

Notes on Cucumber Salting^{(1) (2)}

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THE procedures followed by individual cucumber salters vary widely. For one reason or another, a certain method is adopted and thereafter changes are usually not made unless serious trouble is encountered. Studies on the relative merits of some of the methods in use at commercial pickle plants were undertaken as a part of the cucumber investigations being conducted in North Carolina. These included the use of sheltered and unsheltered vats, the circulation of brine, and the painting of vats. Observations on the advantages and disadvantages of the various methods should prove of benefit to cucumber salters in general. Some may find that they can reduce costs, eliminate labor or improve their products.

Sheltered and Unsheltered Vats

THERE is considerable difference of opinion among salters regarding the sheltering of the vats. Some leave them in the open while others provide varying degrees of shelter. Outside vats collect rain water which dilutes the brine, but no growth of scum (*Mycoderma*) occurs. Scum growth is controlled by the sun's rays. No rain water collects on sheltered vats, but an abundant growth of scum will occur unless some preventive measures are taken.

A series of experiments was undertaken to compare the effectiveness of certain different means of preventing scum formation. These involved the curing and storage of salt stock in 85-bushel vats, some of which were unsheltered and others sheltered. In these experiments the salting schedule was uniform. An initial brine concentration of 40° salometer was used. The brine was maintained at that strength for one week and then increased 5° per week until 70° was reached. Subsequently, the brine was maintained at the latter concentration.

No scum growth was observed at any time with the unsheltered vats. Occasional heavy rains caused dilution of the surface brine and it was necessary to add extra amounts of salt in order to maintain the desired brine concentration. This method of handling vats is used

quite extensively in North Carolina as well as in other areas of the South and in some plants in the North.

In the sheltered vat experiments, the surface of the brine was agitated at frequent intervals as a means of preventing scum growth. The agitation was accomplished by means of a wooden rake which was made by nailing an inch board, three inches wide and 12 inches long, to the end of a 6-foot stick. A few notches cut in the lower edge of the board increased the stirring action. During the first two months of the curing period the temperature averaged about 80° F. and it was found necessary to agitate the brine surface at daily intervals. Later on, during the winter months, scum growth was much slower and agitation at much wider intervals was sufficient. During this time the surface was agitated as soon as a detectable film of scum was visible. It was found that the brine should be maintained to a depth of 4 inches or more above the head boards in order to facilitate an adequate submersion of the scum growth. The effectiveness of this procedure lies in the fact that the *Mycoderma* require oxygen from the air for growth. When they are submerged in brine, even a short distance, sufficient oxygen is not obtained.

No originality is claimed for the surface agitation procedure. Campbell¹ mentioned it as a means of scum growth prevention and it was further emphasized by F. W. Fabian at the Pickle and Kraut Packers Technical School at East Lansing, Michigan, in February, 1938. Furthermore, a limited number of salters employ this practice. It is suggested that more salters with sheltered vats try this procedure. Brine surface agitation requires less labor than skimming, more effectively controls the growth of scum, and leaves no filth to be cleaned up. The agitation can be performed quickly, as only about a minute is required at each vat. When skimming is practiced, a sizeable layer of scum must be allowed to develop before the material can be removed conveniently. Considerable amounts of lactic acid may be destroyed during the development of this layer.

In these experiments, the vats were opened after eleven months. The salt stock was inspected and found to be firm and in good condition, both in the unsheltered

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¹ Campbell, C. H. 1937. Outdoor season booms pickle volume. *Canning Age*, 18: 221-224, 228, 229 and 232.

vats and in the sheltered vats receiving brine surface agitation as a method of scum control.

It is concluded from these experiments that if proper care is taken, good salt stock can be produced in either sheltered or unsheltered vats; the choice is primarily a matter of convenience. Heavy rainfall causes brine dilution in outside vats and under these conditions additional salt is required. Accordingly, shelters may be used to an advantage to overcome this difficulty. If the vats are sheltered, frequent agitation of the surface brine has proved to be a very satisfactory method of controlling scum.

Painting Vats

A FEW salters paint the inside of their vats but the practice is not common. At the beginning of this experiment, one of twelve experimental vats was given two coats of a commercial asphalt-base paint designed for the purpose. This paint was found to be satisfactory, and the next year all the remaining vats were treated in like manner. No flavor was imparted by the paint and there was no detectable effect upon the quality of the stock or upon the course of the fermentation as the result of its use.

The following procedure may be followed in painting the vats. A mixture of equal quantities of the asphalt paint and uncolored gasoline is applied to the clean, well-dried inside surface of the vat by means of a brush. The paint is allowed to dry for one day between coats and for two days after the last coat. Two coats should be applied to unpainted or new surfaces and an application of a single coat every second year thereafter will be required to keep the surface intact.

The use of the paint decidedly decreased leakage of brine. Some trouble was experienced with new, unpainted vats due to loss of brine. One vat in particular leaked through pores in the staves and around the chime. The leaking stopped entirely following an application of the paint.

In addition, vats with painted interior surfaces should be more easily cleaned prior to refilling due to the fact that the surfaces are smooth and sealed. It is recommended that the salter continue to use the cleaning method which has proven most satisfactory at his plant even though he should paint the vats. A wire brush should not be used in the cleaning operation because it will remove a large portion of the paint.

Brine Circulation

THE question of brine circulation is another point of difference among salters. Some claim that it promotes a more even fermentation and curing and others believe that aeration incidental to the pumping is detrimental. In order to investigate this question, experiments, which involved the use of two unsheltered and one sheltered vat, were conducted during two curing seasons. The brine was circulated for an hour a day for the first two months. A pump, having a capacity of about five gallons a minute, withdrew brine from the bottom of the vat and discharged it over the top surface. During the second year of the experiment, air was intro-

duced into the pump, until the brine flowed white, as a means of producing excessive aeration. The amount of pumping was definitely greater than that normally done at any commercial plant in order to exaggerate any effect which might result from this practice.

In no case did the circulation of the brine produce any noticeable effect on the keeping qualities of the stock. Stock from circulated vats was equal in firmness and texture to that from uncirculated lots. There were no significant differences in the rates of acid formation during fermentation or in the final acidity. Thus it seems that there is no apparent objection to the pumping of brine, even when accompanied by considerable aeration.

At times, in commercial plants, the brine on the surface may become weaker than that at the bottom of a vat, and circulation may be advisable in order to equalize the brine concentration and favor a more even curing; otherwise, there appears to be no particular advantage in the procedure.

Care of Empty Vats

VATS are handled in several ways between the time they are emptied of salt-stock and refilled with cucumbers. Unless the climate is very moist, brine or water is generally left in them to prevent excessive drying and shrinking of the staves. Some salters allow the brine to remain; in outside vats, however, rain will dilute the surface brine and allow the growth of microorganisms. Scum will grow on brine in sheltered vats. In either case, the vats are unsightly, give off an offensive odor, and require considerable cleaning before refilling. Another common procedure is to drain out the brine at the time the salt-stock is removed and refill with water. An abundant growth of green algae and bacteria occurs, and an offensive odor is given off under these conditions.

A better treatment is to drain the brine from the vat, refill with water, and stir in hydrated lime at the rate of about 10 pounds per 1,000 gallons of water. In most cases the growth of microorganisms will be prevented and the vat will remain sweet. Many vats treated in this manner have been observed in which the water remained crystal clear. It is obvious that vats which are exposed for long periods at below-freezing temperatures cannot be cared for in this manner.

Conclusions

1. Good salt stock can be produced in either sheltered or unsheltered vats.
2. Growth of scum can be controlled on sheltered vats by frequent periodic agitation of the surface brine.
3. The use of a paint similar to that employed in these experiments should prove desirable because it decreases brine leakage and does not impart a flavor or otherwise impair the quality of the salt stock.
4. Circulation equalizes brine concentration in the vat. No other significant effect was observed when brine in fermenting vats was circulated to the extent described in this experiment.
5. Vats that have been emptied of salt stock can be kept sweet by draining off the brine, filling with water, and mixing in hydrated lime at the rate of about 10 pounds per 1,000 gallons of water.