Chapter 3

3- Lentil

Lens culinaris Medik.

Prepared By

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Introduction

Lentil (*Lens culinaris* Medik.) may have been one of the first agricultural crops grown more than 8,500 years ago. The lentil (*Lens culinaris*) is an edible pulse. It is a bushy annual plant of the legume family, grown for its lens-shaped seeds. It is about 40 cm tall and the seeds grow in pods, usually with two seeds in each.

Statistical distribution in Egypt and world:

Total world production from lentil was about 4.6 million ton from cultivated area of about 4.1million hectare and average productivity of wheat in the world was about 1110 kg/ha. Canada was the country which cultivated highest area in the world countries i.e. 1.3 million hectare, and produced highest total productivity in the world i.e. 1.9 million tons and Armenia recorded highest average of productivity from land unite area and recorded 2769 kg/ha. The total cultivated area in Egypt in 2010 was 13800 hectar produced total grain yield of 21780 ton with an average of 1578 kg/ha

Country	Cultivated area/ha	Total production (tons)	Average of production kg/ha)
World	4179702	4641139	1110
Egypt	13800	21780	1578
Highest country	Canada 1335500	Canada 1947100	Armenia 2769

History:

Lentil (*Lens culinaris* Medik.) may have been one of the first agricultural crops grown more than 8,500 years ago. Production of this cool season annual crop spread from the Near East to the Mediterranean area, Asia, Europe and finally the Western Hemisphere.

Uses:

Protein content ranges from 22 to 35%, but the nutritional value is low because lentil is deficient in the amino acids methionine and cysteine. It is used in soups, stews, casseroles and salad dishes. Lentils also contain dietary fiber, folate, vitamin B_1, and minerals. Lentils are often mixed with grains, such as rice, which results in a complete protein dish. Lentils are a good source of iron

Geographical distribution:

Lentil is grown between 20°N and 40°N in the northern hemisphere and most counties planting lentil in the world are USA, China, Turkey, Canada, Pakistan and Iran.

Variety Selection:

Growers should consider maturity, growth habit, seed size and color as well as yield potential when selecting a variety of lentil. Currently buyers prefer lentils with larger seeds that are light in color and without mottling on the seed coat.

Giza 9 variety has small seed (25 g/1000 seed) and cultivated in Upper Egypt and Delta region.

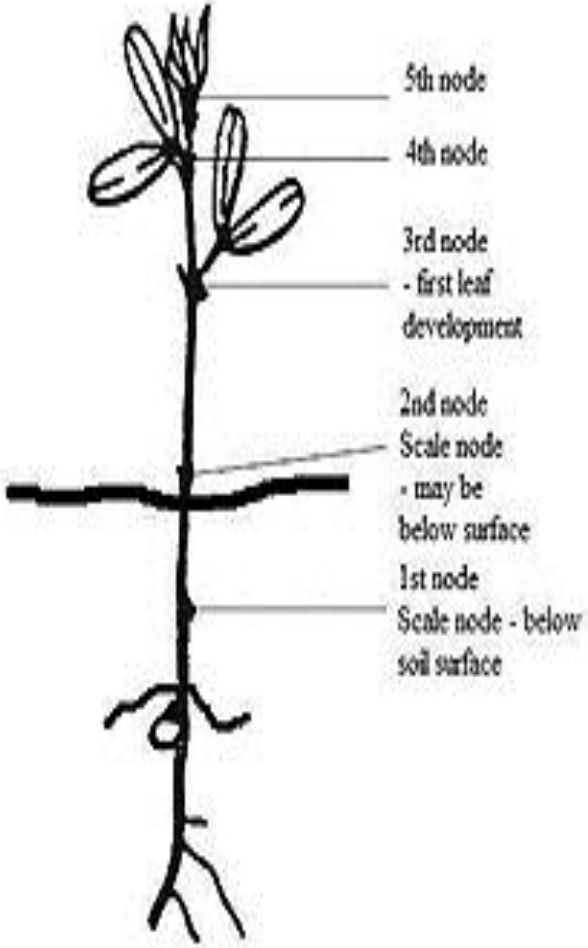
Giza 37 variety has small seed (25 g/1000 seed) and cultivated in North Delta region.

Giza 29 variety has small seed (25 g/1000 seed) and cultivated in all Egyptian regions.

Siena 1 variety has a big seed (45 g/1000 seed) and cultivated in North Cost of Egypt in sandy soils.

Giza 51 variety has a big seed (35 g/1000 seed) and cultivated in all Egyptian regions.

Lentil germination and seedling



Epigeal

Lentil plant

Environments Requirements:

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

Soil:

Lentil is adapted to all soil types, from sand to clay loam, if there is good internal drainage. Lentil cultivated in loamy soil especial rich in calcium element. The suitable soil of lentil cultivation in Egypt is yellow heavy Loamy soil. Lentil not cultivated in heavy soils more fertility, saline or alkaloid soils. A soil pH near 7.0 is best for lentil production.

Seedbed Preparation:

A firm, smooth seedbed with most of the previous crop residue incorporated is best for lentil. Uneven surfaces, large clods, rocks or protruding crop residue can interfere with seed placement and complicate later swathing and combining.

Sown Date:

The suitable date of lentil cultivation in Egypt at mid-October to mid-November in Delta region and cultivation at first October to first November at upper Egypt. We should cultivated lentil at suitable date due to the following reasons:

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

2-In lately sown 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 which increase weed competition loss of germination and vigor delayed and reduces yields. Eradication of weeds from seed field is paramount because weed seed may be difficult to remove from lentil fields at harvest or during conditioning. ***Late in lentil cultivation at this date will reduce seed yield due to down mildew on lentil especially in Delta region.***

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

Sowing Rate:

Lentils cultivate at seeding rate of 40-60 kg/fed according to varieties and method of sown i.e. plant population density of 60-90 plant/m^2. We should cultivated lentil at suitable rate due to the following reasons:

1-*Sown lentil with low seeding rates*, *germination percentage may be reduce due to higher soil temperature and can delay seedling emerge and reduce plant population.* Low sown rate causes increase in weeds number in the field which competitor with lentil plants reflected decreases per unit area.

2-*Sown lentil with more than optimum seeding rate* ***leading to increase competition between lentil plants reflected 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-Sown lentil with optimum sown rate reduces competition between plants then increase photosynthesis rate which consequently increase seed yield. *Sown lentil with optimum stand increase number of plant per unit area reflected lentil plants will be more approached to uniformity which helps sun radiation penetration within lentil plants then increase net photosynthesis, consequently increase seed number and size then*

Seeding Method:

The optimum planting method of lentil under Egyptian condition at rows drilling using method of (Affair or Heraty) in rows 25-30 cm apart (90-100 plants/m^2).

Fertilization Requirements:

1-Lentil seed must be incubating with *R. leguminosarum* before planting directly.

2-Lentil will fertilize with nitrogen fertilizer with 10-20 kg N/acre as starter dose before the second irrigation.

3-lentil fertilized with calcium superphosphate (15.5 P_2O_5) before planting at a rate of 100-150 kg/fed according soil fertility.

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

5-Lentil fertilized with foliar application of microelements especially when grown in the newly reclaimed soils with (Ferro + Zinc + manganese) at concentration of 50 ppm twice after 40 days from planting and after foliar application by two weeks.

Irrigation:

The first irrigation of lentil must be after planting by 30-40 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 done during seed filling stage, this in the old soil in valley. In case of newly reclaimed soils which especially sandy soil increase number of irrigations to 4-6 irrigations and reduce number interval days according to soil type or using sprinkler irrigation.

Weed control:

Weed control of annual winter weeds in lentil by hand in Egypt. *Orbanche spp* is the dangerous weed that chemically controlled using herbicide of Gesagard 80% WP at rate of 1 kg/fed after planting and before irrigation directly.

Seed yield:

- Seed yield of lentil about 800-1000 kg/feddan (5-6 ardab/fed) and the weight of ardab is 160 kg without processing and 148 kg after processing.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Select the most appropriate answer from the following questions.

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

a) 3.1 and 3.6. b) 4.1 and 4.6. c) 5.1 and 5.6. d) 6.1 and 6.6.

2. The average productivity of lentil in the world is

a) 910kg ha^{-1}. b) 1010 kg ha^{-1}, c) 1110 kg ha^{-1}. d) 1210 kg ha^{-1}.

3. The highest production of lentil in the world is

a) China. b) Canada. c) Turkey. d) Egypt.

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

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

5. The optimum temperature for lentil germination is

a) 15°C. b)20°C. c) 25°C. d) 30°C.

6. In the northern hemisphere, lentil 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. Lentil productivity (kg ha-1) in Egypt is

a) 1378 kg ha^{-1}, b) 1478 kg ha^{-1} c) 1578 kg ha^{-1} d) 1678 kg ha^{-1}

8. Increasing in light intensity during growing lentil leading to

a) decrease plant height. b) increase dry matter

c) increase branching d) answer in b + c.

9. Decreasing in light intensity during growing lentil leading to

a) reducing branching. b) reducing NP uptake

c) reducing flowering d) answer in a + b.

10. Lentil growth and production are best in

a) yellow loamy soils. b) calcic terrarosa.

c) deep black cotton soil. d) sandy soils.

11. Lentil cultivar has a big seed is

a) Siena 1. b) Giza 9. c) Giza 29. d) Giza 37.

12. Lentil cultivar has a small seed and grown only in Upper Egypt is

a) Giza 9. b) Giza 29. c) Giza 51. d) Giza 37.

13.Lentil cultivar has a big seed and grown in all Egypt regions is

a) Siena 1. b) Giza 29. c) Giza 37. d) Giza 51.

14. The optimum sowing date of lentil in Egypt is

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

c) End-November. d) First December.

15.Optimum seeding rate of lentil in Egypt is

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

16. Lentil grown in the newly soils in Egypt is

a) calcic soils. b) saline soils.

c) high fertility soils. d) sandy rich in calcium element.

17. Delayed sowing of lentil in Delta region results in

a) flower dropping. b) poor seed quality.

c) lodging plants. d) down mildew infection.

18. 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}.

19.The optimum temperature during lentil growth is.

a) 20-25 C° b) 25-30 C° c) 30-35 C° d) 35-45 C°

20.Lentil fertilized with Zinc, Ferro and manganese micronutrients in newly reclaimed lands at rate of

a) 20 ppm. b) 30 ppm. c) 40 ppm. d) 50 ppm.

Put sign True or False before the following sentences:

1-( ) Lentil (*Lens culinaris* Medik.) may have been one of the first agricultural crops grown more than 8,500 years ago.

2-( ) Lentil seed contained protein ranges from 22 to 35% and is a good source of iron.

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

4-( ) Reducing in light intensity during lentil growth reducing branching, shortest plants and reducing in NP uptake.

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

6-( ) Late in lentil cultivation at optimum date will reduce seed yield due to down mildew on lentil especially in Delta region.

7-( ) Sown lentil at optimum planting date increases the period of vegetative growth consequently increase the period of photosynthesis and reduced competition between lentil plants then increase seed yield.

8-( ) Sown lentil with low seeding rates, germination percentage may be reduce due to higher soil temperature and can delay seedling emerge and reduce plant population.

9-( ) Sown lentil with more than optimum seeding rate leading to increase competition between lentil plants reflected 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.

10-( ) Sown lentil with optimum stand increase number of plant per unit area reflected lentil plants will be more approached to uniformity which helps sun radiation penetration within lentil plants then increase net photosynthesis, consequently increase seed number and size then increased seed yield.