

Plant breeding for disease resistance in modern agriculture



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The world today, have a very great demand for plant breeding. This is a very magnificent technology that is used to change the trait character of the plant species. Changing the trait in the characteristic of the plant plays a major role in today's modern agriculture sector. Plant breeding techniques also help contribute to the incredible efficiency of modern agriculture. This contribution is made on many aspects such as in soil, climates but the most important is in the disease resistance. In plant breeding, the breeder utilizes their knowledge in making the best feature of two different parents' plant while selecting them in the best possible way to combine them. Different books indicate that Mendel is known as the father of genetics. Till date, it is very important for plant breeding especially in the Australian continent. Initially when the breeding program had been introduced in Australia, the main aim of breeders was to maintain a higher yield and to make the crop drought resistant; whereas now, this now have been moved to breed the disease resistant variety in different cultivating aspects. Plant breeding in 1890 was established by John Garton; yet it successfully came under commercialization in the late nineteenth century. Plant breeding is a broad-spectrum that has many steps involved in the breeding. Collection of the germplasm, evaluation and selection of the parent, cross hybridization in selected plants, selection of characters in the parents, emasculation bagging and tagging are some of the steps involved in plant breeding. However, in the modern agriculture genetic modification technology (GM) is used. It is a technology that helps in altering of genes (inserting or deleting genes) between the same or different species but in an in-vitro (inside laboratory) conditions. Apart from diseases, in agriculture is insect and the pests. They feed on the parts of the plants like leaves, stems or flowers making the plant

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very easily susceptible for diseases. In general, insect infestation on the plants leads to yield loss and also the quality of the product. In-order to protect the plants from pest farmers use pesticides. This not only kills the harmful pest but also the useful ones. There are some crop varieties that's breeders developed through hybridization and selection for insect pest resistance. There are different steps involved in plant breeding. They are; collection of different plants from different regions, evaluation and selection of parents, hybridization or mixing, selection of superior recombinant by growing the seeds initially and testing and releasing of new cultivars obtaining the desired seed with the required trait. Plant breeding not just play a vital role in the crop yield but also in the disease resistance. Crops in-order to give a good and a very high potential yield needs to be disease free or disease resistance. This includes the fungus, bacteria and the virus which are pathogens. The capacity of the plant to block pathogens are the host resistant plant. This is possible through plant breeding. With the process of plant breeding, it results in the reduction of the cost input for the production making it cost reasonable for not just a farmer but also to the consumers. Disease resistant plants are above all very safe for human beings as it does not contain any artificial synthesis or pesticides that is applied on the plant. Additionally, plant breeding reduces hazards or environmental pollution and on living being hazard which are impacted by the use of harmful pesticides on the plant crop. This is why plant breeding has a very high advantage in the disease resistance. The modern agriculture is under a very high pressure. The population is growing very high. The food consumption is really getting onto the sly limit. Each and individual farmers need feeding more and more people daily but with the same amount of land where the <https://assignbuster.com/plant-breeding-for-disease-resistance-in-modern-agriculture/>

production is limiting every year despite a very hard effort. The amount of food produced in last centuries is the same that we will be needing to produce in the next years to come. This is in inside earth climate change, drought and pests. More and more farmers are migrating leaving more barren lands. In future we tend in having less lands with which we ought to make more food. We can only achieve it with more seeds. Plant breeding has been making plants stronger with providing greater yield with pest resistance, early maturity and with a better quality making them easier to harvest. Research has been the key but yet more of the research is needed. Plant breeders breed better seeds which is yet somehow bringing a negative long-term result by reducing the footprint of agriculture. There are many types of trait locus and molecular markers that are available. However, those that are chosen depends on many factors. Among them, co-dominant is highly preferable. Polymorphism is necessary for genetic mapping not the physical mapping. Currently, molecular markers where there is sequence for the information are preferred to anonymous markers. For the effective of sharing PCR is used. It is very common for the plant breeders to come up with necrosis during their breeding process which has a potential to abandon sensitive varieties from breeding. Despite these facts, using effectors has a very wide range of benefits. Some of them are; a quick rapid assay, cost effective, saves a lot of places, operating cost are kept minimum, breeders tend in knowing the exact effector causing symptom on the plant. A condition which is not normal and has an alternating effect that brings an abnormal growth in a plant which is termed as a plant disease. In the past, there were many cases which were termed as epidemic which brought the total loss of the plant crop in terms of yield and production which were either

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by natural calamities such as drought, famine and so on. On the other hand, farmers are often hurdled by the disease pest in the plant crop and this has often brought huge concerns and debates among farmers and the researchers or the plant breeder. Therefore, researchers or plant breeders are actively involved in making a plant disease resistant. They have created some varieties that are drought resistant and disease resistant as well. This has brought plant breeding and breeders to a new era.

Plant breeding has often been encountered as a very difficult and a lengthy process despite the steps in the breeding show a very simpler step. Earlier, plant breeding was done in the traditional method which consumed a lot of time; mostly it took years to breed at least a variety. This was mainly done for the varietal development. But today, with the advancement of the technology, this can be done in a very quicker time, Additionally, this breeding technology also had capacities in changing the genetic composition of the plants. But today, plant breeding is not just about conducting experiments or breeding on the field for varieties rather it is for the disease resistance of plant crops. Often crops are attacked by harmful pest which cause a very high impact on the resistance of the plant which is used to remove the unwanted traits or character of the plant and insert a new useful trait into the plant system. This is all done inside the laboratory condition. With the highest level of technology present today, such as PCR, we can easily operate the equipment without any interferences.

Case Study:

It is very important and vital that plant breeding take place from time to time for both farmers and the breeders (company) to survive. Most of the breeding's are done in collaboration between the breeding company and the farmers while some are solely done in the laboratory conditions. Plant breeding basically not just maintains the diversity in keeping it in a good condition but also has a higher capacity in making the plant disease resistant.

Another ample example of plant breeding is the one done in the molecular level. This has a very highly equipped machine which changes the DNA sequence of a plant by either inserting or deletion of a gene in the plant crop. For instance, in wheat plant, the loss of yield from fungal disease is mainly cause my *P. nodurum* and *P. tritici-repentis* which brings about a loss of approximately \$ 1. 7 billion in the Australian economy. There are cases that represents that's plant breeding has highly been very advance in the recent years which the innovation of various technology such as DNA fingerprinting that is very fast and cost effective. Above all, this technology requires no pre-information for the process of investigation.

Also, in the wheat plant it has been observed that disease trait was removed from the crop and inserted a resistant gene. The most cost effective and a convenient way for the breeders for effector sensitivity is the gene resistant. This can either be done by marker assisted breeding or by effector assisted breeding. Effector sensitivity for gene resistant in the wheat plant can me mapped towards the chromosome of the wheat for the disease resistance.

Example, SnTox3-Snn3 infiltrates the effector proteins in the wheat plant that is very sensitive to the necrosis or the death of a cell in the susceptible
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wheat variety. This has brought many varieties of the wheat crop in commercialization in the western Australia. Also, from the haploid population of the wheat plant double haploid population from e intergrain were released. Therefore, breeding for different plant disease in the crop using the molecular marker especially in the wheat crop have had a very handy and a positive result in disease resistance of the wheat plant. Breeding for a better resistance plant for disease resistance in plant crops in regard to the plant crops.

Plant breeding has become one of the most popular method for breeding the hybrid crops in different environmental condition. Drought resistance, lack of water or nitrogen stress are very important for the agriculture. Plant breeding has been in practice since the beginning of the agriculture. In every country plant breeding is necessary for the sustainable agriculture practice that produces stress free crops helping in the rise of the economy of the country. Plant breeding is very useful for making the crop more resistant with plant breeding, alteration of the genes could bring a disease-free plant or help in removing the harmful disease character traits from the plant and inserting the useful genes to make the plant crop more resistant to factors such as disease, drought and son and so for. Also, when there is a high number of resistant genes in a plant crop especially supporting the disease resistance the market value automatically gets risen. In other words, there is a very high market value for the resistant crop variety. Plant breeding has an advantage if increasing the yield of a crop plant. This can be only possible when there is a disease-free crop resulting in aftermath of a high yield. Plant breeding is all about domestication involving such as seed dormancy,

improve seed yield and a disease resistant crop and improved food adaptation for its uses. Domesticated crop that are grown by breeders cannot survive on their own and needs an artificial support. Breeders breed the plant such as corn in the green revolution are some examples that farmers use and apply rapidly. It is often said that the genetic makeup of the plants could be modified to a much greater extent than we normally appreciate. However, breeding of several crop plants, like pulses and vegetables, has not yet been so intensive as that of wheat and rice. There is much more modification that are to be done on these crops on the basis of their yield. The world's result has also shown from the past that there are many losses in the yield of the plant crop with several factors that intend to reduce the yield of the crop. For example, climate, disease, soil and so on and so forth. For these in the coming year, many detailed researches are to be carried out and investigate them with a proper finding and a sustainable solution. Also, additionally, in order to achieve these future prospects, crop biotechnology could also accelerate the plant breeding in disease resistance in the modern agriculture practices.

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