

Written Submission on the Genetically Modified (GM) Papaya

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My name is Samuel Sai-Ming Sun, Research Professor and Director of the Partner State Key Laboratory of Agrobiotechnology at the Chinese University of Hong Kong. I was responsible for the cloning of the first plant gene in 1980 and have since been conducting research and teaching in plant biotechnology at industry and higher education institutes in the USA and Hong Kong. I was professor from 1987 to 1995 at the University of Hawaii which participated in the development of the very first GM papaya. Although I was not directly engaged in this genetic engineering, as a pioneering plant biotechnology expert at the University, I indirectly provided knowledge/technology to scientists who worked on this project in Hawaii. I write in this capacity with emphasis on science.

Plants including fruit plants suffer from all kind of diseases. Particular damaging is viral infection for which no effective and direct treatment is available. Papaya suffers from papaya ring spot virus (PRSV) infection which limits its production worldwide. This deadly virus destroyed papaya production in Hawaii in the 1950's until the development of the GM Rainbow variety papayas in the 1980's which won approval by the Environmental Protection Agency (EPA) and Food and Drug Administration (FDA) for sale in 1997. More than 75% of the papayas grown in Hawaii now are these GM papayas, exporting to the US mainland, Canada, and China. In April 2010, even Japan approved the import of GM papaya from Hawaii. The virus protection technology so developed has since been applied worldwide on papaya. Thus the GM papayas and technology have a history of over 15 years on the international market and application.

The protection technology of papaya from PRSV virus infection is rather simple in principle. As this virus consists only of its genetic material DNA and a protection coat made of protein, scientists developed a mechanism in the papaya to prevent the infected virus from replication, i.e. to stop its multiplication in papaya to cause damage, kind of like our immunization to prevent disease. There are two

technological approaches to do so, one is to stop the duplication of virus DNA and the other is kind of not to let the multiplying virus DNA put on its protection protein coat, so that the invaded virus in the papaya cells will be contain or limited only in the infected areas and not spreading all over to cause deadly damage to the papaya tree and fruit. There is observation from Hawaii that restricting the virus has allowed for organic papayas to be grown as well. The virus protection engineering technology makes use of virus own genes, which are present in the papayas infected with this virus including the organic ones, so people consume these papayas will consume at the same time these genes and of cause the virus as well. In areas prevalent with this virus, papayas including those organically grown will be easily infected by this virus, and people consume the virus and its genes all the time.

In summary, this existing papaya protection technology has had a long history of some 20 years from its development with products on international market over 15 years. It is a simple, effective, and safe technology to protect the production of papaya which many people enjoy.



Fig. 1. Genetic modified and non-modified papaya growing in the field



Fig. 2. After virus infection, only genetic engineered papaya still growing well



Fig. 3. GM papaya without virus damage selling on Hawaii market



Fig. 4. Papaya infected with the virus