hand is toxic to many of the nematode trapping fungi and could have an adverse effect on biocontrol agents in soil. Predacious nematodes succumb to all nematicides, but most species are not abundant in agricultural soils and probably have a very minor influence on plant-parasitic populations.

Recently a sporozoan parasite of root-knot and other nematodes has been shown to be tolerant of a number of nematicidal chemicals. Thus, an awareness of the biocontrol agents present, and their tolerance to various nematicides, could lead to an integration of control practices for maximum effectiveness.

Effect on nutrition

Nematicides do influence the physical and biological composition of treated soil. Research had shown that neither residues of the parent compound, nor other halide containing organic compounds, were present in crops grown on treated soil. It was also of interest, however, to know whether the nutritional value of crops was affected. With the support of USDA and the cooperation of Dr. Gladys Emerson of the Human Nutrition Section, School of Public Health, University of California, Los Angeles, the nutritional components of carrots, citrus and lima beans grown on EDB, DBCP and/or 1,3-D treated soil were studied. No adverse effects on any nutritional components were noted. The only significant change that occurred was an increase in Beta carotene content. Beta carotene is a precursor of Vitamin A. Analysis of beans and citrus, showed no adverse effects of soil treatment with DBCP, EDB and/or 1,3-D.

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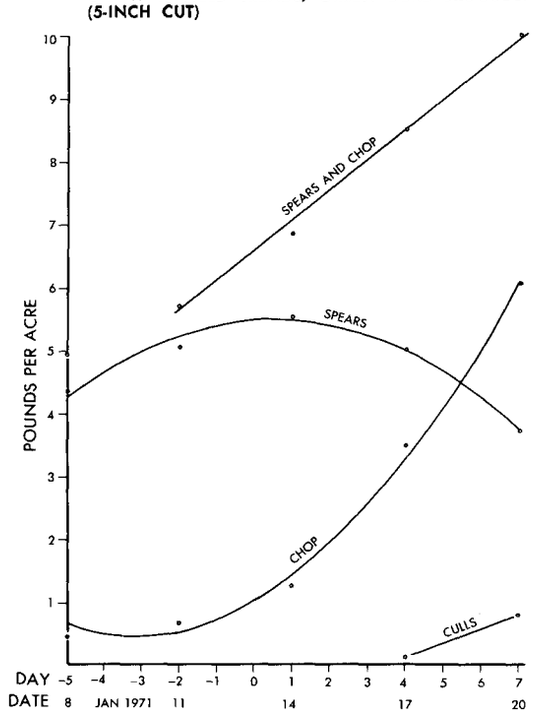
Once-over harvesting of

BROCCOLI FOR FREEZING

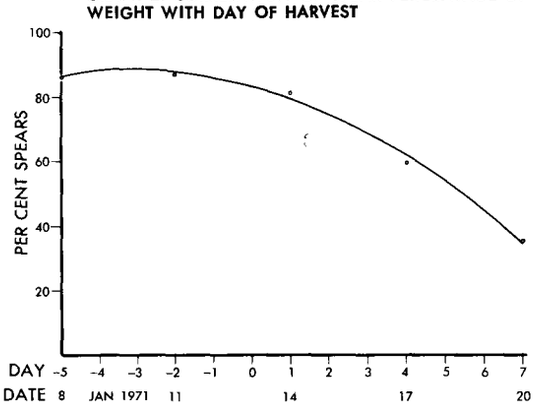
R. A. BRENDLER

With both yield and quality changes occurring rapidly from day to day, a simple objective method of field sampling broccoli is highly desirable for a once-over harvest operation by hand and is essential for machine harvesting. Studies reported here indicate the difficulty in devising such a sampling method and point out the need for good judgment by farmers and field men until a good method is developed.

GRAPH 1. YIELD TRENDS, GREEN DUKE BROCCOLI (5-INCH CUT)



GRAPH 2. CORRELATION OF SPEAR PERCENTAGE BY WEIGHT WITH DAY OF HARVEST



BROCCOLI VARIETIES now being used in California for freezing are usually harvested two or three times because the earliest heads in the field are ready to harvest two weeks or more ahead of the latest heads. Uniformity of maturity that would allow once-over harvest would reduce the cost of hand harvesting and is essential for mechanical harvesting.

To find out what happens from day to day in a broccoli field, five small-scale single harvests were made in an eight-bed trial of Green Duke broccoli grown by Ray Swift and Louis Brucker on the Oxnard Plain. Green Duke is one of several new varieties with relatively uniform maturity.

First harvest

The first harvest was on January 8, and subsequent harvests were three days apart. Plots to be harvested were arranged in a randomized complete block design. Each block was 20 feet of a two-row bed (40-inch centers). There were five replications.

At each harvest all heads of ¾-inch or more in diameter were harvested. Quality control personnel of the Oxnard Frozen Foods Cooperative graded the broccoli from each plot into spears, chop, and culls. Before grading, all heads were cut to 5 inches in length. To be graded "spear" quality, a head of broccoli must have a minimum stem diameter at the 5-inch cut of approximately ⅝ inch and the beads must be of good quality and not overmature. "Chop" grade broccoli either

fails to meet the stem diameter requirement of the spear grade or bead quality is not quite good enough for the spear grade. Heads, or portions of heads, having over-mature beads are "culls." The term "chop" comes from the practice of chopping this material into small pieces before packaging and freezing.

Graph 1 shows yield trends of spears, chop, culls, and a combination of spears and chop. "Zero" day on the graph is the day of highest yield of spears. The yield curve for spears shows that there was a five-day period when yield of spears exceeded 5,200 lbs per acre. During this time the yield of spears and chop combined was increasing at the rate of 464 lbs per acre per day. Five thousand pounds per acre of spear grade broccoli exceeds the average yield in Ventura County.

In the harvest five days before the peak yield of spears, most of the chop material was made up of heads too small to be graded as spears. In harvests two days prior to the peak yield of spears, or later, most of the chop material consisted of branches trimmed from large heads that were too mature for the spear grade.

In computing the graph line to show the yield trend of spears and chop, the data for the harvest five days before the peak yield of spears were omitted because yield increase during the first three-day interval was at a lower rate than later on. No heads were graded "cull" until four days after the peak yield of spears.

For a crop in which both yield and quality are changing rapidly from day to day, a simple objective means of predicting the best days to harvest is highly desirable. Graph 2 does little more than show that sampling a field to determine the percentage of the crop making spear grade cannot be used to predict a good harvest date. The reason is that, at the same time the percentage of heads making spear grade is being increased by heads reaching the required stem diameter, it is also being decreased by heads becoming over-mature. Until an objective method based on field sampling is developed, the time for harvesting will have to be based on good judgment of farmers and field men.

R. A. Brendler is Farm Advisor, Ventura County. Cooperators in this study included: Ray Swift, and Louis Brucker, growers, Oxnard; Gino Lorenzi, fieldman for Oxnard Frozen Foods, Oxnard; and Kenneth Knapp, quality control manager, Oxnard Frozen Foods Cooperative.

Cooling trials with

PLASTIC TRAY PACK NECTARINES IN VARIOUS CONTAINERS

F. G. MITCHELL • R. A. PARSONS • GENE MAYER

Studies were conducted on the effect of side venting patterns on the cooling rate of nectarines in several commercial containers, and in a container with a new experimental design. The location of vents had some effect on cooling rate, but the differences did not appear to be commercially important. Dividing the vent area into a large number of small openings substantially slowed room cooling (the cooling of containers by placing them in a cold room) without improving uniformity. Room cooling was speeded considerably when the side vent area was increased to about 6 per cent. However, further increases in the vent area only slightly speeded room cooling. The value of vent areas greater than 6 per cent, especially when located along top or bottom score lines, must be weighed against their potential weakening effect on the container. When forced-air cooling was used (the forcing of cold air through the container and around the fruit) the cooling time was directly related to vent area regardless of size and location. The design of the experimental container facilitated air circulation, resulting in only small differences in cooling time between the 3.8 and 5.6 per cent side vent openings. The use of this container design and the choice of container venting may depend upon the results of static stacking tests which were not included in these studies.

SOME CALIFORNIA peach and nectarine shippers used corrugated paperboard containers during the 1970 season as an alternative to wooden lugs for tray-packed fruit. The tray pack consists of two layers of fruit in light-weight plastic trays. To be successful such containers must permit the fruit to be promptly and thoroughly cooled. The tests reported here were made to compare the cooling rate of nectarines in several types of corrugated containers and in wood lugs, and to evaluate the venting needs for satisfactory cooling.

Test procedures

Tests were conducted in a cooling tunnel that had been demonstrated capable of duplicating full pallet cooling results. Refrigeration was supplied by placing the tunnel in a cold room. Air was drawn through the tunnel by a centrifugal blower and was controlled by a calibrated, sharp-edged orifice plate.

Each type of container was tested under both room cooling and forced-air cooling. Room cooling is accomplished by circulating cold air past containers which are placed in the cooling room. Cooling depends upon the conduction of heat through container walls, and upon some turbulence and mixing as cold air moves past container vents. Forced-air cooling is a University-developed system whereby the air supply is forced to pass through the containers and around the fruit for recirculation. The intimate contact between the product and the coolant air substantially reduces the cooling time. In these forced-air cooling tests the ratio of air volume to fruit weight was similar to that recommended for room cooling.

Six packed containers of known weight were placed in the tunnel two layers deep and three packages long as shown in