



Advanced Crop Quality

Lecture -7

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How to extract oils from seeds

- ❑ Oil Crops are grown for their oil and nutritive and economical values.
- ❑ Most of them are used for oil extraction such as sesame, sun flower, safflower , brassica , soybean ,peanut and castor bean .
- ❑ Their residues (kusba in Arabic language) are used in animal fodder .
- ❑ The other group of oil crops are bibulous . they are grown for their fibers such as cotton , flax and oil is the secondary product of their seeds . cotton soybean seeds became another source of protein .

❑ Economic importance of oil crops lies not only being a source of oil but they can be used in many industries such as dyes, soap, cosmetic, preparations, drugs, in addition to the fodders that can be prepared of the residues after processing and oil extraction.

❑ **Countries produce the oil crops are :**

1- Cotton :China , Russia , USA ,India

2- Peanut : India ,China ,USA ,Burma ,Sudan

3- Safflower : India ,China ,Canada ,Germany ,France

4-Sesamum : India ,China ,Sudan ,Mexico , Japan

Chemical methods for filtering crude oil from impurities and undesirable colors

- 1) Degumming, such as phosphatides, lecithin, and other impurities from Plant Crude Oil, is carried out by heating the crude oil to a temperature of 75 ° C, then leaving it for 8-12 hours, where the gums and impurities settle.
- 2) Neutralization stage, which is the removal of free fatty acids and gum residue by converting them into organic salts.

This is done by using a solution of caustic soda (sodium hydroxide) NaOH, then separating it using centrifuges, the neutralized oil or fat is washed with water to remove soapy substances.

□ 3) Bleaching stage,

-The colors of the pigments present in the crude oil, such as carotenoids, are removed to obtain oils with desirable colors for the consumer.

-This process is done by using aluminum silicate, where it is mixed with oil or fat, then the mixture is heated and dried from moisture and air, and then the Bleaching process is carried out at a degree of 120-130 °C and under rarefied pressure, where the mineral material is absorbed.

-The mixture is filtered through a special porous medium that allows the passage of oil and prevents the passage of solids.

4) Winterization

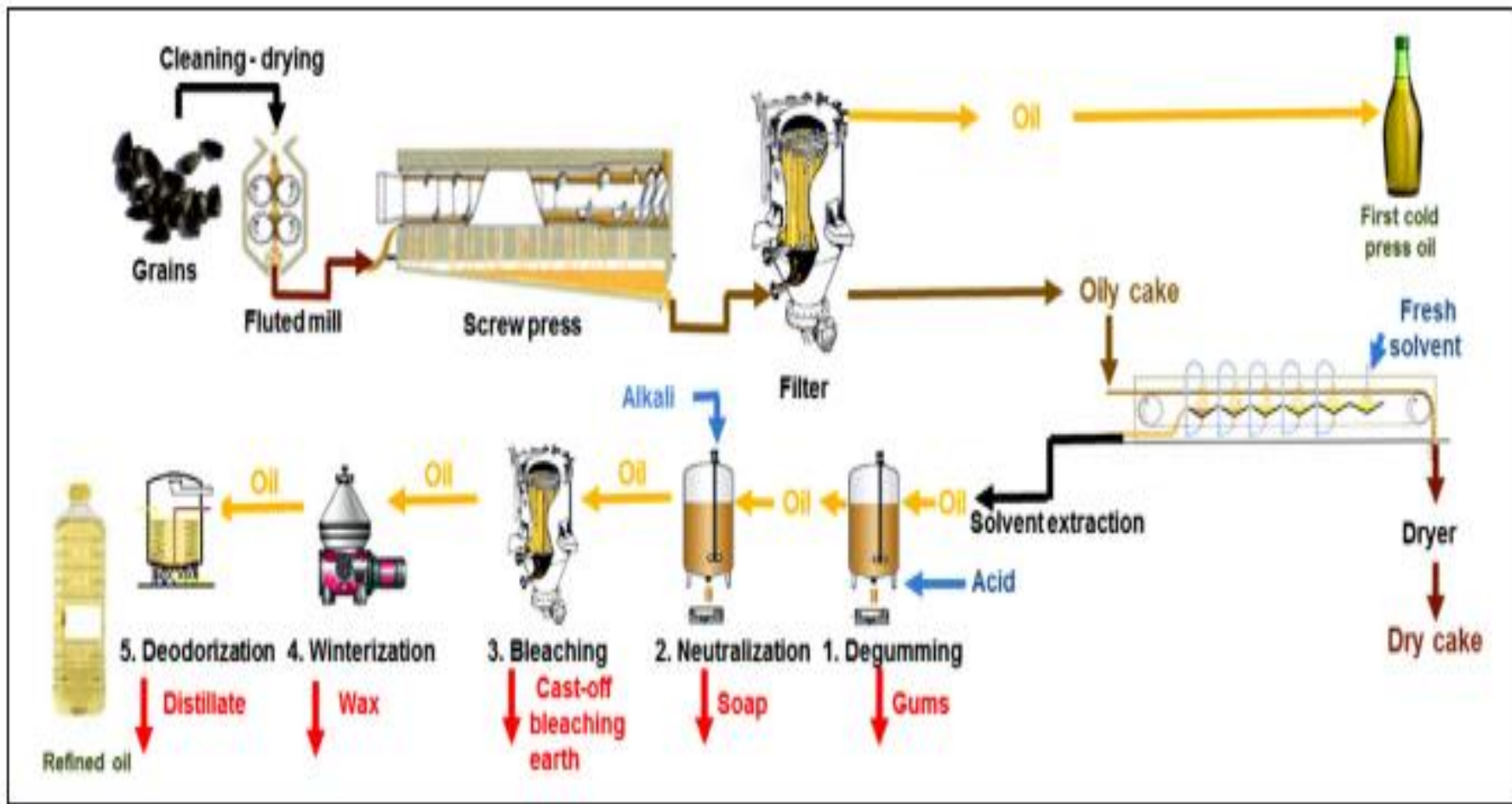
- Also called dewaxing has as main objective to eliminate long chain waxes (with carbon number higher than C42) and saturated triglycerides by reducing the oil's temperature to 6–8 °C and eliminating the solid particles, by filtration.

(Winterization is the step that reduces the least the minor compounds and particularly tocopherols.

5) Deodorization stage:

-The purpose of which is to remove substances that cause undesirable taste and odor resulting from aldehydes and ketones.

- These materials are removed due to the a difference in the degree of volatilization between the oil or fat particles and those materials. The bleaching oil is heated and dried from air and moisture, then purified at 250 °C under rarefied pressure, after which it is cooled and pumped to the packaging department for marketing.



Extracting and refining steps of sunflower oil

The effect of environmental conditions on the quantity and quality of oil (sunflower, for example)

- ❑ Sunflower seed oil is one of the best vegetable oils due to
- ❑ The high percentage of unsaturated fatty acids, which are oleic acid and linoleic acid, which reach 90% in the oil.
- ❑ High percentage of soluble vitamins and antioxidants.
- ❑ Its low content of the 3-double bonds unsaturated fatty acid (linolenic), which makes sunflower seed oil more stable and tolerant of storage.



- ❑ The percentage of oil varies according to the temperature, which is the main environmental factor affecting the oil percentage during the seed filling stage.
- ❑ Some studies have indicated that one of the causes of the difference in the oil percentage in sunflower seeds is the changes in temperature during the seed filling period, as the percentage of oil increases with the increase in temperature during this period.

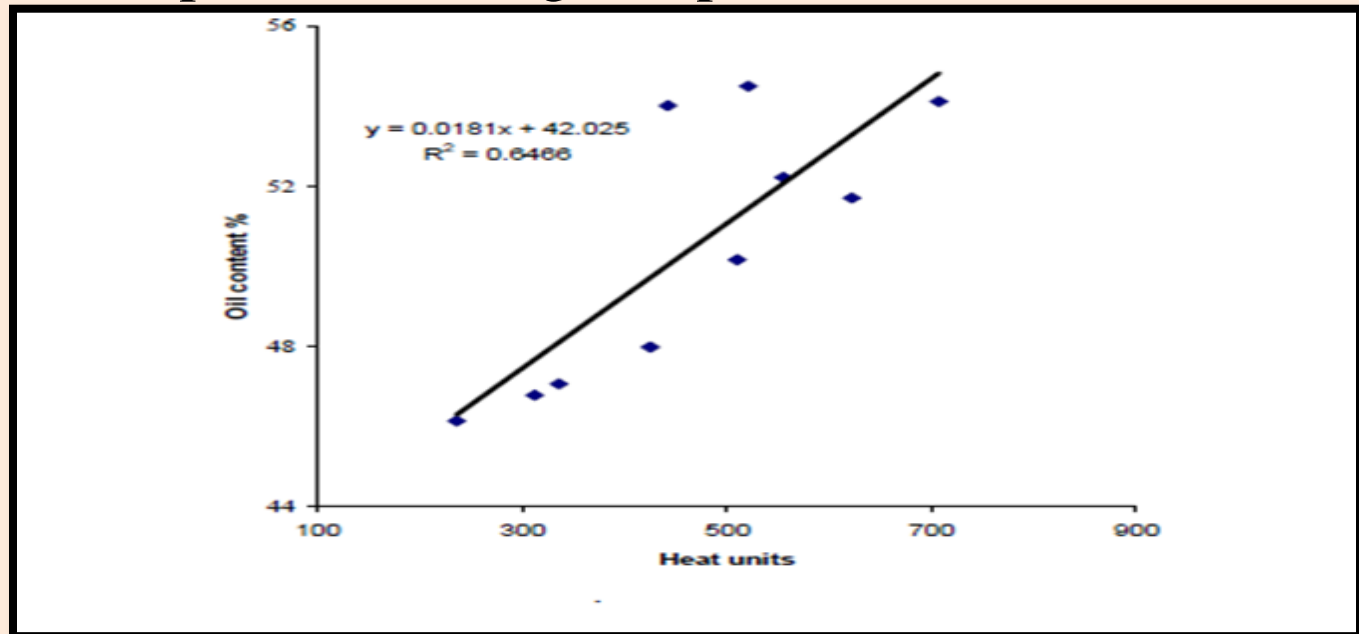


Fig. 1 Relationship between heat units and oil content

- ❑ Also, temperatures affect the unsaturated fatty acid content of sunflower seed oil more than any other environmental factor and more than any other oil crop.
- ❑ High temperatures during the formation and of seeds maturity lead to an increase in the percentage of monounsaturated fatty acids (oleic acid), due to high temperatures lead to a decrease in the availability of oxygen, which affects the activity of the desaturates enzyme responsible for converting oleic acid into 2 double bonds (linoleic acid).

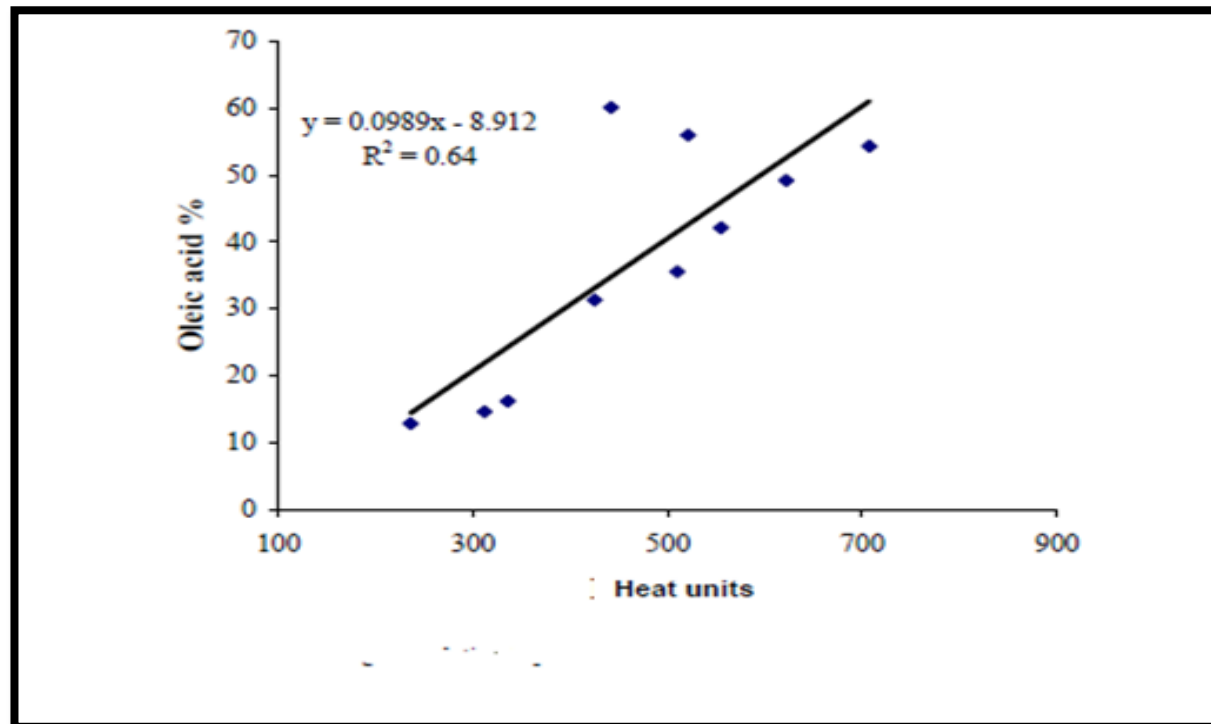


Fig. 2. Relationship between heat units and oleic acid.

□ At low temperatures during the formation and seeds maturity, where the necessary oxygen is available for the activity of the desaturase enzyme, which leads to an increase in the percentage of linoleic acid in the oil.

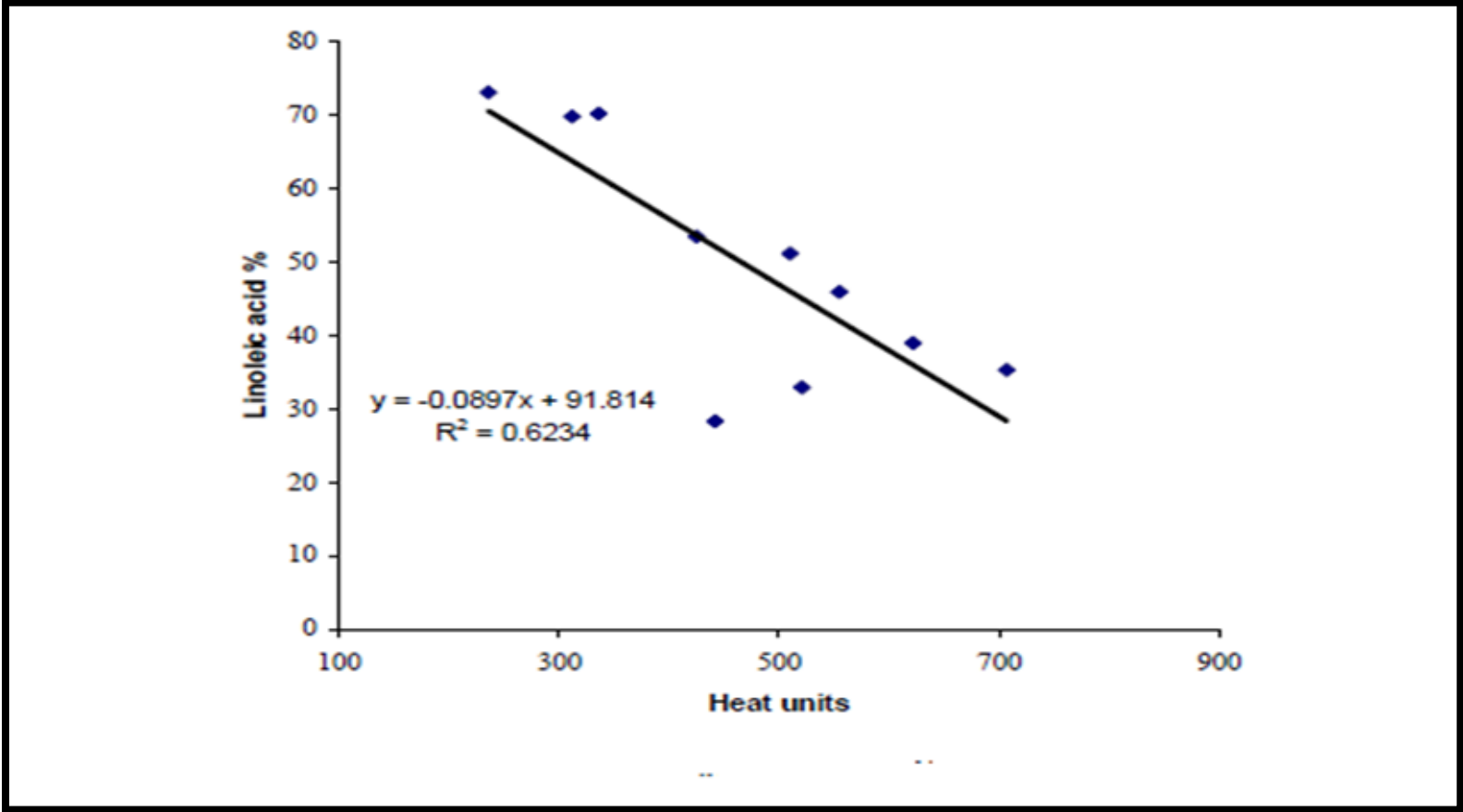


Fig.3. Relationship between heat units and Linoleic acid

□ Unger (1986) showed that there is an inverse relationship between oleic acid and linoleic acid, and this relationship depends largely on: genetic structures, agricultural processes and environmental conditions, especially temperatures, which have a significant impact on the formation of fatty acids.

Effect of plant density of content of fatty acids

- ❑ Many researchers found that the high plant density leads to an increase in temperature, the rate of respiration, and a lack of oxygen, which leads to a decrease or inhibition of the activity of the desaturate enzyme, and then reduces the conversion of oleic acid to other unsaturated fatty acids such as linoleic acid and linolenic, which results in a high percentage of oleic acid, and the opposite occurs at low plant densities.
- ❑ This decrease in the percentage of linoleic acid by increasing the plant density may make the oil one of the best oils used in the industry, as well as the oil becomes more stable when exposed to oxidation, which prolongs its storage period.

oilseeds need to suitable conditions for storage, the most important of which are temperature and humidity, because their height may lead to:

- 1 - Increase the activity of enzymes in the seeds, which leads to the breakdown of fatty acids.
- 2- Increasing the humidity leads to discoloration of the seed content and a decrease in the quality of the oil in it due to the increase in the free fatty acids, due to increase the hydrolysis.
- 3 - High temperature and humidity lead to the activity of microorganisms, which results from an increase in the process of rancidity and oxidation of the oil.
- 4- The high rate of broken and infected seeds in storage and the high temperature leads to an increase in the process of seed respiration and thus an increase in the emission of CO₂ gas, as it is emitted at a rate of (5 cm³ / day) in broken seeds and at a rate of (0.1 cm³ / day) in healthy, sultry Dormant seeds.

5-The decomposition of proteins, carbohydrates and phosphatides in the fatty tissues of the seeds leads to the production of soluble substances in the oil, which leads to an increase in the percentage of impurities in it and the development of an unacceptable smell and color, as well as an increase in the percentage of free fatty acids.



Thank you
for your
attention