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BREEDING FOR DROUGHT RESISTANCE

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"Read More, Grow More"



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BREEDING FOR DROUGHT

RESISTANCE

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INTRODUCTION

ne of the major crisis in the present world is drought. Drought may be the inadequacy of water availability, including precipitation and soil water (Bernier *et al.*, 2008). As water availability is less, water stress is created. To overcome the water stress, plants adopt various mechanisms which are collectively known as *drought resistance mechanisms*. Water stress has marked effect on cellular activities, growth, development and ultimately yield. The mechanisms adopted by plants are analysed and used to develop drought resistant (trying to prevent) or tolerant (able to withstand) plants (Nguyen *et al.*, 1997). The sources of drought resistance are cultivated varieties, land races, related wild species or it may be introduced by genetic engineering.

EFFECTS OF DROUGHT STRESS

• Increase in Reactive Oxygen Species SC(ROS)

- Down regulation of non-cyclic transport
- Decrease in CO₂ intake

MECHANISM OF DROUGHT STRESS RESISTANCE

Drought Avoidance

It is the ability of plant to maintain high water status during drought. They include deep roots, stomatal closure, leaf rolling, tissue hydration, high transpiration efficiency.

Drought Tolerance

Drought tolerance is ability of plants can sustain at very low water level. The include osmotic adjustment, protective solutes, high proline, dessication tolerant enzymes, high stomatal conductance and photosynthetic maintenance.





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Drought Escape

The ability of a plant to mature before water stress becomes a serious limiting It includes early flowering, early factor. high leaf N_2 level, maturity, high photosynthetic capacity and remobilization of assimilates.

SOURCES OF DROUGHT ional Multid RESISITANCE

- ✓ Cultivated Varieties
- ✓ Land races
- ✓ Wild Species
- ✓ Genetic Engineering.

GENETICS OF DROUGHT RESISTANCE

The genetic control of the traits ranges from oligogenic (determined by few genes) to **polygenic** (influenced by several genes). The oligogenic traits are waxy bloom, glossy trait, glaucousness, glabrous leaves, Abscisic acid accumulation in wheat, proline accumulation in barley mutant. The other traits are generally considered as polygenic in nature.

BREEDING METHODS AND APPROCHES

In the breeding process, the ultimate goal is to be minimising the impact of dehydration on plant growth (Ceccarelli et al, 2004). The intra-specific crosses are done mostly as genetic barriers are negligible. F₂ generation is used in selection. The following methods were utilised for breeding approach such as mass selection, pure line selection, recurrent selection and somaclonal variations.

Mass selection: By the name it means to developing of large population and selection of plants with desired traits.

Pure line selection: Crossing of drought tolerant parent with high yielding parent is done and best F₂ generation plants are selected. Seeds are collected for propagation.

Recurrent selection: It is the method which involves reselection generation after generation with interbreeding of selected plants to provide for genetic recombination. It improves the frequency of desirable alleles for a character.

Somaclonal variation: These are the variations that occur in somaclones. These variations may be temporary or permanent. Non heritable variations are temporary (physiological effects) and heritable variations are permanent (mutation, chromosomal aberrations). (Serraj et al, 2011)

Advantages of breeding for drought resistance

- Crops can also be cultivated in drought prone zones.
- Crops are grown under water stress conditions.
- Stabilization of crops
- The plants are able to withstand extreme stress situation.

Difficulties in breeding for drought resistance

- As it is breeding for drought resistance, it is difficult to maintain the drought condition constantly due to year to year and location to location variations in the moisture regime.
- All drought resistant characters estimation is difficult.
- Inverse relationship between drought resistance and yield. So the work is tedious.

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SABUJEEMA

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- The sources of drought resistance like CON
- wild cultivars' usage is difficult.
- Maintenance of population in controlled condition is difficult.

A Breeding Approach to Develop drought Resistant Varieties Singh, B.D. (2001)



The Released variety having high resistance to drought and it will be subjected to commercial cultivation.

CONCLUSION

Drought resistance breeding is to reduce the impact of drought and dehydration on plant growth. It is important to develop drought tolerant plants in our future because of increasing water scarcity. It's obvious this breeding process helps us to create more drought resistant plants. This aids in reducing our dependency on water in abundance.

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