SNS COLLEGE OF TECHNOLOGY
(An Autonomous Institution)
Coimbatore – 641035.

**Unit 4 – Topic 6**

**Processing of oil seeds**

## 7.0 Introduction

India is fourth oilseed producing country in the next only to USA, China and Brazil. Many varieties of oilseeds, the major oilseeds are soybean, cottonseed, groundnut, Sunflower, Rapeseed, Sesame seed, Copra, Castor seed and Palm Kernels. India occupies the place of pride as the world's largest producer of Groundnuts, Sesame seeds, Linseeds and Castor seeds. Ending on the period of cultivation, the oilseeds are classified as "Kharif crop" and "Rabi crop".

The oils and fats are composed of mixtures of glycerides of various fatty acids. The fats and oils are broadly classified in to edible and non edible. Groundnut, soybean, mustard are some of the sources of the edible oil. The edible oil is main source of fat taken in daily meals and is used for cooking purposes and salad dressings. Oils are also used in the soap industry, paint, varnishes and plasticizers industry. The mechanical expression and solvent extraction methods are employed for the manufacture of oil from the oil seeds.

## 7.1 Raw material preparation

Oilseed and nut should be properly dried before storage, and cleaned to remove sand, dust, leaves and other contaminants. All raw materials should be sorted to remove stones and moudly nuts. Some moulds, especially in the case of groundnuts, can cause aflatoxin poisoning. When storage is necessary, this should be in weather proof, ventilated rooms which are protected against birds, insects and rodents. Some raw materials (for example groundnuts, sunflower seeds) need dehusking (or decorticating). Decortication is important to give high yields of oil and reduce the bulk of material to processed. However, expellers normally require a proportion of fibrous material in order to work and, particularly with groundnuts; some husk is normally added to allow oil to escape more freely from the press. Coconut is dehusked and split manually by skilled operators. Most oilseeds (copra, palm kernels and groundnuts) need grinding in mills

before oil extraction to increase the yields of oil. All oil-bearing materials need to have correct moisture content to maximize the oil yields.

**7.2 Oil Extraction methods**

**a) Mechanical expression**

During the process of mechanical expression, the oil seeds are compressed in various types of compression devices/equipment. Expression is the process of mechanically pressing liquid out of liquid containing solids. Screw press, roll presses, collapsible plate are some examples of wide range of equipment used for expression of liquid.

**i) Hydraulic press**: The hydraulic press is considered of a series of horizontal corrugated iron plates. These plates are separated by 4 – 14 premoulded oil seed cakes. Pressing is completed in two stages. In first stage, the oil seeds are pressed at about 5 MPa for 15-20 min and then pressure of 28 MPa is applied for 5-10 min to complete the expression process. The recovery of the oil varied depending upon the sizes and seed being pressed. But, the at commercial level, the hydraulic press is replaced by screw type presses.

**ii) Screw press**: A screw press has a horizontal main shaft. The screw assembly is formed integrally with this shaft. The screw rotates within a cage or barrel. The barrel is made of case hardened, tool steel bars or rings to allow drainage of the oil as the pressure on the feed material is increased. At the discharge end, a movable choke or cone controls the operating pressure. It is achieved by changing the width of annular space through which the oil cake passes. The choke is adjusted by a hand wheel on the opposite end of the screw. The configuration of screw is such that the volume displacement at the feed end of the press is considerably greater than at the discharge end. As a result of such configuration, as the material is conveyed from feed end to discharge end, it is subjected to increasing pressure. As pressure increases, the material is compressed and oil is expelled through the spacers between the cage lining bars.

**iii) Ram press:** A long pivoted lever moves a piston backwards and forewords inside a cylindrical cage constructed from a metal bars spaced to allow the passage of oil. At one end of the piston's stroke, it opens an entry port from the seed hopper so that seed enters the press cage. When the piston is moved forward, the entry post is closed and the oilseed is compressed

in the cage. As a result, oil is expelled from the oilseed the emerges through the gaps in the cage. Compressed seed is pushed out through the gaps in the cage. Compressed seed is pushed out through circular gap at the end of the cage.

**b) Oil Extraction**

Extraction is a process of separating a liquid from a solid system with the use of a solvent. Extraction is also a process of diffusion with the help of low boiling point solvent. This process gives a higher recovery of oil and a drier cake than expression. Solvent extraction is capable of removing nearly all of the available oil from oilseed meal. This extraction process provides meal of better preservation qualities and with higher protein qualities.

In this process, the solvent is poured to the well prepared material. It is then followed by the diffusion of oil solvent mixture to the surface of solid for recovery of oil. The most common solvent used in India is *n-hexane* having boiling point of 65.5 ºC. The oil is separated from mixture of oil and hexane called miscella by distillation and stripping under vacuum. The extracted meal having hexane is de-solventized by heating with live steam in a de-solventizer. This meal is known as deoiled cake and it contains about less than 1 % residual oil. The solvent from the distillation and stripping columns as well as from the de-solventizer is condensed and recovered and stored in the solvent storage tank. The separated from the miscella goes to the storage tank after cooling.

Solvent extraction plant use hexane as a solvent to extract oil from oilseed cake. These plants are expensive and only suitable for large volumes which justify the capital cost of equipment. Where large amounts of oilseed cake are available, solvent extraction becomes a commercially-viable option to extract residual oil left in the cake and leave an almost oil-free powder known as oilseed meal. Both cake and meal are incorporated in animal feeds.

**7.3 Process of Oil Refining**

In many local markets further refining is not required as the complexes of unrefined oils are preferred. International markets tend to prefer lighter less intense oils for cooking which means further processing of the oil. There is serious of refining processes that can be carried out after the oil has been filtered.

**i) De-odorising**

Volatile compounds that produce bad odours can eliminated through the process of sparging, i.e. bubbling steam through the oil, under a vacuum.

**ii) Wintering**

Allowing the oil to stand for a time at low temperatures so that glycerides, which naturally occur in the oil, with higher melting points solidify and can then be removed from the oil by filtering. Over time glycerides can degrade releasing fatty acids into the oil increasing the acidity levels and reducing the quality.

**iii) Neutralisation**

Fatty acids can be neutralized by adding a sodium hydroxide solution, also known as caustic soda, or by stripping, which is a similar process to de-odorising.

**iv) Bleaching**

Some oils have a very dark colour to them that is unpopular with consumers. The appearance of the oil can be lightened by bleaching.

**v) De-gumming**

De-gumming is a way of treating seed that have high phosphatide content. The phosphetide, which makes a gummy residue, is removed by mixing the oil with 2 to 3% water. This hydrated phosphatide can then be removed by settling, filtering or centrifuged.

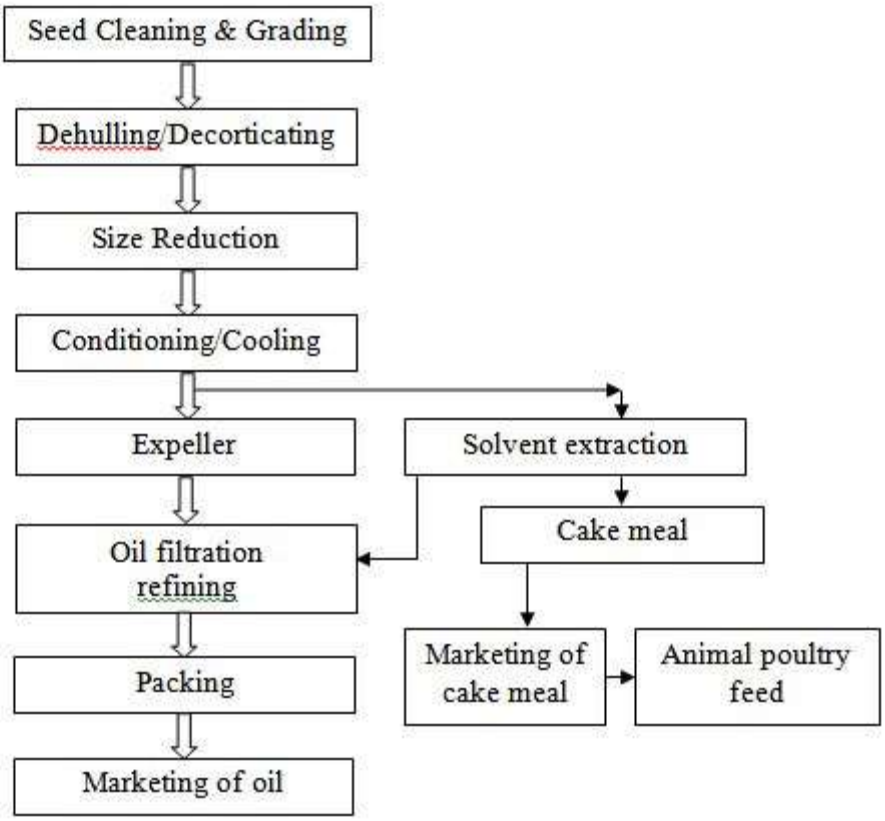


**Fig. 7.1 Process flow chart of oil seeds processing**

**References**


- Anon. (2004). Course manual for short course on Post harvest processing and agro processing centres for value addition in rural areas. Post Harvest Technology Scheme, University of Agricultural Sciences, Bangalore.
- Anon. (2011). Report on Bench Marking of Food Processing Technologies. Indian Institute of Crop Processing Technology, Thanjavur.
- Chakraverthy, A. (1995). Post harvest technology of cereals, pulses and oilseeds. Oxford & IBH publishing Pvt. Ltd., New Delhi.
- Pandey, P. H. (1998). Principles and Practices of Post Harvest Technology. Kalyani publishing Pvt. Ltd., Ludhiana.

- Sahay, K. M. and Singh, K. K. (1994). Unit operations of Agricultural Processing. Vikas Publishing House Pvt. Ltd., New Delhi.

- Srivastava, P. K. and Kachru, R. P. (1995). Compendium of technologies for oil seed processing and utilization. Central Institute of Agricultural Engineering, Bhopal.