For Discussion on
24 March 2023

Discussion Paper GMO 01/2023

Genetically Modified Organisms (Control of Release) Expert Group

Report on the Survey of Genetically Modified Organisms in Hong Kong

Purpose

This paper reports to Members on the findings of the survey conducted on genetically modified organisms (GMOs) in local markets and farms during 2020-2021 and 2021-22.

Background

2. The Agriculture, Fisheries and Conservation Department (AFCD) conducts regular surveys on GMOs in Hong Kong, covering various crops available in local markets and farms, as well as other living organisms available from markets and farms, which could possibly be genetically modified. Samples are collected according to the GMO survey plans, which are updated annually making reference to information on GMOs commercialised or being put under field trial overseas. The surveys enable the Government to closely monitor the status of GMOs in Hong Kong, and thus complement the enforcement measure under the Genetically Modified Organisms (Control of Release) Ordinance, Cap. 607 (the Ordinance).

3. Surveys in the past years have found that a substantial proportion of papaya fruits sold as food in the market and locally grown papaya plants are genetically modified. Furthermore, a small amount of agricultural products intended to be used as food, feed or for processing, or for contained purposes, including soybean, watermelon, radish, wheat, animal feed, and carnation, were found to be genetically modified[1]. In addition, genetically modified (GM) zebra fish (*Danio rerio*) and Tetra Fish (*Tetragonopterus* spp.) were found in aquarium fish markets.

4. In 2020-21 and 2021-22, we collected and tested 1,341 samples in total,

[1] Please refer to the following website for the results of GMO surveys from 2008 to 2022: http://www.afcd.gov.hk/english/conservation/con_gmo/gmo_edu/gmo_edu_survey.html

covering a variety of fruits, vegetables, grains, ornamental flowers and aquarium fish. Among these, we have tested 520 locally grown papaya samples in order to find out the extent of planting of GM papaya in Hong Kong. Papayas tested positive for genetic modifications were further tested to identify their varieties. As part of the survey, we have also included 31 aquarium fish samples from the market which were claimed or suspected to be fluorescent. Meanwhile, 24 wild-caught native rice fish (*Oryzias curvinotus*) were sampled to check if they carried the GM markers.

Results

5. Summaries of the GMO test results for 2020-21 and 2021-2022 are at **Annexes 1 and 2** respectively. Among the 1,341 samples collected, GMOs were found among locally grown papaya plants (342 samples), papaya fruits from markets (37 samples), seed (1 sample) and aquarium fish (7 samples).

6. During the two-year survey, GM papaya made up 66% (342 out of 520) of the locally grown papaya plants sampled and 38% (37 out of 97) of the papaya fruits sampled from markets. Both the percentages of locally grown GM papaya and that of GM papaya fruits from the markets are lower than those in the last two years i.e. 71% and 63% respectively.

7. **Annex 3** shows the identities of the locally grown GM papaya samples and GM papaya fruit samples from markets. All of the 342 locally grown GM papaya samples in 2020-22 belong to GM strains that are engineered to be resistant to the papaya ringspot virus (PRSV). Among these, 298 samples were found to belong to the TW-lines[2] (87%), 32 samples were Huanong-1[3] (9%), 9 samples were hybrids of TW-lines and Huanong-1 (3%), and 3 samples was 55-1 ("CUH-CP551-8" or commonly called "Hawaiian Papaya"[4]) (1%).

8. As for the 37 GM papaya fruits from the markets sampled in 2020-21 and 2021-2022, 29 samples were of the TW-lines (78%), 7 samples were 55-1 (19%) and 1 sample was Huanong-1 (3%).

---

[2] The TW-lines include two GM varieties, i.e. the transformation events 16-0-1 (U.S. Patent No. US8258282-B2 by Yeh S.-D. et al.) and 18-2-4 (U.S. Patent No.: US8232381-B2 by Yeh S.-D. et al.). These two GM varieties are resulted from the same vector plasmid and carry very similar transgene insert, but they differ in their insertion position and the sequence of the transgene insert margins.

[3] Guo, J., Yang, L., Liu, X., Guan, X., Jiang, L. and Zhang, D. 2009. Characterization of the Exogenous Insert and Development of Event-specific PCR Detection Methods for Genetically Modified Huanong No. 1 Papaya. *J Agric Food Chem.* 57:7205-7212.

[4] USDA/APHIS. 1996. USDA/APHIS petition 96-051-01P for the determination of nonregulated status for transgenic Sunset' papaya lines 55-1 and 63-1: environmental assessment and finding of no significant impact. http://www.aphis.usda.gov/brs/aphisdocs2/96_05101p_com.pdf

9. In addition, one papaya seed sample collected at a seed shop in 2020-2021 was found to be GM positive and identified as Huanong-1.

10. Apart from papaya, no other products intended for food, feed or for processing were found to be GMO.

11. As for products for contained purposes, among the 31 aquarium fish samples collected from the market in 2020-22, 7 fish samples were found to be GM positive, including 6 zebra fish samples and 1 tetra fish sample, with red fluorescent protein gene tested. Like in previous years, none of the native rice fish caught in the wild was found to be genetically modified.

GM papaya* and *GMOs-FFP

12. The Genetically Modified Organisms (Control of Release) (Exemption) Notice, Cap. 607B (the Notice) exempts all varieties of GM papaya from the application of Section 5 of the Ordinance, which provides that a person must not knowingly cause a GMO to be released into the environment or maintain the life of a GMO that is in a state of being released into the environment. Therefore, it is not an offence under the Ordinance that a person grows or maintains in the field the GM papaya found in the present surveys.

13. The Notice also exempts GM papaya of 55-1 and Huanong 1 from the application of the Section 7 of the Ordinance, which provides that a person must not knowingly import a GMO that is intended for release into the environment. Therefore, import of the one papaya seed sample of Huanong-1 was exempted in this case.

14. For GMOs intended for direct consumption as food, feed, or for processing (GMOs-FFP), including the GM papaya being sold as food in markets found in the present surveys, the Ordinance does not require prior approval for their import or use. However, when shipments of GMOs-FFP are being imported, they have to be accompanied with prescribed documents to enable easy identification of the GMOs and to provide the contact points for further information.

15. To enhance awareness of the agricultural sector on GMO and the Ordinance, when collecting crop samples at local farms, we had distributed relevant promotional pamphlets on the Ordinance to farmers to raise awareness on GMO and the Ordinance. Retailers found to sell GMOs-FFP were also issued letters accordingly to remind them of the relevant import/export documentation requirements. Promotional posters regarding importance of seed source and the Ordinance were distributed to AFCD's Organic Farm Section and Leisure and Cultural Services Department's Green

Campaign Section to engage organic farmers and community farmers. In addition, letters together with relevant promotional pamphlets were distributed to 320 local traders on food or feed, or on its processing in 2022.

GM flower

16. GM flower usually exists in the form of cut flower intended for contained use, so prior approval for its import and use is not required. Letters together with relevant promotional pamphlets were distributed to 320 local horticulture-related traders in 2022 to enhance their awareness on GMO and the Ordinance.

GM aquarium fish

17. GM fluorescent fish being kept in contained setting for research purposes or aquarium display also do not require prior approval for their import and use. Nevertheless, it is an offence under the Ordinance to knowingly release the GM fluorescent fish into the environment, such as streams and ponds. AFCD regularly inspects aquarium fish shops selling GM fluorescent fish to see if appropriate measures are taken to prevent the fish from escaping to the environment. Under regular monitoring on freshwater habitats, GM tetra fish and GM zebra fish have not been found in the countryside of Hong Kong.

18. Aquarium fish retailers found to sell GM fluorescent fish during market survey were also issued letters to remind them about the controls of the Ordinance and the relevant import/export documentation requirements, and that measures should be taken to confine their GM fish in contained use. As advised by the GMO Expert Group, a notice card was also sent to these retailers to remind their customers to prevent the environmental release of these GMOs. On the other hand, letters together with relevant promotional pamphlets were distributed to 170 aquarium fish traders in 2022, to raise awareness on GMO and the Ordinance. Promotional pamphlets on the controls of the Ordinance and GM aquarium fish were also distributed in country park visitor centres and the Hong Kong Wetland Park, to remind the public not to release GM aquarium fish to the environment.

Advice Sought

19. Members are invited to note the survey results and provide views and comments.

Agriculture, Fisheries and Conservation Department
March 2023

Annex 1

Summary of GMO Test Results 2020/21

	Number of tested samples	Surveyed species	Number of positive samples	Species of samples with positive result
Fruits from markets	49	Apple, *Cucumis* spp., Grape, Papaya, Pineapple, *Prunus* spp., Watermelon	9	Papaya
Vegetables from markets	58	Beetroot, *Capsicum* spp., Eggplant, Gourd, Maize, Potato, Radish, Soybean, Sugarcane, Tomato	0	
Animal feeds	8	Animal Feed (Mixed Seeds), Maize, Sunflower	0	
Other foods from markets	23	Flaxseed, Peanut, Soybean	0	
Seeds	98	Alfalfa, Beetroot, *Brassica* spp., *Capsicum* spp., *Cucumis* spp., Eggplant, Gourd, Maize, Papaya, Petunia, Radish, Sunflower, Tomato, Watermelon, Wheat	1	Papaya
Locally grown crops	400	Wheat Beetroot, *Brassica* spp., *Capsicum* spp., Cassava, Eggplant, Gourd, Maize, Papaya, Peanut, Pineapple, Potato, Radish, Rice, Soybean, Sugar cane, Tomato, Watermelon,	186	Papaya
Ornamental flowers	3	Carnation, Petunia, Rose	0	
Aquarium fish	25	Rice Fish (wild), Rice Fish (from shops), Tetra Fish, Zebra Fish	1	Zebra Fish
Total	664		197	Papaya, Zebra Fish

Annex 2

Summary of GMO Test Results 2021/22

	Number of tested samples	Surveyed species	Number of positive samples	Species of samples with positive result
Fruits from markets	87	Apple, *Cucumis* spp., Grape, Papaya, Pineapple, *Prunus* spp., Watermelon	28	Papaya
Vegetables from markets	67	Beetroot, *Capsicum spp*., Eggplant, Gourd, Maize, Potato, Radish, Soybean, Sugar cane, Tomato	0	
Animal feeds	9	Animal Feed (Mixed Seeds), Maize, Sunflower	0	
Other foods from markets	23	Flaxseed, Peanut, Soybean	0	
Seeds	93	Alfalfa, Beetroot , *Brassica* spp., *Capsicum* spp., *Cucumis* spp., Eggplant, Gourd, Maize, Papaya, Petunia, Radish, Sunflower, Tomato, Watermelon, Wheat	0	
Locally grown crops	363	Beetroot, *Brassica* spp., *Capsicum* spp., Cassava, *Cucumis* spp., Eggplant, Gourd, Maize, Papaya, Peanut, Pineapple, Potato, Radish, Rice, Soybean ,Sugarcane, Tomato, Watermelon	156	Papaya
Ornamental flowers	5	Carnation, Petunia, Rose	0	
Aquarium fish	30	Rice Fish (wild), Rice Fish (from shops), Tetra Fish, Zebra Fish	6	Tetra Fish, Zebra Fish
Total	677		190	Papaya, Tetra Fish, Zebra Fish

Annex 3

Test results for papaya sampled in 2020/21 and 2021/22

A) Locally grown papaya plants

Year		2020-21	2021-22	Total
Samples collected		272	248	520
GM positive		186	156	342
Strains	TW-lines	157	141	298
	Huanong-1	23	9	32
	TW-lines x Huanong-1	6	3	9
	55-1	0	3	3

B) Papaya fruits from markets

Year		2020-21	2021-22	Total
Samples collected		31	66	97
GM positive		9	28	37
Strains	TW-lines	4	25	29
	Huanong-1	0	1	1
	55-1	5	2	7