5. Sowing

Recall a little

- You already know that soil and seed both go hand in hand
- Soil provides medium for plant growth
- A seed will develop in to a healthy seedling only when it is placed in proper medium, at proper depth, time and spacing.
- The prime object of seed treatment is to protect seed and to promote the growth of plant.

5.1 Sowing

Sowing can be defined as the process of placing seed into the well prepared soil at proper place (depth) for growth OR The process of putting seed in the ground soil for growing crop plant is known as sowing.

5.1.1 Sowing time, depth and spacing

Proper and healthy stand of a crop is essential for getting its higher yield. It depends on the time, depth and method of sowing.

Can you recall?

- Which are the common seasons of sowing in Maharashtra and their approximate time of sowing ?
- Which crops are prominently grown in those seasons in your locality ?

Time of sowing

The exact or proper time of sowing depends upon different factors, such as sowing season, atmospheric as well as soil temperature and moisture content in seeding zone of soil. The common sowing seasons in Maharashtra are *Kharif*, *rabi* and summer.

The *Kharif* crop is usually sown after the regular onset of monsoon in the month of June to July. Very early sowing may not be advantageous, as it may result in failure of crop due to prolonged dry spell. However in certain situations early sowing may be advantageous, particularly for *rabi* crops. Usual sowing time of *rabi* crop is October to November. In certain cases advancing sowing in September to October may be helpful for taking advantage of available soil moisture. Time of sowing of summer crop varies from January to February. For most of the crops it is preferably first fortnight of January.

Try this

- Prepare a schedule of sowing dates in different seasons as per your opinion.
- Practice the sowing by any one method.
- Observe the changes in growth of plants at different dates of sowing.
- Determine the proper time of sowing based on crop stand and difference in growth performance.

There should be sufficient moisture in seeding zone, so that it would help in proper germination of seed and emergence of crop plants. Similarly, each crop needs definite range of temperature for proper germination and also for further vegetative growth. The sowing time should be such that moisture stress period (due to long dry spell) may be avoided at critical stages of crop growth. High soil and atmospheric temperature at the time of sowing not only affects the seed germination but also favours the effect of different insects – pest and diseases e.g. stem borer of sugarcane, shootfly of jowar, etc. In short optimum time of sowing is therefore, a time which provides suitable environment at all the stages of crop growth.

The optimum time of sowing differs not only from crop to crop but also within different varieties of the same crop.

Depth of sowing

Sowing of seed at the appropriate depth is an important factor affecting establishment of good stand of crop.

Can you tell?

- Why seed depth is important?
- Which depth is safe for sowing?
- Do we need seed to be soaked in water before they are sown?
- How does planting depth affect germination?

The optimum depth of sowing depends upon soil moisture, size of seed, seed reserve and coleoptile length. For getting good vigour, it is necessary that the germination of seed should be good and for proper germination, it is always important that the seed should be placed in the moist zone of soil. Too shallow or too deep sowing results in large number of gaps and less plant population. Due to shallow sowing the seed germinon is poor because of inadequate moisture in the upper layer of soil. Too deep sowing may also affects crop stand because in many cases seedling may not be able to push their shoots above the ground level from greater depth. Besides affecting plant population, the weed problem also becomes serious under such conditions.

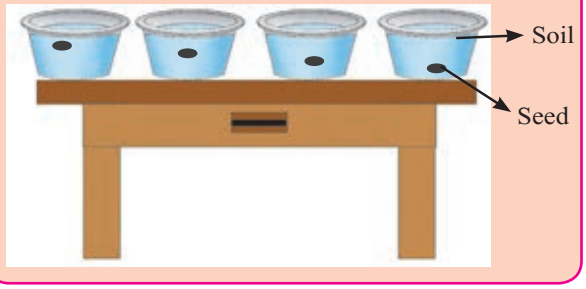
The size of seed also have great influence on the depth at which seed should be sown. The crops like groundnut, castor, etc having bigger size of seed can be sown to a greater depth up to 6 cm. On the other hand crops like finger millet, pearl millet, tobacco, etc. having small sized seed have to be sown as shallow as possible. The thumb rule is to sow the seed to a depth approximately 3 to 4 times their diameter. For most of the crops the optimum depth of sowing ranges between 3 to 5 cm.

Shallow sowing depth of 2 to 3 cm is needed for the crops like pearl millet and finger millet. For small sized seeds which are sown shallow needs to be irrigated frequently to ensure good emergence of crop.

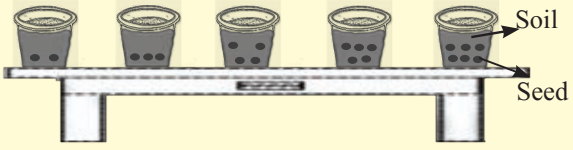
In the case of deep sowing, the seed reserves should be sufficient to put forth long coleoptile for emergence. The coleoptile length also differs from variety to variety of the same crop. For example – tall traditional varieties of wheat having long coleoptile length can be sown deep. On the other hand Mexican varieties with short coleoptile length need to be sown shallow.

Try out and think about it

- Take 5 containers (pots)
- Fill them with soil.
- Sow the seed in each pot at different depth and water it.
- Observe the result regarding emergence and discuss.



Observe and Discuss



Take few earthen pots of same size and fill them with soil. Sow the seeds in each container with increased number i.e. two seed in first, three in second, four in third and so on. Observe the growth parameters of plant in each pot. Discuss the result.

Spacing

The full yield potential of an individual plant is achieved when sown at optimum spacing. Too dense or wide planting may result in reduction of yield per unit area. If sown densely, the growth of individual plant will be affected due to competition among plants for space, food, water, etc. Similarly, yield from individual plant cannot be increased beyond certain limits. As such the spacing between two rows and two plants within a row should be optimum. It depends upon different factors such as growth habit of plant, soil type, purpose for which crop is grown and also the sowing season. The crop with branching habit or with good tillering capacity will require more space. Individual plant growth may be vigorous in rainy season. Hence, in rainy season the spacing may be wider than in summer season. On the same line wider spacing is required on heavy soil as compared to light soil. The spacing also depends upon the purpose for which crop is grown. Increase in plant height with less diameter is preferable for fodder crop and therefore, fodder crops are generally sown dense than grain crop. In crops grown on stored soil moisture under rainfed conditions, the spacing should be such to avoid overcrowding of plants that may deplete most of the moisture before crop matures. In short spacing should be so adjusted to have optimum plant population under different conditions.

Do this

How theoretically plant population is calculated by using figure of spacing for a particular area. Use following formula

$$\text{Plant population} = \frac{\text{Area } m^2}{\text{Spacing } m^2}$$

Try this

Calculate the plant population of 1 hectare Jowar crop when spacing is 30 cm × 25 cm.

5.2 Seed treatment

5.2.1 Definition

Seed treatment is the procedure of treating the seed with different insecticides, fungicides or combination of both for protecting their health. It also includes treatments subjecting seed to solar energy exposure, immersion in water, etc.

In short seed treatment is the treatment given to the seed to improve germination, vigour potential and to maintain good health of seed.

Fig. 5.1 : Seed treatment

Fig. 5.2 : Seed treatment

5.2.2 Objectives of seed treatment

The various objectives of seed treatment are as follows

(1) Protection of seed from seed rot and seedling blight

Rottening of seed, seedling blight and other seed and soil borne diseases can be prevented by giving appropriate seed treatment prior to sowing. Coating seed with certain chemical is done for this purpose.

(2) Prevention of the spread of disease

The infection from systemic diseases during different growth stages of crop and also during storage is prevented by appropriate seed treatment. Treatment is also helpful in preventing non systemic diseases.

(3) Protection of seed from insects in soil and in storage

The seed treatment with various insecticides alongwith fungicides is effective against storage pest and certain insects in soil.

(4) Improvement in seed germination

Germination of seed is improved by controlling seed surface flora, by breaking dormancy, removing inhibitors and treating seed with germination promoters.

(5) Reduction in cost of production

The cost of plant protection can be reduced by using treated seed for cultivation.
This helps in minimizing the cost of crop production to a greater extrent.

(6) Production of good quality seed

Good quality seed can be produced when crop stand is uniform, vigorous and healthy. This can be achieved by using properly treated seed for sowing.

(7) Increase in nitrogen fixation:

Seed of leguminous crop is treated with rhizobium culture (nodule bacteria) for increase in nitrogen fixation through increased nodulation on the root. The seed of cereals or monocotyledons such as jowar, wheat, bajri, paddy, cotton, vegetables, etc. is treated with azotobacter. For sugarcane sets acetobacter and azospirillum species are useful for the same reason i.e. 'N' fixation.

(8) Convenience in sowing

The seed of cotton crop is intermingled into each other due to fuzz. This fuzz difficulty can be avoided by treating the seed with paste of soil and fresh cow dung or by delinting with concentrated sulphuric acid.

(9) Induction of earliness and variations:

The maturity period of crop can be minimized by giving vernalization treatment to the seed. Similarly variations in original morphological and general structure of seed can be achieved by giving radiation treatment to the seed.

(10) Protection of beneficial insects

The insects like honey bee are beneficial to plants for pollination, fertilization, etc. The chemicals used for plant protection kill such insects. This can be avoided by using properly treated seed for sowing.

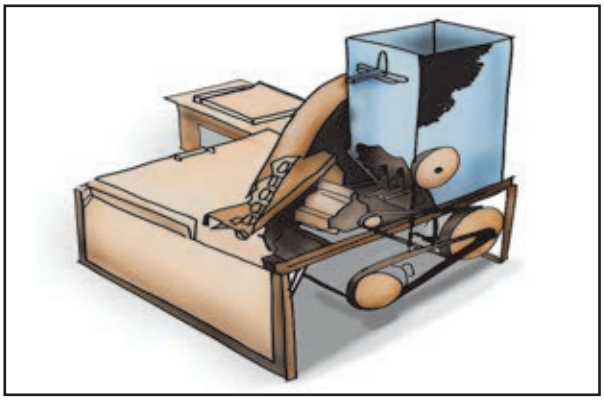


Fig. 5.3 : Slurry seed treater

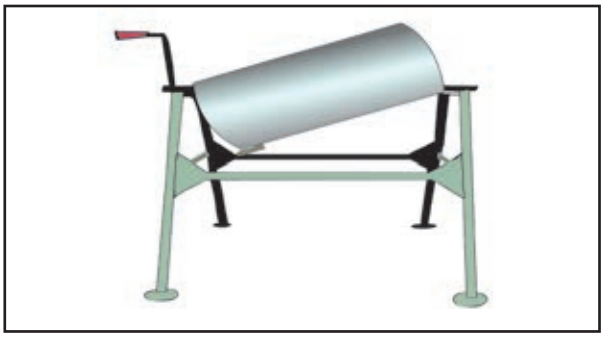


Fig. 5.4 : Seed treating drum

(11) Hardening of seed

Drought and cold tolerance can be achieved by treating seed with chemicals like calcium chloride ($CaCl_2$), Potassium chloride (KCl), monopotassium phosphate (KH_2PO_4).

(12) Seed fortification

This treatment is given for achieving high vigour to overcome soil reactions.

Do you know ?

Following equipments are used for seed treatment

- Seed treating drum (Home made drum / mixers)
- Slurry seed treater
- Mist – o – matic treaters
- Grain auger
- Shovel

5.2.3 Types of Seed treatment

Different types of seed treatments are as follows –

(1) Treatments for improving seed germination and vigour

(a) Soaking of seed in water – Cotton seed is soaked in water for 4 to 6 hours in case of deshi and 10 to 12 hours in case of American varieties

(b) Use of chemicals –Treatment of common salt NaCl or KH_2PO_4 (1%) for 12 hours is given to jowar seed for improving germination and vigour.

(c) Treatments such as pre chilling, pre drying seed and rubbing seed against hard surface, low and high temperature treatments are done for breaking seed dormancy.

(2) Seed treatment with fungicides and insecticides

Advantages of such treatments are as follows

- It protect seed from seed rot.
- It controls the attack of soil insects.
- Protect seed from store grain pest
- It prevents the spread of plant diseases.

The three main types of fungicidal and insecticidal treatments are as follows

(a) Seed Disinfection: It means eradication of fungal spores that have established within the seed coat or in deep seated tissues. The chemicals used must penetrate in to the seed to kill the fungus.

(b) Seed Disinfestation: Seed disinfestation refers to the destruction of surface borne organisms that have contaminated seed surface but not infected the seed surface. Chemicals are applied through soaks, dusts or dips.

(c) Seed Protection: This is done to protect the seed and young seedlings from the organisms present in the soil.

Remember this

Following precautions should be taken while treating the seed

(i) Treated seed should never be used as food for human or cattle.

(ii) For avoiding use of treated seed as a food, the seed bag should be clearly labelled as 'poisonous and dangerous, if consumed.'

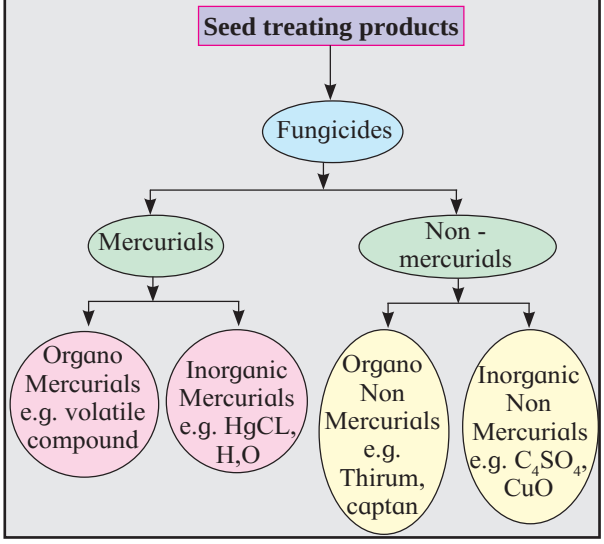
(iii) The proportion of seed and chemical should be as per recommendation.

(iv) Seed with high moisture content is susceptible to injury, when treated with concentrated products.

(v) Treat only actual quantity of seed required for sowing.

(vi) Wear safty kit while treating seed and avoid contact of chemicals with skin and respiratory tract.

Make a list and discuss the use of following fungicides.



(3) Special seed treatments:

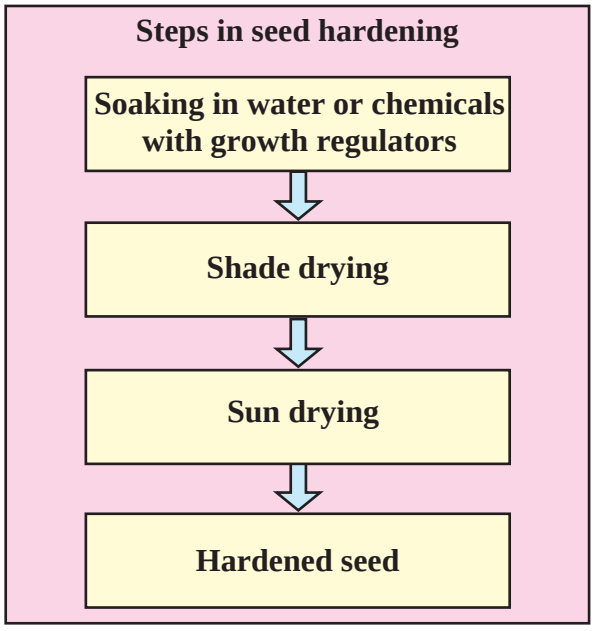
(a) Seed hardening: - This treatment given is for achieving drought and cold tolerance. Chemicals like $CaCl_2$, KCl, and KH_2PO_4 are used for this treatment.

(b) Seed fortification: - This is done to achieve high vigour to overcome soil reactions. The chemicals useful for this treatment are manganese sulphate ($MnSO_4$), etc.

(C) Seed peeleting: This treatment consists of coating the seed with nutrients. This is generally used for forest tree seed.

(d) Moist sand conditioning: This seed treatment is given for minimizing loss of seed viability.

Soybean seed is mixed with moist sand @ 5 to 10% moisture content. This is done for cocoa seed also.



5.3 Methods of sowing

Crop can be sown by different methods as described below:

(1) Broadcasting: The seed is spread or scattered by hand on the soil surface and lateron mixed in to the soil by working with wooden plough or harrow. This method is usually followed for irrigated crop. Majority of cereals and fodder crops are sown by this method.

Fig. 5.5 : Broadcasting

This method is cheapest, simplest and fastest. However, it has some disadvantages. The seed rate required by this method is relatively high. The crop stand is not uniform, as the distribution of seed by this method is uneven. Some places remains gappy and on the other hand some places become crowded. In the case of fine seeded crops, the seed is usually mixed with sand, ash, etc. Inter culturing is also not possible be implements. The crops sown by this method are jowar, bajra, wheat, paddy, red gram, sannhemp, etc.

(2) Drilling: Drilling means sowing of seed to certain depth in lines by seed drills. The seed drills may be two coultered (dufan), three tyned (Tifan) or four tyned (Chaufan). As the seed is placed in lines at uniform depth, the crop stand is more uniform. Inter cultivation operations can be done by bullock drawn implements because of definite space between two rows of crop. This method needs less seed rate as compared to broadcasting. The examples of crop grown by this methods are bajra, jowar, wheat, green gram, pigeon pea, etc.

Fig. 5.6 : drilling by tractor drawn implemnt

Fig. 5.7 : Drilling by bullock drawn implement

(3) Dibbling: In dibbling method of sowing seed is placed at specific depth and spacing by a dibbler, planter or mostly by hand. This method requires more time and more labour for sowing. However this method has certain advantages. The seed rate required is less and crop stand is more uniform.

The interculturing is also possible in both directions by implements. The vigorously growing crops which need wider spacing are usually sown by this method. This method is useful for cotton, sunflower, ground nut, etc.

Fig. 5.8 : Dibbling

(4) Planting: When crop is sown by using vegetative plant parts such as tuber, rhizomes, cuttings, sets, etc, the sowing is referred as planting.

Fig. 5.9 : Planting of Sugarcane

The seed material is placed in soil and covered with soil by manual labour. The most common crops sown by this method are sugarcane, turmeric, potato, ginger, etc.

(5) Sowing in plough furrows: This method of sowing is commonly followed in dry land farming. This method is useful to take the advantage of moisture in lower layer of soil. The seed is placed at the bottom of the plough furrow and is covered, when succeeding furrow is turned over. This method is used for crops like gram, pea, wheat, maize, red gram, etc. This is slow and laborious method.

(6) Transplanting: Transplanting method consists of raising seedling in the nursery and then replanting them in main field. This method is usually followed for crops having small seed like paddy, chilli, tomato, tobacco and most of the vegetables as well as flower crops. The seed is sown in the nursery beds with all extra care needed for tender seedlings. While the seedlings are in the nursery, the farmer get sufficient time to thoroughly prepare his land. When the crop attains specific height or grown to a specific stage, they are pulled out from nursery bed and planted in the main field. The nursery bed should be irrigated properly prior to uprooting of seedlings from nursery. This is necessary for their easy removal. Similarly, main field should be irrigated lightly after transplanting, so that the seedlings get established faster.

Fig. 5.10 : Transplanting of paddy seedlings

Exercise

Q.1 A. Fill in the blanks.

1. The process of putting seed in the ground soil for growing crop plant is called as -------.
2. *Kharif* crop is usually sown in the month of ----------.
3. The thumb rule is to sow the seed to a depth approximately ---------- times their diameter.
4. For increased nitrogen fixation, leguminous crops are treated with ---------- culture.
5. The maturity period of crop can be minimized by giving ---------- treatment to the seed.

B. Make the pairs

'A' group	'B' group
1. Broadcasting	a. Sowing by seed drills
2. Dibbling	b. Sowing by hand using planter
3. Drilling	c. Scattering seed on soil surface
	d. Raising plant in the nursery
	e. Sowing by using vegetative plant part

C. State true or false

1. Water soaking treatment to cotton seed is given for improving seed germination.
2. Seed disinfestations means eradication of fungal spores that have established within seed coat.
4. Seed disinfection means destruction of surface borne organisms.
4. Moist sand conditioning is given for minimizing loss of seed viability.
5. Good quality seed is produced, when crop stand is uniform, vigorous and healthy.

Q. 2 Answer in brief.

1. Give the examples of crops sown by planting method.
2. What is meant by seed treatment?
3. Why it is necessary that seed should be placed at optimum depth?
4. Give the disadvantages of broadcasting.
5. Write the advantages of dibbling.

Q. 3 Answer the following questions

1. Explain broadcasting with examples of crops
2. Complete following chart.

Sr. No.	Name of the Crop	Method sowing
1	----------	Broadcasting
2	----------	Dibbling
3	----------	Planting
4	----------	Transplanting
5	----------	Sowing in plough furrows
6	----------	Drilling

3. Calculate the plant population for 1 hectare jowar crop when spacing is 30 cm × 15 cm
4. Describe the depth of sowing.
5. Explain with examples the different treatments given for improving seed germination and vigour.

Q. 4 Answer in detail

1. Define seed treatment and give its objectives.
2. Read the following information and answer the questions.

Seed treatment materials are available in the form of dusts, wettable powders and liquids. Dust fungicides are applied at the rate of 2 to 2.5 gm per kilograms of seed. They are mixed by mechanical mixer. Slurry fungicides applied in a water suspension, which is mixed with seed in a slurry seed treater. Use of liquid solution is known as the quick wet method. A solution of a volatile fungicide is applied to the seed and is thoroughly mixed with them. Most seed treatments contain dyes which serves two purposes. First as a warning that seeds have been treated and second as a visible means of evaluating the completeness of treatment coverage. Some important causes of poor seed treatments are use of wrong or inappropriate fungicide, use of inadequate dosages and carelessness in the treatment procedure.

a. In which forms the seed treatment material is available?

b. What is the rate of application of dust fungicides?

c. How slurry type of fungicides are applied?

d. Give the purpose of using dye in seed treatment.

e. List out any two causes of poor seed treatment.

3. Explain the different methods of sowing and give examples.
4. State the advantages of seed treatment with fungicides and insecticides and explain their types.
5. Describe the different factors useful in deciding proper time of sowing.

Activity :

Practice the different methods of sowing in the field.

Do yourself Write the precaution taken from you regarding the activity of sowing.

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