



## Frequently asked question/FAQ

### 1. **What are the different types of maize grown in the world?**

The different types of maize are Flint, dent, floury, sweet or sugary, popcorn, waxy, multi colored and various other types of maize are grown throughout world. The colour, size, kernel shape and other attributes varies significantly. The production of yellow maize predominates in the United States, Brazil and China. However, white maize is preferred in Africa, Central America and Northern South America because of its sweeter, more flavor products.

### 2. **What are the uses of gluten and hull?**

Gluten and hulls are mainly used in the production of livestock and poultry feed starch, corn starch, chewing gum, bakeries, baking powder, and brewing confectionery. In industries they are used in the production of textiles, laundry, paper and paper boxes, explosives, cosmetics, adhesives.

### 3. **What are the major by products from maize milling industry?**

The by-products from maize based industries are

- i. Maize (Corn) Steep Liquor
- ii. Maize Gum/ corn oil
- iii. Maize Gluten
- iv. Maize Husk

### 4. **Write a note on the use of corn starch?**

Commercial cornstarch is used in the manufacture of sweeteners, sizing of paper and textile and as a food thickener and stabilizer. Starch finds uses in fast food, sweets, sausages, tablets, paper, corrugated board etc. They plays a prominent part in our everyday life.



Almost, fifty percent of starch was converted to High Fructose Syrups (HFS).

**5. Write a note on the steps involved in the production of maize starch?**

The basic unit operations involve in the production of maize starch from raw maize are

- **Cleaning:** The raw material is cleaned to remove foreign matters.
- **Steeping:** Kernels are steeped in large tanks of warm water containing acid and sulphur dioxide. The steeping is for a short period of time.
- **Milling:** Soften kernels are wet milled in a pool of water.
- **Settling and Decanting:** The milled product is allowed to settle under gravity and thereafter, the water is decanted to obtain a thick slurry of corn mass
- **Sieving:** The slurry is sieved to remove the husks
- **Centrifuging:** The starch with the slurry less germ and husks is separated from the protein
- **Dewatering:** The starch is dewatered to form starch cake
- **Granulating:** The cake is broken to smaller pieces to increase its surface area to effective drying
- **Drying:** The starch is dried using flash dryer
- **Milling:** The dried corn starch is milled into desirable particle size
- **Packaging:** The starch is packaged appropriately in air tight and moisture impermeable packaging material.

**6. Write a note on the dry milling of maize?**

Maize is dry milled in two ways by stone grinding the kernels to produce hominy grits and whole meals rich in bran and germ. The latter process produces highly refined grits, meals and flours with longer shelf lives.



## 7. Write a note on the maize production of the world?

United States, Brazil, Mexico, Argentina, India, France, Indonesia, South Africa, and Italy produce 79% of the world's maize production. Between 1990 and 2011, the area of maize cultivation increased from 129.1 to 163.9 million hectares. During the same period the production of maize in metric tons per hectare increased from 3.7 to 5.1, and total maize production increased from 482.0 to 832.5 million metric tons.

## 8. What are the major uses of maize?

Worldwide, 60–70% of maize production is used domestically as livestock feed, and the remaining 30–40% is used for production of items for human consumption. Japan does not produce maize, but is the top maize importer in the world. 90 per cent of Japan's maize requirements comes from USA and another 8-9 per cent from Argentina and Brazil. Industries in need of starch include textile, pharmaceuticals, food and beverages, paper and packaging, manufacturing and chemicals depend on maize.

## 9. How is maize starch and gluten separated?

In the modern process, the slurry containing starch and gluten is concentrated. Then the lighter gluten particles are separated from the relatively heavier starch particles by the centrifugal force in high speed centrifuges. The centrifuging of starch is carried out in two stages. In many modern plants, the second stage of centrifugation is performed by number of hydro clones type of equipment. The starch obtained from the second stage of separation is filtered and then dried to produce dry starches.

## 10. Explain the process of wet processing?

The wet milling process employed by starch manufacturers is considerably different from other processes due to large quantity of water required for the process, resulting in the liquid product.

The wet milling process consists of the following steps: (a) cleaning, (b) soaking, (c). germ separation and germ recovery (d) milling and fibre recovery and; (e) separation of starch and gluten.

Cleaning: All impurities such as dust; chaff, cobs, stones; insect-infested grain and broken grain, and other foreign materials are removed from corn by screening and aspirating.

Steeping/soaking: The major objectives of steeping are 1) soften the kernel for grinding, 2) separation of germ, 3) separation of gluten from the starch granules, 4) remove soluble portion, mainly from the germ. Water impregnated with SO<sub>2</sub> (i.e, acidulated water with sulphuric acid) at



50°C is used for steeping for a period varying from 28 to 48 hours. The steeping is carried out. The steeped corn attains a moisture content of about 45 per cent.

Germ Recovery: The wet and softened corn kernels is conveyed to the degerminating unit. Where the soft kernels is teared apart freeing the germs without grinding them. The germ being lighter is separated from other heavier ingredients, by centrifugal force.

Milling and Fibre Recovery: Endosperm and hull are ground by either traditional Burrstone mill or modern entoleter impact mills. The milled slurry, containing the ground starch, gluten, and hulls, is passed through a series of hexagonal reels where the coarser hulls and fibres are removed.

### **11. What makes maize an ideal cereal for processing?**

Among all cereals physical properties and composition of maize is ideally suited for processing. The nutrient compositions indicates that among the cereals maize has the highest fat content. Corn oil is a high value product making this crop economically viable for processing. Maize also has high fibre content which aids in processing. This makes it one of the important cereal for processing.

### **12. Write a note on the production of maize in India?**

India is one of the major producers of maize in the world with Karnataka being the top producer. Annual increase of production of 5.5 per cent has been achieved, which increased the yield from 14 Mn MT in 2004-05 to 23 Mn MT in 2013-14. Our toal area under maize cultivation is 8.6 Mn Hectares with an average yield of 2.7 Tonnes / Hectare. This productivity is less than half the global average of 5.5 MT/hectare. An effort to increase the yield per hectare is the requirement for our country.

### **13. List the major reasons for low yield of maize in India?**

Maize is grown throughout the year in India. It is predominantly a kharif crop with 85 per cent of the area under cultivation in the season. Maize is the third most important cereal crop in India after rice and wheat. It accounts for approximately 9 per cent of total food grain production in the country.

Constraints for low productivity of maize in our country are

- Climatic conditions resulting in drought/excess water associated with increased pressure of diseases/ pests
- Cultivation in kharif is mainly under rain-fed conditions on marginal



lands with inadequacy in irrigation

- Lack of development of single cross hybrid technology, which is a key to higher productivity gains like USA, China and other countries. This results in deficiencies in the production and distribution system of quality seed
- Small farm holdings and limited resource availability with farmers

**14. Explain the controversies involved in the utilization of maize for alcohol production?**

Bioethanol is the major alternate fuel for automobile industries. This is considered as clean fuel. In developed countries alcohol is produced from the glucose which is produced from maize starch. This has led to the debate whether, food crop can be used for alcohol production to be used as an alternate fuel to petrol for running cars. Should it not go for the production of food for the poor people in the developing and poor countries?

**15. Describe the structure of Maize?**

Maize seed is a single fruit called the kernel. It includes an embryo, endosperm, aleurone, and pericarp. The pericarp is a thin outer layer that has a protection role for the endosperm and embryo. Pericarp thickness ranges from 25 to 140  $\mu\text{m}$  among genotypes. Pericarp adheres tightly to the outer surface of the aleurone layer and is thought to impart semi permeable properties to the corn kernel. A waxy cutin layer that retards moisture exchange covers an outer layer of cells, the epidermis. The endosperm usually comprises 82-84% of the kernel dry weight and 86-89% starch by weight. The germ is composed of the embryo and the scutellum. The scutellum acts as the nutritive organ for the embryo, and the germ stores nutrients and hormones that are necessary for the initial stage of germination.