

Control Of Vapors In Storage Essential For Prolonging Life Of Avocados And Citrus Fruits

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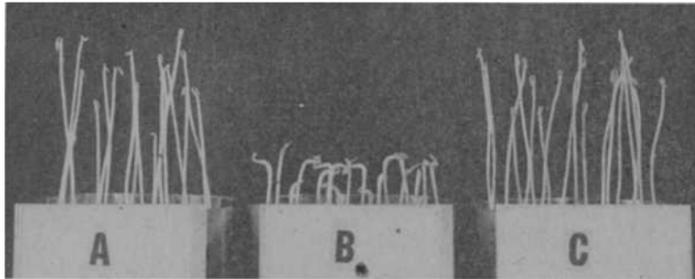
One of the factors which plays an important role in avocado storage is the accumulation of an active emanation recently identified in this laboratory as ethylene gas.

The production of this gas is closely associated with the trend in respiration. By exposing several samples of avocados to temperatures vary-

jected to mold emanations.

These active vapors can be readily absorbed from the atmosphere by passing the air through a solution of bromine. As a demonstration of this, pea seedlings were used as indicators for air purity.

If a stream of air, free of active volatiles, is passed through a con-



The absorption of active vapors by bromine illustrated by pea plants. (A) The effect of air first passed through a container of moldy fruit, then through a bromine absorber to continue on over the peas. (B) The effect of air passed through a container of moldy fruit directly to the peas. (C) Normal growth resulted when air, free of active volatiles, passed through a container of pea seedlings.

ing from 41°F to 77°F, it was found that the rise in respiration started at different dates.

No evolution of active emanation was observed prior to these dates, as evidenced from the use of pea seedlings, which are very sensitive to ethylene gas. The maximum suppression in growth of these seedlings coincided with the peak in carbon dioxide production.

Citrus

The behavior of citrus fruits in storage was found to be markedly different from that of avocados.

With lemons, no measurable quantities of active vapors were noticed as long as the fruit was sound. The occurrence of a slight amount of mold altered the picture decidedly. The effects of the common green mold are most pronounced. The gaseous products of this rot increase the rate of respiration and accelerate color development of sound green lemons.

Carbon Dioxide Production

Air was passed over four samples of fifty lemons each, at a constant rate, with the exception of the treated fruit, which was exposed to the vapors of the infected fruit. The moldy lemons were kept in containers separated by means of tubes packed with cotton from the jars filled with sound lemons.

At the storage temperature of 59°F, the maximum carbon dioxide evolution is commonly 100% higher than in fruit subjected to air free of these active vapors.

Shedding of stem ends—buttons—and rind deterioration known as pitting and spotting often take place along with the above mentioned symptoms.

Emanations of a single moldy lemon can produce these effects in 500 sound fruit. This action is not limited to fruit immediately after picking. At any time during a seven months storage period of lemons the mold emanations bring about greatly increased respiration, which is doubtlessly responsible for the lowered vitality and very much decreased storage life of lemons sub-

Fertilized Legumes Aid Following Crop Of Non-legumes

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studies will be required in each area.

Non-legumes

The increases of non-legumes such as grasses, cereal hay, and threshed grain following the fertilized legumes have varied from 38% to 107%. In addition, many of the fertilized plots continue to give increased growth of legumes, as for example, bur clover mixed with the grasses on range lands.

Though a good start has been obtained much remains to be done to find the most efficient combination of legumes and of fertilizer practice to secure the maximum benefits for the various areas of the state.

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Poultry Nutrition Research Proves Helpful To Humans

A brief report concerning the search for a successful formula for a synthetic diet for chickens, and some of the unforeseen benefits to humans and animals disclosed by investigation of vitamins discovered in the search for the diet.

Nutritional research made possible the formula for a synthetic diet which would promote growth and reproduction in chickens. It discovered Vitamin K which has proved of value in human medicine, especially surgery. And it led to the process for making synthetic folic acid that gives relief to humans afflicted with certain types of anemia.

Universities, experiment stations, and industrial laboratories have contributed to the scientific advances made in the general field of fundamental nutrition.

Project 677-D-2

The progress made in nutritional research is reflected in the records of Project 677-D-2, a research program conducted by the Division of Poultry Husbandry.

Organized in 1935, the project had the expressed purpose of seeking to construct a diet of purified feedstuffs that would supply completely, the nutritional requirements of the chicken for growth and reproduction.

Vitamin K

The same year that Project 677-D-2 was started, and within a few weeks of each other, a scientist in Denmark and scientists working in the Division of Poultry Husbandry in California, announced the discovery of an unknown vitamin.

The new vitamin was named Vitamin K, and is known as the coagulation vitamin because of its ability to cause the clotting of blood.

Absence of Vitamin K in the diet of the chick leads to hemorrhages, but there is no problem in supplying an adequate amount of the vitamin in the normal poultry diet.

Studies of Vitamin K by research laboratories in other fields extended into investigation of its value in human medicine. There it proved of

tainer of peas grown by a standardized procedure, the growth of the seedlings is normal as shown in (C) of the accompanying illustration.

When the air is first passed through a container with green mold, the result is a depression in growth as shown in (B).

Finally, (A) refers to the effect on peas of an air stream which passed through a container with a moldy lemon, then through a bromine absorber, and finally over the peas. Clearly the bromine took out the active emanation.

In subsequent experiments it was found that activated charcoal treated with bromine was highly effective in purifying the air stream. These tests can be cited as strong suggestion that the vapor under consideration is an unsaturated hydrocarbon, presumably ethylene.

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Vertical Cabinet Type Electric Sterilizer Tested For Lethal Effect On Bacteria In Milk Cans

J. R. Tavernetti

Tests were made on a vertical cabinet sterilizer heated by five strip heaters and using no moisture except that on the equipment after washing.

The cabinet has outside dimensions of 50" depth, 38" width and 66" height, is insulated with three inches of mineral wool all around

For the tests seven standard 10 gallon milk cans—6 sterilized, 1 control—were used. Milk was allowed to stand in the cans at room temperature for 4 hours after which they were rinsed with cold water and placed in the sterilizer and heated. The cans were then removed and bacteria counts made and compared

TABLE I

Temperatures at Various Points in Sterilizer When Loaded with Six 10 Gallon Milk Cans (150 lbs. metal)

Time Mins.	Thermocouples				Can*		Thermometer Air T
	Air #1	Air #2	Air #3	Air #4	#5	#6	
0	79	80	80	80	86	82	—
6	82	86	97	97	84	80	95
15	106	115	135	135	99	90	118
25	129	142	167	167	122	108	145
35	154	169	194	192	153	129	172
45	178	192	217	217	180	156	192
50	187	201	226	225	190	167	200 Heat Off
55	192	205	223	221	199	178	200
65	189	198	205	199	201	185	180
75	180	189	192	189	198	187	165
95	171	180	181	176	189	181	155 Cans removed

*Thermocouple soldered in junction of bottom and side on outside of can.

TABLE II

Results of Tests for Lethal Effect on Bacteria in Sterilizer

Can Number	Condition of can	Bacteria Colony Count
216—sterilized	old fair condition no rust	215
77—sterilized	old dented fair condition	68
617—sterilized	old sl. etched good condition	900
391—sterilized	old dented rust spots bottom	840
693—sterilized	good condition	225
336—sterilized	old dented sl. etched no rust	69
584—not sterilized	control can not washed old sl. rusty	228,000

and has a net storage space of 30 cubic feet.

The heaters which have a total connected load of 2500 watts are located under a false bottom and the heat is circulated through a flue located on the back wall. It is equipped with a thermostat which cuts off the heat at the temperature at which it is set and the heat does not go on again until the thermostat is reset.

with the control.

Temperatures of the air and the cans were taken at various points in the cabinet by thermocouples and an ordinary thermometer with which the cabinet was equipped.

In tables 1 and 2 are shown the results of the tests.

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Proper Temperatures Important In The Storage, Precooling And The Shipping Of Stone Fruits

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and at 32°. It is questionable if apricots should be held longer than three weeks.

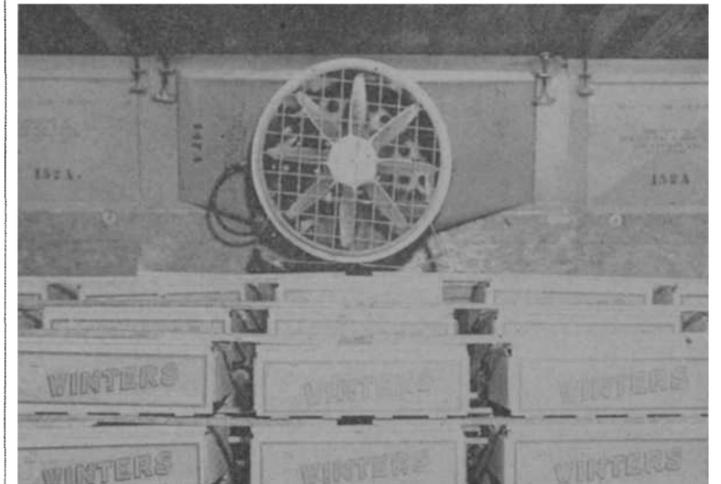
Plums

Plums, of which we have numerous varieties, hold their dessert quality in storage rather well, most of them being quite acceptable for a month to six weeks. Tragedy has, in some instances, kept well and has maintained its quality for two

months. After four to six weeks, Santa Rosa sometimes failed to ripen. The flesh of the greener fruits was often woodlike in texture, and bitter. Browning also developed around the pit.

Precooling

Except at the beginning of the



Loading of apricots in a refrigerator car. Precooling fan in place at top of ice bunker opening. The fruit is precooled for 12 to 18 hours.

months. After four to six weeks, Santa Rosa sometimes failed to ripen. The flesh of the greener fruits was often woodlike in texture, and bitter. Browning also developed around the pit.

Cherries

Except during precooling and while in transit, cherries are usually not held under refrigeration. Limited storage trials with Tartarian, Black Republican, Bing and Lam-

shipping season when some ripening of plums and apricots in transit is more beneficial than detrimental, precooling of stone fruits in California is general.

In the absence of definite precooling standards, the term "precooled" has sometimes been applied to fruit where only the top heat is removed and where at the time of shipping the temperature in the center of the packages was between 50° and 60° F. When fruit in the center of packages is cooled to 40° it can be transported for ten days in well iced cars with maximum temperatures of between 40° and 48°.

Riboflavin

In the course of work on Project 677-D-2 studies were made of the vitamin factor, riboflavin. Investigations proved that a deficiency of this vitamin in the diet of chickens caused the production of eggs with low hatchability.

Dead embryos had characteristics defects, such as dwarf size, degeneration of the kidneys, deformed down, and evidences of edema and anemia.

In 1937 California poultrymen reported an epidemic-like prevalence of eggs with low hatchability. They were advised to increase the riboflavin content of the diet they gave their chickens. They did so and the egg hatchability jumped to normal.

Pyridoxine

Pyridoxine is another vitamin factor to be discovered in the progress of Project 677-D-2.

A scientist working on the project conducted parallel investigations with rats. He made certain findings which he applied to the experiments in progress with the poultry diet. His observations in his rat studies were confirmed. Thus pyridoxine was first isolated and the first description made of the neurological manifestations of its deficiency.

Lack of sufficient pyridoxine in the diet of the chick is indicated by such symptoms as weakness, nervousness, and convulsions.

Pantothenic Acid

Pantothenic acid was investigated to determine the possible place of this vitamin in the sought-for synthetic diet.

It was found that the presence, or a deficiency, of pantothenic acid in the diet of the parent hen affected the embryos in her eggs. A sufficiency of this vitamin is needed to prevent a certain type of dermatitis—an inflammation of the skin—in the chicks and is necessary for reproduction by the adults.

Choline

Tests of choline proved this vitamin factor to be necessary for good growth and normal bone formation in chickens and turkeys.

Biotin

Investigations of biotin established

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Fruit cooled to 32° to 34° will carry under a lower temperature during the first few days in transit and, in a well constructed car in good repair and kept well iced, may even arrive at destination slightly colder than if precooled only to 40°. Since, however, the temperature of refrigerator cars at the time of loading is not generally below 45° to 50°, and the ice in the car frequently does not maintain an average air temperature lower than between 40° to 50°, the advantages gained by precooling fruit to 32° to 34° are not always so great as anticipated. Cooling to these temperatures is most effective when the car itself is precooled to a temperature approximating that of the fruit loaded.

Hydrocooling

Hydrocooling is infinitely more rapid than cooling in air and this is now employed commercially with a number of vegetables.

In experimental tests conducted by Federal investigators in the state of Washington, the temperature of individual cherries was reduced from 65° to 34° in seven minutes, or about 145 times as fast as packed fruit held in still air at 32°. No cracking or other injury was noted from water cooling for seven minutes.

Dry Ice

Since trials in using dry ice to retard mold growth on fruit in transit and since its retarding effects upon coloring and softening have been established, interest has been taken in using it as a supplement to refrigeration.

In a test shipment of Bing and Tartarian cherries conducted in 1941, five pairs of test cars, one of each pair containing dry ice, were shipped to the New York market. The fruit from each was sold in the auction and size for size the price paid for the fruit in the dry ice cars ranged from 10c to 49c per box more than the fruit from the untreated cars.

Possibly the commercial use of dry ice in conjunction with good precooling, may make possible the shipment of a better quality product.

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