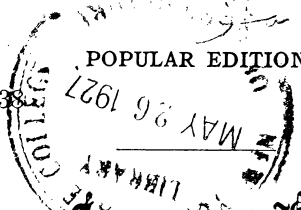


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New York State Agricultural Experiment Station

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SOME NEW YORK STATE CATSUPS

PREVENTING SPOILAGE IN CATSUP

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PREVENTING SPOILAGE IN CATSUP

Two forms of Catsup Spoilage

The commercial manufacture of tomato catsup has reached the stage where very little if any difficulty is encountered in keeping the product fit for use until consumed. Occasionally, however, a bottle of catsup will be opened that will display a tendency to "blow up" or effervesce, sometimes to the annoyance of the consumer thru the spattering of clothing or table linen with the contents of the bottle. This form of spoilage is due to inadequate sterilization or faulty sealing of the catsup in the manufacturing process. With catsup of the proper composition and with reasonable care on the part of the manufacturer, this spoilage is easily eliminated.

Another defect of catsup that is more likely to occur, particularly in the homemade product, is spoilage after the bottle has been opened but before all of the contents can be used. Unlike most canned goods, a bottle of catsup is not usually consumed at one or two meals but may be exposed to the air for several days before it is finally emptied. This exposure not infrequently proves the undoing of commercial catsups and is particularly disastrous to homemade catsup unless special precautions are taken in compounding the ingredients and in the processing.

While the Station experiments on the preservative action on catsup of different ingredients had to do primarily with the manufacture of catsup on a commercial scale, several points of interest to the housewife, who puts up her own catsup were brought out by the investigators and these findings form the basis for this account.

Clean Tomatoes Essential

Catsup is made from the juice or pulp of ripe tomatoes which has been concentrated to a certain point by boiling and to which has been added sugar, salt, vinegar, and spices. It is not altogether a simple matter of mixing certain amounts of these materials in a kettle, boiling, and putting into bottles, however, if a really high-grade product is to be obtained.

The first essential to successful catsup making and one that will offset all other efforts if not given due consideration is the selection

*This reviews in a popular way the findings in Bulletin No. 538 of this Station entitled "The Preservative Action in Catsup of Salt, Sugar, Benzoate, and Acid," by Carl S. Pederson and Robert S. Breed. A copy of the bulletin may be had upon request as long as the supply lasts.

of clean, sound, fresh, ripe tomatoes. All green or yellow spots should be carefully removed at the outset. Green or yellow tomatoes discolor the catsup, and of course rotted fruit should be entirely discarded.

The clean fruit is scalded or steamed to loosen the skins and is then placed in a colander or sieve to remove the seeds. The liquid recovered from this process is then ready for boiling down. Boiling should be done in an enamelware, or earthen kettle. The use of iron utensils about catsups results in discoloration due to a combining of certain ingredients in the catsup with the iron. In commercial plants large wooden vats, glass lined tanks, or copper kettles are generally found with the heat coming from steam passed thru copper coils.

**Boil for
35 to 45
Minutes**

Boiling should continue until the volume of the pulp or juice is reduced about half. A longer cooking period than 45 minutes may produce a dark-colored catsup, but may be necessary in order to concentrate sufficiently to give a heavy body to the catsup.

Catsup must be well stirred during cooking to prevent scorching or sticking. Scorching not only gives a disagreeable flavor to the catsup but darkens it as well.

Foaming of the boiling catsup is sometimes encountered where the material is boiling too rapidly. This can be helped to some extent by adding a pat of butter. Straining the pulp thru a cloth and boiling down the juice alone to about half its volume and then adding the tomato solids reduces the difficulty with foaming and burning. While this is a time-consuming process, it gives a bright colored catsup.

**Choice of
Spices**

Individual taste will determine the spices to be used in homemade catsup. It should be remembered, however, that spices exert little, if any preservative action on the catsup, and hence should be used only for the flavor that they impart. Too much spice will mask the rich tomato flavor of the catsup, while certain spices, such as allspice, black pepper, and cloves, impart a dark color to the product. Paprika and red pepper, on the other hand, aid in maintaining a bright red color in the catsup, altho paprika has little flavoring value.

The spices that are chosen should be placed in a cloth bag of ample size and hung in the boiling catsup where their several flavors will be extracted. The bag should remain in the boiling catsup from 30 to 40 minutes in order to insure sufficient extraction to give the desired flavor.

Generally, whole spices will be found more satisfactory than ground spices or extracts, altho oil of cloves is sometimes added to advantage in place of whole cloves.

The use of onions or garlic is entirely a matter of taste. However, if they are used, they should be finely chopped and hung in the boiling catsup as is done with the spices for about 20 minutes before the end of the boiling period. Onions may be added directly to the catsup, but they must then be strained out after cooking to obtain a smooth, high-grade catsup.

Preventing Spoilage Boiling the catsup serves to cook and concentrate the tomato juice or pulp, to extract the spices, and to sterilize the catsup by killing all yeasts, molds, and bacteria that may be present. If the finished catsup is bottled in clean hot bottles while it is still steaming hot, if it is not allowed to come in contact with utensils which may introduce fresh contamination, and if it is well sealed and of the proper composition it should keep indefinitely.

Aside from faulty sealing and sterilization, which may be easily remedied with a little care, the chief difficulty encountered by the housewife is the spoiling of the catsup after the bottle is opened and before its contents can be used up. Three ingredients which enter into the seasoning of catsup play an important part in preventing spoilage. These are salt, sugar, and vinegar. With the proper proportion of these three ingredients and with the vinegar added at the proper time in the cooking process, catsup will keep any reasonable length of time, both before and after opening.

Salt and sugar are both excellent preservatives, either alone or in combination, and are used by the housewife in canning and preserving operations, but the addition of a large enough quantity of either of these materials alone to insure safe keeping renders the catsup unpalatable. Fortunately, the right combination of sugar, salt, and vinegar produces a catsup of good flavor that does not permit the growth of spoilage bacteria and prevents the growth of the majority of yeasts and molds. These proportions are given later (p. 6) and should be carefully observed.

Precautions in Use of Vinegar Perhaps the commonest mistake made in preparing catsup at home is the addition of the vinegar too early in the process with the result that it is boiled away to such an extent that the completed catsup does not contain sufficient vinegar to keep well. Also, if the salt and sugar are added too early, the catsup will turn dark in color.

To overcome these difficulties, therefore, it is recommended that the vinegar, salt, and sugar be added to the catsup *not more than five minutes before* the end of the cooking. Very strong vinegar should be used, preferably a redistilled vinegar* of 10 per cent acid, or 100 grain as it is sometimes called.

Most Catsup Recipes Defective An examination of many recipes from cook books reveals the fact that most of them would result in dark-colored catsup that would spoil readily and would have a coarse texture, all due to the neglect of one or two essential details in catsup making. An important weakness in nearly all the recipes is the failure to take into account the loss of vinegar during the boiling process.

One of the better recipes is quoted below in order to point out the defects found in most of them.

½ bushel ripe tomatoes	2 tablespoons celery seed
½ cup salt	2 tablespoons mace
½ pound sugar	2 tablespoons cloves
1 tablespoon cayenne pepper	1 tablespoon grated garlic
1 tablespoon ground ginger	1 quart vinegar

Boil tomatoes until tender, strain. Boil to reduce volume. Add vinegar and simmer. Add salt, spice, and garlic. Heat to boiling and bottle.

There are several things wrong with this recipe. The catsup when opened will spoil readily, even if properly put up. It will be dark in color. It will not be smooth and free-flowing. It will vary greatly in flavor and quality, depending upon the person using the recipe. The type of vinegar is not specified, altho cider vinegar is implied. Many other similar recipes might be quoted which may give well-flavored catsups in the hands of experienced cooks, but which are so briefly described or fail to take into account certain essential precautions that disappointment and loss are sure to follow.

Suggested Recipes Doubtless if the necessary precautions were taken with the usual recipes found in cook books, suitable catsups could be made at home. However, a recipe which has been developed by the Station workers in the course of their investigations is given here as a guide for those who have had difficulties in the past. This recipe, if followed carefully in all details of cooking outlined above, should give a high-grade catsup of pleasing flavor, texture, and color. The recipe is as follows:

*Redistilled vinegar cannot be obtained at most groceries. The ordinary white vinegar contains only 5 per cent of acetic acid, and cider vinegar about 4 per cent.

30 pounds of tomatoes after removing skins, seeds, and green spots
 $1\frac{1}{4}$ to $1\frac{1}{2}$ cups salt 5 to 8 cups sugar

$2\frac{1}{4}$ to $3\frac{1}{3}$ cups redistilled vinegar*

Spices for mild-spiced catsup

6 teaspoons celery seed	3 teaspoons paprika
3 teaspoons mustard	2 teaspoons cayenne pepper
2 teaspoons cinnamon	4 onions

Spices for heavily spiced catsup

2 teaspoons mace	4 teaspoons white pepper
2 teaspoons cassia	2 teaspoons celery seed
2 teaspoons chillies	$\frac{1}{4}$ teaspoon grated garlic
2 teaspoons cayenne pepper	2 teaspoons mustard
4 teaspoons paprika	8 onions

The spicing of catsup is very largely a matter of individual taste and can therefore be varied at will, but at least the minimum quantities of vinegar, sugar, and salt, given in the recipes must be used. The higher quantities mentioned give a heavier catsup which of course will not require as much boiling to concentrate to a desired consistency. In some of the popular commercial catsups as much as 8 cups of sugar, $1\frac{2}{3}$ cups of salt, and $4\frac{1}{2}$ cups of vinegar is added to each 30 pounds of tomatoes.

To produce a catsup of proper consistency, 30 pounds of tomatoes should be boiled down to give 16 pounds of catsup. However, depending upon whether the low or high quantities of sugar are used and upon the amount of water in the tomatoes at the start, boiling may have to be continued until the material is reduced to 13 pounds. The consistency of catsup, like the flavor, is largely a matter of personal preference.

To determine the point where boiling should be discontinued, the kettle and contents should be weighed before and after boiling, as for example

Before boiling	
Weight of kettle	2 pounds 8 ounces
Weight of tomato juice	30 pounds
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Total weight	32 pounds 8 ounces
After boiling	
Weight of catsup	16 pounds
Weight of kettle	2 pounds 8 ounces
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Total Weight	18 pounds 8 ounces

*If redistilled vinegar cannot be obtained, use $4\frac{1}{2}$ to $6\frac{1}{3}$ cups of white vinegar 5 per cent strength, or 6 to 8 cups of cider vinegar, 4 per cent strength.

Things to Remember

By way of listing the chief points to be remembered in the making of catsup in the home, the following is a summary of what has gone before.

1. Remove green and yellow spots from tomatoes to insure good color in the catsup.
2. Use an enamelware or earthen kettle for making catsup.
3. Boiling should be as rapid as possible and should be completed in 45 minutes if possible. Too long a period makes a dark-colored catsup.
4. Stir well to prevent sticking as scorching darkens the color of the catsup and mars the flavor.
5. A small pat of butter will usually check excessive foaming.
6. Straining the pulp thru a cloth, boiling the juice alone until concentrated, then adding the tomato solids, spices, etc., and boiling again gives a high-grade, bright red catsup but the method is time-consuming.
7. Spices have very little preservative value and should be used for flavoring only. Too much spice hides the tomato flavor. Ground spices darken the catsup, as do also allspice, black pepper and cloves. Extracts impart a harsh flavor generally.
8. Spices should be placed loosely in a coarse linen or cheesecloth bag and hung in the boiling catsup to extract for 30 to 40 minutes.
9. Onions and garlic may be used, according to taste. They, too, should be placed in a bag and hung in the catsup, but only for 20 minutes at the end of the cooking. They should be grated or chopped quite fine.
10. Vinegar, sugar, and salt give flavor to catsup and also have a decided preservative effect. In boiling, the vinegar is boiled off slowly, so it is important that the vinegar be added *not more than five minutes* before the end of the cooking period.
11. Sugar and salt when boiled any length of time cause a darkening of the catsup. It is advisable, therefore, to add the sugar and salt at the same time that the vinegar is added.
12. It is preferable to use redistilled vinegar containing 10 per cent acid as this lessens the concentration necessary before adding the vinegar. However, it is not ordinarily possible for the housewife to secure vinegar as strong as this. When the weaker vinegar is used more of it is required to give the same effect.
13. Vinegar, sugar, and salt mask the flavor of each other. If any one of these materials is increased materially, then the amounts of the other two must also be raised.
14. To keep reasonably well, catsup must contain 20 per cent sugar, 3 per cent salt, and 0.6 per cent acetic acid. The recipe given on page 6 provides ingredients in sufficient quantities to meet these requirements.