Processing of cashew nuts

Hello,, Viewers Welcome to the lecture series of Food Technology, In Today's lecture I am going to deliver the lecture on "Processing of Cashew nuts.

This episode divided into the following five sections

- 1. Introduction
- 2. Processing
- 3. Environmental Pollution in cashew nut processing
- 4. Health benefits of Cashew nuts and
- 5. Conclusion

Introduction

Cashew is one of the important tropical crops called as "poor man's crop, rich man's food". The cashew nut is native of Brazil from where Portuguese travelers took the cashew plants to India. In India Cashue plant first recorded in Cochin by 1578, in Goa by 1598.

The crop is grown mainly in peninsular states of India particularly along the coastal states like Kerala, Karnataka, Goa, Maharashtra, Tamil Nadu, Andhra Pradesh, Orissa and West Bengal.

India processed about 1.18 million MT of raw cashew seeds through 3650 cashew processing industries scattered in many states of country and providing employment to over half million people.

The cashew industries in India employed different methodology for processing. It depends on the variety of raw material, location, technological mechanization and availability of secured energy supply.

2. Processing

There are two commonly followed methods of cashew nut processing such as Steam cooking process and Roasting process.

In cooking process vegetable oil is extracted from the cashew shell of the seeds, which is used in paint and adhesive industries. Due to lack of skilled man-power for cutting process of cooked nut and difference in taste of nut, many of the industries in India are following roasting process.

In the roasting process, thick black smoke is released from the rotating roasting drum called Broma chamber through the stack. The smoke generated through this process has irritating odor and it is public nuisance in the neighborhood. Including this, it is also a source of air pollution and waste water is generated from the quenching operation of the roasted cashew nut discharged. Cooking process also discharges wastewater from the steam cooker and emits air pollutants by Baby Boiler for steam generation and Borma heater.

Since these industries are small and cottage category units, no conventional and technoeconomically cost effective pollution abatement systems. Therefore it has become necessary to study the entire cashew nut processing industry sector in India to suggest techno-economically feasible environmental standards.

Even though the pollution load from individual unit is relatively low, the magnitude of pollution problem from the cluster of units is very high.

General Steps involved in the Processing of cashew nuts

The general processing steps involved in cashew processing are,

- Drying of freshly harvested raw seed for storage
- Soaking of seed
- Steam cooking or roasting
- Decortications which means that the removal of outer layer
- Separation
- Kernel that means edible part of nuts drying
- Peeling and Packing.

Drying of raw nuts

Sun dried in yards, weight loss may vary from 3% to over 10% depending on time of harvesting and area of origin. The raw nuts after harvest are sun dried for 2-3 days to reduce the moisture from 25 % to 9 % and stored in gunny bag. The raw cashew nut contains the kernel 20-30 percent and papery seed coat 2-3 percent.

Therefore, the remaining 70-75 percent raw nut weight is the shell.

ROASTING: There are two type of roasting in the process

1. Drum Roasting - Nuts passed through heated drum where it catches fire for 2-3 minutes

2. Oil-Roasting: Dried nuts conditioned with water passed through a hot oil bath by conveyer. In this condition, the nuts come out.

STEAMING

This method now a day's adopted widely all over India. The dried nuts are steam cooked. Well dried raw nuts are subjected for steam boiling which is commonly adopted method of nut conditioning in India.

The raw nuts are steamed conditioned about 90-100 lb pressure for 25-30 minutes and then allowed for 24 hrs cooling.

Decortications

Decortications either by shelling or cutting

In SHELLING–Roasted nuts have to be shelled by breaking shells with wooden mallets In CUTTING – Steamed nuts have to be cut with blades mounted on wooden tables. Raw nuts after conditioning and cooling are to be shelled to remove kernels with the help of hand cum pedal operated shell cutter. After shelling the kernels and shell pieces are separated manually.

The kernel after shelling will have moisture content more than 10 %. Therefore, dry the kernels to moisture content about 3.5-4.5%. Dry the kernel in hot chamber at 65-70 degree centigrade in perforated tray for 6-8 hours. After drying, the kernels are kept in moist chamber for 4-6 hours for easy removal of brown skin and minimum broken kernel.

Peeling

The brown skin cashew nuts are peeled off and initial grading by wholes, pieces and color takes place.

The peeling process involved removal of testa from the kernel with the help of sharp knife **Grading**

The kernels are graded by Cashew Export and Promotion Council specifications are adopted for grading of cashew kernels

Filling

The graded kernels are:

(a) Vita packed in 25lbs tins – after vacuuming and infusing carbon dioxide, or

(b) Packed in 25lbs or 50lbs gas infused flexi packs.

Packing

(a) Two 25lbs tins are packed in a corrugated box. Or

(b) Two 25lb or one 50lb flexi packs are packed in a corrugated box

Roasting Process

The roasting of cashew seeds is carried out in a manually rotating open drum of diameter 600 mm and 2.5m length, with an inclination of axis 15°–20° to facilitate the flow of the material from inlet to outlet by rotation of the drum and gravity.

The drum is placed in a 'dog- house' (means that cage like house). Initially the drum is heated externally by firing about 25 to 30 kg of roasted cashew shell for about 15 to 20 minutes. Once the drum is heated up, the cashew nuts are fed manually through an elevated hopper into the inlet of the hot drum. The drum is rotated manually, so that the cashew nuts are moved from inlet to outlet of the drum. Due to the high temperature of the drum, the Cashew Nut Shell Liquid in the cashew nut catches fire spontaneously and the nuts are roasted through the entire length of the drum without any supporting fuel.

Cashew Nut Cooker A cylindrical steam cooker with provision of cashew nut feeding at the top and discharging of cooked nuts from the side near bottom, has a capacity of holding 4 bags (80 kg each) of cashew nut in a batch. Once the cashew nut is loaded, steam from a boiler is introduced into cooker at a pressure of 7.0–8.5 kg/cm². The cashew nuts in the cooker are steam cooked and when all the nuts are sufficiently cooked, the excess steam starts releasing near the bottom outlet. The steam is injected into the cooker till the steam starts escaping from the outlet mouth of the cooker. This process takes about 10–20 minutes time. Then the steam injection into the cooker is stopped and the condensed water

at the bottom of the cooker is discharged in to a container and disposed on ground through septic tank.

In cashew nut cooking process in Kerala have different process in steam injection quantity. The steam is injected for about 15 minutes even after the steam starts escaping from the outlet mouth of the cooker. This method consumes more steam. The cooker condensate water is the source of water pollution. The cooked cashew nut are removed from the bottom of the cooker and spread on the floor for cooling.

The cooled nuts are sent for cutting section to cut open and collect the kernel. The total batch time is about 40–45 minutes. Usually, the units are provided with a baby boiler and minimum two cookers, while one cooker is in cooking operation, the other cooker is in unloading and loading operation. Normally the cooking operation is carried out for 2–4hrs in a day, cooking 5 to 10 batches of nuts, depending on the production capacity of the units.

Kernel Drying (Broma)

The kernel coming from the Roasting Process as well as Cooking Process contains a brown cover, known as 'testa', over it. To remove testa over the kernel and also control the moisture content in the kernels, they are exposed to prolonged and controlled heating with hot air at 80-90°C for about 6-7 hrs in the chamber. About 5–8% of moisture is removed from the kernels in the process. This process is known as "Borma". Indirect heating of atmospheric air generates the hot air over hot surface in a "Oven". The Borma Ovens are fired with cashew shell from Roasting Process or de-oiled cashew cake from Cooking Process for about 4–6 hrs depending on the quantity of kernels to be dried. The flue gases from the oven are discharged by a natural draft stack of about 13–15m hight. Kerala and Maharashtra states in India most of the small scale units carried out the Borma operation by electric heaters which consume large electricity and the process will be dependent on power supply. The process description and environmental pollution discharge. The yield of various products from cashew processing from both the methods

3. Environmental Pollution in cashew nut processing

The cashew nut processing is requires intensive manpower, generally carried out during 6-18 hrs only during the day time. During the process of cashew nuts the hot gases from the inlet of the drum are discharge into atmosphere by a natural draft stack of about 15–18 m height. The cashew nuts, in burning state, are discharged at the outlet of the drum and quenched immediately with spray of water to prevent further roasting. The water consumption by quenching process is in the range of 14–21litre/100 kg of nut roasted. The ash generated from the drum initial firing with roasted shell is sprinkled on the wet nuts to prevent sticking. The quench water is collected in a oil trap and discharged on ground as wastewater. The water vapor and fumes generated while quenching are discharged by independent short vents connected to the dog-house.

In some units, these vents are also connected to the main chimney.

The cooled nuts are sent for shelling. The manual feeding of the cashew nut and the rotation of the drum are so synchronized that about 6 to 7 bags of cashew nut are roasted in an hour (Each bag weigh about 80kg of cashew nut).

The pollution in the steam roasting process, commonly known as "cooking process" which consists of a baby boiler followed by a steam cooker where the cashew nuts are cooked with steam.

The baby boiler is a hand stoked fire tube boiler, which produces steam at 7.0–8.5 kg/cm². The roasted cashew shell or de-oiled cakes are fed manually (about 2 to 3 kg fuel once in 15 to 20 minutes) at the bottom of the boiler. The combustion air is drawn through the gate by natural draft stack at the top of the boiler. The flue gases from the boiler are discharged into atmosphere through the stack 12–15m hight. The flue gas emissions from the boiler are the source of air pollution.

Environmental Standards for Cashew Processing Industries

The environmental standards approved by the Peer & Core Committee of Central Pollution Control Board for the cashew Seed Industry.

Pollution control board strictly suggest the stack height, it results in better dispersion of Sulphur Dioxide, Nitrogen Oxides and Phenolic Compounds pollutants into the atmosphere. By implementing the appropriate stack height the ground level concentrations of these pollutants can minimize.

Waste water Discharge Standards

The wastewater generation from different sources of cashew nut roasting and cooking process are as follows:

Quenching operation in roasting process: 200 liters/day. In this process 2–4 hrs of operation in a day.

Cooking Process: 70-80 liters/day

In view of such infrequent nature of wastewater generation, this water with Biochemical oxygen demand of 5000 ppm, Chemical oxygen demand of 10000 ppm and Oil & Grease Extractable, mostly in the form of phenolics compounds at 2000 ppm.

The following alternatives are recommended to comply with following wastewater discharge standards for disposal on land Solid Waste Disposal Practices

• The use of cashew shell generated especially by roasting process, as fuel, has to go through bio gasification route to convert into less polluting fuel gas term measure

•The ash generated at the bottom of 'Borma' air heater as well as the Steam Boiler and excess ash from initial firing of the roasting drum, have to be properly condensed using with necessary precautions so that there are no secondary air emissions.

• The cashew shell or de-oiled cake should not be sold to retail users for domestic and commercial firing purposes due to their obnoxious odour.

Cashew Nut Industry

New and Relocation-sitting Criteria: Even though the pollutant emission load into environment by a single cashew nut unit is low, it has been observed that the total

emissions load by number of such units in a cluster causes considerable environmental degradation. To avoid the combined effect by number of units on the environment, the cashew nut processing industries with roasting/cooking process have to be located with the following criteria

1.0 Cashew Seed Processing Industry shall be established at least 1.0 km away from residential area, hospital, schools, public building or a place where flammable substances are stores / processed.

2.0 Cashew Seed Processing Industry shall be established 5.0 km away from notified municipal limits of any town/city or airport.

3.0 Cashew Seed Processing Industry shall not be constructed within 200 m from the middle of Railway Tracks, National Highway and State Highway and 50 m from the middle of other roads.

4.0 In normal circumstances, installation of new cashew seed processing industry shall not be allowed in sensitive area notified by the State Pollution Control Boards / Pollution Control Committees under the provisions of the National Air Quality Guidelines using coal as fuel.

5.0 The distance between the Cashew Seed Processing Industries should not be less than 500 meter to avoid clustering of Cashew Seed Processing Industry in an area.

4. Health Benefits of the Cashew Nut:

1. Prevents Cancer:

Proanthocyanidins are a class of flavonols which fight against tumor cells by stopping them to divide further. These proanthocyanidins and high copper content in cashew nuts help fight against cancerous cells and keeps you away from colon cancer. This is one of the major cashew nut benefits.

2. Healthy Heart:

Cashews contain low fat content when compared to other nuts and that too in the oleic acid form which is very healthy for heart. They are cholesterol free and the antioxidants present keeps you away from heart diseases.

3. Lowers High Blood Pressure: Cashew nuts lower your blood pressure with the help of magnesium present in them.

4. Helps Hair: Copper is the mineral which helps your hair get that color. So if you take cashews which are full of copper content, you can get that black hair that you always wished for.

5. Healthy Bones: Like calcium, magnesium is also important for bone health which is the main content in cashew nuts.

6. Healthy Nerves: Magnesium is stored on the bones surface which prevents calcium from entering the nerve cells and thus keeps the blood vessels and muscles relaxed. Insufficient amount of magnesium can lead calcium to enter the blood vessels leading them to high blood pressure, migraine headache etc.

7. Prevents Gallstones: Daily intake of cashew nut can reduce the risk of developing gallstones up to 25%.

8. Helps in Weight Loss: Even though cashew nuts are considered as fats, it contains good cholesterol. So contrary to popular belief, those who eat cashews at least twice a week gain less weight when compared to those who eat less.

9. Anti-oxidants: Selenium, copper, magnesium etc. act as co-factors for many enzymes.

10. Helps Digestion:

Cashew nuts help in growth and development, nucleic acid synthesis and digestion

11. High on Vitamins:

Cashew nuts are rich in vitamins like riboflavin, pantotheonic acid, thiamin, niacin etc. These vitamins keep you safe from sideroblastic anemia, pellagra, etc.

12. Healthy Gums and Teeth:

As mentioned before, the magnesium content present in cashew nuts is very good for bones. So it gives healthy teeth as well as strong gums to hold them.

13. Pleasant sleep:

After menopause, these cashew nuts can give you relaxed and pleasant sleep during nights.

14. Free Radicals:

Cashew nuts help our body to utilize iron properly and eliminate free radicals which cause health problems.

15. Macular Degeneration: Macular degeneration is the leading cause of severe vision loss in people over age 60, Cashew nuts have the ability to filter Sun's UV rays and protect us from macular degeneration.

5. Conclusion

The cashew tree is a tropical evergreen tree that produces the cashew seed and the cashew apple. It can grow as high as 14 meters, but the dwarf cashew, growing up to 6 meters, has proved more profitable, with earlier maturity and higher yields.

Cashews are not actually nuts but seeds. They are a popular snack and food source. Cashews, unlike oily tree nuts, contain starch to about 10% of their weight. This makes them more effective than nuts in thickening water-based dishes such as soups, meat stews, and some Indian milk-based desserts. Many Southeast Asian cuisines use cashews for this unusual characteristic, rather than other nuts. The shell of the cashew nut is toxic, which is why the nut is never sold in the shell to consumers

The general processing steps involved in cashew processing are, drying of freshly harvested raw seed for storage, soaking of seed, steam cooking or roasting, decortications, separation, kernel drying, peeling and Packing.

In a 100 gram serving, raw cashews provide 553 calories, 67% of the Daily Value (DV) in total fats, 36% DV of protein, 13% DV of dietary fiber and 11% DV of carbohydrates .

Cashews are rich sources of dietary minerals, including particularly copper, manganese, phosphorus, megnesium, vitamin-B6 and vitamin-K. Iron, potassium, zinc and selenium are present in significant content. Cashews 100 grams raw contain 113 mg of beta-sitosterol. Although, there is a lot of the health benefit in eating the cashew nuts, but don't eat too many at once. Because of their high fat content, over consumption of cashew nuts can cause unwanted weight gain in individuals. Thank you