Lecture 1

Environmental & other factors affecting seed multiplication

Introduction:- Seed Industry has played a vital role in the availability of high quality seed of improved crop varieties with attendant modern power equipment, improved fertilizers, and better methods of insect and weed control. These altogether have revolutionised farming. Note the vital roles played by seed industry in modern revolution.

- Expansion of production capability
- Efficiency in rapid increase of new cultivars
- Maintenance of genetic purity.
- Quantity of seeds needed by farmers each year is enormous.

Environment affecting seed production include:

- Availability of water through rainfall/irrigation: During vegetative phase, ample rain is needed by a seed crop, but this should ideally be followed by a relatively dry period for the reproductive phase. In dry districts, irrigation water should be supplemented, the latter permitting water to be controlled to advantage. Note that flowering, pollination, seed setting are assisted by a moderate humidity, while drier conditions are needed for ripeming. Use of artificial drying must be considered where relative humidity is relatively high

or unfriendly.

- Suitable soil temperature: In the temperature regions, temperature at sowing time influences establishment in the soil. In the tropics, soil temperature at sowing is not a major factor. This explains why fruits thrown arbitrarily in the tropical forests give rise to maturing flowering/fruiting plants some years later.

- Appropriate light intensity/quality: As important as light is needed for the manufacture of food of many plant species, through the process of photosynthesis, many seeds germinate under light conditions. Among cultivated plants, most seeds germinate without any light requirements. Seeds of certain species require either light or dark for germination to occur. While others require brief illumination for germination, some are completely indifferent. Effect of light on germinatipn is also dependent on the intensity (and duration) and quality. The chemical reaction is controlled by wave length of light absorbed in plant cells by the same chemical pigment controlling floral induction phytochrome: The far-red absorbing form/induced by exposure to red light) is believed to be biologically active form that functions as an enzyme in seed germination.

Red light

P_R (660nm)

P_{F-R}

(In active form Germ blocked) (Active form Germ. Proceeds)

(730nm)

Far –Red light

Red light (660nm) exposure converts, phytochromes to the biologically active far-red absorbing form and germination can proceed (for light requiring seeds. Exposure to far red light (730nm) reconverts phytochrome the red-absorbing form and germination is blocked (or suitable for dark requiring seed. Stimulation of germination by red light and its inhibition by far-red light can be

repeated many times and always the nature of the last illumination decides the germination response.

Factors influencing light sensitivity: include age of seed, period of inbibition, temperature of inbibition, stratification, germination temperature (also osmotic effects and oxygen tension). Chemicals affecting light sensitivity to seeds e.g. Thiourea, Kinetin and Gibberellic acid can substitute for light requirements of some seeds.

Where light and other environmental conditions are not available, other regions should be explored for interstate/international operation.

Other factors:-

- Soil: The history of the land area must be known. One should not dabble into land areas under strict tenure control. Good if plots are large enough for mechanisation, but if not it is not a major requirement. The soil itself should fertile (judging from the plants growing on it). Besides, the soil should be deep and well-drained to discourage water – logging but sufficiently retentive to avoid drying out. The soil should never be acid or alkaline. Good if soil is free from soil-borne pests and diseases, Application of seed treatment chemicals to seeds before sowing may help to reduce harzards from infected soils. For leguminous crops, it would be desirable to have correct strain of Rhizobia bacteria for root nodulation. Organic/inorganic fertilizers must be applied with care, strictly following proper dosage application. Also note that organic fertilizers do not release their nutrients in good time. It is important also for the soil to have adequate mineral status.

Wind: This should be properly looked into where they pose problems. Wind breaks in form of structures should be considered. Strong winds especially during the reproductive phase may result in severe crop losses through lodging, shattering and shedding of seed.

- **Biological factors**: Population of insects (both wild and/or domestic) may be needed for pollination.

Note: Care should be exercised in the use of insecticides, bearing in mind, effects on pollinating insects.

Note: Plant protection operations involving the use of insecticides should bear in mind effects on pollinating insects.

- Disease - ridden areas and seed-borne pathogenic areas should be avoided as much as possible.

- ***Season:*** Although climate in an area may be fixed, but one could make the best choice of season in order to use climate of an area to our best advantage.

Note: Choice of sowing date must be made to provide the best possible conditions for the reproductive phase.

Farms should be accessible to permit visitation from field inspectors/extension officers.

Farms/Regions with large farms are best for seed multiplication where holdings are small and fragmented, isolation is difficult to arrange system of land ownership and tenure should permit continuity for crop rotations to be well planned in advance. Farms should be accessible to permit visits from extension officers/field inspectors.

Farmers Qualities:- Farmers must be energetic, meticulous, intelligent and reliable. An indolent farmers can bring nothing out of farming.

Pollination:- This is the deposition of pollen on the stigma. Pollination is assisted by moderately dry weather. When controlling insect pests, farmers must be mindful of not killing pollinating insects along. There are two major types of pollination, wind and insect.

Wind pollination:- Plants exhibiting wind pollination do not need to have beautiful flowers. They are usually unattractive to insects and are easily spread by wind to neighbouring plants bearing flowers Insect pollination; Insects in search of nectar spread pollens from one flower to another on the same plant (Self pollination) or on another plant (Gross pollination)

Insect pollinated flowers are by nature attractive, colourful and possess scents appealing to insects for visitation. In spreading pollens, the latter is laid on the sticky stigma of another flower.

Fertilization: After pollination, the receptive stigma sends pollen tube through the style of the flower. In the pollen tube flows the generative and endosperm cells, and in most flowers, double fertilization occurs, leading to individual formation of embryo and endosperm. The rate of development of embryo and endosperm after fertilisation will eventually determine whether seed is endospermic or non-endospermic. In cocoa, flowers are ill-adapted to self pollination, have no scent or nectar, and the pollen is too sticky for wind pollination, the mechanism of fertilization remained a mystery for a long time but it is now believed that ceratopogonid midges are mainly responsible. After pollination, the fruits develop and become ripe in 5- 6 months.