Twelve-Year Evaluation of
Citrus Tristeza Virus Tolerant Rootstocks
Budded With Washington Navel Orange

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ABSTRACT. Four citrus tristeza virus tolerant rootstocks budded with Washington navel orange
were evaluated in Aguirre, Carabobo State, Venezuela. Yield results of 12 yr and development and
quality parameters are presented. Volkamer lemon and Taiwanica orange showed the best results,
but Swingle citrumelo and Troyer citrange should be considered as alternatives under these condi-
tions.

Index words. Yield, fruit quality, elevation.

Currently the Venezuelan citricul-
ture is recuperating rapidly, from the
great loss caused by the citrus
tristeza virus (CTV). The need for
CTV tolerant rootstocks made re-
search on the behaviour of such
rootstocks under our conditions
necessary. Washington navel orange,
is the second (most) important variety
in Venezuela after Valencia orange.
Navel orange represents approxi-
mately 15% of all citrus plants, in the
country or approximately two million
trees.

Since 1976, FUSAGRI has been
evaluating the new rootstocks budded
with the variety indicated for produc-
tion behaviour, vegetative growth
and fruit quality (1, 2, 3, 4, 5, 6).

Results are presented which show
the most recent evaluations (7).

MATERIALS AND METHODS

Characteristics of the location and
climatic conditions were described
previously (7).

The plants were 12 yr old with a
spacing of 7m x 7m in a triangular pat-
tern. A randomized complete block
design with 3 replications and 6 plants
per replication was used.

RESULTS AND DISCUSSION

Table 1 shows the average fruit
yield of Washington navel between
1980 and 1988 on different rootstocks.
Volkamer lemon and Taiwanica orange showed the highest average
yield. However, Swingle citrumelo
and Carrizo citrange had acceptable
yields. These results were more evi-
dent based on number of fruits per
plant in the last year. Taiwanica
orange and Volkamer lemon induced
the biggest canopy and they were the
most efficient rootstocks. Assuming a
price fruit of 1.25 Bs. (1 US$ = 40.00
Bs.) the income range was between
85,000 and 170,000 Bs./ha/yr. The
cost of production was around 40,000
Bs./ha/yr.

Plants on Swingle citrumelo and
Carrizo citrange had the lowest
canopy volume, which suggests the
possibility of reducing their spacing in
the field.

The fruit quality was good on all
the evaluated rootstocks (Table 2),
and best on Taiwanica orange and
Carrizo citrange.

The external fruit quality and the
fruit diameter was acceptable on Vol-
kamer lemon and Taiwanica orange
(Table 2), but the latter had the thic-
est peel.

Volkamer lemon produced the
largest fruit yield per plant (Table 2).
The value of the fruit yield per hect-
tare was excellent on all the different
rootstocks.

In conclusion, Volkamer lemon
and Taiwanica orange, were the best
rootstock relative to production.
Swingle citrumelo and Troyer cit-
range could be planted in higher den-
sity to prove the productivity per
area. The fruit quality was acceptable
TABLE 1
EVALUATION OF 12-YR-OLD WASHINGTON NAVEL ORANGES BUDDED TO TRISTEZA-TOLERANT ROOTSTOCKS

<table>
<thead>
<tr>
<th>Rootstocks</th>
<th>Fruit yield (kg/plant)</th>
<th>No. of fruits/ plant</th>
<th>Canopy volume (m³)</th>
<th>kg fruit/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volkamer lemon</td>
<td>113 a</td>
<td>800 a</td>
<td>37 bc</td>
<td>3 a</td>
</tr>
<tr>
<td>Taiwanica orange</td>
<td>93 ab</td>
<td>557 a</td>
<td>44 a</td>
<td>3 a</td>
</tr>
<tr>
<td>Swingle citrumelo</td>
<td>78 b</td>
<td>290 b</td>
<td>28 ed</td>
<td>2 a</td>
</tr>
<tr>
<td>Troyer citrange</td>
<td>71 b</td>
<td>292 b</td>
<td>23 d</td>
<td>3 a</td>
</tr>
</tbody>
</table>

Average 1980-88 (235 plants/ha)

Measured 1988

TABLE 2
FRUIT QUALITY EVALUATION OF WASHINGTON NAVEL ORANGES GRAFTED TO TRISTEZA-TOLERANT ROOTSTOCKS

<table>
<thead>
<tr>
<th>Rootstocks</th>
<th>Juice (%)</th>
<th>TSS (%)</th>
<th>Diameter (cm)</th>
<th>TSS Acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taiwanica orange</td>
<td>50 a</td>
<td>10.0 a</td>
<td>7.9</td>
<td>14 a</td>
</tr>
<tr>
<td>Troyer citrange</td>
<td>51 a</td>
<td>10.0 a</td>
<td>7.7</td>
<td>14 a</td>
</tr>
<tr>
<td>Volkamer lemon</td>
<td>48 a</td>
<td>10.0 a</td>
<td>7.7</td>
<td>12 a</td>
</tr>
<tr>
<td>Swingle citrumelo</td>
<td>50 a</td>
<td>9.5 a</td>
<td>7.8</td>
<td>12 a</td>
</tr>
</tbody>
</table>

Samples taken in June 1988

Total soluble solids

on all the rootstocks and can be planted under our conditions at elevations over 400 m.

We recommend the use of more than one rootstock per farm, according to the climatic conditions and soil characteristics.

ACKNOWLEDGMENTS

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