Chapter 5
Oil Crops
1-Sunflower *Helianthus annuus L.*
Asteraceae

Prepared By

Prof. Dr. Ali El-Saied Sharief

Faculty of Agriculture, Mansoura University, Egypt

Sunflower

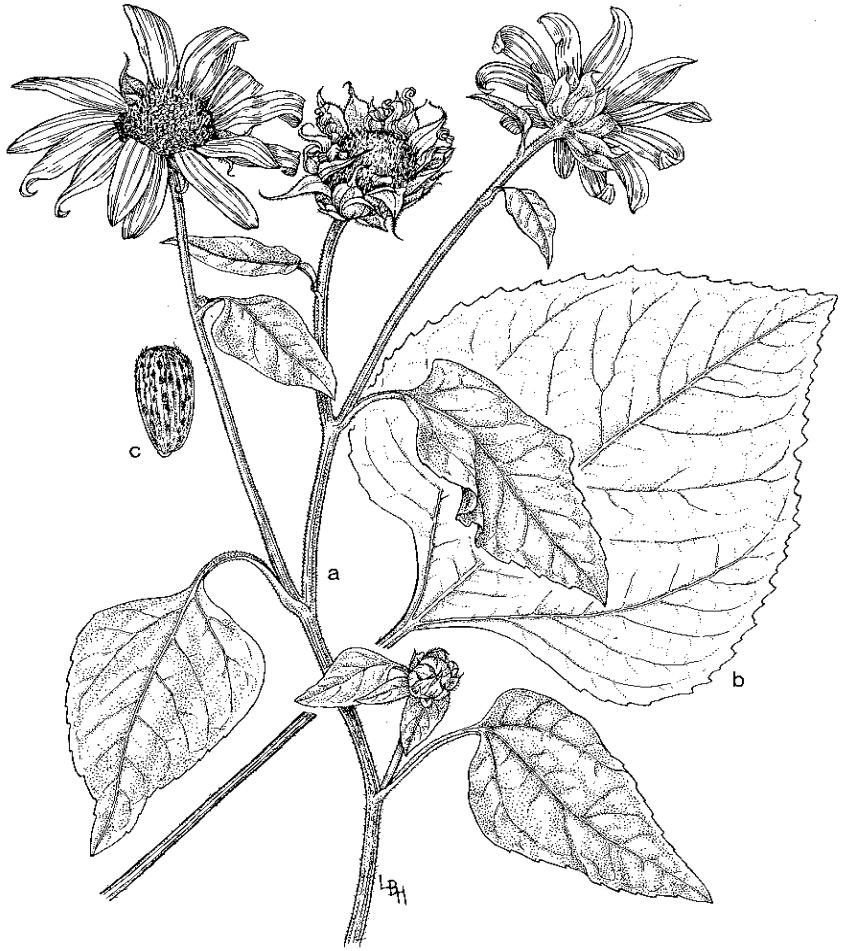

Fig. 144. Sunflower *(Helianthus annuus)*. *a*. Upper part of plant with showy flower heads and leaves. *b*. Large basal leaf. *c*. Achene with dark spots and slightly hairy summit; the two scales have dropped off.

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Statistical of Production

- The world total planted area from Sunflower was 26.5 million hectares produced about 47.8 million tons with average of 1803 kg/ha.
- The highest harvested area from Argentine cultivated 1.8 million hectares, and highest production from Argentine was 3.5 million tons. The highest productivity per unite area from Israel was 7088 kg/ha.
- In Egypt, the total cultivated area was 6000 hectares produced about 20000 tons with an average 3333 kg/ha. (FAO State, 2017).

Introduction

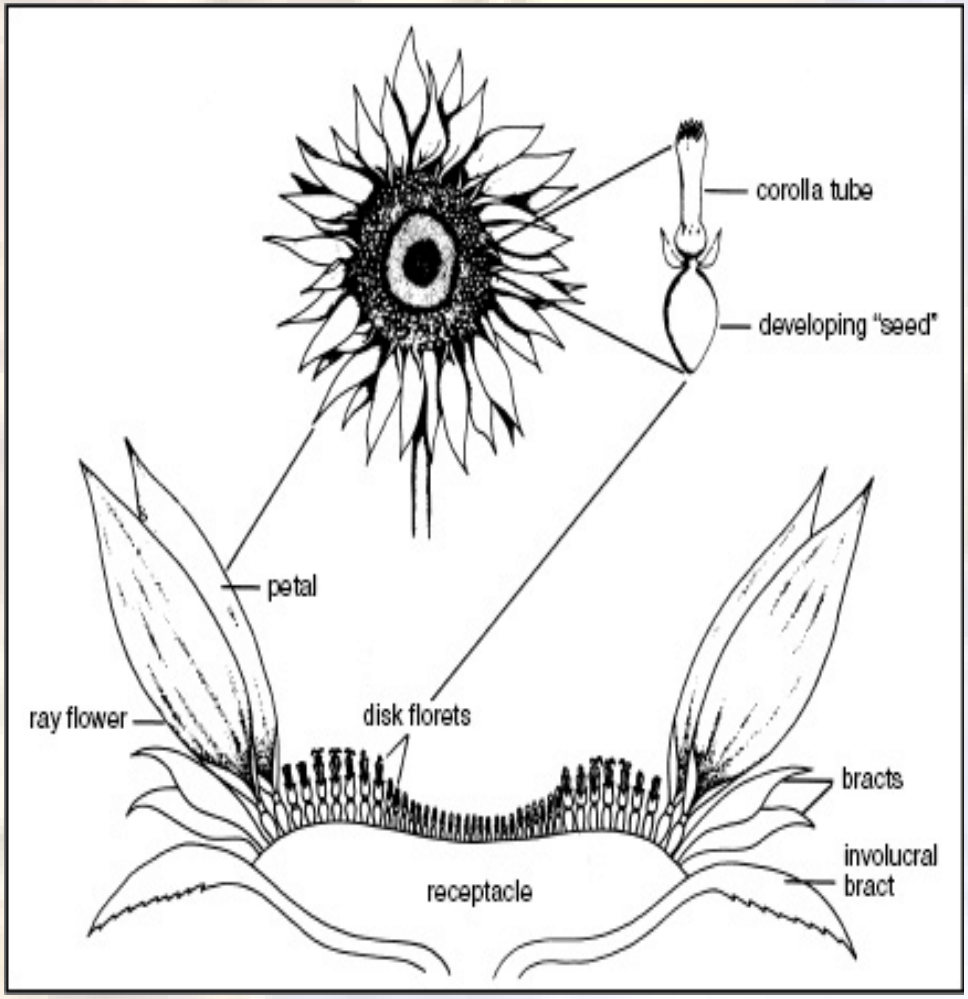
Two primary types of sunflower are grown: (1) oilseed for vegetable oil production and (2) nonoilseed for human food and bird-food markets (Figure 1).

(1)

(2)

Taxonomy

The cultivated sunflower (Helianthus annuus L.) is one of the 67 species in the genus Helianthus. All are native to the Americas and most are found in the U.S. It is a member of the Compositae family and has a typical composite flower.



GROWTH STAGES

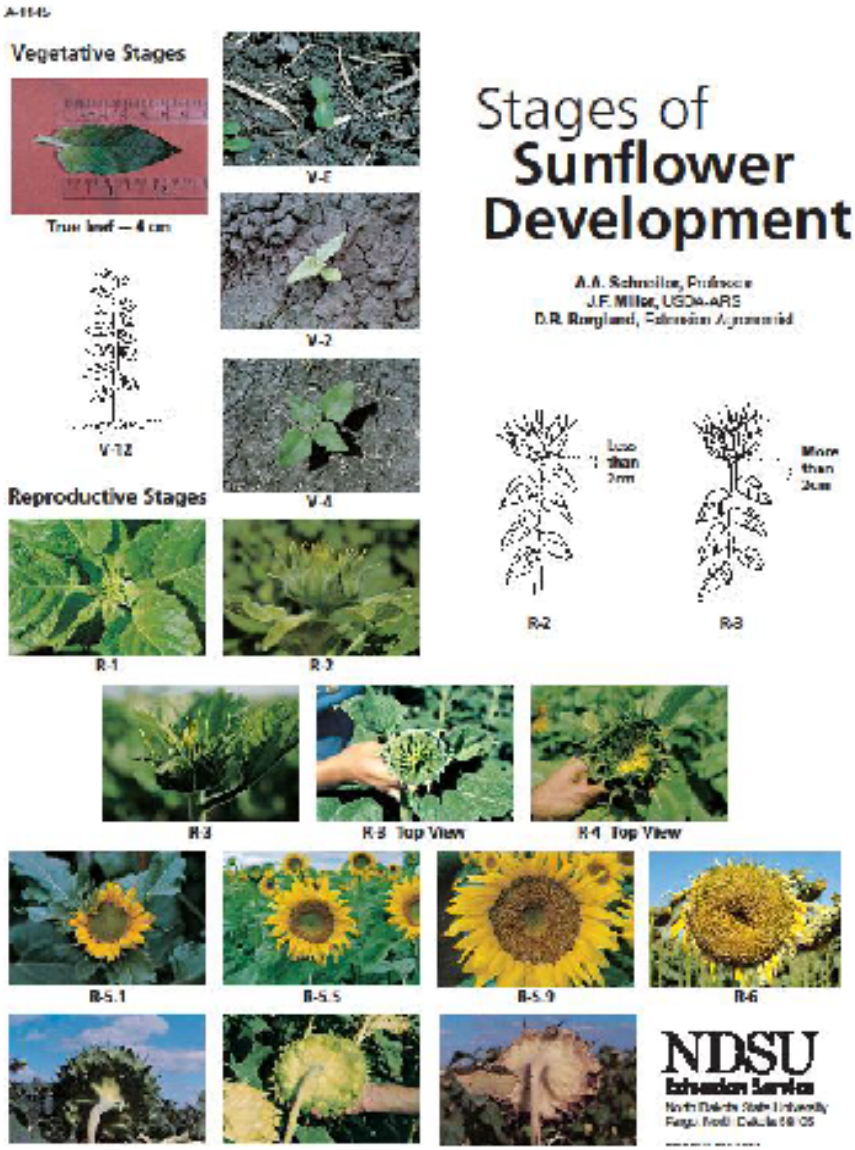


Figure 2. Sunflower growth stages and description. From A. A. Schneiter and J. F. Miller. 1981. Description of Sunflower Growth Stages. Crop Sci.11: 635-638.

Table 8. Sunflower growth stages and description. From A. A. Schneiter and J. F. Miller. 1981. Description of Sunflower Growth Stages. Crop Sci.11: 635-638.

Stage	Description
VE Vegetative Emergence	Seedling has emerged and the first leaf beyond the cotyledons is less than 4 cm long.
V (number) Vegetative Stages (e.g. V-1, V-2, V-3 etc.)	These are determined by counting the number of true leaves at least 4 cm in length beginning as V-1, V-2, V-3, V-4, etc. If senescence of of the lower leaves has occurred, count leaf scars (excluding those where the cotyledons were attached) to determine the proper stage.
R-1 Reproductive Stages	The terminal bud forms a miniature floral head rather than a cluster of leaves. When viewed from directly above, the immature bracts have a many-pointed star-like appearance.
R2	The immature bud elongates 0.5 to 2.0 cm above the nearest leaf attached to the stem. Disregard leaves attached directly to the back of the bud.
R3	The immature bud elongates more than 2 cm above the nearest leaf.
R4	The inflorescence begins to open. When viewed from directly above, immature ray flowers are visible.
R5 (decimal) (e.g., R-5.1, R-5.2, R-5.3, etc.)	This stage is the beginning of flowering. The stage can be divided into sub-stages dependent upon the percent of the head area (disk flowers) that have completed or are in flowering. Ex. R-5.3 (30%), R-5.8 (80%), etc.
R6	Flowering is complete and the ray flowers are wilting
R7	The back of the head has started to turn a pale yellow.
R8	The back of the head is yellow but the bracts remain green.
R9	The bracts become yellow and brown. This stage is regarded as physiological maturity.

Hybrid Selection and cultivars

Selection of sunflower hybrids to plant is one of the most important decisions a producer must make each season (Figure 8). First, three classes of hybrids - NuSun oilseed, traditional oilseed and confection hybrids are available,. Second, variables such as yield, quality factors, maturity, dry down, stand ability, and pest and disease tolerance, should be considered.

Giza 102 (41-43% oil) cultivated in all Egypt regions and ripping after 70-75 days from planting. Sakha 53 (40-42 % oil) and ripping after 100 days from planting. Sunflower hybrids such Veodoic, Francksol and Colofor 3 were imported from European Union.

NuSun oilseed sunflower hybrids will produce an oil quality with more than 55 percent oleic fatty acid. This oil is in wide demand by the frying food industry and potentially could be a bottled oil. Some hybrid seed companies are providing a grower guarantee that their hybrids will make the minimum oleic grade. Traditional oilseed sunflower hybrids have a high linoleic and lower oleic fatty acid quality in contrast with the NuSun hybrids.

Traditional hybrids have been grown for their multipurpose marketability, with large export demand and hulling for the kernel market being most important.

Seed Quality:

High quality, uniform seed with high germination, known hybrid varietal purity and freedom from weed seeds and disease should be selected to reduce production risks. The standard germination test provides an indication of performance under ideal conditions but is limited in its ability to estimate what will happen under stress. Accelerated aging is another method used to evaluate seed vigor. Any old or carry-over seed should have both types of tests conducted.

Most seed is treated with a fungicide and insecticide to protect the germinating seedling. Seed should be uniformly sized to allow precision in the planting operation.

Soils

Sunflower is adapted to a variety of soil conditions, but grows best on well-drained, high water-holding capacity soils with a nearly neutral pH (pH 6.5-7.5).

Production performance on high-stress soils, such as those affected by drought potential, salinity or wetness, is not exceptional but compares favorably with other commercial crops commonly grown. Sunflower not cultivated in saline (more 3000 ppm) and bad drainage soils.

Soil Fertility

Sunflower, like other green plants, requires at least 16 elements for growth. Some of these, such as oxygen, hydrogen and carbon, are obtained from water and the air. The other nutrients are obtained from the soil.

Nitrogen, phosphorus and sulfur are frequently deficient in soils in any climatic zone.

Potassium, calcium and magnesium are frequently deficient in high-rainfall areas. Deficiencies of iron, manganese, zinc, copper, molybdenum, boron and chlorine are uncommon but can appear in many climatic zones.

Tillage and Seedbed Preparation

Tillage traditionally has been used to control weeds and incorporate herbicides in preparation for planting. When tillage is used in low rainfall areas, producers must take care to control weeds while leaving as much of the previous crop's residue intact as possible.

Tillage never should occur when soils are too wet. Soils that are tilled when too wet and then dry will crust, turn lumpy and generally provide for poor seedbed conditions for germination and establishment.

Planting Dates

Sunflower may be planted during a wide range of dates. Planting may extend from March until late July in Egypt. Growing conditions during the season will affect yield, oil content and fatty acid composition. High temperatures during seed formation have been identified as the main environmental factor affecting the ratio of linoleic and oleic acid content.

So, the optimum planting date will be dependent upon the variety and environments during the growing season. Sown sunflower at suitable planting date increased seed yield per unit area due to increases in vegetative stages reflected increases in photosynthic rate, consequently increased seed number and size.

Seeding rate and Plant Population

Sunflower will perform well in a wide range of plant populations and plant spacing. Fields with a row spacing of less than 50-60 cm are considered to be solid seeded. Hill spacing was 20-25 cm according to cultivar. Seed rate was 4-5 kg/fed.

Sunflower plants will compensate for differences in plant population by adjusting seed and head size. As plant population decreases, seed and head size will increase. Oilseed hybrids generally are planted at higher populations than confection varieties, as the size of harvested seed is less important. . Plant populations for oilseed sunflower should be between 15,000 and 25,000 plants per acre. So, the increases in seed yield per unit area due to optimum plant density increased vegetative growth and plants more uniformty, reflected increases in photosynthic rate, consequently increased seed number and size.

Crop Rotation

Sunflower cultivated in crop rotation after winter crops such field bean, Egyptian clover, lentil and chickpea or wheat and hordium. Also cultivated after vegetable crops such tomato and potato. The third rotation is the suitable rotation in sunflower.

Fertilizer Recommendations

Sunflower fertilized with 100 kg/fed from Calcium super phosphate (15.5 P_2O_5) during seed bed preparation. Also, 50 kg from potassium sulphate (48% K_2O) during seed bed preparation or with first dose of nitrogen. Two equal portions of nitrogen fertilizer at rate of 30 kg N/fed in the form of ammonium nitrate will be added, the first dose after thinning and the second dose after two weeks. Manure fertilizer at 30 m3/fed and micronutrients (45 g Fe + 25 g Zn + 25 g Mn + 20 g Cu in 200 L water) twice the first 45 days from sown and the second after two weeks will be used in new reclaimed soil.

Weed Control

The most effective weed management is accomplished by an integrated system that uses both cultural and chemical control. Preplant cultural practices to reduce weed seed populations, pre-emergence tillage and postemergence cultivation may be needed to supplement the herbicides under adverse climatic conditions and to control late-emerging weeds or weeds that are not controlled by herbicides.

Herbicides vary in their effectiveness against various weeds. Stop 50% Ec at 1.7 L/fed in 300 L water was use to control after planting and before irrigation.

Harvesting

After 80-100 days from sown according to cultivar and sown dates sunflower ripening. Irrigation water must prevent before two weeks from harvesting. Plants were harvested by hand or by combined then dried before storage.

Seed Yield

The seed yield of sunflower was about 1000-1500 kg/fed according to soil type and cultivars and sown dates.

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