

Formosana

A somaclonal variant with a high tolerance to *Fusarium Oxysporum* f. sp. *cabense* Tropical Race 4

Introduction

- Formosana is a cavendish banana variety with a high tolerance to *Fusarium Oxysporum* f. sp. *cabense* Tropical Race 4 (Foc TR4), which was acquired through somaclonal variation by the Taiwan Banana Research Institute.
- It is derived from tissue culture plants of Giant Cavendish, which was the primary variety used in Taiwan before the presence of Fusarium wilt.
- From a list of Giant Cavendish somaclonal selections, the first tolerant plant to be selected, tested, and released successfully to commercial growers was named Tai Chiao No.1 (also known as GCTCV-215-1).
- Further testing led to the identification of another improved Giant Cavendish selection which has been named Formosana (also known as GCTCV-218). Formosana replaced Tai Chiao No. 1 in infested orchards in Taiwan due to its improved tolerance and horticultural characteristics.



Horticultural Characteristics of Formosana

- A productive tall selection.
- The plant has a large strong pseudostem, with thick upright leaves that bunch at the crown.
- Cylindrical bunch conformation. Finger length is longer than standard Williams which gives a high pack out of large and extra-large fruit and makes it suitable for the export markets.
- Longer cycling selection – About 1 – 2 months longer than standard Williams.
- High yielding bunches – Bunch mass is similar to popular varieties such as Grand Nain and Williams. In Taiwan bunches were 8.9 kg heavier than that of Giant Cavendish. In Mozambique in Foc TR4 infected soils, Formosana bunches were significantly heavier than that of Nandi, an improved selection of Grand Nain

Cumulative crop characteristics over an average of 3 cycle for Formosana in relation to Williams in Ecuador:

Characteristics	Williams (mean of 3 ratoons)	Formosana (mean of 3 ratoons)
Plant height (m)	3.60	3.70
Bunch mass (kg)	38.69	36.06
Hands/bunch	11.5	11.4

Source: Galiltec

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Main parent crop characteristics and reaction to Foc TR4 of Formosana in relation to Grand Nain collected by Lapanday Food Company in the Philippines:

Characteristics	Grand Nain	Formosana
Plant height (m)	2,31	2.85
Bunch mass (kg)	24.5	27.6
Hands/bunch	7.3	8.4
Planting to flower emergence (days)	239	259

Source: Molina, A.B et al., 2016.

Cumulative crop characteristics over an average of 3 cycles for Formosana in relation to Williams in sub-tropical area, Komatipoort, South Africa:

Characteristics	Williams (mean of 3 ratoons)	Formosana (mean of 3 ratoons)
Plant height (m)	298	321
Bunch mass (kg)	36	37
Hands/bunch	10	10
Cycle time (months)	12.16	13.86

Tolerance to Fusarium Wilt

Tolerant Cavendish varieties has been a long-sought strategy to manage Foc TR4. Studies (Hwang & Ko, 2004; Molina *et al.*, 2016; Viljoen *et al.*, 2020) showed that Formosana is significantly more tolerant to Foc TR4 than susceptible Cavendish varieties such as Williams and Grand Nain.

In Taiwan, Formosana had a disease incidence of 4.3% in the parent crop and 4.1% on the ratoon crop. The corresponding figures were 25.5% and 29.6% for the wilt susceptible Giant Cavendish. In the Philippines, Formosana had an average disease incidence of 6% vs 74% of Grand Nain between 2008 and 2011. In another trial conducted between 2012 and 2015, the disease incidence of Formosana was 8%, comparing to the 87% of susceptible Grand Nain in the same TR 4 infested plot.

		Giant Cavendish	Formosana	Grand Nain
2000	Average disease (%)	25.5	4.3	-
2001	Average disease (%)	1.6- 12.2	4.1	-
2008-2011	Average disease (%)	-	6	74
2012-2015	Average disease (%)	-	8	87

Source: 2000 Annual Report (TBRI) and Molina

In Mozambique, a disease rating out of 5 were given to plants planted in TR4 infected soil. Formosana had an average disease rating of less than 2 in the plant crop, and less than 2.5 in the

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ratoon crop, while Nandi had an average disease rating of more than 4.5 in the plant and ratoon crop (Viljoen *et al.*, 2020)

General cultivation guidelines for Formosana

- 1) Formosana is a highly tolerant variety to Foc TR4. It will show less severe symptoms than susceptible varieties when grown under similar environmental conditions and inoculum pressure. It is important that the use of Formosana should form part of an integrated approach to the management of Foc TR4.
- 2) Bunches need good propping in the field due to plants being tall.
- 3) Formosana need optimal climate, soil, and management conditions to perform at its best. It is not recommended for marginal areas with poor drainage and insufficient irrigation.





Comparison of Formosana (GCTCV-218) (left) and parental Giant Cavendish Pei Chao (right) planted in an Foc TR4 infested field, in Taiwan.

References

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