

THE PREPARATION OF MOLD POWDER FOR BLUE-VEINED CHEESES¹

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In the manufacture of blue-veined cheeses the usual method of inoculation has been to sprinkle spores of the desired mold, in the form of a powder, over the curd at the time it is being placed in the hoops. A mold powder is commonly prepared by growing the mold on some medium and then drying and powdering the mass of material. Various methods have been suggested for growing the mold, including (a) the inoculation of baked products specially prepared from rye, whole wheat or barley flour or of the interior of a loaf of ordinary bread (2, 3, 4), and (b) dipping strips of bread into an acid suspension of mold spores (1, 5). These procedures are carried out as simply as possible, and the inoculated material is usually incubated at a relatively low temperature. One method of limiting the growth of foreign molds has been to gradually acidulate the desired strain of mold to formalin and then dip the bread into an acid suspension of the mold spores containing 1 per cent formalin (5).

In various attempts, at the Iowa Agricultural Experiment Station, to employ the commonly suggested methods for the preparation of mold powder, practical difficulties were encountered which made advisable the use of a method which could be more satisfactorily controlled. These difficulties included (a) the development of foreign molds in the inoculated material, (b) a relatively low yield of powder because of the failure of the mold to grow in a portion of the inoculated material, and (c) the long time required for spores to develop.

MATERIALS AND METHOD

After employing various procedures for preparing mold powder, the following method has been adopted for the preparation of mold powder to be used in the manufacture of Iowa Blue Cheese, a Roquefort type cheese made from cows' milk.

Medium used. Whole wheat bread is cut into cubes approximately 0.5 inch on a side and placed in salt-mouth bottles, the bottles being filled from about one-third to about one-half full. The bottles are plugged with cotton and sterilized at about 15 pounds pressure for about 30 minutes, care being taken to raise the temperature very slowly to prevent cracking of the glass. After partial cooling, the bottles are removed from the autoclave and are quickly shaken to keep the pieces of bread from adhering in large masses.

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FIG. 2. TYPES OF CONTAINERS USED FOR GROWING MOULD.
Left, unincubated; right, mold well developed.

There seems to be an advantage in sprinkling the unsterilized bread with a small amount of water so that the sterilized material will not be too dry. Sterile water can also be added to the sterilized bread.

Inoculation. Two methods of inoculating the sterilized bread have been employed. The first consists of making a suspension of spores in water and adding this to the sterile material. The second and preferred method consists of sterilizing several cubes of bread in a large test tube and inoculating them with the desired mold; after sporulation has occurred the cubes are transferred to the bottles of bread and the bottles thoroughly shaken to distribute the spores. With this procedure a very heavy inoculation of the bread is easily secured.

Incubation. The inoculated bottles are incubated at 31° C. until copious spore formation has occurred. The time required varies from 8 to 12 days, depending on the strain of mold being used and, presumably, other factors.

During the incubation the bottles are shaken occasionally to insure heavy inoculation of all pieces of the bread and to keep the pieces from packing together and thus limiting the air supply. Even with frequent shaking, however, the pieces of bread overgrown with mold tend to settle together.

Drying. The bread, covered with spores, is removed from the containers and dried in a thin layer on cheesecloth supported by a frame. If desired, cheesecloth can be spread over the layer of bread. The drying is carried out in a warm room and requires from 2 to 4 days. When only a small amount of bread is being dried it can be suspended in a cheesecloth bag.

Grinding. After the material is completely dry it is pulverized in a small stone churn to which small stones have been added to serve as balls. Small amounts of bread can be ground in a mortar. The powdered material is passed through a 40-mesh screen to remove the larger particles.

Storage. The finished powder is placed in tin cans and held in a cool place until used.

NATURAL RESULTS WITH MODIFICATION OF THE METHOD

Various modifications of the method, as outlined, have been used. Whole bread did not seem to support as good a growth of the molds employed as whole wheat bread. Cracker crumbs were less satisfactory than white bread, probably because the crackers tended to pack into large masses which prevented easy access of air. The addition of an aqueous solution of lactic acid did not appear to improve the growth of the molds with any of the materials used. Large Wismeyer or round flasks were employed but seemed to be less satisfactory than the salt-mouth bottles. The larger openings in the bottles may provide a better air supply than the smaller openings in the flasks.

SPORE CONTENTS OF POWDERS

The spore contents of the powders that have been made varied from 30 million to 1.5 billion per gram, as determined by the plate method using potato agar as the medium, with most of the powders having spore contents between 100 million and 300 million per gram. When the spores were suspended in water and a count made with a hemocytometer, much higher values were secured; with this procedure many of the spores were seen to be in groups.

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