

Agronomy of seed production – agro climatic requirements and their influence on quality seed production.

STEPS OF QUALITY SEED PRODUCTION

Genetic principles of Seed Production

- ❑ Production of genetically pure and otherwise good quality pedigree seed is an exacting task requiring high technical skills and comparatively heavy financial investment.
- ❑ During seed production strict attention must be given to the maintenance of genetic purity and other qualities of seeds in order to exploit the full dividends sought to be obtained by introduction of new superior crop plant varieties.
- ❑ In other words, seed production must be carried out under standardized and well-organized condition

GENETIC PRINCIPLES OF SEED PRODUCTION

1. Developmental Variation
2. Mechanical Mixture
3. Mutation
4. Natural Crossing
5. Minor Genetic Variation
6. Selective Influence of Disease
7. Techniques of Plant Breeder

PROCEDURE FOR MAINTAINING GENETIC PURITY

- ❑ Control of Some Source
- ❑ Preceding Crop Requirements
- ❑ Isolation Distance
- ❑ Roguing
- ❑ Seed Certification
- ❑ Grow-out Tests

Agronomic Principles of Seed Production

- ❑ Selection of Suitable Agro climatic Zone
- ❑ Selection of Land
- ❑ Isolation Distance of the Seed Crop
- ❑ Preparation of the land
- ❑ Selection of the variety
- ❑ Seed
- ❑ Seed Treatments
- ❑ Time of Sowing / Planting
- ❑ Seed Rate
- ❑ Method of Sowing
- ❑ Depth of Sowing
- ❑ Roguing
- ❑ Supplementary Pollination

Contd....

- ❑ Intercultural operation
- ❑ Disease – Pest Control
- ❑ Nutrition of the Crop
- ❑ Irrigation
- ❑ Harvesting
- ❑ Drying Of Seed
- ❑ Seed Testing
- ❑ Seed Testing Report
- ❑ Biofortification & Biopriming

Seed Testing:

- ✓ Sampling
- ✓ Purity Test
- ✓ Germination Test
- ✓ Seed Viability Test
- ✓ Moisture Content Test

Biofortification & Biopriming

Bio-fortification: Greek word “bios” means “life” and Latin word “fortificare” means “make strong”. Food fortification or enrichment is the process of adding micronutrients (essential trace elements and vitamins) to food.

Crop bio-fortification:

- Crop Bio-fortification is the idea of breeding crops to increase their nutritional value.

Ex; Zn rice, Zn wheat, iron pearl millet, QPM, Golden rice

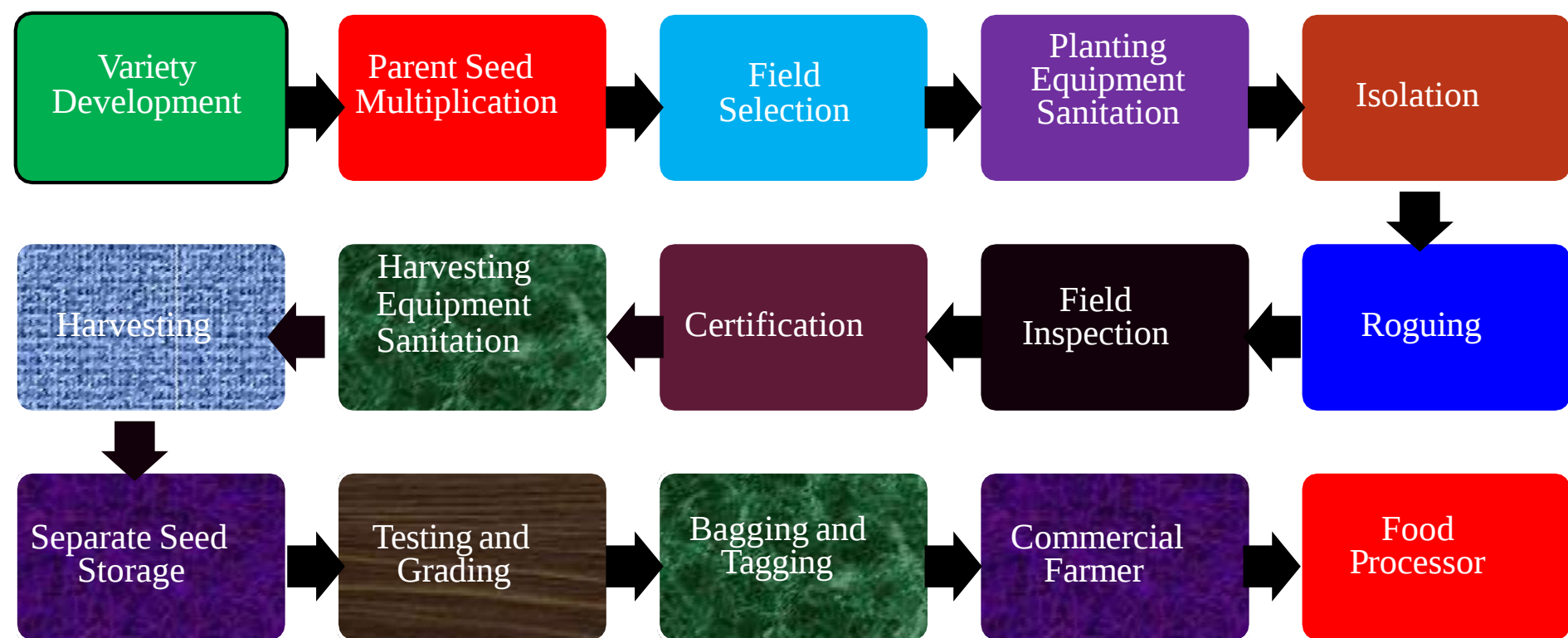
Bio Priming:

Synonymous term to Biological seed treatment.

A new technique of integrating biological (inoculation of seed with beneficial organism to protect seed) and physiological aspects (seed hydration) of disease control.

In broader sense, it is an ecological approach and an effective alternative to chemical control unique from chemical seed treatments by their utilization of living microorganisms. ex *Trichoderma viridae*, *Trichoderma harzianum*

QUALITY SEED PRODUCTION IN A FLOW CHART



SEED PRODUCTION AGENCY

There are three type of Seed Production Agency.

- 1) Government sector.
- 2) Public sector.
- 3) Private sector

National Seed Production Agencies

- ❖ National Seed Corporation (NSC), DELHI
- ❖ State Farm Corporation of India (SFC)
- ❖ Indian Councils of Agriculture Research (ICAR)
- ❖ Indian Institute of Horticulture Research (IIHR)
- ❖ India Agriculture Research Institute (IARI)

State Seed Production Agencies

State Seed Certification Ltd (SSCL), Ganesh Chandra Avenue, Kolkata-700013,

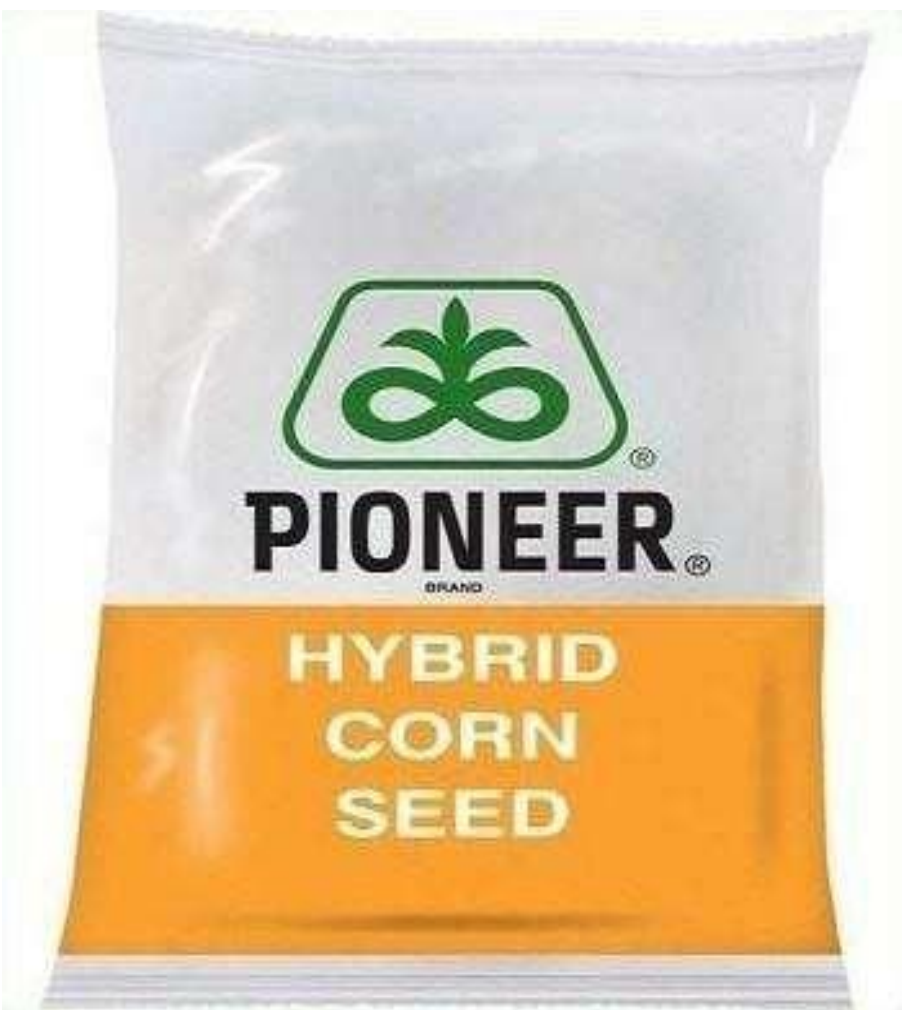
State Seed Certification (SSC), Tollygunge, Kolkata

Private Seed Companies

A number of private seed companies are also engaged in seed production, research and development activities 1969 onwards.

- Syngenta India Ltd
- Sutton and son Calcutta (WB)
- Bejo Sheetal hybrid seed Jalna (MH)
- Unicorn group Hyderabad.
- Namdari seeds Bangalore
- Hindustan Lever Ltd Bombay
- Pioneer Seed company Ltd Hyderabad
- Maharashtra hybrid, seed company Jalna
- Indo-American Hybrid seed Ltd Bangalore
- Nath seeds Aurangabad





NATIONAL SEED POLICY

Objectives of the National Seeds Policy:

- ❑ The provision of an appropriate climate for the seed industry to utilize available and prospective opportunities.
- ❑ Safe guarding of the interests of Indian farmers and the conservation of agro-biodiversity
- ❑ A regulatory system of a new genre is, therefore, which will encompass quality assurance mechanisms coupled with facilitation of a vibrant and responsible seed industry

The main feature of the national seed policy, 2020

- ❑ Development of new and improved varieties of plants
- ❑ Timely availability of quality seeds
- ❑ Compulsory registration of seeds
- ❑ Creation of infrastructure facilities
- ❑ Quality assurance, promotion of seed industry,
- ❑ Abolition of licensing for seed dealers,
- ❑ Facility for import of best quality seeds,
- ❑ Encouragement to export of seeds
- ❑ Creation of Seed Banks and National Seed Grid.

SEED ACTS & POLICIES

- National seed act 1966
- Seed control order 1983
- New seed policy 1988
- The Seeds Bill , 2004
- National Seed plan-2005-06.
- National Food Security Mission -2007
- Export-Import policy 2002-07
- Seed Bank Scheme, 2000
- Enactment of the Seeds Act, 1966
- Seed Review Team-SRT,1968

SEED IMPORT AND EXPORT

The annual import value of seed : Approx \$200 mil.

- **Hybrid seed**: annual import of 15000 tons (75%): \$45 mil.(mainly from China)
- **Hybrid Maize**:10000 tons (60%) or \$40 mil.(mainly from Thailand and India)
- **Vegetable seed**: Imported 80% or \$100 mil. Mainly from Thailand, China, Japan, Korea and French.

Export of seed: Very small or insignificantly

Source:www.google.com

QUALITY SEED PRODUCTION THROUGH SEED VILLAGE SCHEME

“A seed village“ is a village where trained group of farmers are involved in production of seeds of various crops and cater to the needs of themselves, fellow farmers of the village and farmers of neighbouring villages in appropriate time and at affordable cost.

To produce better quality of seeds through farmers' participation, a new initiative to Participatory Seed Production. This is a novel scheme of Govt. of India run by State Agricultural Department.

CONCEPT OF SEED VILLAGE:

- ❑ Organizing seed production in cluster (or) compact area
- ❑ Replacing existing local varieties with new high yielding varieties.
- ❑ Increasing the seed production
- ❑ To meet the local demand, timely supply and reasonable cost
- ❑ Self sufficiency and self reliance of the village
- ❑ Increasing the seed replacement rate

PARTICIPATORY SEED PRODUCTION BY DIFFERENT AGRICULTURAL CREDIT SOCIETY

- ❑ Seed Village Scheme
- ❑ Crop Cafeteria
- ❑ Kisan Mela
- ❑ Model Village Scheme
- ❑ Participation in Exhibition, Kisan Goshthis and farmers' training programmes
- ❑ Revolving Fund Scheme

WOMEN PARTICIPATION IN QUALITY SEED PRODUCTION

- Promotion of **woman entrepreneurs** in developing countries is essential to reduce poverty and strengthening their socio-economic status.
- It has been observed in a number of countries that women can participate as **entrepreneurship more efficiently in agriculture** if proper facilities are given.
- Women are **good communicator** and more conscious about making profit.
- An intelligent woman is an **Efficient Manager** and can handle her business more effectively **through SHG**.
- It is a holistic approach for **rural women empowerment** and through which poverty can be reduced significantly.



SCOPE OF QUALITY SEED PRODUCTION IN DRY TRACT

- Moreover 40 % of food grain production comes from dry lands. India will need 308.5 mt of food grains by 2030 to feed the growing population
- At present, 3 ha of dry land crop produce cereal grain equivalent to that produced in one ha irrigated area
- Almost 80% of maize (*Zea mays*) and Jowar, 90% of Bajra and approximately 95% of pulses and 75% of oilseeds are obtained from dryland agriculture.



SCOPE OF QUALITY SEED PRODUCTION IN HORTICULTURE

- ❖ Vegetable are bestowed with title of protective food as being rich in vitamins, proteins, carbohydrates mineral salts etc
- ❖ In developing countries like like india , vegetables plays a tremendous role in alleviating the malnutrition and improved nutritional standard.
- ❖ India holds the second position in vegetable producer after china.
- ❖ The total production of vegetables has increased from 23.4 MT in 1961-62 to the tune of 162.89 MT in 2013-14.
- ❖ By following appropriate seed production techniques in vegetable crop the growers can be able to produce quality seed for own use and on the other hand can fetch handsome remuneration by selling seeds.
- ❖ The overall vegetable production with respect to quantity and quality can gain rapid momentum.

SCOPE OF ORGANIC SEED PRODUCTION

At the simplest level, organic seed “ means planting seed (i.e. "certified" seed) that is produced and audited to internationally recognised organic agricultural production standards, i.e. “certified organic”.

REASON TO GROW ORGANIC SEED:

- ❑ The market is expanding for organic products
- ❑ Consumers have concerns about environment and pesticides residues

STATUS OF ORGANIC SEED PRODUCTION OF DIFFERENT CROP:

India produced around **1.35 million MT** (2015-16) of certified organic products which includes all varieties of food products namely Sugarcane, Oil Seeds, Cereals & Millets, Cotton, Pulses, Medicinal Plants, Tea, Fruits, Spices, Dry Fruits, Vegetables, Coffee etc.

Among all the states, **Madhya Pradesh** has covered largest area under organic certification followed by Himachal Pradesh and Rajasthan.

EXPORTS: The total volume of export during 2015-16 was **263687 MT**. The organic food export realization was around **298 million USD**.

THRUST AREA OF SEED PRODUCTION IN INDIA

- ❑ Promotion of seed production unit/agency for Varietal development and plant variety protection
- ❑ Infrastructure development, seed production, processing and marketing
- ❑ Targeting export of seed and planting material
- ❑ Strengthening rural youth and women for seed production , certification and marketing
- ❑ Utilization of bio technology in seed production and germ plasm conservation.
- ❑ Seed Replacement for self pollinated crops
- ❑ Transgenic Plant Varieties
- ❑ Promotion of Domestic Seed
- ❑ Strengthening of monitoring system

Selection of suitable agro-climatic region

- ❖ Variety should be adapted to photoperiod and temperature of that area
- ❖ Moderate rainfall and humidity is good for seed production
- ❖ Dry sunny period and moderate temperature for pollination
- ❖ General regions with extreme summer heat & very cold winters should be avoided for seed production.
- ❖ Ample sunshine, relatively moderate rainfall & the absence of strong winds

Selection of seed plot

Seed plot should have following characters

- Soil texture & fertility should be according to the requirement of the seed crops.
- Should be free from volunteer plants, weed plants & other crop plants.
- The soil should be comparatively free from soil- borne diseases & insect pests.
- In the preceding season the same crop should have not been grown on this land, if it is so required by seed certification standards

Isolation of seed crop

- ❖ Done by providing distance between seed fields & contaminating field
- ❖ On a small scale i.e. in nucleus/breeder's seed production the isolation can also be provided by enclosing plants in cage by enclosing individual flowers or by removing male flower part and then by individual artificial pollination.
- ❖ After harvesting isolation of seed produced of different varieties is necessary to avoid mechanical contamination.
- ❖ Similarly bags or other containers used to hold the seed must be carefully cleaned to remove any seed which may have remained in the bags from previous lots.

Preparation of land

- The land for seed crop must be prepared well.
- Good land preparation helps improved germination, good stand establishment & destruction of potential weeds.
- It also aids in water management & good uniform irrigation.



Selection of variety

- a) The variety should be adapted to agro- climatic conditions of the region.
- b) The variety should really be high yielder.
- c) The variety should posses other desirable attributes, namely disease resistance, earliness, grain quality.



Seed treatments

- Chemical seed treatment.
- Seed treatment for breaking dormancy due to hardseediness



Time of planting

- The seed crops should invariably be sown at their normal planting time.
- Depending upon incidences of disease & pests, some adjustments could be made if necessary.
- At time of planting there should be sufficient soil moisture for germination to take place.



Seed rate

Lower seed rates than usual for raising commercial crop are desirable because they facilitate rouging operations & inspection of seed crop

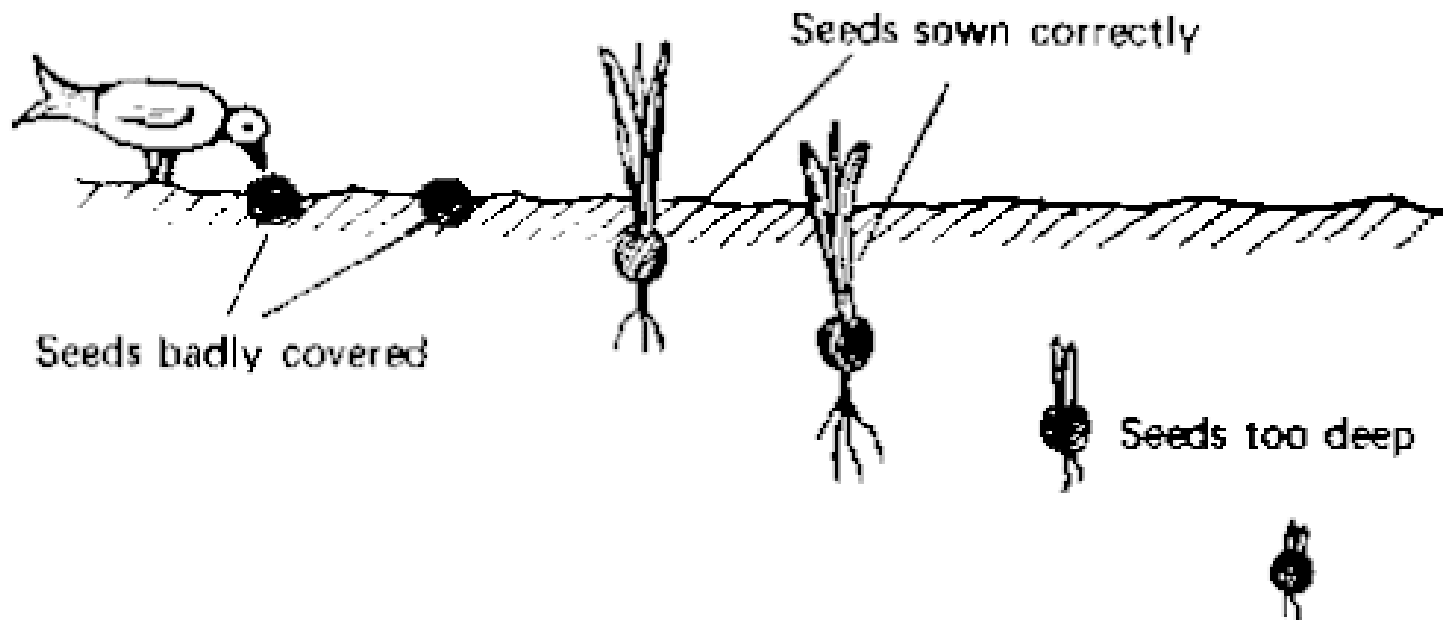


Method of Sowing

- Row method of sowing
- Mechanical drilling can be used
- Desired amount
- Uniform depth
- Clean equipments
- Proper distance between plants

Depth of Sowing

- Shallow plantation in case of small seeds
- Deep plantation in case of large seeds
- Deep plantation in dry soils



Rouging

It is wise to remove the whole plant and not just the flowerhead.

The number of rouging necessary will vary with the crop, cleanness of planting seed & stage of the multiplication of the seed crop. Rouging in most of the field crops may be done at any of the following stages as per needs of the seed crop.

1. Vegetative /pre-flowering stage
2. Flowering stage
3. Maturity stage

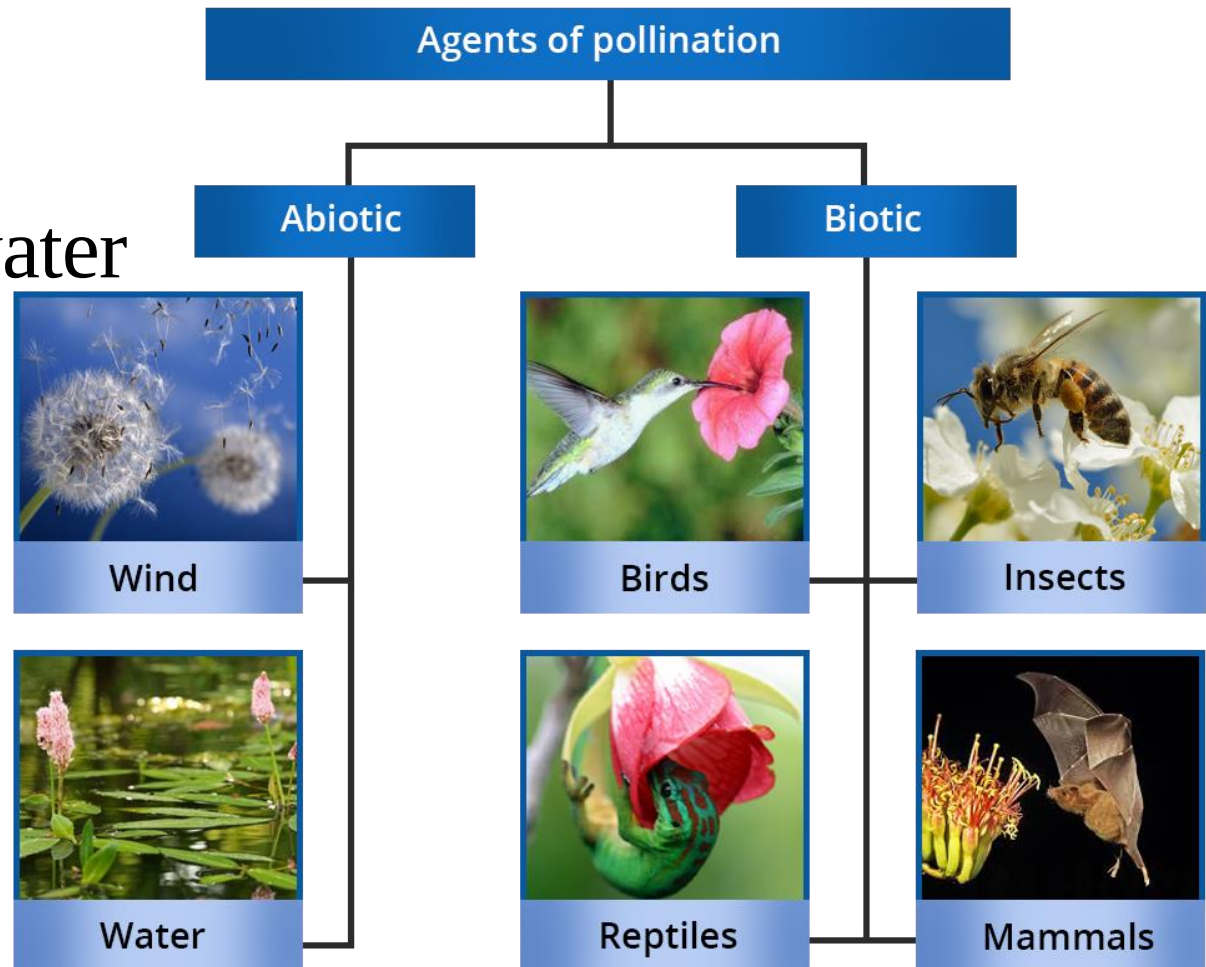


Pollination

□ Honey bee

□ Insects

□ Wind and water



Weed control

- a) The presence of weed seeds at time of crop harvest leads to mixing of weed seeds with crop seeds. In many instances it is difficult to remove them during the processing of seeds.
- b) The presence of weeds in the seed field or nearby areas may serve as host to no. of diseases. Good & effective weed control therefore would be necessary to obtain good seed yields & to avoid contamination



Disease/ Insect control

- If systematic diseases agents are not checked the seed produces will get infected with spores of disease and produce diseased plants in the next season.
- Agents of systemic disease, leave their spores on seed coats. If not checked this results in a greater susceptibility to various seedling diseases which can affect the crop.

Seed yield & quality are reduced.

Management of diseases & pests in seed crops:-

- a) Plant only treated seed
- b) Prepare & adopt appropriate schedule of spraying for effective disease & insect control.
- c) Roguing of diseased plants & ear heads from time to time also helps in checking the further spread of diseases.

Nutrition

- ❖ Nitrogen, phosphorous potassium & several other elements play an important role for proper development of plants & seeds.
- ❖ Identify the nutritional requirement of seed crops & apply adequate fertilizer
- ❖ Results in maximum yields, good seed quality & better expression of plant type which facilitate rouging & thereby helps in maintaining higher genetic purity as well.

Irrigation

- ❑ Dried regions are more suitable for good quality, disease free seed production in that condition irrigation is essential to obtain good seed yields.
- ❑ Before planting & at intervals up to flowering.
- ❑ One or two irrigations beyond flowering are desirable for may seed crop.
- ❑ In general lighter soils need more irrigation than heavier soils.

Harvesting of seed crops

- Optimum time of harvest is when seed is fully mature
- When weather damage begun, seed is easily harvested cleaned resulting in minimum harvest losses.
- Earlier harvesting makes combining difficult & relative losses due to threshing & cleaning are greater.
- Late harvesting result in increased weather damage & losses due shattering seeds & lodging of plants in field.

Method of Harvesting

- By hands
- Quality of seed depends upon handling of harvested crop & the care taken during threshing
- Maintain lot identity
- May be by machine

Drying of seeds

More moisture at the time of harvest

Precautions for seeddrying

Identity of the lots must be maintained

Care should be taken to ensure that mechanical mixture does not take place

Drying of seeds to safe moisture limits should be done rather quickly.

If the seeds are to be artificially dried they should be supplied to processing plants soon after harvesting

Storage of raw seeds

- ❖ Short period Storage should be in stacks or bags kept in ordinary buildings or godowns after sun drying
- ❖ Filling in neat & clean bags, if old then properly treated before use
 - Proper labeling
 - The stacks of bags should be made on wooden pallets.
 - Storage place should be:
 - Properly clean
 - Dry
 - Cool
 - Sprayed with malathion
 - fumigated

CONCLUSION

- ❖ Paleolithic man discovered the function of the seed and thereafter humans became farmers.
- ❖ Seeds are the food for men, animals and birds.
- ❖ Seed in Agriculture is a material which is used for planting or regeneration purpose.
- ❖ **Quality seed posses high vigour, genetically pure and free from disease and pest**
- ❖ Quality seed is a **vital input** in crop production
- ❖ The good quality seed has **high return per unit area** as the genetic potentiality of the crop can be fully exploited.
- ❖ **World seed production** (million tonnes) of important crops as Rice -741, Wheat- 750, Maize-1061 m t production (FAO, 2016)
- ❖ **Indian Production of Seed** (Metric tonnes) as Breeder -11222, Foundation- 2,20907, Certified-38,02904
- ❖ **Follow Genetic principles & Agronomic Procedures** of Seed Production for quality seeds
- ❖ **Seed certification** is needed to ensure the acceptable standards of seed viability, vigour, purity and seed health.
- ❖ **Quality Seed Production thrust areas** – Infrastructure development, targeting export, utilizing rural human resources for participatory seed production, germplasm conservation and harnessing Biotechnology



Thank you