Ministry of Higher Education
Salahaddin University
College of Agricultural Engineering Sciencies
field Crops and Medicinal Plants Department

Principles of Field Crops
Second Grade
Fall Semester (2022-2023)
Instructor: Saber Wasman (PhD)
Lecture 7

1

Process of Germination

When seeds placed under the proper conditions:

1- Seeds are capable of immediate germination gradually absorb water, their moisture maybe 60-100 of the dry weight and the seed swollen.

2- Soluble nutrient particularly sugars go into solution and diffused from cell to cell synthesized into cellulose. Proteins and fats are broken down.

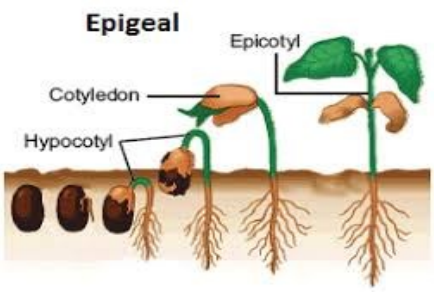
3- Emerging seedling exposed to light, begins photosynthesis early.

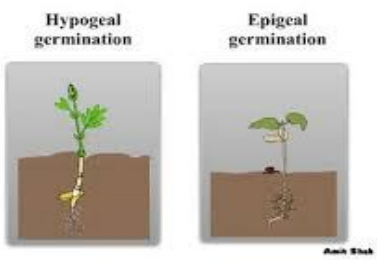
2

Types of Germination

A- Epigeal germination, which the cotyledons are above the soil surface by the elongation of hypocotyls.

B- Hypogeal germination: the cotyledons remain in the soil, the plumule grows or is pushed upward by the elongation of an epicotyls.





3

Qualities of Seeds for Germination

1- Whole versus broken seeds:

Broken seeds that contain the embryo germinate less, have a higher seedling mortality and produce smaller plants than whole seeds. Mechanical injury due to broken seed coats are splitting frequently occurs in field peas.

2- Seed maturity

3- Seed size: Small seeds produces small seedlings.

Such as Small seed of wheat yielded 18% less than the large seeds

4

Dormancy in seeds

Seeds of crop species show dormancy i.e., they fail to grow immediately after maturity even though external conditions favor germination

Causes of dormancy:

Dormancy may result from seed characteristics or environmental conditions as follows:

5

1- Thick or hard seed coats prevent intake of water and probably also oxygen. The hard seeds in many legumes are an example.

2- Seed coats interfere with the absorption of oxygen e.g. Oats and barley.

3- In some species the embryo is still in mature and has not yet reached its full development at harvest.

6

4- Germination inhibitors which must undergo natural or applied chemical changes to permit germination.

5- High temp. during seed maturity may induce dormancy

7

Seeding Crops

After the land has been plowed and smoothed and pulverized it will need therefore to divide into strips, ridge or furrow according to crop type and irrigation system.

Growing crops under rainfall conditions doesn't need field dividing

8

While for some crops which need irrigation such as wheat or barley after scattering or broadcasting or drilling the seeds, the field is divided into small basins, of a dimensions 2-12 m up to 7-15 m in general, or 3-4 x 7-9 m in corn, but it is more in wheat and clover, 10x12 m or it could be divided into strips with width 15-20 m and length up to 200 m, depending on the land slope, soil texture, crop type and method of irrigation.

9

Methods of sowing

The prepared land should be sown with good quality seeds, reasonably good quality seed is a prime essential to successful crop production, whereas poor seed is a serious farm hazard.

Seeds germination and purity must be tested before sowing, seed must be free from weed seeds and should be free from disease pathogens or insects.

Methods of sowing depend on crop type, irrigation system, the purpose of growing certain crops.

10

In general the methods are:

Broadcasting;

- The seeds distributed by hand over the entire surface without any rows.
- It needs experience to cover a fair amount of area in a day with good results.
- After that seeds are mixed with the soil by a light harrow such as spike tooth harrow.
- The advantage of broadcasting it is simple and a large area can be covered in a short time.

11

- It is suitable for grass and other crops for which seeds are very small and is necessary to get a thick growth.
- The germination will not be uniform and the distribution will be irregular and large quantity of seeds is required.

12

Drilling:

- The seed place in lines. The distance between the lines for cereals crops is about 15-20 cm and for legumes it will be a little more depending upon the type of crops, soil and other conditions.
- Seeds placed in a uniform depth and this helps in good germination and uniform growth.
- For dry farming, drilling is very suitable and in order to cover large areas in a short time, large drills are used.

https://www.youtube.com/watch?v=AQZ042pIcMo

13

- Under conditions where fertilizers have to be applied this operation can be carried out at the same time as sowing.
- In order to prevent fertilizer coming direct contact with the seed, it is placed in a separate line or at different depth from the seed.

14

Planters:

- It is used to sow in lines, and at a little distance from each other in the line.
- It is normal to plant three or more seeds in one place.
- This type of sowing is suitable for such crops as rice, maize, cotton, beans…etc.
- https://www.youtube.com/watch?v=LKh6RIoX6yQ

15

Rate of sowing or seeding rate:

- The rate of seeding means amount of seeds sown per unit area which is donum in Iraq (2500 m2).
- It depends on crop type, seed size and date of sowing, depth of sowing, method of sowing, soil texture and characters.
- For late sowing, hand sowing and under irrigation the amount must be increased.
- The sowing rate depends on seed germination percentage and seed purity.

16

Depth of sowing:

- Depth of sowing is extremely important in securing good plant stands. Small seeds should usually be planted shallow, but large seeds should be planted a little deeper.
- Seeds would emerge faster in sandy soils than in clay soils, and also in warm soils as compared to cold.
- In dry soils, seeds should be planted slightly deeper so that they come in contact with moisture. Hypogenous germination pattern emerge easier than epigeous germination.

17

Date of time of sowing:

Planting date for field crops is selected according to the suitability of temperature degrees for plant growing stages (at early and late stages), besides the suitability of photoperiod for final stage which is flowering period and fruit formation.

18