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Organic Breeding-next generation breeding approach to improve crop varieties for organic farming

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Introduction:

Nowadays farming practices are becoming more advanced and intensified to maximize crop yields by the usage of chemicals (insecticides, pesticides, fungicides, weedicides, chemical fertilizers). These materials badly affect human health, soil health environment. This conventional farming could be replaced by Organic farming. In a few words, organic farming involves growing techniques and methods that seek to protect the environment, humans, and animals through sustainable agriculture. To satisfy the growing organic market Organic plant breeding need to advance, new crop varieties are required to adapt to the specific needs of Organic farming. The plant breeding system should give importance to organic farming for the improvement of plant ideotype suitable for the condition. Organic farmers are currently growing less adaptable varieties because there is little interest of the private sector in developing varieties for organic agriculture growing in diverse environments. In simple words, organic plant breeding refers to the development of new crop cultivars without the use of any chemicals.

Need of organic breeding:

We know the population of the world is increasing, adequate food and shelter need to be provided to the increasing population. this can be only possible through sustainable agriculture. but due to the usage of harmful agrochemicals the quality of soil, water and air is affected very much. organic farming eliminates the usage of such chemicals.it increases soil productivity. so organic breeding is needed to satisfy the growing needs of the organic farming sector.

Organic breeding Techniques:

a) Permitted techniques for Organic breeding

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Hybrids: From the definition of the concept behind organic breeding, hybridization as such can be permitted, provided that the F1-offspring is fertile and the parent lines can be propagated under organic conditions.

DNA marker-assisted selection*:* It can be permitted in an organic breeding program if DNA screening is performed without enzymes originating from GMOs and without radiation.

Meristem culture: It can be used in certified organic breeding programs because it is considered as being close to classical breeding techniques.

b) Techniques not permitted for Organic breeding

- Genetic modification or GMOs.
- Cytoplasmic male sterility-based hybrids without restorer genes.
- Somatic hybridization or protoplast fusion.
- Radiated mentor pollen for mutation induction.
- Mutation induction with radiations or chemical substances.

The future of organic plant breeding

The need for organic seed production and breeding will continue to grow as organic production increases. There is now growing interest in breeding for organics, what remains to emerge in the form or forms, this breeding may take. There are three distinct forms of plant breeding, formal, farmer, and participatory.

Formal breeding: It can be either public or private and is conducted by professional scientists to release new varieties for the market. Here farmers may or may not be involved in the evaluation of these varieties, they have no real decision-making power.

Farmer breeding: This form is often referred to as "Seed Saving," wherein the farmer selects plants from crops in production that possess desirable qualities and then collects seed from those plants for future planting.

Participatory breeding: This model is a combination of formal and farmer breeding. It can take one of two modes, the participation of farmers in formal-led research or the participation of science professionals in farmer-led research. They often differ at the stage at which the farmer becomes involved in shaping the germplasm based on their experiences with both the crops and consumer markets.

Advantages of Organic breeding:

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- It is used for developing cultivars and hybrids suitable for organic farming. The use of organic varieties helps in reducing the cost of cultivation by avoiding the use of various agrochemicals.
- The use of organic varieties is eco-friendly.it permits the multiplication of natural enemies (parasites and predators) of harmful insects resulting in effective biological control.
- In Organic plant breeding, more importance is given to the improvement of quality rather than yields.
- In Organic plant breeding usage of chemicals is prohibited, so there are no or minimal chances of environmental pollution.
- Usage of organic varieties will lead to sustainable agriculture.

Barriers of organic breeding:

- Yield in organic farming is low compared to conventional farming, so most people will not prefer organic breeding crop varieties.
- There are very limited resources of organic genetic resources.
- Most organic breed crop varieties do not reach farmers due to a lack of knowledge on organic farming.
- The cost of producing organic crops is higher on the other hand the performance in organic crops is lower than non-organic ones.

Conclusion:

Organic breeding could be the next-generation approach in sustainable organic farming. Organic breeding involves the usage of organic products by reducing the pollution and contamination of the environment. Plant breeders should consider it as a holistic approach and develop new crop varieties which can suitable for all environments and climate changes. Most of the organic crop varieties are capable of disease resistance, so overall inputs for crops are also reduced. organic breeding should be introduced in every small region of the country. organic breeding not only helps farmers but also makes a big change in harmful modern conventional farming.

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