FACTORS AFFECTING THE INCIDENCE AND SPECIATION OF FUNGI COLONIZING WALNUT FRUITS

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Fungal colonization of Walnuts

A primary objective of the work done in 1979 was to obtain information on the nut tissues colonized by fungi and to determine the pathways through which fungi move from the hull surface to the kernel. To accomplish this, walnuts were inoculated with five species of fungi commonly isolated from walnut hulls and kernels: Alternaria, Aspergillus, Penicillium, Cladosporium, and Rhizopus. The fungi were applied in a 0.2% Tergitol 7/water solution which was sprayed onto the hulls on three dates during the growing season. The last application was done approximately two weeks prior to harvest, when the hulls of the nuts had split.

The inoculated nuts were evaluated in two ways. During the growing season, samples were removed every two weeks for laboratory isolations. Each nut was evaluated for colony growth from the pedicel, hull tissue, kernel and vascular tissue. At harvest, three samples of thirty nuts of each date and suspension were sent to Diamond/Sunsweet for routine visual examination and quality ratings.

Inoculation of nuts with several fungi at various times during the growing season had no effect on the amount of visual mold. There were, however, some dramatic differences in the nut tissues that were colonized. With the exception of the blossom end and the stem end, very few fungi were isolated from the hull tissue at any time during the season. The blossom end and hull end tissues were colonized throughout the season, with the level of infestation being somewhat higher in the blossom end. The percentage of nuts colonized increased at the time of hull split. This was most evident when isolations were made from the stem end. Prior to hull split 25 to 30% of the nuts were colonized at the stem end, this level increased to 80 to 100% at hull split. The increase in the colonization of stem end tissue corresponded with an increase in the number of kernels that were infected. There was negligible colonization of the kernel until hull split and at this time the percentage of kernels infected increased to 40%. This suggests that the fungi move from the stem end of the hull into the kernel.

Based on colonization of the kernel, the fungi most important in causing mold problems are Penicillium, Aspergillus, Alternaria and Rhizopus, of these Penicillium appears most frequently, both in the hull and kernel tissues. Aspergillus readily colonizes hull tissue but is less likely to appear in the kernel. Cladosporium did not appreciably colonize any of the nut tissue.

Captan, Benlate and Botran were applied as foliar sprays in replicated plots in three locations: Woodland, Knights Landing, and Visalia, CA. Mold levels did not exceed 10% in the controls. The fungicides did not have an effect on reducing mold at this level.

Humidity trials

Experiments testing the effect of combinations of temperature and relative humidity were performed. Between 45° and 80° F temperature is not as critical to mold development as relative humidity. Relative humidities of 85% or higher for a period of seven days or longer contributed to increased mold development.