
Speed Breeding Approach in Vegetable Crops

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ABSTRACT

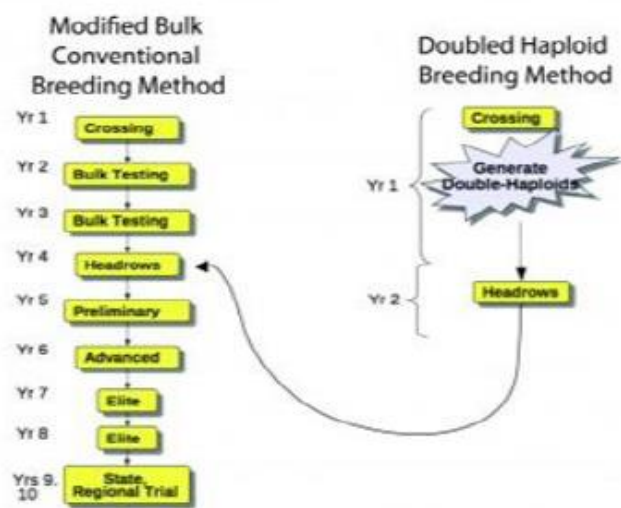
The present developments in genetics and plant breeding gave a flexible way for sequencing, tagging, mapping and introgression of a gene for the required character at cheapest price, but it takes long time. Speed breeding combined with other tools lead to reduce the breeding cycle, generation advancement and accelerates the development of varieties in minimum period. Combination of speed breeding with other genetic tools like genome editing, marker assisted backcrossing, transgenic approaches to develop homozygous inbred lines followed by crossing will facilitate rapid cycling, genetic gain and rapid development of improved cultivars.

INTRODUCTION

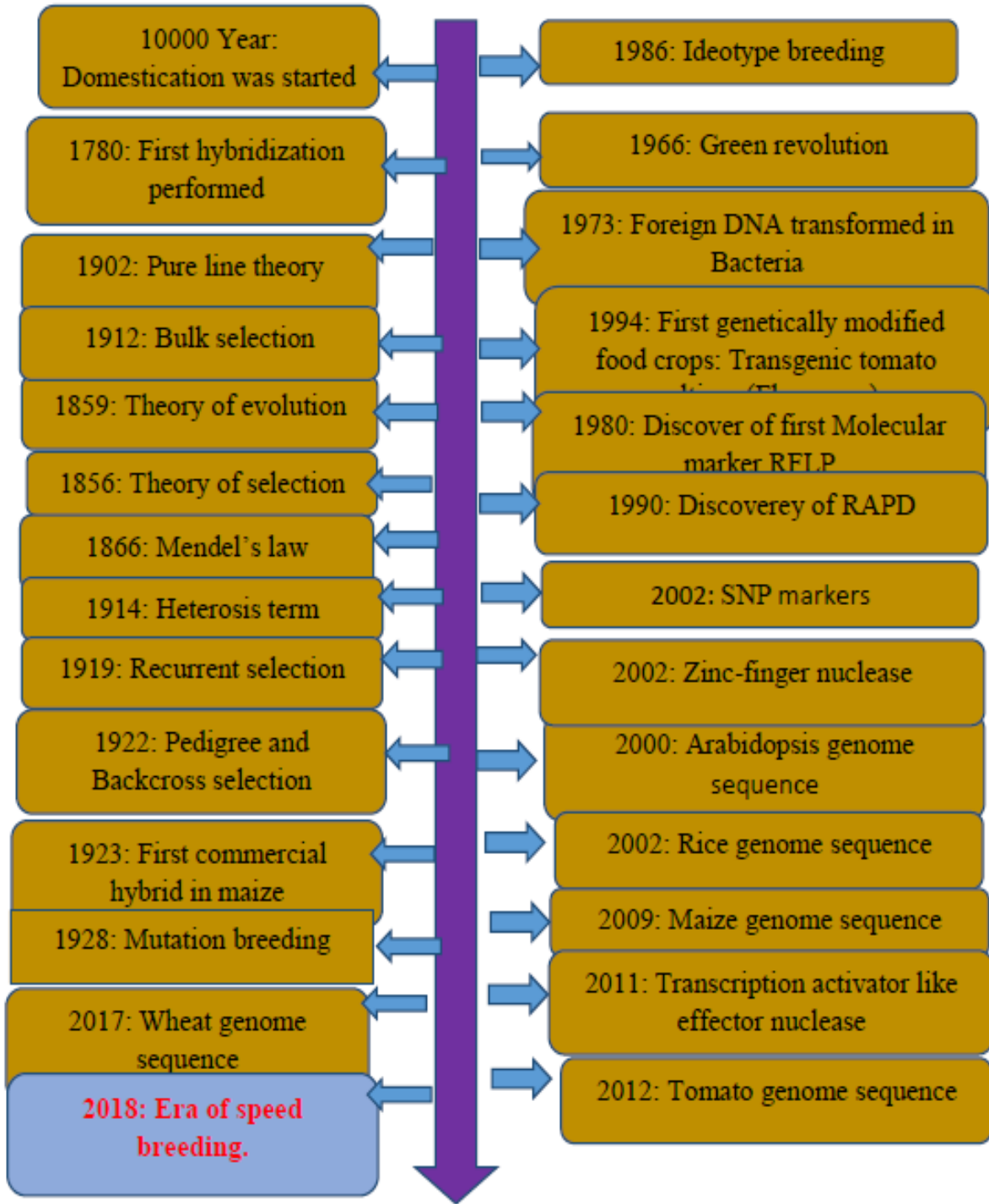
The present global population is approximately 780 crores and is expected to increase around 990 crores in 2050. Climatic changes *viz.*, temperature fluctuations, cyclones and water stress are expected to increase new kinds of diseases and pest occurrence, needs rapid crop improvement programmes. The single seed descent and shuttle breeding are considered as rapid breeding tools for evolving new varieties from 1940s (Anbukkarasi *et al.*, 2022). At present, scientists have artificially modified the growing conditions by using protected structures for raising plants throughout the year with respect to breeding programmes. These techniques commonly known

as speed breeding (SB) and includes accelerated single seed descent techniques, rapid generation cycling by using molecular markers, fast generation cycling by using embryo cultures. These speed breeding techniques has been applied in cereals, millets, pulses and oil seeds.

PREVIOUS METHODS FOLLOWED TO MINIMIZE THE TIME FOR BREEDING PROGRAMME

<p>Shuttle breeding: Borlaug's intervention</p>	<p>Double haploids technology (DH)</p>
<p>Objective: Speeding the process by raising two continuous crop cultivation in a year</p> <p>First: Time taken for raising generations is reduced.</p> <p>Second: Suited to various climatic situations.</p>	<p>Formed from anther or egg cells, and doubling of chromosome restores the fertility.</p> 

ERA OF SPEED BREEDING



History and evolution of speed breeding technology

DISCOVERY OF SPEED BREEDING

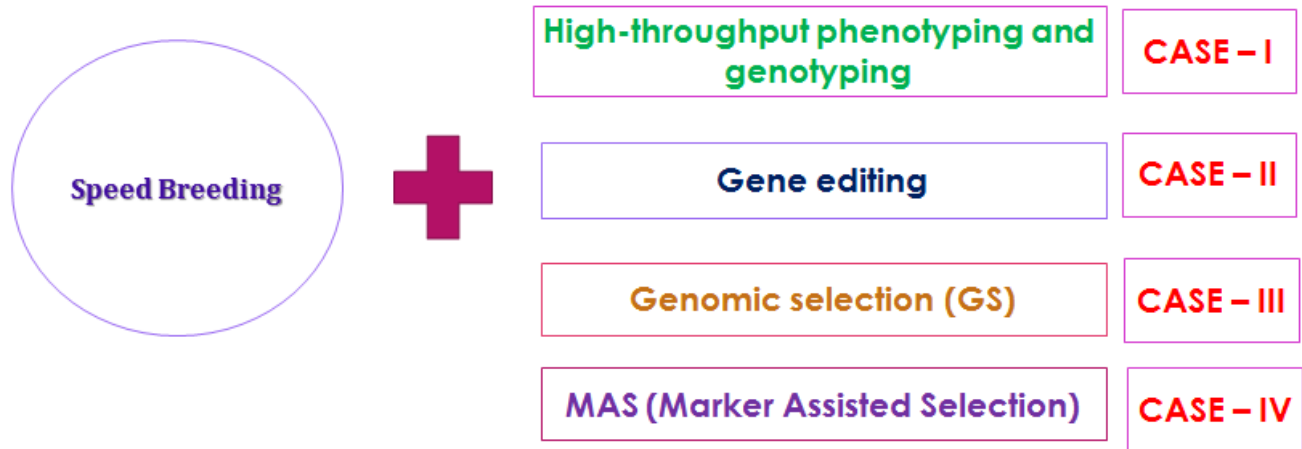
During 1990s, American space agency NASA in association with Utah State University discovered the ways of rapid breeding of wheat in space. This idea was attracted by Dr Lee Hickey along with Dr. Brande Wulff. DS Faraday developed new wheae variety by using speed breeding during 2017 in Australia and which is rich in amino acids and tolerant to sprouting before harvesting.

PRINCIPLE

To use optimum duration and quality of light and optimum temperature which enhances the photosynthesis, activate earliness, grain development, harvest and ultimately reduces crop duration. Speed breeding with single seed descent is widely followed to develop desirable varieties in minimum period, which is cheaper than di-haploids.

FOR SPEED UP CROP IMPROVEMENT

COMBINATION OF SPEED BREEDING WITH OTHER BREEDING TECHNOLOGIES



The homozygous lines can be developed rapidly by speed up the methodologies targeted at

- a) Development of dihaploids.
- b) Marker assisted selection.
- c) Gene editing.

APPLICATIONS OF SPEED BREEDING

Radish, pea, tomato, amaranth, tapioca, potato, cabbage and cauliflower are suitable for speed breeding techniques.

LIMITATIONS OF SPEED BREEDING

The speed breeding procedures in several vegetables are not developed so far. Many vegetable crops are photosensitive in nature, and these crops may not cultivated throughout the year. Speed breeding program are carried in protected greenhouses which requires high initial investment.

CONCLUSION

Combination of speed breeding with other genetic tools like genome editing, marker assisted backcrossing, transgenic approaches to develop homozygous inbred lines followed by crossing will facilitate rapid cycling, genetic gain and rapid development of improved cultivars.

REFERENCES

Anbukkarasi, V., M. Dhandapani, M. Prabhu and L. Pugalendhi, 2022. Genetic improvement of Cucurbitaceous Vegetables through Speed Breeding Approaches. *Agro Science Today* 3 (8): 9471- 9474.