

## Role of Plant Breeders in Agricultural Research

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### Introduction

Plant breeders are essential and responsible individual in agricultural research. They know how to select desirable genes/plants among plant population for utilizing in different crossing programmes. Plant breeder is master of all branches of agriculture they have idea of all the disciplines, such as agronomy, soil science, entomology, pathology, crop physiology, seed science and now a day's Biotechnology to get a desirable product. They know how to attain the best quality and more yield from a plant. Plant breeders are the leaders working in all activities including teaching, research and extension. The roles and responsibilities of plant breeders are like expertise of reducing the interval between crossbreeding of plants for development of viable and commercial plant varieties of agricultural and horticultural crops. As we all known that the human population is increasing day by day very rapidly and the cultivated area of the crop decreasing day by day so there is need of such types of crop variety which gave high yield in limited area to achieving this target plant breeders play main role

Another criterion is quality parameters of seed. To improve the characteristics of seed quality, seed size, and seed maturity, resistance against biotic and abiotic stress. Lodging characteristic of crop all are deal by plant breeders. Plant breeders must have knowledge of all the agricultural subjects to develop plants that are the best for future plant breeding programme as well as climate change adaptation, to improve and preserve the food security.

Plant breeding is a branch of agriculture that focuses on manipulating plant heredity to develop new and improved plant types for use of society. People in society are aware and appreciative of the enormous diversity in plants and plant products. They are aware that whereas some of this variation is natural, humans with special expertise (plant breeders) create some of it. crossing different plants. The tools and methods used by plant breeders



have been developed and advanced through the years. There are milestones in plant breeding technology as well as accomplishments by plant breeders over the years.

### **What is Plant Breeding**

Plant breeding is an applied branch of Botany, which deals with improvement of agricultural crops. This branch of agricultural science has contributed maximum to the increase in food production all over the world. Plant breeding is the purposeful manipulation of plant species in order to create desired genotypes and phenotypes for specific purposes. This manipulation involves either controlled pollination, genetic engineering, or both, followed by artificial selection of progeny.

### **Scope of Plant Breeding**

- Genetic manipulation of population by increasing the frequency of desirable alleles in cross pollinated crops and introducing male sterile in self pollinated crops like wheat and Rice.
- Intensive breeding of pulses and oil seed crops as it was done in cereals and other crops.
- Proper breeding methods with improved crop management practices.
- Use of heritability methods with improved crop management practices.
- Development of improved high yielding varieties of vegetable and seed crops.
- Quality Improvement in Oil seed and Vegetables.
- Use of transgenic plants as a medicine. e.g. Potato.
- Development of varieties which are desirable for mechanical threshing and cultivation.

### **The Disciplines a Breeder Ought to Know**

To be successful, a plant breeder must know all he can about the plants he is working with. Thus he should have an under-standing of the botany, genetics and cytogenetics, agronomy, plant physiology, plant pathology, entomology, bacteriology, plant biochemistry and statistics.

- **Botany-** A plant breeder must have a clear understanding of the morphology and reproduction of the plants he aims to improve. He should also be familiar with the taxonomy of the plant.



- **Genetics and cytogenetics-** The principles of genetics and cytogenetics provide the basis for plant breeding methods. Therefore, a thorough knowledge of these subjects is essential for a rapid and efficient improvement of a crop plant.
- **Agronomy-** A good breeder is first a good agronomist. He must be able to raise a good crop in order to select and evaluate his material.
- **Plant Physiology-** Adaptation of a variety is determined by its response to environmental factors like heat, cold, drought, salinity etc. A knowledge of the physiological basis of these responses would help the breeder in developing cold, drought or salinity tolerant varieties. In addition, several physiological approaches to breeding for higher yields are being developed.
- **Plant Pathology-** Breeding for disease resistance is an important objective of plant breeding. For an effective breeding for resistance, a sound knowledge of plant diseases and their pathogens is essential.
- **Entomology-** Insect pests cause considerable damage to crops. A knowledge of insect pests would be necessary in order to breed insect resistant varieties, and to protect susceptible breeding materials from pest damage.
- **Bacteriology-** legumes have root nodules containing Rhizobium, which fix atmospheric nitrogen. The efficiency of this system depends upon both the host and Rhizobium genotypes. Therefore, in legume improvement a knowledge of Rhizobium would be helpful.

### **Responsibilities of plant breeders**

The main responsibility of plant breeder is to develop high yielding varieties which contains useful and desirable traits such as insect, pathogen and drought tolerances. In the current climate changing scenario. The role of plant breeders is vital to the agricultural and horticultural industry as there are continuous challenges to fulfill the demand of farmers needs. Now a days conventional as well as molecular improvement of the crop is necessary, which means plant breeder have knowledge of both biotechnological as well as conventional improvement of crop plant, breeder are very responsible worker in agricultural field they have knowledge of all genes of crop their wild and modern cultivar knowledge and all the information of whole genome of the crop for selecting of new strains and for enhancing traits



of crop plant. They should expertise to quickly and accurately choose plants which contains the genes of interest.

#### **Activities of plant breeders:**

1. To identify research problems of present situation for developing high yielding varieties.
2. To develop the research methodology for improving the molecular and morphological characteristic of crop plant.
3. To identify the crop exhibiting most desirable characters based on its natural genetic variation.
4. To identify and develop new plant breeding materials for future breeding programme.
5. To analyze the scientific data and find the critical conclusion for selecting the best genotype/varieties/ cultivars which are screened/ evaluated in laboratory and field trials.
6. Developing and multiplication of plant genetic material which is develop through biotechnological work.
7. Evaluation and Maintenance of pedigree record, crop catalogue and data base for all the trails which helps to take up need based research activities to combat local/region specific problems.
8. Making cross of various crop material and develop hybrid which gave higher yield as compare to normal seed.
9. To respond the every query from progressive formers, extension leaders/ scientists who are working at village level which helps to solve the problems of needy formers.
10. To write and represent the research work in conference/workshop/seminar at national or international platform and publish research finding in scientific journals.

#### **Conclusion**

Plant breeding aim to improving the genetic makeup of- the crop plants and plant breeders act as the main contributor of agricultural research due to its diverse knowledge and its contribution in agriculture research. Improved varieties are developed through plant breeding. Its objectives are to improve yield, quality disease resistance, drought and frost tolerance and other characteristic of the crops. Plant breeders have potential to develop plant varieties for the entire adverse climate. Plant breeders are working in all activities including teaching, research and extension. They are always treated as contributor of agricultural



research because plant breeders always encourage their other partners to do research in diverse field of agriculture.

Plant breeding has been crucial in increasing agricultural production. Some well known achievements are development of 'semidwarf wheat and rice varieties, noblisation of Indian canes, and production of hybrid and composite varieties of maize, jowar and bajra. Plant breeders should be able to make similar contributions in the future as the land are decrease day by day and Population increases so we need to develop such varieties which are high yielding in less area, so that we are cope up with food security.

