

PROJECT TITLE: MANGO ROOTSTOCKS. LITERATURE REVIEW AND INTERVIEWS.

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Summary

The main objective of this project is to review and update, through literature review and interviews to mango researchers, producers and/or industry people, the existing information about mango rootstock for commercial cultivars, as well as identifying rootstock research lines and find the availability and interest of the main world research institutions for future collaborative projects on the subject all over the world. Although the project was focused mainly on mango cultivars that are marketed in the United States ('Tommy Atkins', 'Ataulfo', 'Kent', 'Keitt' and 'Haden') information about suitable rootstocks for other worldwide commercial cultivars is also included.

The main findings and conclusion of this work are the following:

- 1) Although some other cultivars like 'Ataulfo' and 'Madame Francis' are marketed in the USA and a few other cultivars from Israel, Asia, Australia or Africa origin in the European Union marketed on a smaller scale; the Floridian cultivars, mainly 'Tommy Atkins', 'Kent', 'Keitt' and, to a minor scale, 'Palmer', 'Haden', 'Edwards', 'Osteen' or 'Irwin' dominate the global fresh-fruit export market.
- 2) In almost all the countries, rootstocks are chosen because of the facility of obtaining seeds. In the great majority of cases they are of polyembryonic nature coming from local and well adapted trees long introduced in the area and the same rootstock is almost always used for all cultivars.
- 3) Besides the obvious requirement of compatibility with the grafted cultivars, tolerance to salinity and dwarfism are the two characteristics more desired for a rootstock.
- 4) Not any of the rootstocks used commercially or evaluated in any trial so far exhibit all the desired characteristics for a good mango rootstock.
- 5) There is only enough scientific evidence that '13/1' from Israel, 'Gomera 1' ('G1') from the Canary Islands, 'Olour' from India and 'Sukkary' from Egypt are effectively polyembryonic salt tolerant rootstocks and only '13/1' and 'G1' have been successfully proven as rootstocks for the Floridian cultivars (Tommy Atkins', 'Haden', 'Kent' and 'Keitt' among others). With scarce information about 'Ataulfo' grafted on these two rootstocks.
- 6) Although the effect of some polyembryonic rootstocks and especially the monoembryonic 'Amrapali' regarding the reduction of the tree size, there is a great interaction rootstocks/scion/environment regarding dwarfing effect and because of this is not possible to make definitive recommendations for the Floridian cultivars and/or 'Ataulfo'. However, recent information indicates that 'Piva' from South Africa either as rootstock or interstock may be dwarfing for the Floridian cultivars. The use of interstocks like 'Irwin', 'Esmeralda' and 'Amrapali' have also proven to be dwarfing for different cultivars, including not only the Floridian types but also 'Ataulfo'.
- 7) From all the rootstocks used and currently available around the world, only in the case of '13/1' there is scientific evidence of their ability to absorb nutrients, especially calcium and iron, which is of great interest for the control of the Internal Fruit Breakdown.
- 8) There is experimental evidence of a better adaptation of 'Turpentine' and '13/1' to adverse soil conditions, particularly high pH and alkaline soils and in the case of the Colombian rootstock 'Hilacha', also of better adaptation to flooding and salty conditions.

- 9) A certain degree of tolerance to fruit fly infestation by *Anastrepha obliqua* has been shown in fruits of 'Manila' grafted on the Mexican rootstock 'Criollo and also about an effect of certain Brazilian rootstocks on the resistance of the grafted scions to *Ceratocystis spp* but there are not any reports involving the Floridian cultivars or 'Ataulfo'.
- 10) Some reports from Venezuela, Brazil or Colombia indicate the influence of local rootstocks on different fruit quality parameters for the Floridian cultivars with no information at all existing for 'Ataulfo'.
- 11) 13/1 exhibits more of the desired characteristic for a rootstock than any other one, namely: tolerance to salinity, good adaptation to adverse soil conditions, good ability to absorb nutrients, a high degree of uniformity in its progeny and some dwarfing effect. In addition, high yields for many cultivars including Floridian cultivars but not 'Ataulfo' have been obtained in Israel when grafted on it. However, because of the clear interaction rootstock/cultivar/environment detected in many trials and the excellent yields obtained with other rootstocks in different parts of the world, no definitive conclusions can be given about the suitability of this rootstock for the Floridian cultivars and also not, of course, for Ataulfo.

As this report clearly shows, there are not clear and sound indications for recommending the best rootstock even for the most commercial cultivars, including Florida cultivars or 'Ataulfo', which imply the need to impulse several lines of research such as those indicated below:

- 1) Developing standardized coordinated trials of rootstocks and cultivars in different edapho-climatic locations in the main tropical and subtropical countries of the world.
- 2) Clonal propagation studies, even at the micropropagation level, to obviate the dependence on seed availability and allow the utilization of monoembryonic rootstocks or even of *Mangifera* species compatible with mango, especially of those which possess some of the desired characteristics for a mango rootstock.
- 3) The development of valid molecular or chemical markers for the identification of some of the desirable characteristics of a rootstock, and especially in order to assure the uniformity of the progeny of polyembryonic rootstocks.
- 4) Ploidy studies to evaluate the potential use of tetraploids as dwarfing rootstocks without losing other desired characteristics of their original diploid rootstock.
- 5) Morphological, physiological and anatomical studies, especially of the characteristics of the root system and bark thickness of different rootstocks in relation with the vigour of the grafted plant, but also for the facilities for absorption of water and nutrients.
- 6) Interstocks studies of mono and polyembryonic material, both for the dwarfing effect of the interstock as well as its possible influence on the flowering behavior and on yield.

Many countries are interested in receiving information on mango rootstocks but only those in which mango is an important crop are conducting research projects on this subject. At this time, not any cooperative rootstock project between countries is being undertaken, although many of the institutions and researchers interviewed had expressed their willingness for future cooperative rootstocks projects in different subjects. The possibilities for undertaking these types of projects in different areas of the world: The American continent and the Caribbean, Asia and the Pacific and Africa. Middle East and Europe-are discussed in this report.