



SNS COLLEGE OF TECHNOLOGY
COIMBATORE-35



19FTE302 Technology of Snack and Extruded Foods

UNIT –III

Commercial and industrial process of popcorn

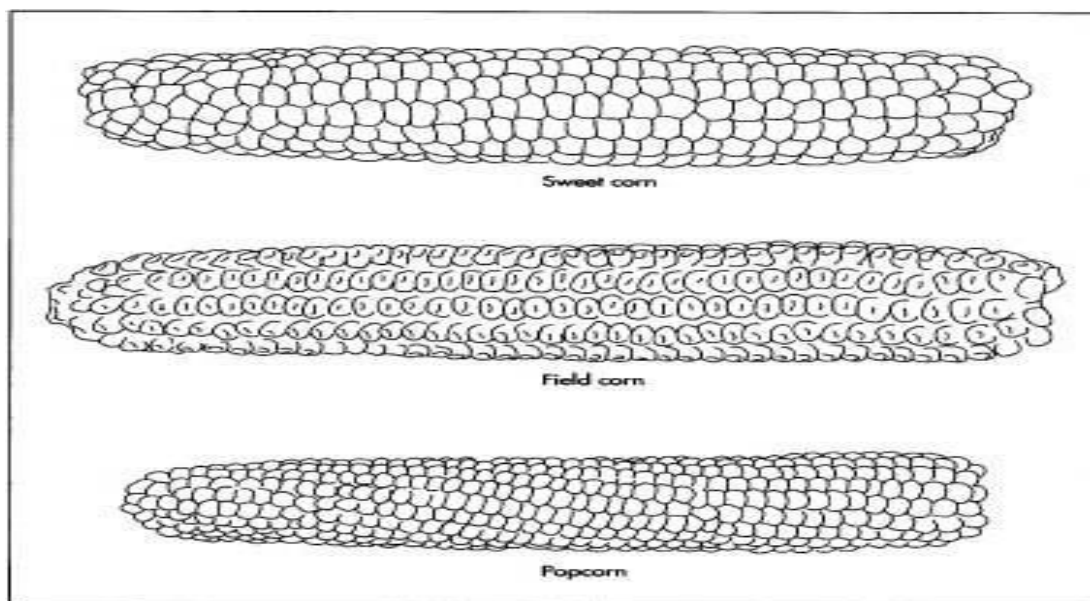
Raw Materials

Selection of the best variety or hybrid of popcorn to be grown and processed for the kind of popcorn to be sold is critical to the raw materials comprising popcorn. In some forms of popcorn, the corn itself is the only raw material. For other methods of marketing popcorn such as microwave popcorn, soybean oil, salt, and flavoring are also needed.

Popcorn varieties and hybrids

There are several commercial classifications of corn. Field corn (also called dent corn or cow corn) is fed to animals. Flour corn is mostly starchy center with a soft hull that allows it to be easily ground into flour. Sweet corn is the kind we eat at the dinner table. Flint corn is usually called Indian corn; its colorful kernels make it highly attractive, and it is used for decoration because it is tough and tasteless. Pod corn is also only used for decoration because each of its kernels has its own separate husk.

Popcorn, also a collection of varieties of *Zea mays*, is the only corn that pops; it is not dried kernels of sweet corn. There are several



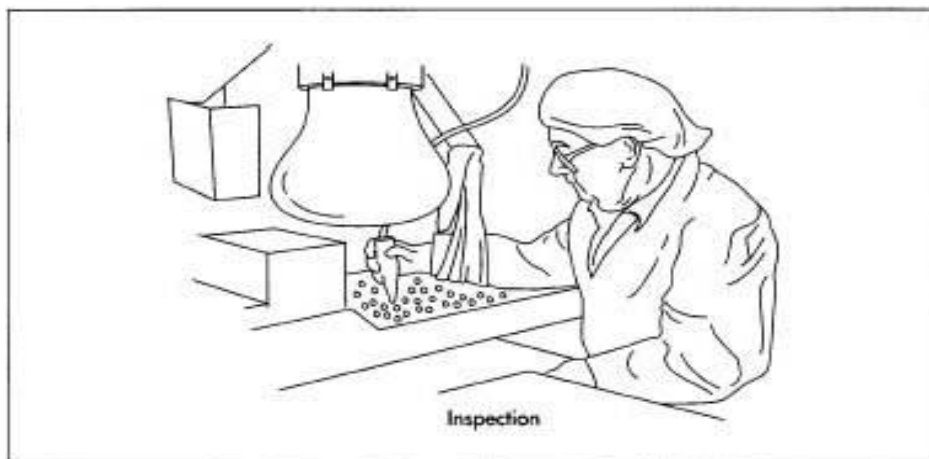
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popular varieties of popcorn out of thousands of hybrids. White hull-less and yellow hull-less are the varieties sold most commonly and packaged in microwave bags. Rice popcorn is a variety with kernels that are pointed at both ends, and pearl popcorn produces round, compact kernels. Tiny red ears that are shaped like strawberries produce red kernels and are called strawberry popcorn. Black popcorn has black grains but pops as white kernels, and rainbow or calico corn has white, yellow, red, and blue kernels. Popcorn is also classified by the characteristics of its popped kernels, with the largest kernels called "Dynamite" and "Snow Puff."

The business of developing new hybrids and cultivating known, productive hybrids is key to the creation of popcorn. A hybrid is made by fertilizing one kind of popcorn plant with the pollen from another kind. The result is a seed that has characteristics of both plants.

A major popcorn producer like Orville Redenbacher Popping Corn Company employs a team of scientists to pollinate its hybrid corn by hand. The kernels that are grown are used as seed to grow the popcorn that will be harvested and sold. As many as 30,000 new hybrids per year are created to try to improve the popcorn product. Producers also work with universities to develop ideal hybrids; millions of dollars are invested annually in this research.

Smaller growers like Snappy Popcorn rely on hybrids that are best suited to their location, climate, and type of product. When the hybrid is well matched to geography, it produces a greater yield. Hybrids are also chosen based on resistance to disease and damage from insects, stalk strength, how easily they grow, and how easily they can be pulled out of the ground. Types of kernels are important, so hybrids are chosen specifically to produce carmel corn, microwave popcorn,



As a final step in the manufacturing process, quality-control inspectors observe the kernels as they move along a conveyor belt and suck out poor-quality kernels with a vacuum hose.

and movie theater popcorn. Movie theaters are interested in selling the greatest volume for the smallest investment, so high-expansion kernels are chosen for this market.

Popping methods

Part of the "design" of popcorn is the method used to pop it. The dry method consists of putting the unpopped grain in a basket or wire cage, agitating it over a heat source like the campfire or coal stove, allowing the corn to pop, and seasoning it with butter and salt. In the wet-pop method, corn is placed in a container with a solid bottom. Oil is added (either before the corn or poured on top), and the oil helps to distribute the heat and cause more even and complete popping. Commercial popping machines use the wet-pop method, and coconut oil is used for its aroma and lightness. Microwave popcorn also uses the wet-pop method, although the moisture is present in a solidified form of oil, flavoring, and salt that melts when the microwaving process begins.

TheManufacturingProcess

Cultivation

1 Popcorn grows best in rich soil. It is planted in checkrows, rows that intersect at right (90-degree) angles, so that it can be harvested by machine. Hybrid forms of popcorn have been perfected to produce the most grains per ear of corn, flavorful kernels, the correct internal moisture to insure that most of the corn pops, and other market-friendly characteristics. When the ears are ripe, the corn is harvested with either a picker that removes the ears and leaves the stalks temporarily or with a combine that crushes the corn stalks, mechanically removes the ears, and husks the corn. Combines tend to do more damage to the ears of corn. The ears are collected in the field in bins or boxes and moved into steel cribs using mechanical elevators or conveyors.

2 The ears are dried in cribs that are narrow and have open slots to minimize the time needed to dry them. A crib can be up to three stories high, as long as a city

block, and with a capacity of up to 4 million lb (1.8 million kg) of corn. The ears are stored for eight to 12 months to allow them to dry, or in an alternative method, hot air is forced up into the cribs through holes in the bottoms of them to reduce the natural drying time. While in the cribs, the corn is carefully tended until the kernels reach a moisture content of 12.5-13.5% moisture, which is ideal for popping characteristics.

In the factory

3 The dried ears of popcorn are then transferred by conveyor belt to the factory and a machine called a scalper. The scalper strips the kernels from the cobs. Simultaneously, a cleaner and de-stoner sort out the shuckings and any dirt or particles by passing it through a series of screens to separate the kernels. They are cleaned and polished in another machine equipped with metal brushes that remove the chaff (sometimes called bee's wings). A gravity separator is then used to separate good kernels from bad; the kernels that have matured properly are lighter in weight, so the bad kernels drop through the bottom of the separator and are recycled for use as seed. The kernels near the two ends of the cob also tend to be either too small or too large to pop properly, and the gravity separator removes them as well.

4 Finally, in the portion of the factory called the fanning mill, fans blow dust and other fine material off the kernels, and the kernels are treated with a natural, inert fumigant to eliminate insects. Most manufacturers avoid pesticides altogether during the winter months when bugs are less common, and all must comply with government regulations regarding their use. Now completely processed, the popcorn kernels travel toward storage bins on a conveyor belt; quality-control

personnel watch the passing flow and vacuum up bad kernels that may have escaped the previous sortings.

5 Types of popcorn with no other additives go directly to holding bins to await packaging. For microwave popcorn, measured amounts of salt, soybean oil, flavoring, and popcorn are pumped or dropped into the microwave bags. The bags are not vacuum-sealed, but they are air tight to prevent moisture in the air from affecting the contents.

6 In the packaging area, popcorn is conveyed from the holding bins to packing machines where it is placed in bags and then boxed for storage or shipment. Usually, the factory will bag a particular type of quantity, say 5 lb (2.27 kg) bags, until it has met its orders plus some for storage. Then the packing line is changed to accommodate different bags and quantities of popcorn.

Quality Control

Quality control practices are essential in the field and factory. The process of pollinating the ears of corn correctly is essential to the production of any popcorn at all. In the factory, the cleaning processes are carefully monitored, and the series of screens and other devices are chosen to remove all stray materials and unwanted kernels. Even magnets are used to pull out bits of metal that may have been introduced by the farm machinery or storage bins. Finally, a team of quality-control inspectors simply observes the kernels as they move along a conveyor belt and removes poor-quality kernels with a vacuum hose.

Byproducts/Waste

Cobs, husks, and stalks are sold for use as feed for cattle and other animals, so very little waste remains from popcorn cultivation and processing.

The Future

Popcorn's future was assured in the 1980s when its nutritional benefits were widely publicized. Weight Watchers recommends popcorn as a snack for the weight-conscious, the American Dental Association endorses this sugar-free snack, and the American Cancer Society recognizes the benefits of the high fiber content of popcorn in possibly preventing several types of cancer. Popcorn's nutritional value is so high that doctors recommend it—even with oil—over many other snack foods.

Microwave packaging has also allowed popcorn manufacturers to enhance their product with flavorings that keep well and produce a range of good tastes when cooked. The competition to create the latest taste sensations (or borrow them from other trendy foods) is fierce in the popcorn trade, but this also helps assure the food's future. American popcorn makers compete among themselves for the best yield and novel flavors, but, increasingly, their competition is coming from growers in Argentina and South Africa.