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## EC1223 Cider and Vinegar Making

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IN AGRICULTURE AND HOME ECONOMICS

U. of N. Agr. College & U. S. Dept. of Agr. Cooperating  
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CIDER AND VINEGAR MAKING

C. C. Wiggans

An enormous loss is sustained annually by fruit growers thru lack of proper utilization of surplus fruits. This is especially true in seasons of over-production when prices are low. The loss is generally greater in home orchards than with the larger plantings since in the latter case more attention is paid to the proper care and storage of the products. Much of this loss can be avoided by using such surplus fruit for the manufacture of cider and vinegar.

Cider Making

Fruit juices generally are very useful in the diet. This is especially true of the fresh sweet product. Large amounts are also preserved for later use. Apples furnish most of the fresh cider that is consumed while the canned and bottled product consists more largely of grape juice. The directions given in this circular apply primarily to the apple.

Fruit to Use. Good cider can be made from nearly all varieties of apples grown in Nebraska although some varieties are more desirable for this purpose than others. Juice from two or more varieties is frequently blended. Cider is better if it does not contain too many solids. It should not be too sweet but the acidity may be relatively high. The sweetness or sourness of the juice of a given variety depends upon its malic acid content rather than upon the amount of sugar it contains.

Second grade fruit is more generally used but this should consist of only ripe, clean apples. Dirty or rotten fruit should never be used, unless it is washed and the rotten portions removed. Unripe fruit does not have sufficient sugar present to make satisfactory cider.

Grinding and Pressing. To properly prepare cider a cider mill and press are almost absolutely necessary. The fruit must be ground or crushed before it is pressed. The finer it is crushed the larger will be the amount of juice secured. When small mills are used it may be necessary to quarter the apples before they are ground.

There are two kinds of presses in general use, the barrel press and the press-cloth press. The first type consists of a slatted barrel (without head) into which the ground pomace falls directly from the grinder. A press block is fitted into the top and pressure applied. Pressures secured from such an outfit are not great enough to thoroughly extract the juice. Also unless the barrel is lined with some kind of cloth such as that from a grain sack the pomace works out thru the cracks and makes the cider pulpy.

The press-cloth press consists of a series of loosely woven cloth squares and racks. A quantity of pomace is enclosed in a cloth and a rack placed on top of it. A series is thus made up and a pressing block placed on top. Ordinary pressure extracts the greater portion of the juice, clear of pulp. With this type of press it is possible to secure approximately three gallons of cider from each bushel of apples.

The pomace may be moistened, reground and pressed a second time but cider secured in this way is not very desirable.

Storage. The freshly pressed cider should be stored only in wooden, earthenware or glass containers since the acids will corrode metals. Straining removes many of the larger pieces of pulp and if it is allowed to stand in a cool place many of the smaller particles will settle to the bottom. If a perfectly clear product is wanted a clarifying agent such as isinglass, white of egg, casein, etc., may be used but they are not extremely satisfactory. Heat may also be used for clarifying.



Cider is most desirable if it is used while still fresh. If, however, it is to be used later, pasteurization, refrigeration or a chemical preservative is necessary. If the juice is bottled and then heated to 175° F. for ten minutes it will keep indefinitely. Temperatures very near the freezing point also prohibit the development of molds and bacteria. Such cider is nearly always concentrated before storage. Chemical preservatives such as benzoate of soda, salicylic acid, boric acid, etc. are also used to prevent fermentation but they are not to be recommended very strongly. They are used only when cider is stored in bulk. Benzoate of soda not to exceed one-tenth of one per cent in amount, (one ounce to fifteen gallons) is allowed by law.

### VINEGAR MAKING

Vinegar making affords probably a larger outlet for surplus fruit than cider since it is in demand the year around and also may be kept indefinitely.

Vinegar may be made from the juice of practically any of our fruits but if apple cider is used it should contain at least 8 to 10% of sugar or the vinegar is liable to be low in acid content. Most Nebraska varieties possess sufficient sugar for this purpose. Immature, decayed or over-ripe fruit, however, give less juice with a lower per cent of sugar.

Successful vinegar making depends upon the proper completion of two bacterial fermentations, namely, the changing of sugar in the cider into alcohol by alcoholic yeasts and the transformation of alcohol into acetic acid by acetic ferment. The first fermentation generally will take place spontaneously since yeast bacteria are nearly always present on the fruit. Acetic bacteria must generally be added. It may also be desirable to add a "starter" for the earlier stage.

Ordinary precautions of cleanliness should be taken at the time of pressing. The juice is generally allowed to stand a few days before it is put into barrels so as to eliminate thru settling, a great part of the sediment. Clean sterilized barrels are necessary. Old vinegar barrels must not be used unless they have been thoroughly sterilized with steam or boiling water. Fill the cask three-fourths full, turn onto the side and plug the bung with cotton or cover with muslin to keep out insects.

Alcoholic fermentation begins immediately after pressing and proceeds at a rate depending upon the temperature. Six months may be necessary to complete the process if the barrel is stored in a cool cellar but this time is greatly shortened if the temperature is 65 to 75 degrees F. Frequently the process is hastened also by adding an active culture as a starter. A cake of fresh compressed yeast dissolved in a cup of water may be added to each five gallons of juice. Pure cultures may also be used. Vinegar or "mother" of vinegar must never be used during this stage of fermentation.

When this fermentation is complete - that is all sugar changed over into alcohol, - the clear liquid should be siphoned or racked off and the cask cleaned. The barrel is then filled half full with "hard" cider and one-fourth as much old vinegar added. "Mother" of vinegar is also frequently used. This should be fresh and not the old tough, leathery material sometimes seen since the latter usually contains undesirable bacteria and even molds which affect the flavor of the resulting vinegar. Fresh "mother" of vinegar is secured by exposing a mixture of one-half vinegar and one-half hard cider to a temperature of 80 degrees F. for a few days. The thin scum which forms on the surface is then transferred to the surface of the liquid in the large container.

Acetic fermentation takes place only in the presence of air. Hence the bung must not be corked. In many cases extra holes are bored in the ends of the barrel so as to allow better ventilation. All openings should be covered with muslin to keep out vinegar flies and other insects. After the acetic acid content reaches 4.5 to 5% the barrels should then be filled full and tightly corked to prevent deterioration of the vinegar by destructive ferments. It is sometimes



clarified by the use of isinglass.

The acetic fermentation requires from three to eighteen months depending upon the temperature. Thus it may take two years to get good vinegar from fresh cider in a cool cellar, while six months may be sufficient if the material is kept at room temperature.

Cider vinegar offered for sale in Nebraska must be made from pure apple juice, be free from all foreign substances such as drugs, etc., and contain by weight 1.6% or more of solids and 4% or more of absolute acetic acid. Vinegar made from any other fruit or grain must be appropriately labelled.

Use of Pure cultures. So many failures have developed in the home manufacture of cider vinegar that gradually the use of pure cultures is developing. These are simply very active forms of the alcoholic and acetic bacteria. Their use insures the proper fermentations. The time necessary for good vinegar formation is also considerably lessened. They are accompanied with full directions for their use and may be secured for a small charge from Colorado Experiment Station, Ft. Collins, Colorado, or Michigan Experiment Station, East Lansing, Michigan.

Vinegar Bees. These are frequently used in making vinegar from sweetened water or molasses. A solution of the "bees" is added and the material set aside to ferment. They consist of a mixture of various yeasts and ferments which usually produce vinegar. Undesirable organisms are always present, however, and frequently seriously injure the quality of the vinegar. Such cultures usually work very rapidly and produce vinegar in a short time if kept under conditions of high temperature. They are not as desirable as pure cultures.

Precautions. Many failures in vinegar making can be avoided by observing the following precautions.

1. - Do not use unripe, rotten or dirty fruit. Immature fruit contains little sugar and much starch which causes a dark, slimy, undesirable product. Rotten or dirty fruit often introduces organisms which interfere with the proper fermentations.
2. - Do not use old vinegar barrels. These introduce acetic bacteria too early, thus preventing or hindering the proper functions of the yeast.
3. - Overcome a lack of proper ferments by use of yeast and "mother" of vinegar at the proper stages. Pure cultures also overcome such difficulties.
4. - Do not cork the barrel tightly unless fermentation has proceeded as far as is desired. Acetic bacteria require the presence of oxygen. After the vinegar has become strong enough, the barrel should be filled full to prevent further changes, which would cause deterioration in the quality of the product.
5. - Do not store at too low a temperature if quick results are desired. Cellar temperatures may prolong the fermentations for two years or even longer, while more heat may reduce them to three months or less.