

Senate Rural and Regional Affairs and Transport Committee

Inquiry into revised draft Import Risk Analysis report on importation of fresh bananas from the Philippines

Second submission by Dr. Chris Hayward, Consultant on Bacterial Plant Diseases

- 1. Long range distribution of Moko bacterial wilt: the historical record**
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1. Long range distribution of Moko bacterial wilt: the historical record

Moko bacterial wilt has been spread inadvertently around the world on rhizomes for planting, between the countries of Central and South America and the Caribbean. The most recent example in January this year is from Jamaica, the first record of the disease in the western Caribbean; in this case the disease is thought to have been brought in on planting material from Honduras some three years earlier. The origin of the disease in the Philippines has been the subject of speculation. Ilagan et al. (2003) refer to anecdotal and circumstantial evidence that the disease was brought to the Philippines from South America during the Japanese occupation. This conflicts with the often repeated statement in the literature that Moko bacterial wilt was first brought in to the Philippines from Central America in the late 1960's, but is in harmony with the DNA-based evidence of Raymundo, Fegan and others indicating an introduction prior to the 1960's.

There are no recorded instances where Moko bacterial wilt has been introduced on dessert banana fruit but it is very likely that the disease has been distributed on cooking bananas for example among the islands of the Philippines. Cooking bananas grown in the Central Visayan islands are marketed in Manila (Molina, 1996). Because the fruit are externally symptomless and relatively firm even when infected internally it is likely that the fruit could serve as a source of infection by mechanical means or by insect transmission at some point after export along the distribution chain.

Most banana exports are to countries which do not grow bananas. Philippine exports go mainly to Japan (790,250 metric tonnes in 2000), and in much smaller amount to New Zealand (7,208 metric tonnes in 2000). Both countries would impose high standards of quality assurance and expect to import high quality fruit. If there are symptomless infections among the exported fruit these would be expected to manifest as prematurely ripened fruit at some point along the distribution and marketing chain. There appear to be no published records of the wastage which might occur from this cause. Of the other countries to which the Philippines exports bananas only China and the Middle East grow bananas.

2. Modes of Dispersal of Moko Bacterial Wilt on Dessert and Cooking Bananas

Moko disease is not carried on the wind like rust on wheat and splash dispersal by wind and rain

is not thought to be of great significance. Aerial distribution by insects is important only where cooking bananas, which are much more susceptible to insect transmission than dessert bananas, are present in large numbers. This mode of spread has occurred in epidemics of Moko bacterial wilt on cooking bananas along the tributaries of the Amazon river. Other aerial vectors such as birds or bats are not known to play any part in epidemiology of the disease. Movement of infested soil by human agency or flood water is of major importance.

In all of the countries which are major exporters of dessert bananas, Ecuador, Colombia, Honduras, Costa Rica, etc, cooking bananas (plantains) are also grown on a large scale, not as a plantation crop but in small backyard plots as in the Philippines. Very often these small holdings are near to plantations of dessert bananas. Australia is fundamentally different in that our people do not cook their bananas and plantains are generally not eaten. About 99% of bananas grown in Australia are dessert bananas mainly Cavendish and Lady Finger. Insect transmission is not known to reach epidemic levels in the absence of cooking bananas.

3. Is it possible to eradicate Moko bacterial wilt once established ?

Once Moko bacterial wilt has become established the prospects for eradication are not good and there are no examples of any country which has succeeded. There is no practical method of eliminating the disease from the soil by fumigation. In the Philippines rice husks are burnt in soil excavated around infected matts in order, effectively, to pasteurize the soil; this procedure is useful in limiting expansion of the disease. The amount of inoculum in the soil is reduced in periods of months to years by crop rotation or fallow periods. There are no chemical controls as there are for diseases affecting the leaves such as Black Sigatoka. Moko bacterial wilt was introduced into Cairns, North Queensland on Heliconia planting material in 1989, and then successfully eradicated but this is classed as a pest incursion. The disease never established. Early discovery and prompt action were key factors in elimination of the disease.

4. Fruit infection and insect transmission

Fruit infection in bananas can occur in two ways, from the inflorescence downwards as a result of insect transmission, or upwards from the root system or a wound site. In Moko bacterial wilt on Bluggoe cooking banana in Central and South America and bugtok (=bacterial hard pulp) in the Philippines the disease is primarily a fruit rot. Where a preexisting infection occurs on the male flower bud masses of bacteria (bacterial ooze) issue from exposed vascular tissue. Insects attracted by the sweetness of the nectar in the male flower pick up bacterial ooze on their limbs and appendages as they forage about, and are then capable of transmitting infection to a healthy male bud nearby. The incidence of infected fingers in a bunch is commonly between 50 and 100%; these figures are not speculative but based on direct observation and the photographic record. This high incidence of infected fingers is probably the result of multiple infection events mediated by a high population of wasps and thrips infesting the inflorescence. The incidence of fruit infection from the root system upwards would be expected to be lower because of a lower initial inoculum dosage, the absence of multiple infection events and a slower dynamic of infection. The fact that Soguilon (2003) isolated the Moko bacterium from only a small number of externally symptomless but internally symptomatic fingers may suggest the influence of a plant defense mechanism such as the hypersensitive response. On the basis of this evidence it has been assumed in the Draft IRA (p.149) that the proportion of fruit that may be infected on a symptomless infected bunch is unlikely to exceed 50%. This is more likely to be an overestimation than an underestimation. In the Philippines the fruit are bagged at an early stage so that insect transmission is not a factor to be considered. If there is symptomless infection it will be the result of infection from the root system or wound site upwards.

Bibliography

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April 6, 2004

A.C.Hayward