Biotechnology in Watermelon

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ABSTRACT

Water melon [*Citrullus lanatus* (Thunb.)] belongs to family Cucurbitaceae and origin Africa. The fruits contain 95% water, 0.2% protein, 0.3% minerals and 3.3% CHO per 100g fresh weight. It is also a rich source of iron. The seed kernels are also used in various sweets and other delicious. The unripe fruits are also cooked as a vegetable in some parts of India. The sweet, juicy pulp of the ripe fruit is eaten fresh throughout the tropics and subtropical regions. The fruit has cooling effect and is used as an expectorant, diuretic and stomachic and is allaying thirst. It is a common man's fruit relished by both rich and poor alike.

INTRODUCTION

Genetic Information for Watermelon

There are 3 major genes control seed coat colors such as,

1. red (r)
2. white (w)
3. tan (t)

- By the interaction of genes, it is produce six phenotypes: black (RR TT WW); clump (RR TT ww); tan (RR tt WW); white with tan tip (RR tt ww); red (rr tt WW); and white with pink tip (rr tt ww)

➢ Fruit shape is controlled by a single, incompletely dominant gene, resulting in fruit that are elongate (OO), oval (Oo), or spherical (oo)

Table 1: Summary of genes identified in watermelon related to different functions

Sr. No.	Category	Types of genes are involved in different functions
1.	Vine genes	Y1 gene for yellow leaf
		gf gene for light green color
2.	Flower genes	ms-1 gene for male sterile
		ms-dw gene for male sterile dwarf
3.	Fruit genes	Sp gene for spotted fruit
		go gene for golden yellow color
		Flesh colors are involved: B gene C gene i-C gene Wf gene y gene y-o gene
4.	Disease resistant genes	zym-FL gene for resistance to Zucchini yellow mosaic virus

Genetic Transformation Systems for Watermelon

- Insertion of bacterial, fungal and virus resistance genes through recombinant DNA technology would facilitate the development of new disease resistant genotypes without significantly altering the genetic composition and desirable phenotypic qualities of accepted cultivars with high fruit quality (Guis *et al*., 2013).

- Transgenic watermelon rootstock resistant to Cucumber green mottle mosaic virus (CGMMV) has been developed using a DNA encoding the CGMMV coat protein gene (CGMMV-CP), and successfully transformed a watermelon rootstock named 'gongdae' (Lin *et al*., 2012).

Plant Regeneration Systems for Watermelon

- The plant regeneration systems in vitro for watermelon have been reported for the several times. The use of shoot tip explants has a potential application for the propagation of elite triploid cultivars and tetraploid watermelon breeding lines production. Many attempts have been made to adapt tissue culture procedures for the propagation of triploid genotypes (Rubaiyat *et al*., 2013).

Future Techniques for Improvement of Watermelon

- These new techniques and their features are:

1. Zinc finger nuclease (ZFN)
2. Oligonucleotide directed mutagenesis (ODM)
3. Cisgenesis and intragenesis
4. RNA-dependent DNA methylation (RdDM)
5. Grafting (on GM rootstock)
6. Reverse breeding
7. Agro-infiltration
8. Synthetic genomics

Among new techniques, ODM, cisgenesis/ intragenesis, and agro-infiltration were the most commonly used for developing crops and reached them at commercial development phase (Thakur *et al*., 2019).

CONCLUSION

As fruits production, watermelon is top most level by weight worldwide. In fruits including apple, strawberry, orange, grape, etc, the advanced technologies are applied very much for their improvement. Therefore, it is more urgent now to improve melon fruits production due to its yield at the highest level. Using classical selection breeding system, watermelon has improved by a few characteristics, especially with seedless or low

seeded watermelon production that released to farmers. Using breeding based on the transgenic technology, no variety or cultivar for watermelon is released to growers although many researches has been carried out as well as reported, especially on disease resistant traits.

REFERENCES

Guis, M., Roustan, J. P., Catherine, D., Michel, P. and Pech, J. C. (2013). Melon Biotechnology. *Biotechnology and Genetic Engineering Reviews*, 15(1): 289-312.

Lin, C. Y., Ku, H. M., Chiang, Y. H., Ho, H. Y., Yu, T. A. and Jan, F. J. (2012). Development of transgenic watermelon resistant to Cucumber mosaic virus and Watermelon mosaic virus by using a single chimeric transgene construct. *Transgenic Research*, 21:983–993.

Rubaiyat, S. S. and Mahabubur, M. R. (2013). Biotechnological approaches of watermelon to meet the future challenges for next decades. *Advances in Bioscience and Bioengineering*, 1(2): 40-48.

Rubaiyat, S. S. and Mahabubur, M. R. (2014). Melon crops improvement through biotechnological techniques for the changing climatic conditions of the 21st century. *International Journal of Genetics and Genomics*, 2(3): 30-41.

Thakur, H., Sharma, S. and Thakur, M. (2019). Recent trends in muskmelon (*Cucumis melo* L.) research: an overview. *The Journal of Horticultural Science and Biotechnology*. 1-15.