood of post-harvest rots,[2] peaches generally cannot be stored for extended periods of time, and the crop must be sold and utilized immediately.

Any means of reducing storage rots of apple or delaying the development of post-harvest rots of peaches can be expected to improve the fruit grower's situation considerably, as it reduces losses which place him at a tactical disadvantage in marketing his crop at a profit. Reduction in post-harvest decay can also reduce losses to the wholesaler, retailer, and the consuming public.

In the experiments described here, treating field boxes with several fungicidal chemicals provided a sufficient reduction in fruit rots to be of practical importance.

Experiments

APPLES. The apples (Red Delicious, Golden Delicious, Rome, and Stayman) used in these experiments were grown under the Captan-Lead spray program at the West Virginia University Experiment Farm, Kearneysville. The field boxes selected for treatment had been used for two or three seasons previous to these experiments and had been well cared for. Many different fungicidal treatments were applied to the boxes either as a spray (using a knapsack sprayer) or as a dip (immersing the boxes in the spray mixture).

Because of the limitations on the use of spray chemicals imposed by the *Miller Amendment*, Public Law 518, only those treatments that may be legally used at the present time will be reported here.

These treatments were captan (2 lb. in 100 gallons of water) and

[1]Principally Blue Mold, Grey Mold, Black Rot, Nigrospora Rot, and Botryosphaeria Rot.

[2]Brown Rot and Rhizopus Rot.

glyodin (1 qt. in 100 gallons of water). One quart of spray mixture was applied to each box. Although no estimate of the quantity of material required for dipping the boxes was made, it was probably less than that used for the spray application. The boxes were treated one month in advance of harvest. At harvest time, they were taken to the orchard and filled with fruit (tree run) by the pickers, and immediately placed in refrigerated storage at the Station. New boxes were also used for Romes and Staymans for comparison with the treated boxes. In addition, used, untreated boxes were used for comparison with all varieties tested. After approximately two and one-half months storage, counts of all diseased and sound fruits were made. The results clearly showed that storage rots were reduced by treatment. In untreated boxes 8 to 14 per cent rot was found as compared to the better treatments where 1 to 4 per cent rot was found, depending on the variety. Equal control was obtained by using new untreated boxes. This means that by spraying old boxes or using new ones, from 7 to 10 boxes of fruit can be saved from each 100 boxes of fruit placed in refrigerated storage. Detailed results, based on close examination of 18,297 fruits in 248 boxes, are presented in Figures 1, 2, 3, and 4.

PEACHES.[3] Studies with Hale Haven peaches, similar to those made with apples, were conducted in two separate localities in the State (Kearneysville and Romney). The spray treatments applied to the boxes were captan (2 lb. in 100 gallons) and paste sulfur (5 lb. actual in 100 gallons). The fruit was put into the treated and untreated boxes by the pickers in the commercially accepted manner. At the same time, fruits were picked by the authors and placed in individual depressions in new cardboard trays commonly used for tray-packing apples, so that the amount of infection before picking could be determined. The field boxes of picked fruit were placed on a truck and hauled to the packing shed where a sub-sample of 20 fruits was taken from each box. The sub-sample was taken from top to bottom, along the side of each harvested box. Fruits showing evidence of rot or other defects were not included in the experiment. Each sound fruit was placed in a depression of a new cardboard tray-pack tray. The fruit was then placed in refrigerated storage over night and cooled to a temperature of approximately 40° F., and removed to laboratory benches at room temperature for the remain-

[3]The wholehearted cooperation of Mr. E. W. Miller and Mr. M. M. Brown, who supplied the boxes and fruit for these experiments, is gratefully acknowledged.

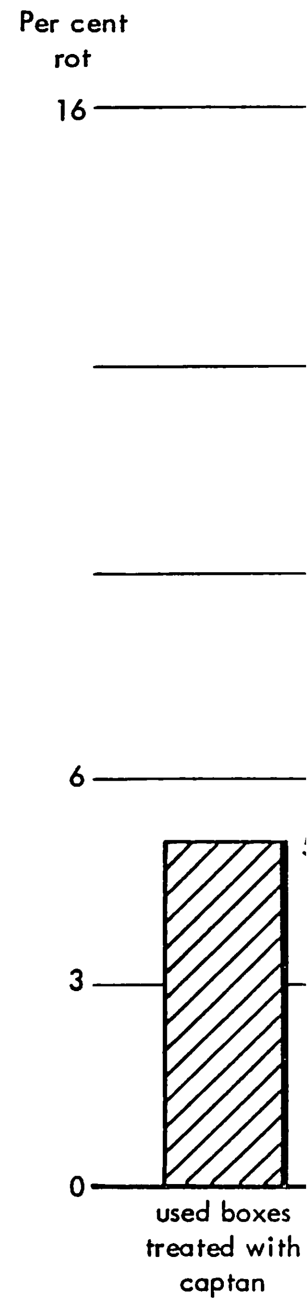

FIGURE 1. Percentage of
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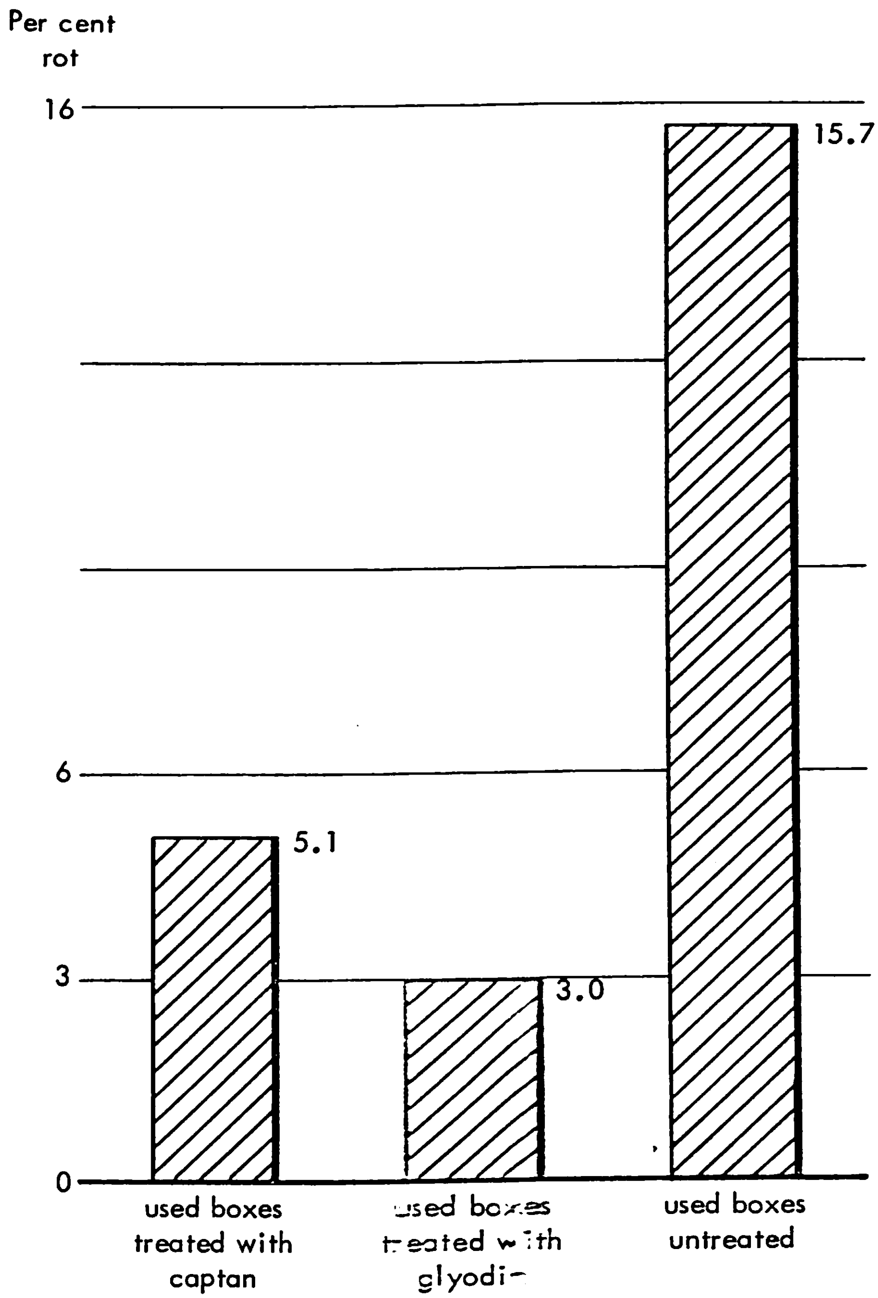

FIGURE 1. Percentage of storage rot in Red Delicious apples harvested and stored in used field boxes sprayed with captan and glyodin fungicides.

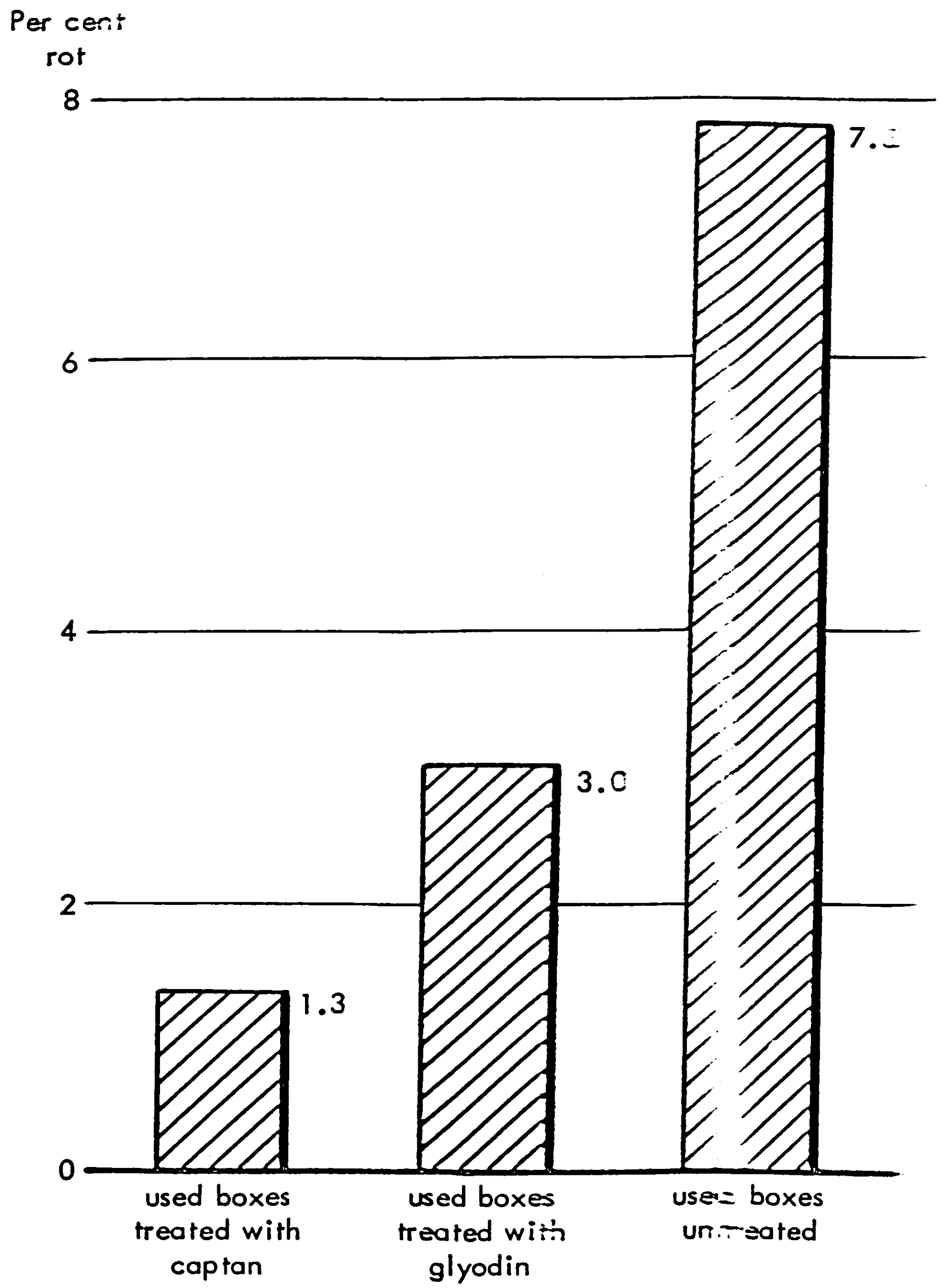

FIGURE 2. Percentage of storage rot in Golden Delicious apples harvested and stored in used field boxes sprayed with captan and glyodin fungicides.

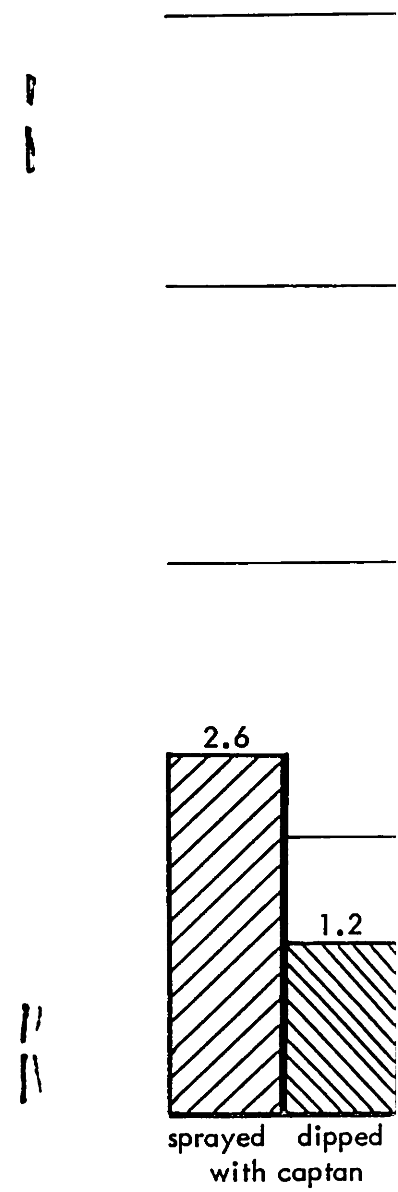

FIGURE 3. Percentage
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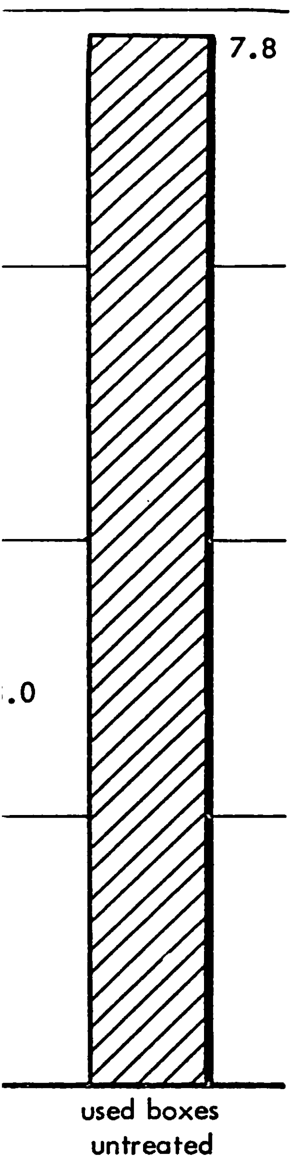

Delicious apples harvested
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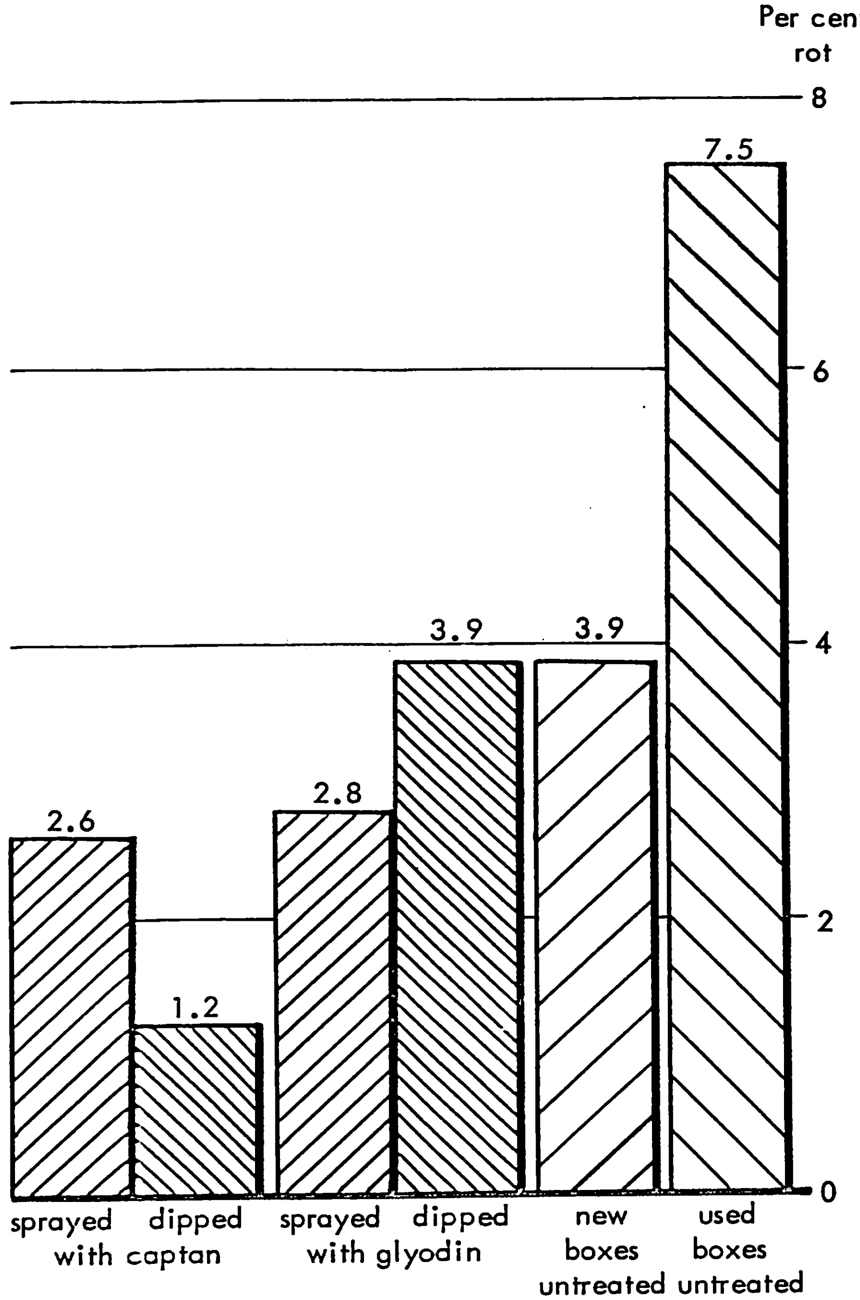

FIGURE 3. Percentage of storage rot in Rome Beauty apples harvested and stored in used field boxes treated with captan and glyodin fungicides.

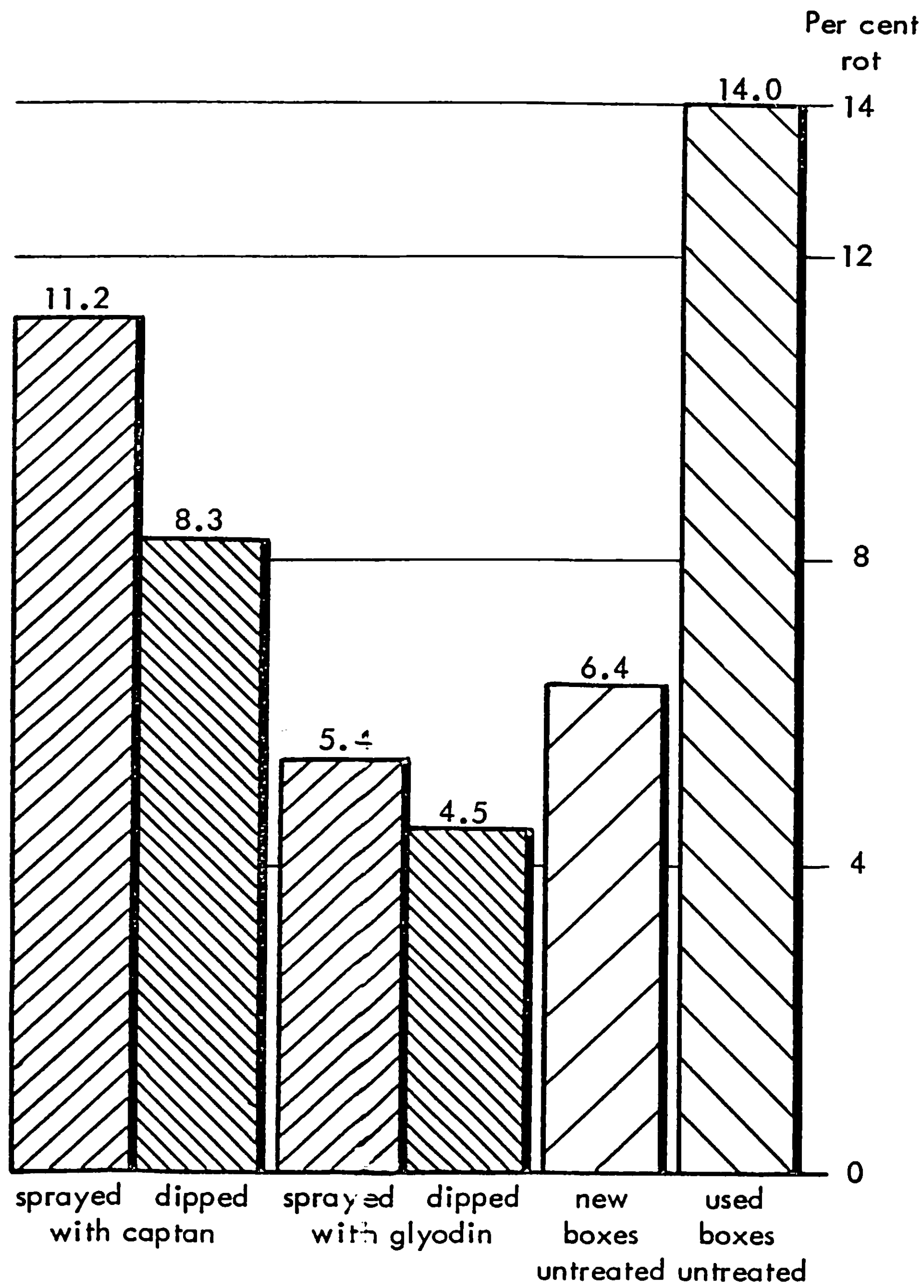

FIGURE 4. Percentage of storage rot in Stayman Winesap apples harvested and stored in used field boxes treated with captan and glyodin fungicides.

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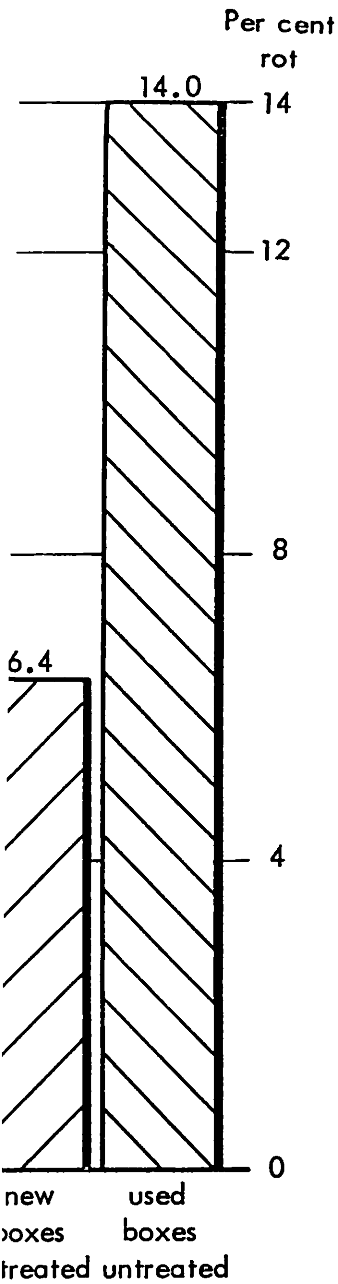
Practical Significance

These experiments sho the savings made possible treatment may be of major ance to the fresh fruit i The harvesting of fruit into new boxes or tray-pa was the best treatment, bu not practical since it would costly. However, the cost terials for treating the fiel ($0.25 for materials for 100 would be negligible whe pared to the value of th saved. At a valuation of $ box for the fruit, this woul a savings of $10.00 to $4 each 100 boxes of fruit. It that more efficient and more effective methods found for treating boxes. ly, there are other materi would be equal to or mo



an Winesap apples harvested
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der of the experiment. In this way, an attempt was made to simulate some of the conditions encountered by peaches from harvest to final sale to the consumer. However, these fruits received more gentle handling than they would have received in commercial channels. Counts of rotting and sound fruits were made 4, 8, and 12 days after harvest. The detailed results of these experiments, based on close examination of 1,200 peaches from 60 boxes, are presented in Figures 5 and 6. All treatments greatly reduced the incidence of post-harvest rots.

Practical Significance

These experiments show that the savings made possible by box treatment may be of major importance to the fresh fruit industry. The harvesting of fruit directly into new boxes or tray-pack trays was the best treatment, but this is not practical since it would be too costly. However, the cost of materials for treating the field boxes ($0.25 for materials for 100 boxes) would be negligible when compared to the value of the fruit saved. At a valuation of $2.00 per box for the fruit, this would mean a savings of $10.00 to $40.00 in each 100 boxes of fruit. It is likely that more efficient and perhaps more effective methods can be found for treating boxes. Possibly, there are other materials that would be equal to or more effective than the ones tested. However, it is presently permissible to use captan and sulfur in post-harvest treatments and glyodin may be applied to fruit on the day of harvest. It is reasonable to assume that no illegal residues will result from this use of these materials.

For these results, it is apparent that used field boxes are a major source of inoculum for post-harvest rots of apples and peaches, and that this source can be at least partially eliminated by fungicidal treatment of the boxes used for harvesting and storing fruit. The application of control measures should yield immediate practical benefits.

Discussion

Practical control of any fruit disease is attained whenever the value of the fruit saved exceeds the materials and labor costs of the control measure. In all of the experiments described here, this requirement has been amply fulfilled. Captan and glyodin performed equally well on Red Delicious, Golden Delicious, and Rome. Glyodin was superior to captan for Stayman. From a practical point of view, the choice of material would depend upon which one was more readily available. There seems in general to be little difference in control, whether the boxes are dipped or sprayed. It is likely that better commercial control would be obtained by spraying than dipping, because of

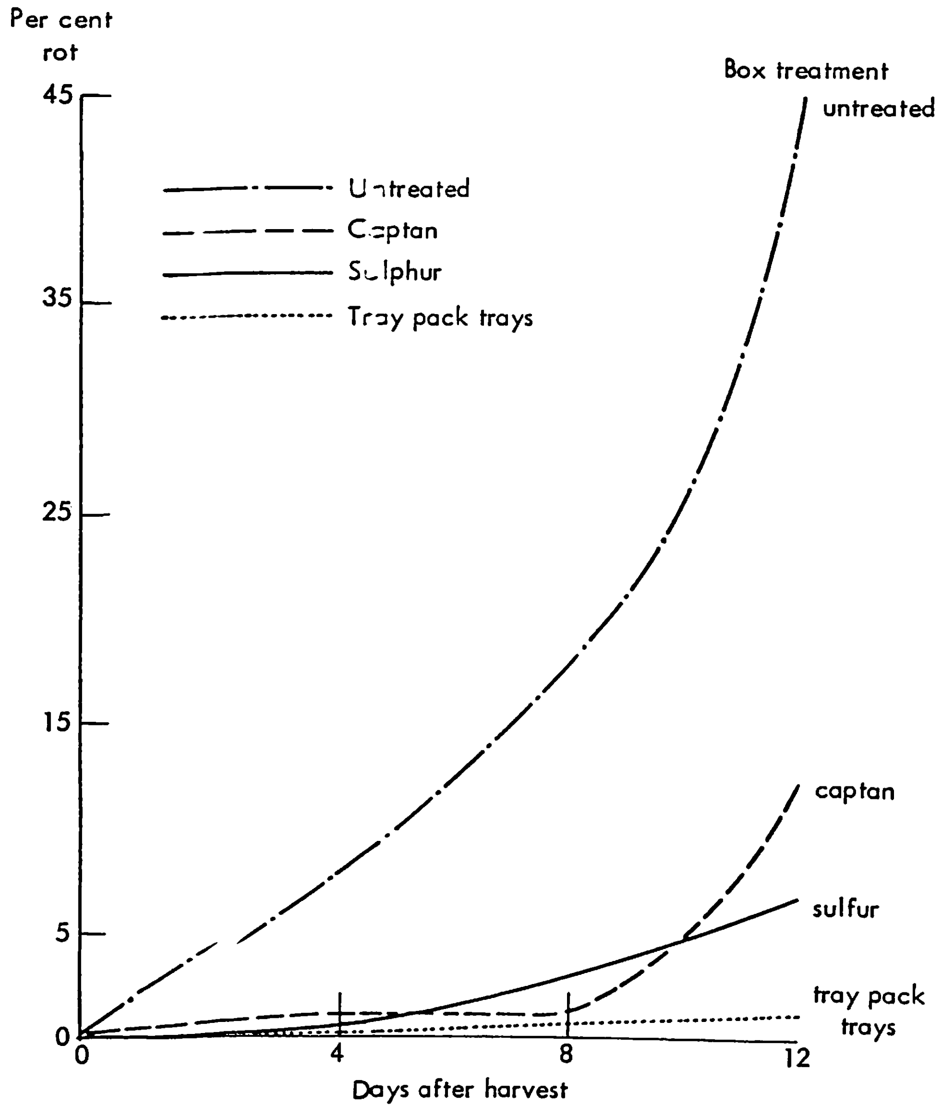
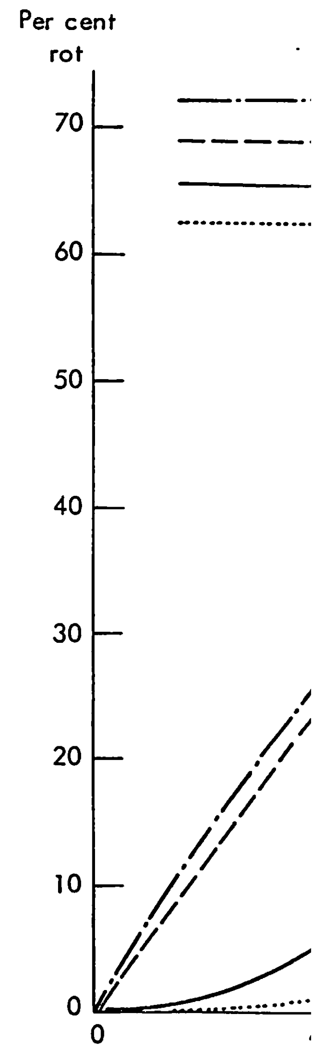


FIGURE 5. Rot development, 4, 8, and 12 days after harvest, in Hale Haven peaches from Romney, harvested in treated field boxes.

the difficulty of maintaining a uniformly effective mixture in the dipping tank, which would have to be specially constructed for this purpose. Also, most growers have a high pressure hydraulic sprayer that could easily be used for applying the chemicals. With a sprayer, the boxes could be sprayed during slack work periods just before harvest and before the sprayer is stored for the winter. However, if the



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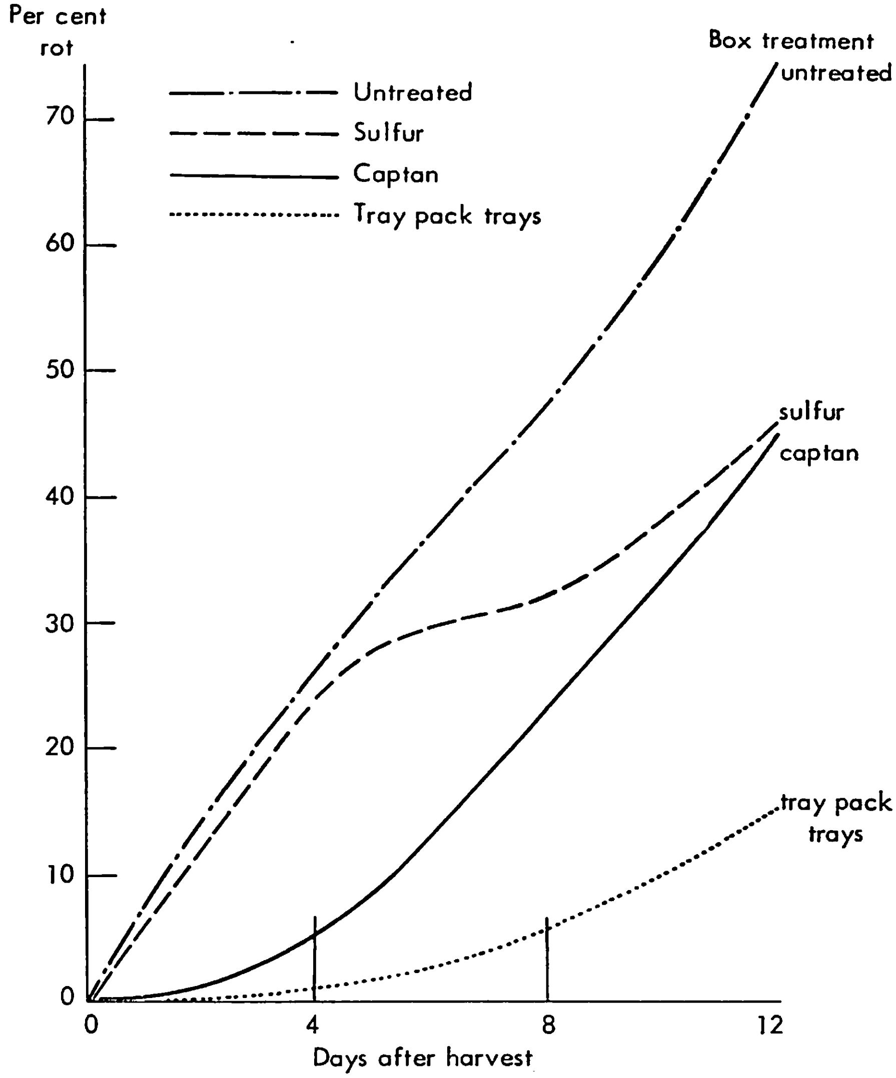

FIGURE 6. Rot development, 4, 8, and 12 days after harvest, in Hale Haven peaches from Kearneysville, harvested in treated field boxes.

boxes are used repeatedly during the harvest season, it may be advisable to treat them before each use. This point has not yet been investigated.

Sulfur was not used on the apple boxes because of the possibility that it might bleach the red apples during a prolonged storage period.

Although the practice of "Hydrocooling" peaches has helped reduce the incidence of post-harvest rots, it has not eliminated the problem. Also, treating boxes in which peaches are harvested is not yet a "cure-all." However, these experiments do indicate that much post-harvest rot results from placing the fruit in contaminated containers at harvest time. Also, it seems that, in contrast to common belief, the bulk of the post-harvest rots are not initiated on the tree.

Since peaches are not usually put in prolonged storage, the principal benefit of using treated boxes would be improving the quality of the fruit put on the market and into the hands of the consumer. This will ultimately work to the financial gain of the producer as well as the consumer.

It should be pointed out that the experiments on both apples and peaches were limited in scope, and both should be tried on a commercial scale to test further the results reported. The results are sufficiently striking that we recommend the use of this practice to fruit growers for limited trial.