Chapter 3

2- Chickpea

Cicer arietinum L.

Prepared
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INTRODUCTION

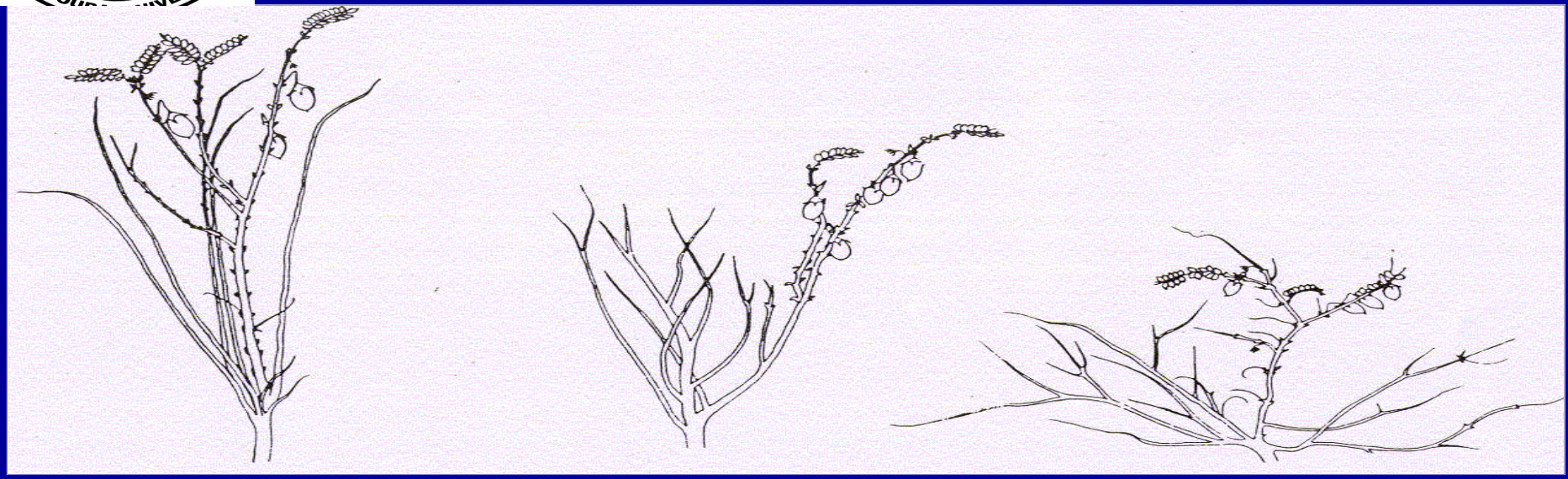
Chickpea (*Cicer arietinum* L.) is an ancient crop that has been grown in the Middle East and parts of Africa for many years.

Wild *C. reticulatum* is interfertile with the cultivated pulse and morphologically closely resembles cultivated *C. arietinum.*

Chickpea seed are eaten fresh as green vegetables, parched, fried, roasted, and boiled; as snack food, sweet and condiments.

Chickpea seed has 38-59% carbohydrate, 3% fiber, 4.8-5.5% oil, 3% ash, 0.2% calcium, and 0.3% phosphorus. Digestibility of protein varies from 76-78% and its carbohydrate from 57-60%.

Chickpea Types



erect **semi erect** **spreading**

Microsperma *(desi* type) **which has small, darker seeds and a rough coat, cultivated mostly in the Indian subcontinent, Ethiopia, Mexico, and Iran.**

Macrosperma *(kabuli* type) **which has lighter coloured, larger seeds and a smoother coat, mainly grown in Southern Europe, Northern Africa, Afghanistan, Pakistan and Chile, also introduced during the 18th century to the Indian subcontinent.**

Statistical of Production

- The world total planted area from Chickpea was14.56 million hectares produced about 14.77 million tons with average of 1014 kg/ha.
- The highest harvested area from India cultivated 9.53 million hectare, and highest production also from India was 9.1 million tons. The highest productivity per unite area from Israeli was 6130 kg/ha.
- In Egypt, the total cultivated area was 1503 hectares produced about 3271 tons with an average 2176 kg/ha. (FAO State, 2017)

Geographical distribution

Chickpea is grown between 20°N and 40°N in the northern hemisphere and most countries planting chickpea in the world is Ethobiea, India, Turkey, Canada, Pakistan and Iran.

Environments Requirements:

Chickpea seed germinate at range of temperature between 15-25C° and optimum of germination temperature at 24C°. Chickpea plant needed moderate temperature for vegetative stage and higher in reproductive development stage. Optimum temperature during growth and reproductive stage ranged from 30-35C°. *Chickpea dry matter; stem and branching will be increase as light intensity increased. Reducing light intensity during chickpea growth reducing branching, shortest plants and reducing in NPK uptake and vice versa increases light intensity during growth of chickpea increase dry matter, tallest plants and increase NPK uptake which reflected increases in seed yield per unite area.*

Variety Selection:

Growers should consider maturity, growth habit, seed size and color pattern as well as yield when selecting a variety to grow. Currently large seeded; lighter colored seed types are preferred for soup and salad bar uses. For the latest information on new varieties and seed available contact your local extension office.

Varieties cultivated in Egypt:

Giza 1 variety has a big seed (25 gm/100 seed) cultivated in all Egypt regions.

Giza 2 variety has a small seed (15 gm/100 seed) cultivated in Upper Egypt soils.

Giza 3 variety has a small seed (15 gm/100 seed) cultivated sandy soils.

Giza 195 variety has medium seed size, cultivates in newly soils specially calcareous sandy soils.

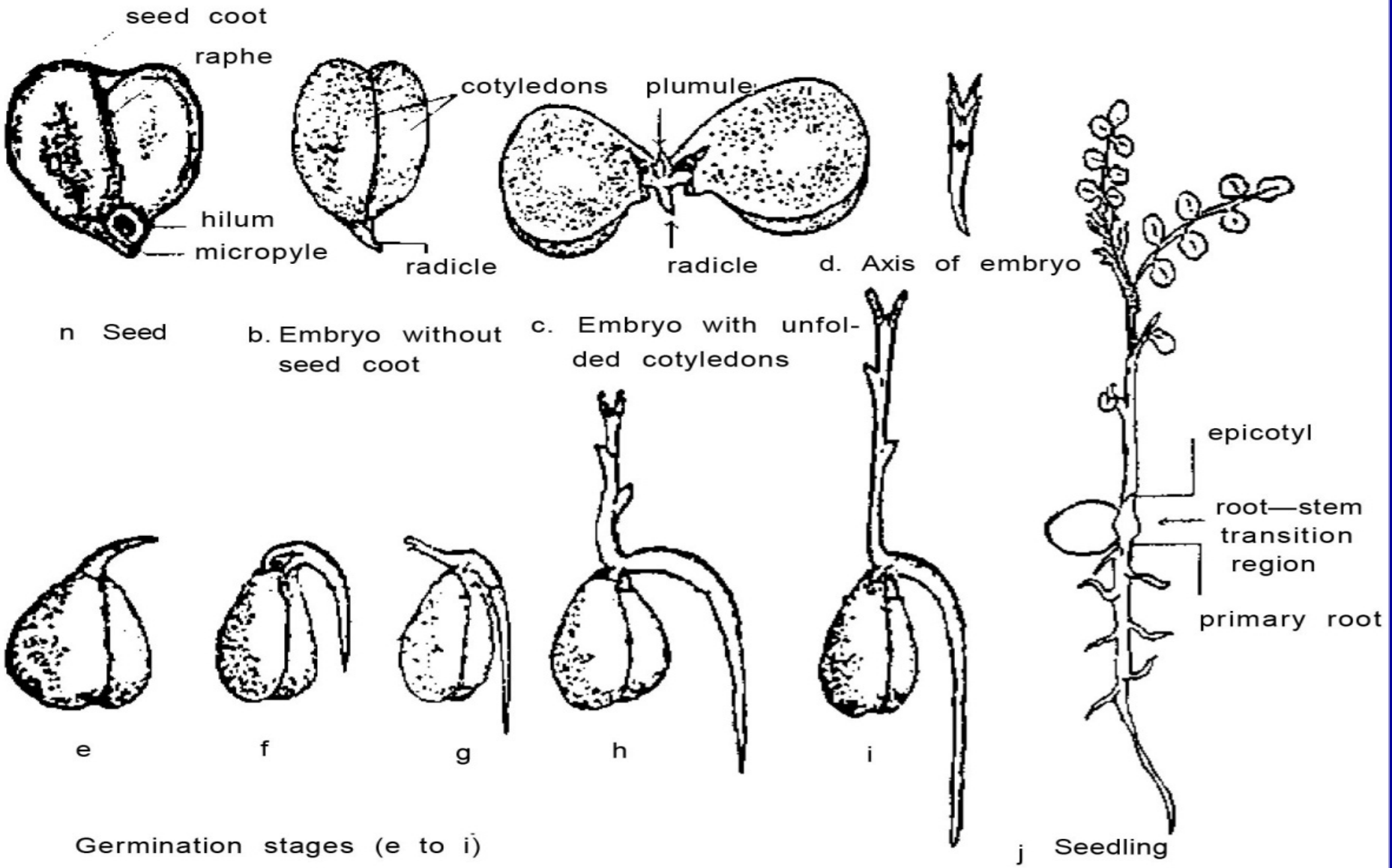
Giza 531 variety has a big seed (25 gm/100 seed) cultivated in all Egypt soils.

Seedbed Preparation:

A firm, smooth seedbed with most of the previous crop residue incorporated is best. This will allow proper depth of planting as well as good seed-soil contact, which is essential for rapid germination and emergence. If soil moisture is short keep deep preplan" tillage to a minimum to prevent excessive drying in the top 5 to 7.5 cm of soil.

Chickpea seeds germinate at an optimum temperature (28-33°C) and moisture level in about 5-6 days. Germination begins with absorption of moisture and swelling of the seed. The radicle emerges first followed by the plumule. The portion of the axis above the cotyledon called the epicotyl, elongates and pushes the plumule upward (Epigeal)

. The growth of the plumule produces an erect shoot and leaves, and the radicle grows to produce the roots. The first true leaf has 2 or 3 pairs of leaflets plus a terminal one.


seed coot
raphe
hilum
micropyle
cotyledons
plumule
radicle
radicle
d. Axis of embryo
n Seed
b. Embryo without seed coot
c. Embryo with unfolded cotyledons
epicotyl
root—stem transition region
primary root
e
f
g
h
i
Germination stages (e to i)
j Seedling

Seeding Date:

The suitable seeding date of chickpea in Egypt is mid-October to mid-November in Delta region and cultivation at first October to first November at Upper Egypt. Late in chickpea sown at this date will reduce seed yield due to increases in temperature which reduce flower setting especially with reducing humidity percentage in Delta region and Upper Egypt

We should cultivate chickpea at suitable date due to the following reasons:

1-In early chickpea sown, germination percentage may be reduce due to higher soil temperature can delay seedling emerge and reduce plant population. Early planting causes increase in weeds number in the field which competitor with chickpea. So, seed yield decreased per unit area.

2-In lately chickpea planting than optimum date, the vegetative growth period will be reduced, consequently the period of photosynthesis reduce causing reduction in seed yield. There are risks associated with late planting of chickpea which increase weed competition loss of germination and vigor delayed and reduces yields.

3-When sown chickpea at optimum sowing date, increase the period of vegetative growth consequently increase the period of photosynthesis and reduced competition between chickpea plants then increase seed yield. Chickpea sown at optimum planting date increase number of plant per unit area reflected plants will be more approached to uniformity which helps sun radiation penetration within chickpea plants then increase net photosynthesis, consequently increase seed number and size then increased seed yield.

Sowing Rate:

Chickpea sown at seeding rate of 40-60 kg/fed is different according to chickpea types and method of planting i.e. plant population density of 30-60 plant/m^2. We should cultivated chickpea at suitable rate due to the following reasons:

1-Planting chickpea with low seeding rates, germination percentage may be reduce due to higher soil temperature and can delay seedling emerge and reduce plant population. Chickpea sown with low seeding rate causes increase in weeds number in the field which competitor with chickpea plants leading decreases in seed yield.

2-Planting chickpea with seeding rate more than optimum rates, there are risks associated which increase competition between plants which reduce net photosynthesis. The lower leaves was parasite on upper leaves which reflected decreases in seed number and size then decreased seed yield per unit area.

3-Planting chickpea with optimum density (seeding rate) reduced competition between plants then increase photosynthesis rate which consequently increase seed yield. Chickpea sown at optimum stand increase number of plant per unit area reflected plants will be more approached to uniformity which helps sun radiation penetration within chickpea plants then increase net photosynthesis, consequently increase seed number and size leading to increase seed yield.

Seeding Method:

The optimum planting method of Chickpea under Egyptian condition at rows 60 cm in both ridge sides or drilling in rows 30 cm apart by methods (Affair or Heraty) in hills 10-15 cm according to type of chickpea (30-60 plants/m^2).

Fertilization Requirements:

1-Chickpea seed must incubate with *R. spp* before planting directly.

2-Chickpea fertilized with nitrogen fertilizer at a rate of 15-20 kg N/fed as starter dose before the second irrigation.

3-Chickpea fertilized with superphosphate calcium (15.5 P_2O_5) before planting must be at a rate of 150-200 kg/acre according soil fertility.

4-Checkpea fertilized with potassium sulphate at rate of 50 kg/acre in the newly cultivated soils.

5-Chickpea fertilized with foliar application of microelements especially in the newly reclaimed soils with (Ferro + Zinc + manganese) at the rate of 0.5 gm/L twice after 40 days from planting and after foliar application by two weeks.

Irrigation requirements:

The first irrigation will be done after planting irrigation by 10-15 days and named (El-Tashtea) in Egypt. The second one at flowering stage and must avoid wind during irrigation to prevent flowers dropping. The third one must be during seed filling, this in the old soil in valley. In case of cultivation in the calcareous newly reclaimed soils which especially sandy soil increase number of irrigations to 6-8 irrigations and reduce number interval days to 7-10 days according to soil type or using sprinkler irrigation.

Weed control:

Weed control of annual winter weeds in Chickpea by hand hoeing in Egypt. Weed control by chemical of annual winter weeds grown in chickpea field by using herbicide of Alagran at rate of 1 kg/fed/200L water.

Seed yield:

Seed yield of chickpea about 900-1100 kg/feddan (6-7 ardab/fed) and the weight of ardab is 150 kg for chickpea has a big size of seed and 155 kg for small seed size.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Select the most appropriate answer from the following questions.

1. The world hectarage (million ha) and production (million tons) of chickpea respectively are

a) 5.0 and 5.0. b) 11.9 and 10.9. c) 12 and 8.0. d) 10 and 5.0.

2. The average productivity of chickpea in the world is

a) 712 kg ha^{-1}. b) 812 kg ha^{-1}, c) 912 kg ha^{-1}. d) 1012 kg ha^{-1}.

3. The highest production of chickpea is in

a) Pakistan. b) India. c) Turkey. d) Egypt.

4. The highest productivity (kg ha-1) of chickpea in the world is in

a) India. b) Pakistan. c) China. d) Ethiopia.

5. The optimum temperature for chickpea germination is

a) 15°C. b)20°C. c) 25°C. d) 30°C.

6. In the northern hemisphere, chickpea is grown between

a) 10°N and 15°N.

b) 5°N and 15°N.

c) 20°N and 40°N.

d) 30°N and 50°N.

7. The constraints at the seedling stage of chickpea grown on North Africa are

a) cold and wet seedbeds.

b) hot and dry seedbeds.

c) hot and saline seedbeds.

d) all the above.

8. Increasing in light intensity during growing chickpea leading to

a) reduce flowering.

b) increase dry matter

c) increase stem and branching

d) answer in b + c.

9. Chickpea growth and production are best in

a) silty clay loams.

b) calcic terrarosa.

c) deep black cotton soil.

d) sandy soils.

10. Chickpea has a big seed cultivar is

a) Giza 1. b) Giza 2. c) Giza 3. d) Giza 195.

11. Chickpea cultivar cultivate in calcareous newly reclaimed soils is

a) Giza 1. b) Giza 2. c) Giza 3. d) Giza 195.

12. The optimum sowing date of chickpea in Egypt is

a) mid- September. b) mid-October to mid- November.

c) End-November. d) First December

13. Optimum seeding rate of chickpea in Egypt is

a) 30-50Kg /fed. b) 40-60Kg /fed. c) 60-70Kg /fed. d) 70-80Kg /fed.

14. The optimum plant population of chickpea depends upon

a) genotype. b) environmental conditions.

c) nutrients and irrigation. d) all the above.

15. Delayed sowing of chickpea results in

a) reduced growth. b) poor seed quality. c) low yield. d) all the above.

16. The optimum rate of nitrogen (N) application in chickpea is

a) 5-10 kg ha^{-1}. b) 10-15 kg ha^{-1}. c) 15-20 kg ha^{-1}. d) 40-50 kg ha^{-1}.

17. The most critical stage for drought stress in chickpea is the stage.

a) vegetative b) flowering c) flowering and pod development d) maturity

Put sign True or False before the following sentences:

1-( ) Chickpea is grown in tropical, sub-tropical and temperate regions. Kabuli type is grown in temperate regions while the desi type chickpea is grown in the semi-arid tropics.

2-( ) The name of Cicer is of Latin origin, derived from the Greek word 'kikus' meaning force or strength.

3-( ) India was the country which cultivated highest area in the world countries and also produced highest in total productivity in the world i.e. 7.4 million tons.

4-( ) Chickpea is grown between 20°N and 40°N in the northern hemisphere.

5-( ) Chickpea dry matter; stem and branching will be increase as light intensity increased.

6-( ) In early chickpea sown germination percentage may be reduce due to higher soil temperature can delay seedling emerge and reduce plant population.

7- In lately chickpea planting than optimum date the vegetative growth period will be reduced, consequently the period of photosynthesis reduce causing reduction in seed yield.

8- Sown chickpea at optimum sowing date increase the period of vegetative growth consequently increase the period of photosynthesis and reduced competition between chickpea plants then increase seed yield.

9- Planting chickpea with low seeding rates, germination percentage may be reduce due to higher soil temperature and can delay seedling emerge and reduce plant population.

10-( ) Planting chickpea with seeding rate more than optimum rates, reduce net photosynthesis and the lower leaves become parasite on upper leaves which reflected decreases in seed number and size then decreased seed yield per unit area.

11-( ) Chickpea sown at optimum stand increase number of plant per unit area reflected plants will be more approached to uniformity which helps sun radiation penetration within chickpea plants then increase net photosynthesis, consequently increase seed number and size leading to increase seed yield.