

# **Current R&D on Fusarium wilt of Banana in Taiwan**

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Pei-Chiao, Cavendish AAA and originated from Fujian province of China, is the major banana variety widely grown in Taiwan for local and export market especially for Japan. It is mainly grown by small growers and produced in southern flat land of Taiwan with warmer climate. With the brand of good eating quality, Taiwan banana used to be the major exporter of Cavendish banana in Japan and contributed significantly for the economic development of Taiwan in 1960s. Currently, the estimated growing acreage of Cavendish banana is about 14,605 Ha and productivity is 23 ton/Ha. Being continuously conceptualized as a convenient health functional fruit, the annual value of banana of local market increased to 2.4 billion USD in 2015. Since the outbreak of Fusarium wilt observed in Pei-Chiao plant at southern Taiwan in 1968, affected area up to 1,000 Ha within 10 years and a new race, race 4, of *Fusarium oxysporum* f.sp. *cubense* (Foc) was identified. To reduce impact of Fusarium wilt on Cavendish banana industry in Taiwan, the emergency control act by adopting quarantine and eradication by the government was enforced in mid-1970s but spread of disease still expanded. Also Taiwan Banana Research Institute (TBRI) was founded in 1971 to reduce the loss caused by Fusarium wilt through research and extension service. Aside from introduction of foreign germplasm for testing to Foc R4, recommendations such as using new land and rotating severely infested land with paddy rice crop are made as well. However, the competitiveness of Taiwan banana industry was still in declining and affected by multiple factors including loss caused by Fusarium wilt and other confounding factors such as high labor cost, typhoon

damage, and unstable supply of high-quality banana for export to Japan.

Clean seedling derived from tissue culture propagation was developed in 1983, and to date more than 70 million tissue culture plants so far are released for growers by TBRI especially in new land since that year. To allow infested land still possible to grow Cavendish banana, the unconventional somaclonal breeding scheme was applied for selection of improved variant from survived plants selected from heavily infested plantation. From 1991 to 2013, 5 somaclones with moderate resistance to Foc R4 (or Tropical R4, TR4), including Tai-Chiao NO.1, Tai-Chiao No.3, Formosana, Tai-Chiao No.5, and Tai-Chiao No.7, were gradually released for use. Under normal management, their expression of resistance is quite stable. Some farms could continue produce Cavendish banana well 10-25 years after converting susceptible Pei-Chiao to Tai-Chiao No.1 or Formosana, respectively. And the acceptance in local and export market are in good shape averagely. Some somaclones when they are recently evaluated in infected area of Guangxi, China and Mozambique in eastern Africa, stable expression of resistance are observed. To abide with research funded by government in Taiwan. the molecular marker for their identification are developed and the two somaclones, Tai-Chiao No.5 and Tai-Chiao No.7, applied for intellectual property in 2008 and 2013 in Taiwan. Tai-Chiao No.7, now is also under variety registration in foreign countries such as China, Japan, Malaysia and Philippines, respectively. Recently, a new clone, Pei-Chiao No.1 which is featured with resistance to Foc TR4 and high-yielding, is under further evaluation and with potential being a new commercial cultivar. Comparing with Formosana or earlier somaclones with moderate resistance to Foc TR4, it is also projected by its mild fruit quality defect associated with corky scab caused by thrip, and physiological maturity bronzing.

Even though somaclones basically show stable resistance to Fusarium wilt in Taiwan or other countries, depending only on replacement of new cultivar can not

solve all the disease in other countries. To improve the efficiency of integrated management on Fusarium wilt of Cavendish banana, it is a must to engage with better integrated management. Under these concerns, TBRI also keeps conducting different trials such as organic farming, ground cover with chive first, pretreatment of tissue culture plant with beneficial endophyte. Data indicated that all these trials could show value-adding effect on mitigating loss caused by Foc TR4.