

MICROWAVE POPCORN

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Introduction:

Microwave popcorn has become a popular snack, mainly because of convenience. Packages of microwave popcorn contain popping corn, salt, flavorings, oil or shortening (mainly to help the flavorings stick to the popcorn).

Investigating Microwave Popcorn

(Based on an investigation by Thomas A. Evans. See reference 2)

Materials Needed

3 packages of Microwave popcorn and original box
Measuring cup
Hot water
Small knife or spatula
Scissors
Bowl to hold popped popcorn
Small bowl or heavy paper cup to hold unpopped popcorn
Liquid dishwashing detergent
Microwave oven

Safety

Safety glasses or goggles must be worn in the laboratory at all times.

If this experiment is performed in a chemistry laboratory, all work surfaces must be cleaned and free from laboratory chemicals. After cleaning work surfaces, it is advised to cover all work areas with aluminum foil or a food-grade paper covering.

All apparatus must be clean and free from laboratory chemicals. Use only special glassware and equipment, stored away from all sources of laboratory chemical contamination, and reserved only for food experiments is recommended.

There are no safety hazards associated with the materials used in this experiment.

Disposal

Generally, all waste materials in this experiment can be disposed in the trash. All disposal must conform to local regulations.

Procedure 1: Popping microwave popcorn

Obtain a new, unopened bag of microwave popcorn. What brand of popcorn?

Smell the bag. Remove the plastic overwrap. Smell the bag of popcorn. What is the wrap for?

Unfold the bag. Why is the bag folded?

The bag is labeled “This side up” or “Heat this side down”. Why?

Place the unfolded bag of popcorn into the microwave oven. Set the power on HIGH. Microwave according to the instructions on the bag and/or box. Normally, the time is set for 3 to 5 minutes. You are instructed to stay by the microwave and listen. When the popping slows to 1-2 seconds between pops, stop the microwave. Why are these instructions important?

Why not microwave the popcorn on LOW? You may want to try this.

Remove the bag of popcorn from the oven. The bag will be HOT. Open carefully. What do you observe? Explain.

Pour the popcorn into a clean bowl and enjoy your snack.

Procedure 2: Examining microwave popcorn

Look at the ingredients listed on the box from the microwave popcorn.

Obtain a new, unopened bag of microwave popcorn. Remove the plastic overwrap. Unfold the bag and tear or cut open the bag at the top.

Can you identify the ingredients, as listed on the box, in the bag? Describe them.

Pour the contents of the bag into a small bowl or heavy paper cup.

Cut the bottom off the popcorn bag. Cut along the seam on the top of the bag, open it up, and use a knife or spatula to scrape off any materials adhering to inside of the bag.

Examine the bag. Is it the same all the way around?

If part of the bag appears to be different, cut out that section. Which part of the bag is different?

Carefully, try to peel apart that section of the bag. It is probably glued together, so, if you can peel off a little bit, that will be sufficient. What is in between the paper? What is its purpose?

If you would like to try an experiment, cut off a small piece of the exposed section from the bag and place it in the microwave. Be prepared to stop the microwave if any problems occur. Turn the microwave on HIGH. Observe the section of the bag for a few seconds. What happened?

Obtain some hot water. Add the hot water to the package contents you saved in a bowl. Stir to mix. What do you observe?

Pour the water off, leaving the kernels behind. Repeat the hot water rinse of the kernels for a second time.

Repeat the hot water rinse for a third time. If oil droplets are still present, add one or two drops of liquid detergent. What do you observe?

Pour off the soapy water and rinse the detergent away with clean water. Drain the water from the kernels and pour them on a paper towel and pat them dry. Measure the amount of the popcorn kernels in a measuring cup. How much popcorn was in the bag?

Make Your Own Microwave Popcorn

Materials Needed

popping corn (Store unused popcorn in a sealed plastic bag or a jar to prevent loss of moisture content.)

paper bag, such as the brown paper lunch bags available in most supermarkets.

Stapler

Measuring cup (1/3 cup)

Salt (popcorn salt preferred)

Optional: Butter, margarine, or butter flavoring (One possible product is I Can't Believe It's Not Butter spray.)

Optional: cheese or other flavorings

Bowl to hold popcorn

Small container to melt butter or margarine

Microwave oven

Safety

Safety glasses or goggles must be worn in the laboratory at all times.

If this experiment is performed in a chemistry laboratory, all work surfaces must be cleaned and free from laboratory chemicals. After cleaning work surfaces, it is advised to cover all work areas with aluminum foil or a food-grade paper covering.

All apparatus must be clean and free from laboratory chemicals. Use only special glassware and equipment, stored away from all sources of laboratory chemical contamination, and reserved only for food experiments is recommended.

There are no safety hazards associated with the materials used in this experiment.

Disposal

Generally, all waste materials in this experiment can be disposed in the trash. All disposal must conform to local regulations.

Procedure

Obtain a paper lunch bag.

Place 1/3 cup popcorn into the bag.

Fold the top over twice, about 1/2 inch (1 cm) folds and staple closed with two staples placed about 2 cm from either side of the fold.

Place the bag in the microwave and cook on high power for 2 to 4 minutes until the popping sounds are about 2 to 3 seconds apart.

Holding the bag by the folded part, remove from the microwave oven. Open the bag carefully to avoid the trapped steam escaping from the bag, and pour into a bowl.

Melt butter in a paper cup. Drizzle it over the popcorn. Add salt, and other desired flavorings, to taste. Toss to mix. Enjoy!

Want a lower calorie butter popcorn? In place of butter, use a products such as I Can't Believe It's Not Butter spray. Spray the fresh popcorn and then add salt and other flavorings.

Explanation

If you tried a previous experiment on popcorn, you should have an idea of the factors that make popcorn pop, the most important being a moisture content of 11 to 14%. Also, if you worked through the first parts of this experiment using commercial microwave popcorn, you should understand the components of that product. So, why did you get results without a special bag or all the stuff you found in the bag of microwave popcorn from the store?

The microwave works by causing the water molecules in the food to vibrate, producing heat. The heat from the hot water partly gelatinizes the starch grains, the water vaporizes and expands in volume, producing sufficient pressure for the popcorn kernel to burst and the endosperm expands in volume due to the pressure difference. The water evaporates and the cooked starch granules are dried out making the endosperm light and crisp.

Although metal in a microwave can cause sparks and can ignite paper, the staples are too small to cause sparking. The aluminum layer in a commercial bag of microwave popcorn, called the susceptor panel, is very thin and produces heat from interaction with microwaves, but generally does not make enough sparks to ignite the paper bag.

References

1. Brown, Alton, *I'm Just Here for the Food*, Stewart, Tabori & Chang, New York, 2002.
2. Evans, Thomas A., *It's all in the bag...a look at microwave popcorn*, Denison University, Granville, OH 43023