

## Popcorn – Snack Research

### **Overview**

Popcorn is one of America's truly native foods. The oldest ear of popcorn, discovered some 55 years ago in a bat cave in New Mexico, is thought to be around 4,000 years old. Popcorn was an important food of the Aztec Indians. It was also an integral part of their ceremonies, often used to decorate ceremonial headdresses, necklaces and statues of their gods, including Tlaloc, the god of rain and fertility.

Today, Americans eat 54 quarts of popcorn per person per year. And while movies and popcorn seem to go together, theaters are not the largest users of popcorn. About 70 percent is purchased by consumers at retail stores in raw or popped form and eaten at home.

How healthy is all this popcorn? Like most foods, it depends on what you put on it and what you eat with it. Plain popcorn is a nutritious, low-calorie snack. However, drenched with butter or margarine and doused with salt, popcorn begins to fall out of favor with nutritionists and dietitians. Add sugary syrups and you have a snack that promotes cavities.

In years past, consumers thought nothing of sitting down and snacking on salty snacks to curb the “munchies”. Salty snacks fried in a variety of oils had great flavor, and serving sizes had not been clarified. Fast forward to today. Obesity is an epidemic; not only adults, but children are at great risk. Two major factors that contribute to obesity are too many calories and too little exercise. While families, schools and society are working to get more exercise into a daily routine, we are concerned in this report with the snack foods being eaten. Why target snack foods? Consumers have taken snacking to a new level. Some consider a snack as a fourth meal of the day.

### **Ranking of Salty Snacks**

Potato chips  
Tortilla chips  
Popcorn  
Cheese snacks  
Pretzels  
Corn snacks (not tortilla chips)

The snack food industry has seen a 4 percent decline since 2002. The snack food market is calculated through sales in food, drug and mass merchandiser outlets – excluding Wal-Mart - and has seen a general decline in the consumption of pretzels, corn and tortilla chip snacks,

cheese snacks and popcorn, all of which were down 6 percent since 2003. Potato chip consumption has remained stagnant. The main threats to the salty snack food market are competition from healthier alternatives outside the category, choosing pita chips and crackers. Salty snacks consumed are bagged and ready to eat.

### **The exception is popcorn.**

While there are companies that sell ready to eat, most popcorn is sold in microwaveable packages or bulk to cook at home or office. Those puffed up kernels come from a cereal grain that has been genetically modified to produce such large puffs. Bulk popcorn comes in many varieties: the most popular ones are the Japanese white hull-less, which has a smaller popcorn kernel, but a very thin hull which will not get stuck in your teeth, and the large yellow variety, called yellow pear, which pops up bigger, but does have a harder hull. Black and red popcorn are also available; both pop small bursts and have a fraction of the popcorn sales. Some gourmet popcorn companies mix all four varieties together.

Popcorn, air-popped, is quite a tasty treat. But there are not many people that will sit with a bowl of plain popcorn; salt and butter are usually added. Some consumers even add sugar to produce a kettle corn product that is sweet and salty.

Popcorn fact sheet

#### **100 grams of popcorn**

<b>Component</b>	<b>Air popped</b>	<b>Kettle corn</b>	<b>Microwave low fat</b>
Calories	387	431	429
Fat	4.5	12.8	9.5
Carbs	77.9	79.1	73.4
Protein	12.9	3.8	12.6
Sugar	0.7	53.2	0.5

A cup of plain popcorn, prepared using the air-pop method in a microwave oven or with an inexpensive air-pop machine, contains fewer than 30 calories and is virtually fat and sodium free. It's also a good source of fiber (about 2 grams per cup), which adds bulk and thereby makes this nonfattening food quite filling.

Every tablespoon of oil used for popping adds around 100 calories, as does every tablespoon of melted butter added after popping. More than two-thirds of the popcorn sold today comes already buttered and salted and ready to microwave-pop in two to three minutes. Calories for

microwave popcorn vary from 40 per cup for “light” varieties to 60 to 70 per cup for “regular” versions. Sodium levels also vary highly, from 50 to 150 milligrams per cup.

Microwave popcorn has become main stream since 1940. Currently, microwave popcorn annual sales are \$240 million dollars. Many children look puzzled by the answer to the old joke “How many people does it take to make a batch of popcorn?” The answer is “5”: one to hold the pan and four to shake the stove. Children are used to the bags that are tossed into the microwave and emerge warm and bursting with hot butter and salted kernels. It is just recently that weight conscious consumers have noted that the bag of popcorn from the microwave is more than one serving, which means most consumers were eating way more calories than they knew. Single serving bags are being sold, along with reduced salt and butter, all in the name of healthy choices. It was reported in August of 2007 that the chemical used in the artificial butter flavor caused some health issues, but this has been researched to show health issues with those who produce the butter flavor and not the consumers.

## **Environment Requirements:**

### **A. Climate:**

Popcorn growth requirements are similar to those for dent corn, with less adaptability to environmental extremes. Popcorn seed germinates more slowly than dent corn, and seedling growth is also slower. Although popcorn varieties are available with maturities as early as 90 days, extensive development of top performing hybrids is limited to those with maturities of 110 days or later.

### **B. Soil:**

Although there is little experimental data regarding effects of soil type on popcorn production, grower experience has shown that any soil type suitable for dent corn should produce a good popcorn crop. However, experience also indicates that popcorn is likely to perform better on medium- to coarse-textured soils (coupled with adequate rainfall or supplemental irrigation) than on fine-textured, poorly drained soils for at least two reasons:

- Popcorn seed germinates more slowly than dent corn, and the seedlings grow more slowly; thus, medium- to coarse-textured soils, which warm slightly faster than fine-textured soils, should improve germination, emergence and seedling establishment.

- The popcorn root system is less extensive than that of dent corn; thus, high-clay-content and/or poorly drained soils foster weak, shallow rooting that reduces yields and increases lodging.

## **Cultural Practices:**

### **A. Seedbed Preparation:**

Careful seedbed preparation is important because seed size is small. A clod-free seedbed with good tilth will ensure coverage of the seed placed just deep enough (1 -2 inches) to be in contact with moist soil.

### **B. Seeding Date:**

Timely planting of popcorn is very important because of its slow germination and seedling growth and because it must reach harvest maturity (see Harvesting section) for maximum popping expansion. Planting should not occur until early-May when soils warm to temperatures conducive to rapid germination and emergence. Planting delays after mid-May need to be balanced with popcorn maturities and the length of growing season.

### **C. Method and Rate of Seeding:**

For plate planters, special popcorn plates are required, and recommendations of the equipment manufacturer should be followed. Both seed size (number of kernels per pound) and grade should appear on the popcorn seed bags.

Little information is available concerning the effects of plant density on the performance of popcorn hybrids. Commonly, seeding rates for popcorn are higher than for dent corn because of its smaller plant size and lower yield per plant. However, if plant populations are too high, the relatively poor stalk strength of popcorn hybrids can result in severe lodging. Generally, a 5 to 25% increase over the recommended dent corn plant densities should be considered for most soils and cultural practices.

### **D. Fertility and Lime Requirements:**

A pH of 6.0 is adequate for popcorn. Test the soil and apply the amount of lime recommended to achieve this pH. Thorough incorporation and mixing are important.

Nutrient requirements for popcorn are estimated to be 85% of those for field corn. Soil P and K should test in the medium to high range (30 to 75

lbs of P and 160 to 240 lbs K per acre). Apply any corrective phosphate or potash recommended on the soil test report.

Maintenance fertilizer equivalent to crop removal should be applied to maintain soil test P and K levels. Nitrogen requirements and maintenance recommendations for phosphate and potash are given in Table 1.

**Table 1: Annual nitrogen, phosphate and potash recommendations for popcorn.**

Yield goal	Soil organic matter, T/a					Soil Test P			Soil Test K		
	0-20	21-35	36-75	76-100	>100	H or below	VH	EH	H or below	VH	EH
bu/A	lbs N/a					lbs P <sub>2</sub> O <sub>5</sub> /a			lbs K <sub>2</sub> O/a		
80-100	100	80	60	30	20	30	15	0	20	10	0
101-120	120	100	80	40	30	35	20	0	25	15	0
121-140	140	120	100	60	40	40	20	0	30	15	0
141-160	160	140	120	80	60	45	25	0	35	20	0

Credits for a preceding legume crop and use of manure should be subtracted from these recommendations.

Dent corn fertilizer programs adapted to popcorn production should take into consideration popcorn's relatively poor standing ability. Very high rates of N can compound lodging problems, especially if soil test K levels are low. Also, because popcorn seedlings grow more slowly than dent corn, the application of starter fertilizer is probably of greater importance.

**E. Variety Selection:**

Popcorn growers shifted from open-pollinated varieties to hybrids for some of the same reasons that dent corn growers did -improved yield and better standing ability. Also, hybrids have better popping expansion and more uniform kernel type and maturity.

A major consideration in hybrid selection is maturity. Maximum popping potential of a hybrid can be achieved only if it reaches full maturity. Any

factor that prematurely terminates plant development (e.g., drought stress, disease, frost, etc.) reduces popping potential, and may result in a crop not marketable as popping corn. Therefore, growers should select hybrids that will usually mature before frost in their area. If planting must be delayed much past normal dates, consider an earlier-maturing hybrid or an alternative crop.

Some popcorn hybrids are dent-sterile and cannot be pollinated by ordinary types of dent or sweet corns. In popcorn *seed fields* (where the harvested crop is to be used as seed for the following year's crop), dent sterility is important because it prevents cross pollination with dent corn. Corn harvested from plants grown from out crossed seed has very poor popping ability. Thus, if the ears from these out crossed plants are not sorted out before shelling, it is virtually impossible to remove all kernels from these ears in the cleaning and grading operation. This adversely affects the quality and appearance of the total crop. For this reason, dent-sterile hybrids are especially desirable where popcorn is to be field-shelled.

In popcorn *production fields* where the harvested crop is to be used for popping, isolation from other types of corn is unnecessary, even if the popcorn is not dent-sterile. Pollen from other corn does not have any effect on the popping ability of popcorn hybrids.

The "right" popcorn hybrids must meet the needs of both grower and consumer. The grower wants high yields, strong stalks and good disease resistance; the consumer wants popped corn that's tender, good tasting and free from hulls. Current commercial hybrids involve some compromise among these requirements.

A large portion of commercial popcorn acreage is contracted with growers by popcorn processors. In most instances, the contracts specify that the processor will determine the hybrids to be used. Growers producing uncontracted popcorn may, of course, grow any hybrid they choose. Sources of information about hybrids include state Extension Services, popcorn seed companies or the current "Hybrid Popcorn Performance Trials" from the Agricultural Experiment Station, Purdue University, West Lafayette, IN 47907.

#### **F. Weed Control:**

The same weeds that commonly infest dent corn fields are also found in popcorn fields. Yield losses will occur when popcorn has to compete with weeds for the nutrients, light and moisture essential to maximum growth and development. Also, certain weed species may serve as alternate hosts for disease and insect pests of popcorn.

Cultural mechanical and chemical methods for weed control in popcorn are similar to those used for dent corn. For chemical control methods, consult your county Extension office or popcorn company agronomist. Follow recommendations, and apply as directed on the herbicide label. Neither Banvel nor 2,4-D are registered for use in popcorn.

### **G. Diseases and Their Control:**

As with weeds and insects, popcorn is subject to the diseases common to dent corn. Fortunately, not all of these diseases are of economic importance and may pass from year-to-year without notice. A few, however, are widespread and can substantially reduce yield and quality if conditions are optimum for infection.

Stalk and root rot diseases are often the most destructive in popcorn. Symptoms are usually first noted when the crop nears physiological maturity. The disease complex is generally caused by several fungal and/or bacterial pathogens rather than by a single causal agent. Yield losses are the result of infected plants having poorly filled ears or lodged plants and dropped ears that escape harvest.

Satisfactory control of popcorn diseases involves a combination of sound cultural practices, which include crop rotation, proper fertilization, proper management of crop residue, use of disease-resistant hybrids and appropriate applications of chemical treatments. Consult state recommendations for specific practices tailored to fit local situations.

### **H. Insects and Their Control:**

Most, if not all, insects that attack dent corn also can attack popcorn. Follow state recommendations and the specific information on the product labels regarding application, safety, and restrictions.

### **I. Harvesting:**

Much popcorn acreage today is harvested by combine, despite the fact that there is likely to be more kernel damage, and thus a reduction in popping volume. Processors who want maximum popping volume may contract with farmers to harvest their popcorn on the ear. While this usually increases production costs, it also results in higher quality popcorn with more potential popping volume. Combined popcorn can give satisfactory popping volumes if it is harvested at the correct moisture content by a properly adjusted combine.

Shelled Grain-harvesting. Popcorn shelled with a combine in the field should have field moisture of between 14 and 18%, with the optimum

being 16-17%. Above 18% moisture, shelling losses are high and there is much **physical damage** to the kernels. Below 14%, the kernels are too susceptible to **impact damage** from combining and associated handling operation; and as already mentioned, kernel damage lowers popping volume.

Combine settings are different for popcorn than for dent corn, and adjustments must be made when switching to popcorn. The cylinder speed, concave clearance and other adjustments should be set to provide a balance between shelling efficiency, machine losses and degree of physical damage to the popcorn. Slower cylinder speeds and wider concave clearances reduce kernel damage. A combine operated at or near its rated capacity will produce less kernel damage than when operated at relatively low levels of throughput. Further "fine tuning" will also likely be needed to account for specific harvest conditions, harvest moisture and popcorn hybrid.

Ear-harvesting. With a heated forced-air system to dry the ears promptly to a safe storage moisture, popcorn can be harvested at 25% moisture. Such a system must be so designed that the drying process does not affect the potential popping volume of the popcorn. With an unheated forced-air system or naturally ventilated storage, ear-harvested popcorn should field-dry to at least 20 (preferably 18) % moisture and then be harvested promptly to minimize field losses.

Like combines, ear pickers can also damage popcorn kernels if not operated properly. Special rubber snapping rolls are available for ear harvesting of popcorn; they cause less damage than the steel ones used for dent corn picking.

Hand-harvesting. The home gardener or small, noncommercial producer can hand-harvest popcorn anytime after it reaches physiological maturity (approximately 35% moisture). Well-ventilated storage must be available to allow the ears to dry without molding. They can be dried by spreading them on covered concrete floors for several weeks.

Factors other than moisture content can influence when to harvest a given popcorn crop. These include incidence of disease, insect and bird damage and freezing temperatures. Popping volume is not affected by a light frost once moisture content drops below 30%; but it could be significantly reduced by a hard freeze when kernel moisture is above 20%. On this basis, it may sometimes be better to harvest and artificially dry popcorn than risk a hard freeze. Below 20% moisture, freezing apparently has little or no effect on popping volume.

## **J. Conditioning:**

To be high-quality, popcorn must be free of microbial contamination and insect and rodent damage. Aside from that, the most important factor influencing the economic value of popcorn is popping volume - i.e., the volume of popped corn produced from a given weight of unpopped kernels. Processors may reject popcorn that does not meet specified minimum popping volume.

Popping volume is affected somewhat by harvesting and handling practices, and by the moisture history of the popcorn prior to popping; but the primary factor is the moisture content of the kernels when popped. Studies have shown that maximum popping volume is produced at moistures ranging from 13.0 to 14.5%, with 13.5% being optimum. Data also indicate that popcorn must be initially dried to at least 13.5% moisture before it attains maximum popping volume. After that, moisture can increase to 15% without significantly decreasing popping volume. Over dried popcorn (11% or below) can be rewetted to 13.5% moisture, but it will not recover the maximum popping volume it had on initial dry down to 13.5%.

Conditioning shelled grain popcorn. Popcorn with less than 18% moisture and combine-harvested can usually be conditioned (i.e., dried down to the proper moisture) without spoilage by using an in-bin forced-air drying system. Such a system should supply approximately 2 cubic feet of drying air per minute per bushel of stored grain. This will not over dry the popcorn, unless the season is unusually dry - i.e. relative humidity (RH) often below 60%.

In areas where RH above 80% is expected for extended periods, a minimum amount of supplemental heat (producing no more than a 7-9°F temperature rise) can be provided, if it can be controlled by a reliable humidistat set at 60% RH and activated only when the outside RH exceeds 80%.

In areas where outside RH is consistently below 60%, it may be advantageous to condition popcorn in unheated air portable-batch- or continuous-flow-type dryers before storage. If operated and monitored properly, this type of system prevents the over drying problems that can occur with an in-storage drying unit.

Conditioning ear-harvested popcorn. Popcorn mechanically harvested on the ear at 20-25% moisture content must be dried promptly to prevent mold growth in storage. Storage structures should incorporate high-volume forced-air ventilation systems to insure uniform drying in all areas of the crib. The high volume of uniform air flow is the key to

preventing mold growth; but provision for supplemental heat during periods of higher humidity, as was recommended for shelled popcorn, is also desirable.

Ear popcorn conditioned by heated forced air needs to be monitored frequently to prevent over drying or too rapid drying, which would reduce potential popping volume. Moisture content can be checked using a commercially available electronic moisture tester either calibrated for popcorn or supplied with a conversion chart for popcorn.

Ear popcorn harvested at 20% or less moisture can usually be stored in naturally ventilated cribs. Natural ventilation should dry the popcorn to a moisture content near that desired for popping without any over drying problems. To insure that air will move freely through the stored popcorn, cribs should be no more than 3-4 feet wide, and the popcorn itself clean and free of husks and other residue. Once ear popcorn has dried to below 16%, it can be shelled and conditioned to the correct popping moisture. This may be done with a forced-air system similar to that previously described.

Re-conditioning over dried popcorn. If popcorn has been over dried, it can be rehydrated to the desired moisture content but, as mentioned above, it will not fully recover its initial popping volume. Usually the best way is to move 70-85% RH air through it over a long period (i.e., from a week to several months, depending on air flow rate and amount of rehydration needed). Another way is to blend the over-dried popcorn with high-moisture popcorn to produce a desired "average" moisture.

Blending, however, does not always provide satisfactory results. One requirement in blending is an accurate knowledge of both the moisture contents of the lots being blended and the blending flow rates to insure that the desired average moisture content of blended popcorn is attained. Even then, the moisture levels of the blended grains will not be exactly the same at equilibrium. The higher-moisture grain will always maintain a slightly higher moisture content than the lower-moisture grain in the blend. However, a difference of less than 1% will not have a measurable effect on popping volume.

Heated-air drying is generally not recommended for popcorn because of problems with over drying, non-uniform drying and occurrence of stress cracks from too rapid drying. Its use, however, may be necessary to prevent spoilage or speed the drying process. If so, and to minimize the amount of stress cracking, drying air temperatures should be in the 90-100°F range, with 120°F being the maximum.

Higher quality popcorn can be expected if drying is done in several stages, with a 12-24 hour tempering period between stages to allow for moisture redistribution within the kernels. An alternative to this is a two stage combination drying system where a heated-air dryer is used to reduce moisture content to approximately 17-18%, then a natural-air or low-temperature drying system finishes the conditioning process.

#### **K. Storage:**

For best storage, the moisture content of popcorn must be low enough to prevent significant fungal and microbial activity, but not so low as to adversely affect its popping volume. Popcorn at 14.5% moisture can be safely stored over winter and into early spring. For longer term storage, it should be dried to 13.5-12.5%.

Aeration systems similar to those systems used for dent corn should be provided for shelled popcorn storage bins to prevent moisture migration and help maintain grain quality during storage. Ear popcorn cribs must allow good natural ventilation and be designed to prevent rain and snow from getting into the popcorn.

Before storing a new crop, all bins and cribs should be cleaned and treated for insects; the grain can also be treated as it is put into storage. Use only those insecticides approved for this type of application, and apply according to manufacturer's recommendations. Popcorn that has not been treated with any insecticide must be watched carefully for any sign of insect activity, particularly if it is to be stored after the weather warms up in the spring. An aeration system will tend to reduce insect activity in the winter by keeping the grain near the average outside temperature. Storage in refrigerated warehouses will prevent damage by stored grain insects. All cribs and bins for popcorn storage should also be rodent proofed. To do this, keep the surrounding area free of weeds and trash, which can harbor rats and mice, and apply an approved rodenticide as necessary to prevent problems from developing in the storage facility.

#### **L. Yield Potential and Performance Results:**

In the major commercial production regions, popcorn yields (measured as pounds of shelled corn per acre) for the years 1977-1981 averaged nearly 2900 pounds which, at 65 pounds per bushel, is equivalent to about 44 bushels per acre. Nebraska usually reports the highest yields because of its high proportion of irrigated acres.

On a weight basis, popcorn hybrids can be expected to yield a little less than half as much as dent corn hybrids. No popcorn yield trials have been conducted in Wisconsin or Minnesota in recent years.

### **Economics of Production and Markets:**

As with any specialty crop, marketing and economics are extremely important considerations in profitable popcorn production. The grower considering a large acreage must be familiar with marketing outlets for the crop and the economics involved.

Generally, three markets are available for good-quality popcorn: processor-contracted acreage, open-market sales, and local sales. However, since not all harvested popcorn may be marketable as popping corn, thought should be given to alternative uses or outlets.

Processor-contracted acreage. Most popcorn is grown under contract to processors. This acreage is adjusted annually to the processors' estimated needs as determined by market analysis. Normally, these estimates are very close to actual demands, which tend to stabilize the popcorn market.

Most contracts specify that a grower plant a given number of acres with a certain hybrid for a fixed price per 100 pounds of delivered popcorn. As an alternative to fixed pricing, some processors write contracts using the commodity price of popcorn on the Board of Trade on a given day, thus allowing the grower some flexibility in the system. By keeping abreast of popcorn supply and demand as well as the price of dent corn and soybeans, processors are able, under normal growing conditions, to contract popcorn at prices that provide a reasonable profit for the successful grower. Hence, growing contracted popcorn is generally competitive with dent corn.

Open-market sales. A popcorn grower who plans to sell on the open market assumes the risk of fluctuations in price. A year or so of high popcorn prices relative to dent corn not only tempts regular popcorn growers to increase their acreage, but also attracts new growers, the result often being over-production, low prices and financial loss. Thus, it is unwise, especially for the novice, to plant a large acreage of popcorn immediately following a year of high prices.

An open-market grower must be aware of current acreage and crop conditions, as well as probable market demand and carryover. The grower should be prepared, financially and storage facility-wise, to hold the crop for an extended length of time. Good-quality popcorn stored

under good conditions will keep indefinitely, allowing the grower to wait for a price that ensures a profit.

Local sales. This market alternative requires a longer-term commitment to popcorn production. Depending on the level of involvement, it can entail becoming a popcorn processor on a small scale. Success in the local sales market depends on the ability of the grower, as both producer and merchant, to grow and process a high-quality product and utilize proper packaging. Growers lacking in any of these areas will likely not fully satisfy their direct sales customers, and sales will drop rapidly, especially in light of the number of competitive popcorns readily available in stores.

Alternative outlets. If the crop is not marketable as popping corn, it can be ground and fed to livestock or poultry. Any outlet for unmarketable popcorn that provides some monetary return on the crop will lessen the extent of the financial loss.

Home Garden Production. All that is required to grow popcorn for home use is adequate space and a little gardening know-how. Most seed catalogs list popcorn varieties for home gardeners. To find one that grows best under your conditions, try several over a couple of years; and keep testing new ones as they come on the market. Maturity is important in variety selection because popcorn that does not reach full maturity before frost will have very poor quality.

Plant popcorn according to package directions. It is better to plant several short rows side by side than one long row. Also, do not plant sweet corn and popcorn in the same garden; if they happen to shed pollen at the same time, the sweet corn quality might be reduced. Popcorn requires adequate nitrogen and should be fertilized accordingly.

Harvest popcorn only after the kernels are hard and the husks completely dry. After picking, remove the husks and store the ears in bags that allow air movement so ears can dry. Each week, shell a few kernels and try popping them. When they pop well, shell the remaining ears and store in moisture-proof containers. Because popcorn can become infested with several types of insects, refrigeration is the best long-term storage.

Determining if moisture content is optimum for the best popping volume is a difficult problem. If the popcorn is "chewy" after popping, it is probably still too wet; so allow the kernels to dry some more, popping a sample every couple of days until the flakes are no longer chewy.

Popcorn that pops poorly with many unpopped kernels is probably too dry and needs moisture. Start by adding one tablespoon of water to a quart of popcorn, mix well a couple of times that day, then after 2-3 days try popping another sample. Continue this procedure until the popcorn pops well.

**Information Sources:**

- Popcorn Production and Marketing. 1985. K. E. Ziegler, R. B. Ashman, G. M. White, and D. S. Wysong. National Corn Handbook, NCH-5, Purdue University, West Lafayette, Indiana.
- Popcorn. 1987. L. W. Rooney and S. O. Serna-Saldivar, in Corn: Chemistry and Technology, Edited by S. A. Watson and P. E. Ramsted, American Association of Cereal Chemists. p. 420-421.

*References to pesticide products in this publication are for your convenience and are not an endorsement of one product over other similar products. You are responsible for using pesticides according to the manufacturer's current label directions. Follow directions exactly to protect the environment and people from pesticide exposure. Failure to do so violates the law.*

**Additional Information:**

- Raw popcorn is considered a snack food.
- Manufacturing the popcorn for sales is minimal. Harvesting, drying and winnowing are the major components.
- Packaging for popcorn must be air tight. This can be something as simple as a zip lock bag, a jar and lid, or a thick mil plastic bag with a pleated bottom. As long as it will keep the moisture in the bag, it will be ideal for popcorn.
- Most bulk popcorn sold is done in bags. Specialty raw popcorn is sold in plastic or glass containers. All do the same thing.
- Labels list ingredients, which in this case is popcorn. Since it is a snack food, there are requirements as to nutrition facts (see examples). All labels have a distribution contact, including web site if it exists. Those sold in retail specialty foods stores and general grocery stores have barcode inventory system on the package, and a use-by date. Most labels have directions for popping corn.

- Separate colored or not colored labels, or printed bags is entirely up to producer and budget restraints.

### **Sales and Marketing:**

- Bulk bagged popcorn can be sold at the farm stand, and at farmers markets under the cottage food industry.
- Packages can be dressed up as fancy as your budget allows
- Sampling in Ohio is unrestricted, and an excellent way to sell your product.
- Different sizes of bags and containers will give your product more variety, and attract a wide variety of customers.
- If selling at the farm stand, you might want to look for second sale items for more revenue: popcorn bags or boxes, popcorn salt, popcorn oil to name a few.
- Experiment with popping the corn right on the cob. It has been marketed that way in the past with 3 cobs decoratively wrapped with directions.
- Organizations have been successful in selling bulk popcorn for fundraising.