Broad overview of the subtropical banana industry

VÍCTOR GALÁN SAÚCO
(vgalan46@)gmail.com
The subtropics

• The subtropics are the parts of the world that are immediately south or north of the tropics and have very hot weather at some times of year (Cambridge English Dictionary).

• Practically reaches until 35ºN and S and may also includes places inside 23ºN and S of Equator at altitudes > 800m

**Tropical Climate**
- Average T of 27ºC
- T differences day/night >summer/winter
- Minimal variation in day length (< 13hours)

**Subtropical Climate** (isotherm 10ºC)
- Wide T fluctuations (day/night and winter/summer)
- High summer T and low winter T
- Low and poor distribution of annual rainfall
Countries with commercial banana cultivation in the subtropics
Main problems of banana in the subtropics

- Frost damage
- Winter chill
- Growth cessation (leaf emission and root growth) → longer cycles
- Foliar obstruction and choke throat problems
- Winter flower initiation
- Underpeel discoloration
- Winter leaf sunburn
- Wind damage
- Hail, lightning
Frost damage and winter chill
Other low temperature problems Bunch emission problems, underpeel decoloration
Other low temperature problems: Wind damage, sunburn
IMPORTANT CONSIDERATIONS FOR BANANA PLANTINGS IN THE SUBTROPICS

Main Goals:
- Obtaining flower initiation and flower emergence during summer and harvesting prior to the onset of low temperatures
- Avoid temperature damage

Cultural practices:
- Good fertilization, irrigation and wind protection
- Appropriate site selection avoiding places with minimum Winter T <10°C and maximum summer T regularly > 38°C. If not → protected cultivation
- Correct planting density and an appropriate sucker selection orientated to timing the crop harvest as well as successive annual crops to coincide with high market prices and to benefit from, or to avoid bad climatic conditions
GREENHOUSE CULTIVATION ADVANTAGES:

*Wind and sea brise protection

• Temperature Increase → →
  ↓crop cycle length ↑bunch weight, finger size

*Increase of foliar surface →→ →Ps

*Reduction of water consumption

• Better control of cultural practices

• Prevention or reduction of wind and insect transmitted diseases
Under cover (ha)
Total ha.
DISADVANTAGES GREENHOUSE CULTIVATION:

* High initial and cover reposition cost
* Visual impact
* Environmental damage (difficult recycling of plastic material)
* Possible sunburn damage
## Area planted and Production in the subtropics

### ORGANIC PRODUCTION

<table>
<thead>
<tr>
<th>Country</th>
<th>Under cover (Ha)</th>
<th>Total (Ha)</th>
<th>Total Production ($\text{10}^3 T$)</th>
<th>Organic Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>⎯</td>
<td>320,000</td>
<td>96,000</td>
<td>Very small</td>
</tr>
<tr>
<td>India</td>
<td>⎯</td>
<td>178,000</td>
<td>6,444</td>
<td>Negligible</td>
</tr>
<tr>
<td>Brazil</td>
<td>⎯</td>
<td>115,186</td>
<td>2,320</td>
<td>0.34%</td>
</tr>
<tr>
<td>Egypt</td>
<td>100</td>
<td>35,085</td>
<td>1,500</td>
<td>Nil</td>
</tr>
<tr>
<td>Pakistan (1)</td>
<td>⎯</td>
<td>29,500</td>
<td>$\approx 115 (*)$</td>
<td>Negligible</td>
</tr>
<tr>
<td>Spain (2)</td>
<td>$\approx 2,600$</td>
<td>$\approx 6,367$</td>
<td>438</td>
<td>($\leq 1%$ but growing)</td>
</tr>
<tr>
<td>South Africa</td>
<td>⎯</td>
<td>9,000</td>
<td>350</td>
<td>Nil</td>
</tr>
<tr>
<td>Morocco</td>
<td>8,386-</td>
<td>8,634</td>
<td>338</td>
<td>Nil</td>
</tr>
<tr>
<td>Turkey</td>
<td>4,080</td>
<td>6,225</td>
<td>306</td>
<td>Nil</td>
</tr>
<tr>
<td>Argentina</td>
<td>⎯</td>
<td>3,000</td>
<td>79</td>
<td>Nil</td>
</tr>
<tr>
<td>Lebanon</td>
<td>⎯</td>
<td>$\approx 2,570$</td>
<td>93</td>
<td>Nil</td>
</tr>
<tr>
<td>Israel</td>
<td>$\approx 2,350$</td>
<td>2,984</td>
<td>147</td>
<td>10-15 ha</td>
</tr>
<tr>
<td>Australia</td>
<td>⎯</td>
<td>$\approx 1500$</td>
<td>39</td>
<td>$\leq 1%$</td>
</tr>
<tr>
<td>Portugal (3)</td>
<td>1,020</td>
<td>29</td>
<td>20 ha</td>
<td></td>
</tr>
</tbody>
</table>
Williams
Prata Aná
Lady Finger
ZELIG
Planting density and spacing in the subtropics

- 1,600-2,600 plants/ha for Cavendish
- Under excellent cultural practices planting density for Cavendish cultivars can reach 3,000 plants/ha
- Higher densities are also used in cooler conditions of Morocco and South Africa and also for ‘Prata Ana’ in Brazil
- 750 plants/ha for Lady Finger
- Planting design is generally rectangular, except for Lady Finger (3.6 x 3.6m)
Planting material and irrigation system

- **Egypt and Israel.** Only TC and 95% drip
- **All other countries** both TC and conventional suckers or rhizomes) and either drip or microsprinkler except flood irrigation in Pakistan, valleys in Egypt and parts of Madeira.

Enough rainfall in Azores and parts of Brazil
Lower incidence than in the tropics due to

Climatic reasons: ↓T and H

Isolation from other banana areas (CI, Madeira, Azores, Turkey)

Strong quarantine restrictions (Australia, Israel, CI)

Exclusive use of Tissue culture plantlets
Burrowing nematode in the subtropics

- Present, but not a main problem in the subtropics (prefers a range of temperature 24-30°C and not reproduce below 16°C or above 30°C)
Banana weevil in the subtropics

- Widespread pest in subtropical countries reported as main pest in India, Australia, Madeira and Canary Islands.
- Much greater problem than in the tropics because of slower plant growth rates and bigger susceptibility of TC plantlets.
Control of Burrowing nematode and banana weevil

- Sanitation
- Biological control
- Strict quarantine practices
- Use of Tissue culture plants
Sigatoka in the subtropics

- BS almost not present, only main problem in ↑ humid location in Brazil
- YS only main problem in areas of Australia, Argentina, Brazil and South Africa with ↑ rainfall, ↑ humidity >95% and minimum night temperatures >18°C
Banana viruses and Moko in the subtropics

- Banana Streak is present but not cited as a problem.
- Bunchy top present in Morocco, Australia and a major constraint in smallholder plantings in India and Pakistan.
- But with TC plants, appropriate eradication program or under greenhouse can be kept under control.
- Moko not present except in restricted areas in Brazil and India.
FUSARIUM WILT

Internal symptoms

External symptoms

Rhizome

Pseudostem
Fusarium wilt (FW) in the subtropics
The TR4 menace

- Present in most soils. Until the apparition of TR4 the incidence of Panama disease in Cavendish cultivars was linked to the existence of unfavourable conditions for banana growing such as low temperature as those occurring in the subtropics or bad soil conditions or any other disease predisposing factor.

- TR4, more specifically the vegetative compatibility group of the pathogen VCG 01213-01216 can destroy Cavendish plantations even under optimum environmental conditions and cultural practices in the absence of any predisposing factor.

- TC plants are the most reliable source of clean material and its use is strongly recommended to reduce the risk of TR4 introduction, but are more susceptible to FW attack than conventional plant material.

- After decades of research on managing Fusarium wilt of banana not any alternative to the use of resistant cultivars has been found to control this disease.

- More of 95% of the marketed dessert bananas also in the local markets of the subtropics are Cavendish.
TR4 in the subtropics

• Fortunately, TR4, yet, has not been detected in many places of the subtropics, but is already present in subtropical China, including Taiwan, Pakistan (rare cases), India, Jordan, Lebanon and Australia

• TR4 was also recently (2016) detected in Israel, but was officially declared eradicated by June 2018
EFFECT OF THE CLIMATIC CHANGE IN BANANA

• ↑ T→ favours banana cultivation in the subtropics, but not big variations of the rainfall pattern →→→→
> incidence of burrowing nematode and Moko, not Black Sigatoka, but TR4?
Panama, TR4 and climatic change

- Temperatures may reduce the incidence of milder strains of *Fusarium* in the subtropics usually linked to unfavourable conditions.
- The favourable range of temperature for *Foc* growth is between 23 and 27 °C, and can grow in vitro even till 38°C.
- The disease becomes usually more intense during the warmer and wet months of the year.
- TR4 can become even more aggressive at higher temperatures than those occurring actually in the subtropics.
- Only strong quarantine measures or the breeding of new cultivars resistant to TR4 and well accepted by the market probably the main challenge for banana scientists in the coming future can solve the problem.
Future Prospects for bananas in the subtropics

- Local (most) or export market
- Easier organic market potential (↓pests and diseases → ↓pesticides)
- Reduced carbon footprint (Mediterranean, CI and Madeira)
- Close to market → ↑flavor ↑taste ↑yield (late harvesting)
- Preference consumers for local products or smaller size bananas
Future Prospects for bananas in the subtropics II

• Proximity to markets + Local markets > tolerance of minor quality defects
• Lower incidence of pests and diseases → reduced use of pesticides but
• Strong competence from multinational banana production
• explains that
• **Turkey** - 4,492 ha (2012) vs. 6,225 ha (2016) - is the only country in the subtropics in which banana plantings are ↑↑ increasing due to ↑↑ import taxes (140%), govern subsidies and insatisfied local market
• **Prospects for the rest of the subtropical countries, are limited** to supply the local market and not further increase in banana production is expected, even if Panama and other pests and diseases can be kept under control.
Many thanks