

Advanced crop quality

Lecture- 10

Dr.Sundus Abdulkariem Mohammed
Agriculture College

Improve oil quality

- ❑ In oil factories, and to improve the quality of the oil, the unsaturated fatty acids must be increased at the expense of the saturated fatty acids.**
- ❑ This is done either by blending or by the winterizing process, which is to reduce the oil temperature to 6°C , which leads to freezing and the formation of crystals that separate and then filter the oil.**
- ❑ The oleic and linoleic acid group of oils is one of the largest and most widely used groups of oils in food, all of which are of vegetable origin and include olive oil, sunflower, sesame, corn, cotton and Peanut.**

❑ The linolenic acid group is present in flax oil, which is not preferred because it contains 3 unsaturated bonds, which quickly oxidizes causing an odor.

❑ The oils used for the purpose of industry must contain a high percentage of linolenic acid because it oxidizes and dries quickly.

Fatty acid		Corn oil g/100 g	Flaxseed oil	Oil /Fat	Linoleic acid	Linolenic acid
14:0	Myristic acid	0.1	0.1	Peanut oil	30.5	0
16:0	Palmitic acid	12.0	5.2	Rapeseed oil	21.2	9.6
16:1	Palmitoleic acid	0.2	0.1	Corn oil	55.9	0.9
17:0	Heptadecanoic acid	0.1	0.1	Walnut oil	56.7	12.3
18:0	Stearic acid	2.0	3.8	Grapeseed oil	67.3	0.3
18:1	Oleic acid	29.1	18.9	Soybean oil	52.6	7.3
18:2n-6	Linoleic acid	54.5	16.2	Sunflower oil	64.1	0.05
18:3n-3	Alpha linolenic acid	0.9	54.9	Olive oil	12.9	0.85
20:0	Arachidic acid	0.5	0.2	Mixed oil	47	1.2
20:1	Eicosenoic acid	0.3	0.2	<i>Abelomschus esculentus</i>	40.70	1.65
20:2n-6	Eicosadienoic acid	0.0	0.1	Butter oil	1.16	0.46
22:0	Behenic acid	0.1	0.2	Cream	0.52	0.12
24:0	Lignoceric acid	0.2	0.0	African sheabutter	5.98	nd
n-6/n-3 ratio		60.6	0.3	Goose fat	12	nd
				Palmkernel fat	2.7	nd
				Cooking butter	12.4	1.24
				Pig fat	8.1	nd



Oil seeds



First step
Oil press



Second step
Oil extraction



Third step
Oil refinery



Edible oil

Suitable conditions for storage oil seeds

- The seeds are dried in the field before storing in case they contain a high percentage of moisture.
- The seeds must be cleaned of plant residues and dust before transporting them to the storing, because their presence causes pollution and may raise the level of moisture.
- Reduce the percentage of broken seeds as they lead to damage.

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

- 1- Increasing the activity of enzymes in the seeds, which leads to the breakdown of fatty acids.
- 2- Increasing moisture leads to discoloration of the seed content and a decrease in the quality of the oil in it due to the increase of single fatty acids due to increased hydrolysis.
- 3 - High temperature and humidity lead to the activity of microorganisms, which results from an increase in the process of rancidity and oil oxidation.

➤ 4-The high rate of crushed and infected seeds in the store and the high temperature leads to an increase in the respiration process of the seeds and thus an increase in the emission of CO₂ gas, as it is emitted at a rate of (5 cm³ day⁻¹) in broken seeds and at a rate of (0.1 cm³ day⁻¹) in healthy, dormant seeds.

➤ 5- The decomposition of proteins, carbohydrates and phosphatides (some of which cause toxicity in the oil) 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 odor and color as well as an increase in the percentage of free fatty acids.

Determining the value and grade (quality) of crop oils

❖ **Determining the quality of the oilseeds that reach the vegetable oil factories based on the analyzes of these samples and determining the following ratios:-**

1- Moisture percentage.

2- Percentage of impurities.

3- The percentage of oil.

4- The percentage of ammonia (proteins).

5-Percentage of fatty acids.

COTTONSEED OIL QUALITY

$$\text{Quality Score \%} = \frac{\text{Qualitative Number} \times \text{Quantitative Number}}{100}$$

✓ Qualitative Number:

It is estimated on the basis **of the oil and ammonia percentage** of the seeds.

Its depending on the environmental conditions and the degree of maturity of the cotton nut.

When calculating the quantitative number of cotton seeds containing more than 16.5% oil, the quantitative number was calculated using the following equation:-

$$\text{Q. N} = (\text{percentage of oil} \times 4) + (\text{percentage of ammonia} \times 6) + 5$$

As for seeds containing an oil content of less than 16.5%, the quantitative number is calculated as follows:-

$$\text{Q. N} = (\text{percentage of oil} \times 6) + (\text{percentage of ammonia} \times 6) - 28$$

- ✓ **Quantitative number:** The qualitative number of cotton seeds is affected by the factors that raise the costs of production and storage, and among these factors are:
 - ✓ **the free fatty acids in the oil.**
 - ✓ **the degree of moisture of the seeds.**
 - ✓ **the percentage of impurities.**

In addition to the degree of dryness of the seeds during transportation or storage, and others factors.

- ❑ It is possible to measure the effect of some of these factors on the characteristics of the seeds, such as the fatty acids in the oil and the degree of moisture in the seeds and impurities.
- ❑ As for the rest of the factors, there are no ways to measure them so far.

The percentage of free fatty acids in the oil indicates the extent of its decomposition, especially when the free fatty acids exceed 3%

And extracting oil from seeds is in the best cases when the seeds contain a percentage of moisture ranging between 10-12%.

If it is less than 10%, a percentage of moisture must be added to the seeds before the extraction process.

If the moisture percentage is more than 12%, the seeds may decompose during storage, which leads to a high temperature of the seeds and then to an oxidation process followed by a rapid rise in the percentage of free fatty acids. These seeds need to be dried from excess moisture before storing and

□ As for the impurities, they indicate a lack of care for the harvesting process and not cleaning the seeds after ginning. The presence of these materials reduces their suitability for pressing and affects the properties of their products.

The following are the bases that determine the descriptive number of seeds on the basis of the percentage of containing these substances.

(a) The descriptive number 100 is a basic description of seeds containing

1% impurities

1.8% free fatty acids

12% moisture

b-The descriptive number is less than 100 for seeds that contain a higher percentage of impurities, free fatty acids and moisture. In this case, the descriptive number is estimated based on the reduction of the following units:-

1- Subtract 0.1 units for every 0.1 increase in seed moisture above 12%.

2- 0.4 units are excreted for every 0.1 of fatty acids above 1.8.

3- 0.1 units are subtracted for every 0.1 of the impurities above 1%.

Example 1/ When analyzing a sample of cotton seeds, the following results are :

<u>The product</u>	<u>%</u>
Oil	18.5
ammonia	3.5
Free fatty acid	1.8
Impurities	1
Humidity	12

Example 2/ When analyzing a sample of cotton seeds, the following results are :

<u>The product</u>	<u>%</u>
Oil	18.5
ammonia	3.5
Free fatty acid	1.9
Impurities	1.1
Humidity	12.1

thanks for *listening*