Vitamin C Loss By Condensed Tomato Products In Storage Shown By Laboratory Research

A brief report of a study concerning the effects of canning and storage on the Vitamin C content of processed tomatoes, reported at the Cleveland meeting of the American Home Economics Association, June, 1946.

Canned tomatoes and tomato products assume first importance as sources of Vitamin C in any situation where fresh fruits and vegetables are not available.

The very high water content—94 per cent—of tomatoes unfortunately means added bulk and expense in storage and shipment. Many concentrates were placed on the market and prepared for use by the armed forces during World War II. Keeping qualities, color and flavor were not entirely satisfactory. A chance observation that the condensed products lost vitamin C very rapidly led to specific investigations.

Studies were made of solid pack, juice, and paste after storage at about 90 Deg. F., 98 Deg. F., and at room temperature.

Solid Pack and Juice

The commercial, unconcentrated, solid pack tomatoes and juice studied lost only 10 per cent of the original Vitamin C content after storage periods varying from six months to one year at room temperature.

Experimental juice and concentrates prepared in the laboratory from a single lot of tomatoes and stored in glass at about 90 Deg. F. and 98 Deg. F. showed a greater loss of vitamin C by the concentrated preparations.

Samples of solid pack and juice stored at 90 Deg. F. for six months retained from 60 to 70 per cent of their original Vitamin C content.

In another lot, samples of juice stored at 98 Deg. F. for three months retained 70 per cent of their Vitamin C content.

The experiments indicated greater losses of Vitamin C in the concentrated products than in the unconcentrated solid pack or juice.

Pastes

Five brands of commercial pastes stored at room temperatures lost an average of 30 per cent, ranging from 23 to 39 per cent, of the Vitamin C content after six months storage.

Two brands on which storage was continued for another six months lost a total of 70 per cent of the vitamin.

One brand of paste which had been exposed to copper tubing in the processing, decreased in six months to a point which the other reached in 12 months.

Tomato paste, either commercial or home canned, lost vitamin C rapidly when stored at incubator temperatures. After four months, less than 30 per cent of the vitamin was retained and at six months, a low level of less than 20 per cent was reached.

Samples stored at 90 Deg. F. for six months kept only 12 per cent of the original vitamin C.

Other samples stored at 98 Deg. F. for three months kept 40 per cent of the vitamin.

Paste and Juice

When copper and vitamin C were added to juice in the amounts necessary to bring the copper content to that of freshly prepared paste the vitamin loss on canning and storage was less than that in the plain juice.

Neither the increased natural copper content or the vitamin C concentration of the paste, nor any substance acquired or formed in the process of vacuum concentration appeared to be the cause of the increased vitamin C loss in the paste.

A portion of the concentrated paste was diluted back to juice consistency, canned and stored. The vitamin C loss was about equal to that of the plain juice.

Conclusions

At 98 Deg. F. the loss of vitamin C from both concentrated and unconcentrated tomato products was increased over that of those stored at room temperature. This is an important factor to be considered when tomato products are to be held at or near tropical storage conditions.

It was observed that the maximum increase in the acidity of the paste compared with the juice represented a doubling of the hydrogen ion concentration. Whether this was a significant factor in the increased loss of vitamin C in the paste is not known.

Concentration of juice to paste may be carried out with good preservation of the original Vitamin C content and such a concentration is desirable for more efficient transportation. The information gained by the experiments indicates that concentration followed by storage, rather than the concentration itself, is responsible for the loss of vitamin C.

Whether it may be feasible to concentrate, transport, dilute and then store is a question to be studied.

The above is a condensed version of a report prepared by Miriam E. Hummel covering a series of studies completed under the direction of Ruth Okey, Professor of Home Economics and Biochemist in the Experiment Station, Berkeley.

Tunnel Type Drier Adapted For Use On Sacked Almonds

Ben D. Moses

Almond production in California is an important industry, which is evidenced by the following table for California for 1944.

Total acreage	102,183 A.
Producing acreage	84,888 A.
Production in the shell	20,700 tons dry nuts
Total value of crop	$15,587,000
Average yield per acre	489 lbs.
Price per ton	$753.00

When almonds are harvested, the nuts are too moist to be stored and until recently they have been dried in the sun on sheets or on trays.

Recently some of the growers have been making use of the type of drier developed for drying rice and other grains in sacks, for drying almonds.

These driers consist of rectangular tunnels or ducts about 2 feet deep, 6 feet wide and 30 to 40 feet long. They are closed at one end, and are fitted to a fan at the other, with a top containing rows of holes somewhat smaller than a sack of nuts. When the sacks are placed over these holes and air is blown through the tunnel it is forced upward through the nuts. The air may be either heated or unheated, depending upon the climate.

The following tabulation has been compiled from data taken in the field and laboratory and from the practical experiences of almond growers themselves.

Provisional Constants and Specifications for Pot Hole Almond Drier

(These are subject to change)

Maximum allowable temperature	145°F
Maximum recommended temperature in tunnel	130°F
Moisture content when harvested maximum	25% - 30%
Moisture content when dried	6% - 7%
Size of filled sack	12"x21"x32"
Weight of a sack of nuts before drying	125 - 140 lbs.
Weight of a sack of nuts after drying	100 - 110 lbs.
Air required per sack	400 CFM
Air velocity through sack	125-130 ft/min.
Hole size (for standard almond sack)	16½"x27"
Center distance between holes	23½"
Velocity through tunnel	1200-1500 ft/min.
Air pressure under sack	¼"-⅜" water
Time to dry:	
20% or higher moisture requires	2 runs
15% to 20% may take	2 runs
10% to 15% may be done in	1 run
Lower than 10% requires	1 run

(Runs may vary from 6 hrs. to 12 hrs. depending upon variety of nuts, moisture content, weather conditions and amount of heat used.)

For the more moist nuts it is considered good practice to turn the sacks at about ⅔ of the time they are on the drier. While the heat required will vary greatly with the varying conditions, it is best to specify the size of the burner for maximum conditions.

Fuels

If natural gas or butane fuel is to be used the heat can be applied directly to the inlet of the blower and should be able to supply 10,000 Btu per sack per hour and adjustable to ¼ or 1/5 of this amount. For oil used in the indirect system this amount should be about 20,000 Btu.

Because nuts in general have a tendency to absorb off flavors, it is best to use the indirect system where oil is used for fuel; natural gas, bottled gas, or electricity can be used to heat the air direct. When the indirect system is used the furnace should have about 7.5 cubic feet of combustion volume per ton of dry nuts capacity and the heating surface about 20 square feet.

Uniform Air Distribution

In the first driers built, some trouble has been experienced with uneven distribution of heat and air. This condition can be considerably helped by giving a little careful thought to the method used in introducing the heat into the air stream and of the transition from the fan discharge to the tunnel. Multijet burners placed uniformly around the center of the fan inlet prevent serious heat stratification. A gradual change, two or three inches to the foot, is practical, from the size and shape of the fan discharge to that of the tunnel will assist in obtaining uniform air distribution.

While most operators depend upon experience to enable them to tell when the nuts are dry, some use a thermometer which is placed on top of one of the sacks and by comparing these readings a few times arrive at a value that proves very helpful.

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New Chemicals for Control of Citrus Mites Studied

L. R. Jeppson

During the past five years the Citrus Experiment Station has conducted field experiments with over 100 new chemicals for the control of the citrus bud mite. Extensive field experiments have been made with three of the most effective chemicals.

Spray emulsions, with one quart of the compound "899" in 100 gallons of water, have given bud mite control comparable to 1½ per cent light medium oil spray. At two quarts in 100 gallons of water the results in experimental tests have generally been more effective than the regular oil spray applications. No injury to lemon trees or fruit has been evident from the "899" sprays at one and two quart concentrations.

Spray suspensions of DN-211 used at one pound in 100 gallons of water have generally given good control of bud mite. Inadequate mite control resulted in several experiments when heavy rains followed soon after applications of DN-211. A slight burning of the very young citrus leaves has been observed on plots where high temperatures have followed soon after treatment.

A four per cent solution of DDT in kerosene at three gallons in 100 gallons of water-emulsion has produced satisfactory bud mite control in field experiments. Spray suspensions of DDT or emulsions using less kerosene have not given adequate reductions of bud mite infestations. As DDT has adverse effects on beneficial insects, its use where citrus bud mite is the only pest to be controlled would probably not be advisable.

Citrus Red Mite—Spider

The DN formulations used in California—DN-dust D8 and DN-111—have not been as effective generally in controlling spider as the regular oil sprays. Usually poor results can be correlated with inadequate methods of application or rainfall soon after treatment. In some instances poor results appear to be due to causes which cannot be readily attributed to improper application methods.

In the results from experiments to determine the relative toxicity of many chemicals to the citrus red mite and their eggs, "899", at concentrations of one quart in 100 gallons of spray, was as effective in controlling red spider as 1½ per cent light medium oil sprays. Experiments are in progress to determine the influence of repeated applications of this spray formulation to citrus trees and their production.

In laboratory tests K-1875 residual toxicity apparently was effective in killing mites placed upon grapefruit 60 days after treatment.

In three field-laboratory tests, K-1875 was applied to lemons in November, December and January, respectively, as solvent-emulsions or wettable powders containing one pound of K-1875 in 100 gallons of water. Under the conditions of these tests K-1875 deposits were toxic to the red mite for over 30 days.

In field experimental studies, formulations of K-1875 in kerosene, aromatic solvents, and wettable powders as well as dusts have all resulted in effective control of the red spider.

Regular spray applications of a four per cent solution of K-1875 in kerosene used at three gallons in 100 gallons of water and 50 per cent K-1875 powder applied at two pounds in 100 gallons of water have given red spider control comparable to similar applications of light medium oil spray emulsions.

Dust formulations containing three to five per cent K-1875 have generally been more effective in controlling red spider than DN-dust D8 when applied at comparable dosages.

Formulations containing three to five pounds of K-1875 in 100 gallons of water have been applied experimentally at about 100 gallons of spray per acre. Applied in an air blast such as is accomplished with the master fan spray-duster, they have shown promise in red spider control.

Tests with several formulations of K-1875 applied by means of fog generators have not resulted in satisfactory reductions of the mites.

Six Spotted Mite

Effective control of the six spotted mite is complicated by its habit of making depressions of localized areas on the under surface of the leaves. The mites may completely web over these depressions or leaf "pockets" which increases the difficulty to make contact with them by chemical applications. Either regular spray applications at one pound of actual K-1875 per 100 gallons of spray or five per cent dusts applied at 100 pounds per acre appeared to be more effective than the standard oil sprays in the control of the six spotted mite.

Like oil sprays, "899" was effective when applications were made before mites had become protected in the depressions but even careful spray applications failed to kill the mites in many of the mite "pockets".

New chemicals are continually being tested for mite control in the laboratory and evaluated in the field.

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Moisture Content Of Most State Grains At Harvest Unfavorable To Development Of Insect Pests

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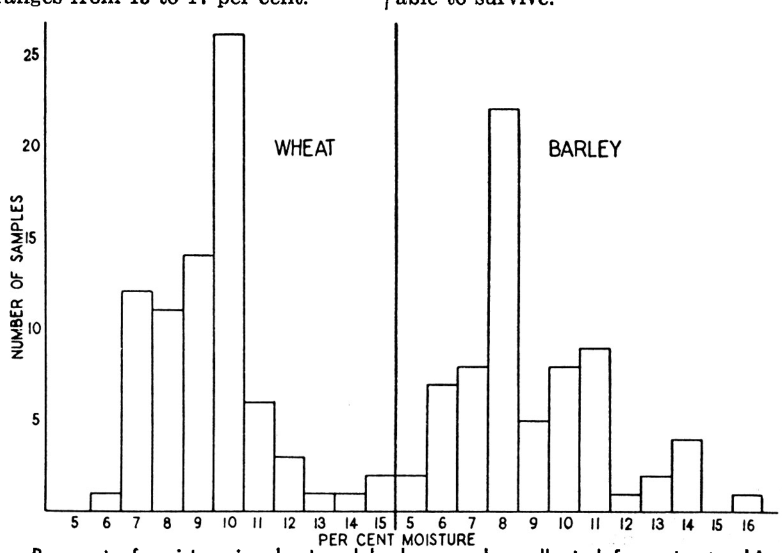
most favorable temperature range is from 80 to 85 Deg. F; while the most ideal moisture content of the food ranges from 13 to 17 per cent.



Per cent of moisture in wheat and barley samples collected from storage bins throughout California. Low moisture content of the majority of the samples insures safe storage when properly protected.

Development becomes less as the temperatures drop and little activity and damage occur when the temperature falls below 55 to 60 Deg. F. As the moisture content of the food drops below 13 per cent, the environment becomes less and less suited for granary insects, and finally a point is reached where the pests are unable to survive.

The minimum moisture content for survival varies for the different insects but in general ranges between 7 and 10 per cent. The development and activity of most of the pests are greatly retarded at a moisture content somewhat above the minimum requirement.

Throughout most of California the temperatures that occur from late spring through fall are extremely favorable for the development of granary insects. Because of this every possible precaution should be taken to store grain in well protected places.

Moisture Content of Grain

Because of the dry weather conditions at harvest, California grain growers are extremely fortunate in that their crops for the most part are harvested with a moisture content well below that which is most favorable for insect development during storage.

Most of the wheat and barley harvested in California has a moisture content of 10 per cent or less.

Grain of high moisture content is only likely to occur along the foggy coast, where it is harvested green, or harvested early in advance of flood waters, or where it contains a large amount of green weeds at threshing.

Grain having a moisture content of less than 13.5 per cent can be safely placed in bulk storage without material danger of heating and sweating.

Because most of California's grain is harvested with a moisture content sufficiently low to insure good keeping qualities, farmers should make every effort to see that it is placed in proper storage. It should be remembered that dry grain is not a suitable food for grain infesting insects.

Storage Units

The dry grain should be placed in clean, tight, dry storage bins. The floors of the bins should be moisture tight and any openings through which rain water might enter the storage units should be sealed off. Unless the grain is kept dry, it is subject to serious insect infestation, and this is almost certain to occur because granary pests are so widely distributed.

In the construction of storage units, tightness should be kept in mind, and wherever possible only those construction materials that will result in tight storage bins should be selected. The construction should be of such a type that it will facilitate ease in cleaning. Good sanitary practices are the basis for successful storage, and there is no substitute.

The placing of low moisture grain in clean, tight bins that are free of insect infestation is a guarantee to successful storage.

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