CONTROL OF MOLDS IN BREADS

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BACKGROUND

Bread has been a staple in the diet of man for many centuries. Generally, breads were prepared and baked daily. Certain breads lose desirable texture and taste characteristics upon storage and are also subject to spoilage by certain fungi (molds). Few types of bread contain natural microbial inhibitors. Today's manufacturing technology has freed us of the task of baking our bread and has yielded a product with a prolonged shelf life. This longer shelf life is partly due to the use of chemicals that inhibit mold growth. Various preservatives (potassium sorbate, sodium benzoate) have been used to inhibit mold spoilage in other food products. Inhibition of yeasts by some preservatives may prevent bread doughs from rising properly.

PROBLEM

Which common food preservatives would be best for preventing mold growth in bread?

MATERIALS

1. A source of bread molds. This may be prepared by opening a fresh loaf of sliced bread, removing the slices and touching them to foreign surfaces, e.g., flour, dirt, grass, etc. replacing the bread and sealing the bag. If the bread is sufficiently moist, molds should begin growing within 4 or 5 days. The molds most likely to grow are blue-greenish mold (Penicillium) or a black mold (Aspergillus). The molds grown will be the mold source for your experiment.

2. Flour, sugar, yeasts, and baking pans for making bread, (Parker House or clover rolls are best and easiest).

3. Small sealing freezer bags.

4. The legal concentration of preservatives in breads is .32% of final weight for calcium propionate, .1% for sodium benzoate, and .1% for potassium sorbate. These values correspond to 1.5 grams of propionate per pound of flour and 0.5 grams of benzoate or sorbate per pound of flour. Other salt forms may be used, e.g., sodium propionate. Chemicals need not be food grade.

PROCEDURE

Overview: A single large lot of flour is to be "inoculated" with mold, and then subdivided into smaller portions that will be treated with different preservatives. Dough will be baked into bread and stored in a warm place.

1. Using any recipe for bread or rolls, weigh out and mix all dry ingredients, including yeast. "Inoculate" the dry ingredients by brushing (with a brush) the mold from the spoiled loaf of bread. Shake a large bag for 5 minutes to thoroughly mix.

2. Weigh out five equal lots of flour sufficient to make 4-6 rolls per lot. To one lot add calcium propionate to achieve a final concentration of .32%; to another add benzoate to .1%; to another add sorbate to .1%; to the others, add nothing. Select one of these last lots with nothing added to serve as the control to determine how quickly the bread spoils under normal conditions with no preservatives. To the other, cloves will be used as a preservative. After baking, whole cloves are to be inserted into the surface of the roll at ¾"-1" spacings.

3. Add wet ingredients, prepare the dough, let all dough rise under similar conditions, and bake. As soon as the rolls are cool, place them individually into labeled heavy plastic bags that can be sealed. It is important that rolls be packaged soon after baking for all products to maintain a constant and high moisture level. As stated above, one lot of rolls is to be treated with whole cloves; another is to serve as a control.

4. Place in a warm place (75ºF would be ideal) and observe daily.

Molds are oxygen requiring; therefore, all growth should be on the surface.

NOTE: None of the samples should be tasted. Certain molds are capable of producing carcinogens (cancer producing toxins) under the above conditions.

RESULTS

Record the presence and extent of mold on the various rolls. A trend should be apparent. The mold you observe should be the same type that was used to inoculate the flour. However, other mold types may arise and should be noted.

Record approximate level of mold as:

- = no mold visible
+ = slight or scant patches
++ = one half of roll covered with mold
++++ = all of roll covered with mold

QUESTIONS

1. Did the bread dough rise equally? Could the different preservatives used affect this? Were all experimental conditions except the levels of preservatives the same?

2. What would be the source of molds other than those that were purposely introduced into the flour?

3. If a small amount of a particular preservative appears to prevent mold growth, then larger amounts would probably be more effective. Why do you think higher levels of preservatives aren't used?

4. Do you think the results would have been the same if the rolls had been permitted to dry out? Why?

5. Natural products, such as cloves, often are very good inhibitors of microbial growth. If this proves to be the case with the clove rolls, why aren't cloves used on all bread products?

6. Why package the rolls individually for observations?

REFERENCES

1. Baker's Digest is a periodical containing technical articles on breads, doughs, yeasts, and preservatives. Quality control personnel at local large bakeries may subscribe to this journal.

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4. Pomeranz, Y., and J. A. Shallenberger. Bread Science and Technology. Westport, CT: AVI Publishing Co., 1971.

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