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USE OF MOLECULAR MARKERS IN IMPROVING RESISTANCE TO BIOTIC STRESS IN SOLANACEAE – A REVIEW

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INTRODUCTION

Solanaceae family comprises tens of genera and thousands of species, including numerous cultivated plants such as tomato, potato, eggplant, tobacco, deadly nightshade and petunia, used for human diet, ornamental and pharmaceutical purpose as well as biological model systems (Mueller et al., 2009). Plants must continuously defend against attacks from pest, viruses, bacteria and fungi. Improving biotic stress tolerance is one of the essential goals of plant breeders. Resistance to a biotic stress factors is seldom controlled by a single gene, often it is controlled by multiple genes, being a quantitative trait.

Some regions of DNA, quantitative trait loci (QTLs), correlate with variations of quantitative traits. They can be mapped using molecular markers. These can be linked to specific genes responsible for resistance or tolerance to pathogens and pests, and can be used to accelerate the breeding process in order to create new varieties, that are not only desirable for the quality of the end product, but are also resistant to biotic stress (Devi et al., 2017). In the case of some biotic stress factors, the research is incipient, with only the first step of locating the QTLs being made. For others, considerable progress has been made, by identifying several types of molecular markers linked to resistance/ susceptibility to a certain pathogen or pest. Molecular markers linked to various phenotypic traits related to plant biotic stress can be used then for selection in the breeding process.

DISCUSSION

An overview on molecular markers used for *Solanaceae* family studies

Marker type	Species
SNP	eggplant
	potato
	tomato
	Solanum pimpinellifolium L.
RAPD	eggplant
	pepper
	okra
CAPS	eggplant
	potato
	tomato
SSR	tomato
	eggplant
	potato
	pepper
	russian box thorn
	cape gooseberry
AFLP	potato
	tomato
	pepper
	okra
RFLP	pepper
	tomato
	potato
	Solanum pimpinellifolium L.
ISSR	pepper
SRAP	tomato
	eggplant
SNAP	pepper
COS	potato
SCAR	tomato

Molecular markers application to improve the resistance of *Solanaceae* species to some biotic stress factors

Biotic stress factors		Molecular Markers
Viruses	ToMV	SSR; SRAP
	TY-LCV	SCAR; AFLP; CAPS
	PVY	QTL
Bacteria	*Ralstonia pseudosolanacearum*	QTL
	Streptomyces scabies	SNP
Fungi	*Alternaria solani*	QTL
	Phytophtora infestans	QTL; SNP; RFLP; RAPD;
	Phytophthora capsici	QTL; RFLP; SSR; SNAP; CAPS
	Fusarium sp.	CAPS; RAPD
Pests	*Globodera pallida*	AFLP; CAPS; RFLP
	Tecia solanivora	QTL
	Bactericera cockerelli	QTL
	Myzus persicae	QTL; SNP

Some of the molecular markers employed to help the breeding process of cultivated plants from *Solanaceae* family are: Single Nucleotide Polymorphism (**SNP**), Random Amplification of Polymorphic DNA (**RAPD**), Restriction Fragment Length Polymorphism (**RFLP**), Amplified Fragment Length Polymorphism (**AFLP**), Simple Sequence Repeats (**SSR**), Inter Simple Sequence Repeats (**ISSR**), Cleaved Amplified Polymorphic Sequence (**CAPS**), Sequence-Related Amplified Polymorphism (**SRAP**), Single-Nucleotide Amplified Polymorphism (**SNAP**), Conserved Orthologs Set (**COS**), Sequence Characterized Amplified Region (**SCAR**).

CONCLUSIONS

- The marker-assisted selection is not only accelerating the breeding process, but is also making it more efficient and is changing the breeding focus from phenotype selection to gene selection (Bai & Lindhaut, 2007).
- Wild plants, relatives of the cultivated ones can be used a reservoir for genetic resistance.
- Developing plants with genetic resistance negates the need for chemical protection and subsequently eliminates its negative effects.
- Once the cultivars with the desired trait are determined, the breeders may proceed to marker-assisted selection.
- Novel resistance genes should be identified, tagged and used in the creation of new varieties of plants resistant to common pathogens and pests.

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