



# M9 forever?

**New rootstocks challenge the dominance of M9**

# Requirements to new apple rootstocks

## Perspective of the nurserymen



Performance in stoolbed



Suitability for micropropagation



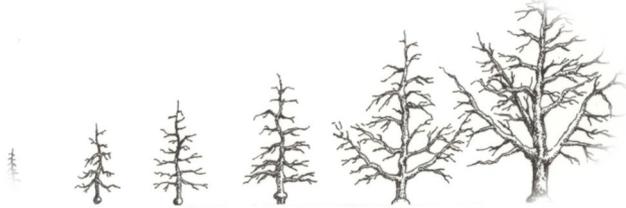
Compatibility with scion



Hypersensitivity to latent viruses

# Requirements to new apple rootstocks

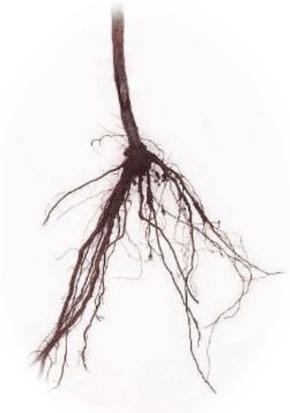
## Agronomic performance



Vigour / dwarfing effect



Precocity



Root anchorage



Yield (efficiency)



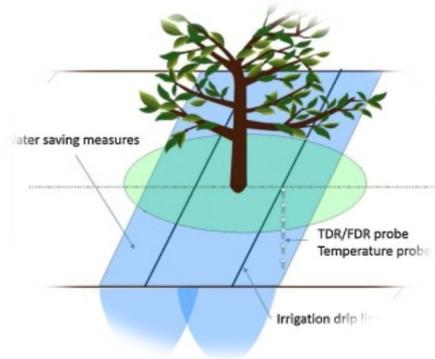
Biennial bearing



Branching angle  
tree architecture

# Requirements to new apple rootstocks

## Agronomic performance



Water uptake



Nutrient uptake



Suitability for (new) planting systems



Interaction with scion cv.

# Requirements to new apple rootstocks

## Agronomic performance



Fruit size



Fruit colour



Fruit internal quality



Burrknots



Rootsuckers

# Requirements to new apple rootstocks

## Biotic stress



Fire blight



Crown rot



Replant disease



Woolly apple aphid



Apple proliferation

# Requirements to new apple rootstocks

## Abiotic stress



Drought



Water stagnation



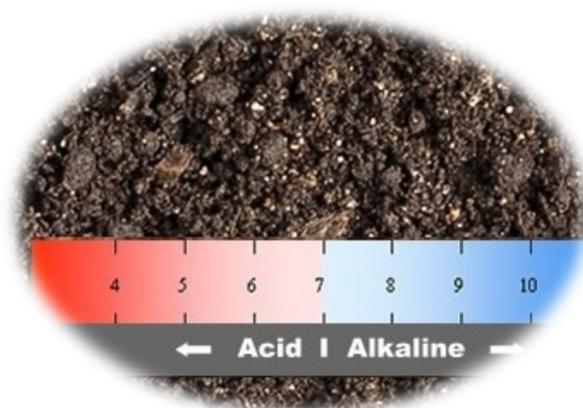
Salinity



Winter hardiness



Low chilling



pH

# Apple rootstock breeding in Europe

	Country	Institute	Released rootstocks (examples)
	<b>Germany</b>	JKI Julius Kühn-Institut	Supporter Serie
	<b>Germany</b>	Obstbau Versuchszentrum Jork	Jork 9
	<b>Estonia</b>	Polli Horticultural Institute	E Serie
	<b>United Kingdom</b>	NIAB EMR East Malling Research Station	M & MM series, AR serie
	<b>Italy</b>	CIV Consorzio Italiano Vivaisti	G and FG Serie (G 8, FG 35 etc.)
	<b>Italy</b>	FEM San Michele	D2212 and others
	<b>Poland</b>	InHort Institute of Pomology Skierniewice	P Serie (P 16, P 22 u.a.)
	<b>Russia</b>	Michurinsk College of Agriculture	Budagovsky serie (B 9, B 491 etc.)
	<b>Sweden</b>	Alnarp Obstbauversuchsstation	Alnarp 2 etc.
	<b>Czech republic</b>	Breeding Station Techobuzice	J-TE Serie (J-TE-E, J-TE-F etc.)

# Apple rootstock breeding in the world out of Europe

	Country	Institute	Released rootstocks (examples)
	<b>China</b>	Shanxi Provincial Institute of Pomology, Taigu	SH serie, Y serie
	<b>China</b>	Liaoning Province Tree Fruit Institute of Pomology, Xiongyue	Liaozhen 2
	<b>China</b>	Qingdao Institute of Agricultural Science Research, Qingdao	QZ1, QZ2, QZ3
	<b>Japan</b>	Aomori Apple Experiment Station, Aomori	Aodai 3
	<b>Japan</b>	Apple Research Center in Morioka	JM Serie (JM1, JM7 etc.)
	<b>Canada</b>	Agriculture Research Station, Kentville	KSC serie
	<b>Canada</b>	Ottawa Research Station in Canada	Ottawa serie
	<b>Canada</b>	Horticultural Research Institute of Ontario, Vineland	V serie
	<b>Canada</b>	Research Station, St-Jean-sur-Richelieu, Quebec	SJ sSerie
	<b>New Zealand</b>	Plant and Food Research, Hastings	
	<b>USA</b>	Michigan State University	MAC Serie (MAC 9, MAC 39 etc.)
	<b>USA</b>	Cornell University, Geneva, NY	Geneva Serie

\*still active

# Multisite testing in USA and Europe



NC-140 Technical Committee post-meeting orchard tour  
North Rose and Sodus, NY, November 14, 2019

[www.nc140.org](http://www.nc140.org)



EUFRIN working group Apple & Pear Variety & Rootstock  
Testing meeting, Bucharest (Romania), March 14th to 16<sup>th</sup>, 2019

[www.eufrin.org](http://www.eufrin.org)