

ANSWERS TO RAP'S LIST OF QUESTIONS

[With answers to clarificatory questions raised by RAP under PBPM 2002/08]

1. *What is the banana industry structure in the Philippines, including statistics concerning geographic distribution, production area, production, yield, marketing and export trade?*
 - The Profile of the Philippine Banana Industry is included in the Manual submitted to the RAP during the entry meeting held on August 6, 2001 at the Office of Department of Agriculture Secretary, the Hon. Leonardo Q. Montemayor..
2. *What are the major research organizations the names of key scientists working on bananas in the Philippines, particularly the Mindanao Province?*
 - The Organizational chart of the Research and Bio-tech Divisions of the private sector (PBGEA), as well as those of government laboratories are included in the Manual submitted to the RAP during the entry meeting held on August 6, 2001 at the Office of Department of Agriculture Secretary, the Hon. Leonardo Q. Montemayor.
3. *What are the commonly used horticultural practices and procedures for banana production in the Philippines?*
 - Banana Plantation horticultural practices and procedures include, among others, **Plant population control, Pruning, Replanting, Propping, Deleafing, Fruit Care, Harvesting, Irrigation, Drainage Construction & Maintenance, and Post Harvest Handling.**
4. *What are the cultural methods of managing pests, diseases and weeds of banana in the Philippines?*
 - In general, banana plantations conduct weekly surveys of all areas of the plantation by trained surveyor heads, an entomologist, plant pathologist and agronomist. Level of pest infestation and disease infection as well as weed densities are recorded.
 - In particular, cultural management for the following pests and diseases are:
 - a) **Black Sigatoka:** Regular pruning of leaves with infected tissue, proper drainage as humidity can increase leaf spot, population control by sucker pruning/sucker selection to improve airflow and coverage of fungicide application, field sanitation, and appropriate fertilization.
 - b) **Moko:** Prevention operation like mat to mat disinfection of tools, eradication of infected mat by burning with rice hulls, quarantine or exclusion of infected mat, and fencing of the area to prevent the entry of persons.
 - c) **Bunchy Top:** Regular survey and eradication of infected mat including adjacent local cultivars.
 - d) **Corm weevil:** Base cleaning to deprive the gravid female of an area to lay eggs and chopping of harvested pseudostem to hasten drying.
 - e) **Weeds:** Slashing and placement of leaf and stem trash.
 - f) **Fruit-feeding insects like thrips, mealy bugs, scale insects and scarring weevils:** Bunch cover or bagging of fruit, pseudostem sanitation or removal of dried leaf sheaths, general field sanitation
 - g) **General pests and diseases:** Relay cropping or mono cropping [harvest only plant crop and plant again.]
 - h) **Post Harvest diseases:** Field sanitation which include fruit obstacle removal, deflowering and removal of trash leaves during bagging, packing house sanitation, proper crown trimming, clean and enough water in the dehanding and delatexing tank, and allowing appropriate time for delatexing before weighing and packing.

What proportion of plants in various plantations is inspected on a weekly basis? Do specialists, e.g., entomologists, plant pathologists and agronomists accompany survey teams at each inspection?

Survey for incidence of Moko, bunchy top and other viral diseases is done at least once a week on a plant to plant basis, meaning 100% of the plant population are thoroughly

examined. Survey for Sigatoka and freckle diseases is also done weekly but on designated monitoring stations at the rate of 10 plants/ha.

The trained surveyors are not always joined by the principal entomologist, pathologist or agronomist at each regular survey but the survey process/results are monitored and reviewed regularly by the specialists. In addition, the surveyors undergo regular training to ensure that the competency levels comply with minimum requirements set by the Company/growers.

5. *Is “area freedom” used as a management measure in the Philippines for banana pests, diseases and weeds?*
- As replied to in the entry meeting, within the context of the international definition of “area freedom”, YES.

According to the BPI response, the Philippines use “area freedom” for managing banana pests. Please provide a list of banana pests that are managed by area freedom arrangements. Is area freedom used to control bugtok/Moko, freckle, Panama, bract mosaic, abaca mosaic and/or bunchy top? If so, please provide details of BPI procedures to achieve and maintain area freedom from these pests. Could you also provide survey and monitoring data for each pest over a reasonable period, preferably 5 years, to demonstrate the efficacy of “area freedom” arrangements in eliminating the pest from a pest free area?

The RAP would like the Philippines to provide detailed operational work plans to explain/demonstrate the use of “area freedom” as a management measure for banana pests, diseases and weeds

The answer should have been, No, “area freedom” or “pest free area” is not being used in managing pests. Although individual plantation practices pest monitoring and surveillance to maintain the low level or no pest in their plantation, we cannot say that it is a “pest free area” in the definition of the IPPC.

Instead we are using “Systems Approach” in managing pests.

Pest free area (PFA) An area in which a specific pest does not occur as demonstrated by scientific evidence and in which where appropriate, this condition is being officially maintained.

6. *What is the prevalence and distribution of pests, diseases and hitchhikers likely to occur on bananas?*
- **Nil.** Bananas that are shipped out to other countries are being processed by selection, deflowered, washed, inspected, vacuum-packed in polyethylene bags and placed in cartons.

The response to questions 6 is at variance with the response to question 62 and also discussions of Philippine experts with the TWG Chairs according to which at least the following pests may occur on banana fruit; freckle, diamond spot, mealybugs, whiteflies and scale insects.

Hard scales (Diaspididae) have been intercepted on Philippine bananas by importing countries and Aspidiotus destructor has been identified as a pest in the Philippines .

However, according to Sugimoto, S (1984) the scale insects (Coccoidea: Homoptera) were intercepted on banana fruits from Mindanao (Research Bulletin of the Plant Protection Service Japan 30, 115-121 refers). The Philippines have not listed mites as pests of bananas in the Philippines although a number of spider mites known to be present in the Philippines and exotic to Australia (e.g. *Oligonychus orthius*, *O. velascoi* and *Caryota cumingii*) are reported to infest banana and a range of other crops. Could information on mite pests affecting bananas in the Philippines be provided?

In a study conducted in 1978, Dr. Leonila A. Corpuz-Raros (Professor, University of the Philippines at Los Baños) listed the following mite species as minor pests of banana: *Oligonychus orthius* Rimando, *O. velascoi* Rimando, *Tetranychus neocalodonicus* Andre and *T. piereni* McGregor. At the same time, Dr. Corpuz-Raros also listed the following predatory mites actively preying on the above-mentioned phytophagous mites: *Amblyseius largoensis* (Muma), *A. longispinosus* (Ivans), *A. tametavensis* Blommers, *Phytoseius diutius* Corpuz and *Typhlodromus transvaalensis* (Nesbitt).

Please provide a complete list of pests and "hitchhikers" (organisms that are normally not pests of banana fruit but may be associated with it) that have been detected on fresh banana fruit during pre-export inspections in the plantations and packhouses, and interceptions by importing countries in Philippine bananas?

Please provide all information regarding the interceptions of pests, diseases and hitchhikers on Philippine bananas from all export market sources, e.g., Japan, Taiwan, Middle East, New Zealand, China, Hong Kong, Russia, Singapore, Yugoslavia, Italy, Turkey, Iran and Egypt. Also, indicate if inspections are carried out in each export destination and what is the level of inspection and reporting?

Please refer [to attachment 3](#) re: Interceptions and non-compliance records by importing countries.

7. What is the infrastructure in the Philippines for pest surveillance, monitoring, recording and reporting of banana pests, diseases and weeds, including the expertise of personnel conducting these activities?

➤ In the banana plantations, the following are undertaken:

- a) **Surveillance/monitoring.** This is done through regular visual observations in the field including laboratory analysis. Degree of insect/weed infestation are based on counts and/ or damage per plant or unit area. Disease infection is based on disease severity rating.
- b) **Recording/Reporting:** Surveys are conducted on a regular basis, the frequency of which depends on the pest surveyed. Data are inputted into computers and survey results are reported as frequently as the survey intervals. Survey results are analyzed and reported by Scientist. Pest/disease surveyors are at least high school graduates, trained and validated by supervisors with at least a BS degree.

Please provide results of surveillance/monitoring and recording/reporting referred to in the BPI response. This information would be vital for developing precise and ultimately defensible estimates in the semi-quantitative/quantitative risk analysis models.

Below are the results of the Sigatoka and freckle survey:

Reports of Weekly Survey of Black Sigatoka and Freckle Diseases [Date Derived from Unshot Plants]						
Note: The number indicates the leaf number with fully expanded youngest leaf designated as leaf No. 1						
Youngest Leaf with Initial Spots				Youngest Leaf with Initial Freckle*		
Year	Month	Average		Year	Month	Average
1997	J	9.75		1997	J	-
	F	9.79			F	-
	M	9.74			M	
	A	9.75			A	-
	M	10.30			M	-
	J	11.00			J	-
	J	11.28			J	-
	A	10.25			A	10.60
	S	9.14			S	9.64
	O	10.38			O	10.00
	N	10.43			N	10.08
	D	10.38			D	10.10
1998	J	9.88		1998	J	9.95
	F	10.53			F	10.05
	M	10.40			M	9.70
	A	10.20			A	9.63
	M	10.50			M	10.00
	J	11.54			J	10.80
	J	11.35			J	8.63
	A	11.00			A	11.03
	S	11.20			S	10.64
	O	11.48			O	10.75
	N	10.80			N	10.88
	D	11.00			D	10.92
1999	J	9.28		1999	J	10.25
	F	9.40			F	9.85
	M	8.92			M	9.66
	A	8.60			A	9.73
	M	9.23			M	9.90
	J	8.54			J	9.92
	J	8.33			J	9.55
	A	8.80			A	9.38
	S	9.98			S	10.32
	O	11.30			O	11.08
	N	10.65			N	11.13
	D	12.00			D	-

**Reports of Weekly Survey of Black Sigatoka and Freckle Diseases
[Date Derived from Unshot Plants]**

Note: The number indicates the leaf number with fully expanded youngest leaf designated as leaf No. 1

Youngest Leaf with Initial Spots				Youngest Leaf with Initial Freckle*		
Year	Month	Average		Year	Month	Average
2000	J	11.85		2000	J	11.80
	F	10.30			F	11.38
	M	10.94			M	11.42
	A	11.78			A	11.45
	M	11.45			M	11.20
	J	10.68			J	11.12
	J	10.85			J	11.35
	A	12.23			A	12.03
	S	12.34			S	12.08
	O	12.15			O	12.15
	N	12.03			N	12.30
	D	11.96			D	12.26
2001	J	11.05		2001	J	11.98
	F	11.53			F	11.90
	M	11.30			M	11.68
	A	11.48			A	11.48
	M	11.05			M	11.25
	J	11.44			J	11.42
	J	11.83			J	11.63
	A	10.83			A	11.35
	S	10.88			S	10.98
	O	11.00			O	10.95
	N	11.47			N	11.45
	D	15.08			D	11.88
2002	J	11.55		2002	J	11.90
	F	11.25			F	11.63
	M	11.40			M	11.65

*Means no visible symptoms

Below are the results of Moko and Bunchy Top survey:

Period Number	BACTERIAL WILT (Moko) Cases / Hectare					BUNCHY TOP Cases / Hectare			
	1998	1999	2000	2001		1998	1999	2000	2001
1	0.053	0.026	0.040	0.045		0.183	0.156	0.125	0.169
2	0.049	0.026	0.043	0.043		0.195	0.154	0.116	0.190
3	0.045	0.025	0.034	0.042		0.198	0.149	0.132	0.186
4	0.042	0.024	0.040	0.046		0.193	0.120	0.145	0.232
5	0.043	0.029	0.050	0.051		0.187	0.140	0.178	0.241
6	0.061	0.042	0.074	0.075		0.273	0.171	0.195	0.238
7	0.063	0.050	0.106	0.061		0.332	0.134	0.211	0.299
8	0.047	0.050	0.134	0.098		0.228	0.127	0.182	0.185
9	0.044	0.037	0.087	0.098		0.173	0.080	0.140	0.205
10	0.037	0.059	0.069	0.083		0.112	0.124	0.128	0.263
11	0.043	0.053	0.062	0.094		0.165	0.125	0.139	0.361
12	0.037	0.049	0.053	0.090		0.158	0.095	0.137	0.471
13	0.028	0.045	0.043	0.064		0.165	0.111	0.152	0.355
TOTAL	0.592	0.516	0.840	0.890		2.561	1.686	1.980	3.396

8. What are the pesticide schedules used in the Philippines for managing arthropod pests, diseases, weeds and other pests?

- In banana plantations, except for Black Sigatoka Control where spray intervals vary from 1-3 weeks, the intervals of pesticide applications to control pests like insects, nematodes, weeds and diseases are based on need or based on threshold levels following IPM approach. For example, nematicides may or may not be applied depending on nematode population levels and root lesion index. Under no circumstance are nematicides applied more than 3 cycles a year with application intervals no closer than 120 days apart.

Please provide a complete list of pesticides used in Philippine banana plantations (see response to questions 13 and expand; please also provide trade names of the pesticides). What is the rate and frequency of application of each pesticide?

Below is the summary of the pesticides, rates and frequency:

Generic	Trade Name	Usage	Rates (ai)	Frequency of Application
Mancozeb	Dithane 448F Vondozeb 42SC, Dithane M-45	Aerial Spray	up to 2.0 kg/ha	8-12 days
Tridemorph	Calixin 750EC	Aerial Spray	up to 0.6 li/ha	10-12 days
Strobilurin	Tega 250SC, Bankit 250SC	Aerial Spray	up to 100 gm/ha	12-18 days
Chlorothalonil	Daconil 720F, Bravo 720F	Aerial Spray	up to 720 gm/ha	8-12 days
Methyl Thiophanate	Topsin M 70WP, Fungitox 75WP	Fruit Spray	up to 1.4 gm/li	3-4x before bagging
Abamectin	Agrimek 1.8EC	Flower bud injection	1.8 ml/li	80 ml/bud
Imidacloprid	Confidor 100SL	Flower bud injection	1 ml/li	80 ml/bud
Spinosad	Success 2.5SC	Flower bud injection	1.5 ml/li	80 ml/bud
Trimethoxam	Actara 25WG	Flower bud injection	1.5 g/li	80 ml/bud
Chlorpyrifos	Lorsban 40EC	Flower bud injection	1.2 ml/li	80 ml/bud
Methomyl	Lannate 40SP	Flower bud injection	3 g/li	80 ml/bud
Fifronil	Ascend 50SC	Flower bud injection	2.0 ml/li	80 ml/bud

9. *Is ‘pesticide resistance’ a problem in the Philippines and, if so, what measures are used to minimize the development of pesticide resistant strains of banana pests, diseases and weeds?*

➤ Pesticide resistance was observed in some pests like Thrips and Black Sigatoka. To minimize resistance, pesticides of various types and modes of action are used alternately. The Philippine Banana industry through the PBGEA has initiated a unified Sigatoka Resistance Monitoring Program to keep growers abreast with the most effective Black Sigatoka compound and to avoid use of ineffective compounds.

10. *What is the procedure for registering pesticides in the Philippines?*

➤ We furnished the RAP during the entry meeting a copy of the FPA Regulatory Policies and Implementing Guideline. Please refer to Chapter 2 from pages 7 to 51 of the Guidelines.

11. *What regulations exist to govern use of registered pesticides in the Philippines and how are these enforced?*

➤ This is likewise included in the FPA Regulatory Policies and Implementing Guidelines. Please refer to Chapter 5 from pages 131 to 168 of the Guidelines.

12. *What are the post-harvest chemical treatments used on banana fruit in the Philippines?*

➤ Chlorine mixed with Alum prior to packing.

What concentrations of chlorine and alum are used and how are these concentrations monitored and maintained? How often is “topping up” or replenishment required with these chemicals under various fruit volume throughputs, climatic conditions, etc.?

Chlorine (10%) mixed with Alum (1%) prior to packing. Concentration is monitored by colorimetric method. Replenishment is done to maintain the required concentration.

13. *Are pesticide residues a concern and, if so, what are these pesticides and what measures are used by the Philippines and importing countries to monitor pesticide residues in or on export bananas?*

- Yes. Pesticides used in banana are: Mancozeb, Tridemorph, Chlorothalonil, Strobilurins, Triazoles, Organosphosphate, Carbamate, Naturalytes. Bases of using these pesticides are local registration in the Philippines' FPA, MRLs stipulated in CODEX ALIMENTARIUS Commission, WHO, and FAO. Also, there are no detectable residue basis per pesticide and market tolerances.

BPI has indicated that pesticide residues are of concern and require monitoring to meet maximum residue limit (MRL) standards. The reply indicates that pesticide residues are a concern, but does not nominate them. The final section then claims that there are no detectable residues basis [?] per pesticide and market tolerances. What pesticides have exceeded MRLs stipulated in CODEX ALIMENTARIUS in any export shipment and what levels of pesticide residues were detected?

Please provide results of pesticide residue monitoring by the Philippines and the importing countries, including a report from the USDA database if at all possible

The Philippines does not undertake pesticide residue monitoring. Japan and Korea undertake regular monitoring of pesticide residue in the fruit. However, we have not been provided with such data.

14. *How much biological and pest management information is available for banana pests, diseases and weeds in the Philippines?*

- There is adequate biological and pest management information to support production of export quality banana fruits.

The reply states there is "adequate" biological pest information to support production of export quality bananas. Please specify the sources and detail of biological and pest management information for banana pests, diseases and weeds in the Philippines. Also, indicate how the term "adequate" was derived (given the heavy reliance on pesticides for the production of bananas in the Philippines.)

Please clarify if this information is included in the fact sheets provided by BPI to the RAP. Is there any additional information available and, if so, please provide such information?

Pieces of biological and pest management information are internally developed or generated by each Company. These are continually integrated into the crop cultural and management practices of each Company. Effective control of such diseases has sustained each banana grower to produce banana fruits meeting export quality specifications. Below are existing examples of integrated management programs for Sigatoka, freckle, moko and viral diseases.

MANAGEMENT SYSTEM FOR SIGATOKA AND FRECKLE CONTROL

1. Weekly leaf disease surveys to determine the extent of infection. This information is a guide whether the spray program will be spaced at shorter or longer interval and the type of fungicide to use.
2. Based on item No. 1 the following spray program is generally used and effectively controls both sigatoka and freckle:
 - a. Wet periods or periods of high disease pressure
Strobilurins (Bankit 250SC, Tega 25SC) at 25 grams ai/ha followed by Triazole (Tilt 25OEC, Bumper 25EC, Sico 25EC) at 0.4 or mancozeb at 4-5 li/ha. These fungicides are mixed with banana oil at 5-6 liter/ha and are applied every 8-15 days interval.
 - b. Dry periods (Feb - April)
Chlorothalonil (Daconil 720F or Bravo 720F) in water only every 8-12 days or this may be alternated with mancozeb (Dithane or Vondozeb) in oil when used.
3. Weekly deleafing cycle
Leaves of mother plant and follower should be completely deleafed if observed to have freckle or Sigatoka. The cycle should be completed during the week. This cultural practice effectively reduces infield inoculum.
4. Management systems from fruit protection to fruit processing as described for Moko & Bunchy-Top control are also effective in eliminating contamination of fruit with Sigatoka spores and freckle.

MANAGEMENT SYSTEM FOR THE CONTROL OF MOKO, BUNCHY TOP AND OTHER VIRUS DISEASES

1. ***Weekly mat to mat survey and eradication***

Weekly surveys are done on a mat to mat basis and eradication instituted as soon as plant is affected by either Moko, Bunchy Top or other viral disease is found. Moko eradication consists of digging up the infected plant and mats immediately surrounding the infected plant and chopped into fine pieces as soon as the disease is confirmed and burned. This system not only reduces infield moko inoculum but also sterilizes the infested site. Infested site may be followed 6-12 months or cultivated and fumigated after eradication and burning to be replanted 45 days after fumigation. For bunchy top and other virus diseases, the infected plants are first sprayed with insecticide, uprooted and chopped finely to prevent any regrowth.
2. ***Mandatory bunch sprays of fungicide, bactericides and insecticides before bagging.*** These are mixtures of copper hydroxide (bactericide)

Thiophanate methyl (fungicide) and Diazinon and initially applied when the 1st 2 hands are exposed and every 2-3 days thereafter before bagging. The newly developing fruit therefore receives a minimum of 4 sprays before bagging. This spray mixture is designed to protect the fruit from bacterial and fungal rotting organisms as well as unwanted insects before bagging.

3. **Deflowering.** This is done before bagging to reduce insect visitation of developing fruit.
4. **Bagging with Lorsban impregnated plastic bags.** This protects the fruit from insect pests such as mealybugs and red rust thrips, from attacking the developing fruit as well as discourages other non-insect pest from visiting the fruit.
5. **Harvest.** All cutting tools used for harvest are disinfested with Formalin (1:2 v/v) mixed with ultraviolet dye for supervision. Fruit ages from 9-12 weeks after bagging exhibiting calibrations of 39/32 to 45/32 of an inch are harvested and hanged on the cable provided with rollers and spacers for transport to the packing station. The cut fruit stalk is treated with alum to stop latex from oozing out and contaminate the fruit. The prime mover of harvested fruit is an aerial tractor. Plastic bags are not removed until the fruit bunch reaches the fruit patio of the packing house. This is to prevent dust or leaves from getting the fruit while in transit.
6. **Fruit Processing (Please see attached Fruit Processing Flow Chart)**
 - a. As soon as the fruit bunch reaches the fruit patio, the plastic bag is removed, the fruit is graded, and defects recorded. The fruit bunch is then hosed with water to remove dust and dirt before dehanging.
 - b. Washed whole bunch are then dehanged and further washed in the dehanging-selection tank. The dehanger immediately discards the defective hands that do not meet market specifications.
 - c. When the fruit has floated to the selection side of the wash tank, the selectors trim the fruit and remove undesirable fingers that are out of specifications. The hand may be maintained as a hand or is divided into clusters if the remaining fingers are not enough to categorize it as a hand. Hands/clusters during selection are wiped with sponge to remove, dirt, and stains from the peel. Sponge soaked in a detergent is usually used.
 - d. The selected hand/cluster is further floated in the flotation tank for 25 minutes before they are selected for weighing. This is to allow the latex to be drained from the fruit so that the crown is clean and ready for postharvest treatment.

- e. After the flotation process, the fruit (hand/clusters) are collected on a tray to constitute, 12.5 kg and then treated by spraying with the chlorine-alum solution.
- f. The treated fruit are then transferred in a box lined with polyethylene liners and then vacuum packed. This is to reduce the oxygen concentration inside the box to slow down or reduce growth and development of crown rotting organism during transit.
- g. Packed fruit are generally palletized and delivered from the packing houses to the wharf by means of trailers covered with tarpauline or refrigerated container vans.
- h. Shipholds are disinfested and pre-cooled before loading.

15. *What are the main sources of scientific and technical information on Philippine banana pests, diseases and weeds and their management?*

- There are unpublished data in the private sector (banana plantation research and bio-tech divisions), University of the Philippines Library, IRRI Library, University of Southern Philippines, University of Southern Mindanao, INIBAP, and Internet.

Do the data sheets include information from the Philippine private sector? The reply indicates there is unpublished data in the private sector. Do reputable researchers referee the scientific data? If this information is not in the public domain, what standards of efficacy and environmental impact are used and, does the FPA have access to the technical data from the private sector?

Scientific data generated by each Company are not refereed by reputable researchers because these are normally not published. However, each Company has a pool of researchers duly accredited by the Philippines' Fertilizer and Pesticide Authority (FPA). Generally, the researchers hold postgraduate degrees relevant to their assigned roles and responsibilities. FPA has access to the technical data from the private sector as required for pesticide registration.

16. *Has Philippines prepared data sheets on pests, diseases and weeds of bananas in the Philippines, including Moko, Bugtok, freckle, Black Sigatoka, banana bract mosaic, Panama disease, fruit flies, scale insects, mealy bugs and white flies, and vector/pathogen relationships?*

- Fact sheets for majority of the pests of quarantine importance are included in the manual given to the RAP during the entry meeting on August 6, 2001..

17. *Can banana fruit act as a source inoculum of banana bract mosaic virus and, if so, can vectors acquire the virus from the fruit and transmit to banana plants?*

- There is no report of the banana bract mosaic virus infecting the fruit in the Philippines. The symptom was observed only in the bract, peduncle and pseudostem.

The pathogens TWG understands that banana fruit can be infected with Banana bract mosaic virus. Has the Philippines recently conducted any work to demonstrate the presence of the virus in banana fruit and transmission of the virus by arthropod vectors from infected banana fruit to banana plants?

No data available yet to demonstrate the presence of Banana Bract Mosaic Virus in banana fruit. Currently, the Bureau of Plant Industry (BPI) is conducting a transmission study on banana bract mosaic virus.

18. *What role does banana fruit play in spreading Moko disease in the Philippines?*

- The role banana fruit plays as a spreader of Moko disease in the commercial cavendish plantation is **nil**. Moko development is very rapid so that unshot banana plants infected with Moko cannot produce fruit before it wilts. Bearing plants infected with Moko produce premature ripens and these are not packed because ripe fruits are not allowed for export.

The pathogens TWG has information from other sources that Moko infected plants can produce fruit bunches and the fruit may ripe prematurely following internal fruit infection. What is the frequency of premature ripe fruit caused by Moko in Philippine commercial Cavendish plantations?

Is there any information on the extent of rain splash dispersal of the bugtok/Moko bacterium? Can dried bacterial ooze be blown in from backyard banana plants to commercial Cavendish plantations? To what extent the bacterium can survive in or on fruit or in dried bacterial ooze?

Is it possible for the Moko bacterium to remain viable in the gum exudate when flowers are removed at bagging and remain viable but not infect the flower scar through the bunch filling and to ripening stage i.e. can the bacterium remain viable in the flower end scar tissue on banana fingers without actually invading the pulp of the fruit?

Premature ripe fruit caused by moko is none in the Cavendish banana plantations because of the institution of strict weekly plant to plant survey.

There is no information available on rain splash dispersal of bugtok/moko bacterium, or if dried bacterial ooze can be blown by the wind, and survival of the bacteria on the fruit and gum exudates.

19. *How many strains of the Moko bacterium occur in the Philippines?*

- In commercial Cavendish banana plantations only the soil-borne (B) strain exists. The strain affecting mainly the cooking bananas (BBB or ABB genomes) is another strain.

According to the investigations of the Pathogens TWG, there is now evidence available to the effect that bugtok and Moko isolates from the Philippines are genetically one and the same thing. Pathogenicity of bugtok isolates to Cavendish plants has also been demonstrated. From these studies, it can be extrapolated that strain B is present in the Philippines on both Cavendish and native cooking bananas, which carry the B genome (e.g. Lakatan and Saba). Work conducted in other countries has shown that B strain is highly insect-transmitted on bananas carrying the B genome and its transmission by insects to Cavendish inflorescence occurs at a relatively low rate. This situation appears to be similar to the observations in the Philippines.

In light of all the above information, it is reasonable to assume that native backyard bananas play a role in providing a source of inoculum for transmission of Ralstonia solanacearum Race 2 strain B to Cavendish plantations. This would also suggest that it

would be extremely difficult to maintain Cavendish plantations free from this pathogen over a long period of time due to the likely ongoing influx of inoculum by contaminated insects from infected backyard bananas, which are widely distributed in Bukidnon, Cotabato and Davao.

Information is required to clarify how many strains of *Ralstonia solanacearum* Race 2 occur in the Philippines and at what level they are insect-transmitted to Cavendish inflorescences

At present there is no information available at what level the strains of *Ralstonia solanacearum* are insect-transmitted to Cavendish inflorescences. BPI and UPLB are conducting insect transmission studies in commercial Cavendish plantations.

20. How long can the Moko bacterium survive in soil?

➤ 6 – 12 months

Information from other sources suggests that the Moko bacterium may survive in soil for more than two years. How long can the Moko bacterium survive in soil under favourable conditions? What data can be provided to support the claim of 6-12 months survival in soil?

Under favorable conditions, the moko bacterium can survive in the soil for 12-18 months (Stover, 1972) but the duration is shorter (5 months) when weeds are effectively controlled (Lehmann-Danziger, 1987). In commercial cavendish banana plantations, it is common to observe recurrence of the disease when areas infected by moko were replanted earlier than 6 months.

21. What are vectors of the Moko bacterium in the Philippines and what is their role in spreading Moko?

➤ No observed insect vectors. Moko can be spread in commercial plantations through use of infested cutting tools.

Numerous species of arthropods frequent banana inflorescences. What are the arthropod species known to occur on banana inflorescences in the Philippines and which of these are capable of transmitting Moko?

The reply states there are no observed insect vectors. It is stated in the reply to Question 14 that there is adequate pest management information available. If so, what research has been done to identify insect vectors of Moko? What are the results of any such research?

The RAP has found little information in the literature on studies associated with insect transmission of bugtok/Moko disease in the Philippines. The RAP would like information from any work done in the Philippines on insect transmission of bugtok/Moko including such things as: the insects involved in transmitting the bacteria; any studies on detection of the bacteria on insects; and the period the bacteria remains viable on insects.

The role of these insects in the transmission of moko in the Philippines is unknown. As mentioned above BPI and UPLB are currently conducting studies to confirm the role of insect in the transmission of moko.

22. *What are the alternative hosts of Moko bacterium in the Philippines?*

➤ Other than the *Musa* species, Moko has not been reported in other hosts.

Please provide a list of plant species on which the Moko bacterium may occur in the Philippines taking into account the information on the host range of this pest in other countries and work conducted in the Philippines.

Other than *Musa spp.*, moko bacterium may occur on *Heliconia spp.*, *Brassica campestris* and *Solanum verbascifolium* (Host Index of plants in the Philippines).

23. *Can Bugtok bacteria infect cavendish bananas, if so, what is the prevalence and distribution of this disease and how is this disease managed in the Philippines?*

➤ Bugtok may possibly infect Cavendish bananas if inoculated. It does not exist in the commercial cavendish plantations despite the fact that these plantations are surrounded by native cooking bananas which are susceptible to Bugtok. Fruit sprays mixed with insecticide and bagging with Lorsban bags prevent insects from infesting the fruit. It is proven that bagging controls Bugtok.

What is the evidence that bugtok does not exist in commercial Cavendish plantations? Bugtok and Moko are caused by the same pathogen. It is highly possible that the disease occurs at very low levels in commercial Cavendish plantations as compared with its high incidence in native cooking bananas. Please clarify this issue. If bugtok can infect Cavendish, and bugtok is insect transmitted and the same causal organism as Moko, does this explain the random incidence of Moko infection in many plantations? Also, it is claimed Lorsban impregnated bags control bugtok. What data are available to support this claim, as the flower ends are attractive to insects well before the bags are applied? Also, Lorsban impregnated bags are not permitted for use in South Cotabato for environmental reasons. How is bugtok controlled there?

Bugtok may infect cavendish bananas when artificially inoculated. Under natural conditions, it does not exist in commercial cavendish banana plantations despite the fact that these plantations are surrounded by native cooking bananas which are susceptible to bugtok. This condition is true because of the following agricultural practices fully implemented in the commercial cavendish banana plantations:

- Bud is injected with insecticide 3-4 days after bud emergence.
- Insecticide sprays are applied to the bud at 3-4 day intervals starting from 3-4 days after shooting up to the time when all hands are exposed.
- Bud/fruit is bagged with an insecticide-impregnated polyethylene bag that prevents insects from infesting/visiting the inflorescence.
- Fruit is "de-belled" at stage when all hands are exposed.
- Fruit is de-flowered as soon as possible.

24. *Are banana floral remnants infected/infested with Moko and Bugtok bacteria and, if so, how long can these bacteria survive in floral remnants?*

- In commercial cavendish plantations, field deflowering is a standard operating procedure. Therefore the Moko bacterium is not given a chance to develop on the floral parts. There is no information on how long will the Bugtok bacterium remain viable in Bugtok-infected flower parts.

Would Moko bacterium infect banana flowers if they were not removed? If the flowers were infected, how long could the bacteria survive in infected floral parts? Would viable bacteria be present in infected floral parts at the time of harvesting bananas?

Even if the bacteria are present in the infected floral parts at the time of harvest, the bacteria are eliminated by chlorinated water in the fruit wash tank.

25. *Which species of fruit flies are known to infest bananas in the Philippines?*

- Scientific name, *Bactrocera philippinensis* Drew & Hancock.

26. *At what stage do bananas become susceptible to these fruit flies?*

- Only at a very ripe stage.

27. *Are these fruit flies able to lay eggs in hard green bananas?*

- No.

28. *What procedures are used, and how effective they are, in ensuring that packed bananas are free from materials such as leaf trash and contaminated soil, which may act as a source of inoculum for plant diseases (e.g. Black Sigatoka, Panama) and other pests.*

- To ensure that packed fruit is free from materials such as leaf trash and contaminated soil, fruit at harvest are transported by overhead cable to the packing stations. In the packing stations, fruit is thoroughly washed during selection and delatexing. Then it undergoes chlorine-alum post harvest treatment before packing.

The reply does not indicate how effective the procedures are for ensuring freedom from leaf trash and contaminated soil. Is there any data to prove these measures are effective in ensuring freedom from contaminants? What measures are taken to eliminate dust contamination of cartons, pallets, etc., in packing areas and during transport to the wharf?

Banana boxes are assembled/stitched/glued only at the same day when they are used. Before then, they are stored in well-ventilated, clean areas/rooms normally second floor section of packing sheds free from dust and banana tissues (leaf, etc).

Boxed bananas are transported to the wharf on pallets in refrigerated vans and therefore under "sealed" condition to allow appropriate refrigeration. Therefore, the chance of contamination is nil.

Please refer to [Fruit Processing Flow Chart](#).

29. *What are the Philippines quarantine conditions for movement within the country of banana plants, fruit, used farm machinery and containers to exclude pests and diseases?*

- For banana plants- Administrative Order #14 Series of 1950 Subject - Regulation governing the Inter-provincial Quarantine on all plants of the species of the genus *Musa*, in order to prevent the spread of abaca diseases known as bunchy-top including heart-rot, mosaic, wilt (vascular disease) and bacterial leaf

streak; providing measures for the destruction of all infected plants hills or clumps and revoking Bureau of Agriculture Adm. Order # 38 & 51.

- For fruits - Free movement
- For used farm machinery - No treatment
- For containers - With treatment

[Note: Copy of the said Administrative Order # 14, Series of 1950 was already furnished the RAP.]

Is there any evidence that the movement of contaminated farm machinery has resulted in spread of Moko disease in the Philippines?

There are no specific data/evidence to prove that movement of contaminated machines resulted to the spread of moko disease.

30. *Does the Philippine government and/or industry require certification and registration of banana plantations and, if so, what are measure are required for these purposes?*

- Yes. Like any corporate institution, the banana plantation business is subject to government laws requiring certification and registration. Among these government organizations that require certification and registration are the Securities & Exchange Commission (SEC), Board of Investments (BOI), Department of Environment & Natural Resources (DENR) and the Department of Trade and Industry (DTI) as well as the local government units.

31. *Are the Philippine banana growers / plantation managers required to keep records of pest and disease occurrences and pesticide applications?*

- Yes. Banana plantations have their own research and bio-tech divisions which handle all aspects of the technical operation of the plantation.

Are all Philippine banana growers/plantation managers required to keep records of pest and disease occurrences and pesticide applications? If so, does BPI have access to these records and could this information be made available to the RAP?

To date, no regulatory law requires growers/plantation managers to keep records of pest and disease occurrences and pesticide applications. However, corporate pest and disease control practices require them to keep records of pest and disease incidences and pesticide applications. Records of pest and diseases as well as pesticide applications may be available to the BPI and the RAP upon request.

32. *Are there any environmental concerns in the Philippines associated with the production and consumption of bananas and, if so, what measures are used to address such concerns?*

- Yes, there are concerns on pesticide residues on/in fruits and contamination of the environment by production wastes. Following are some of the precautionary measures practiced by banana plantations to address these concerns:
 - a) IPM practices
 - b) Use of environment friendly pest control agents
 - c) Implementation of cultural practices that limit pest population and limit the use of pesticides
 - d) Maintain residue levels within defined/established MRLs
 - e) Establish biological buffers to protect non-target organisms
 - f) Proper waste disposal
 - g) Environmental Compliance Certificate (ECC) required by the Department of Environment & Natural Resources (DENR)

The reply states there are environmental concerns in the Philippines associated with the production and consumption of bananas. What are these environmental concerns/problems, e.g., pesticide residues, contamination of waterways, soil, air, waste disposal, etc.? Provide details of testing results. What chemicals are of greatest concern for environmental problems?

These concerns include pesticide residues in/on fruit, contamination of water ways with pesticides and disposal of empty pesticide containers.

To mitigate these concerns, the following are conditions are met in the plantations:

Pesticides used in the plantations are approved and registered for use on bananas by appropriate regulatory agencies (Philippine FPA, US EPA, FAO/WHO).

Pesticide residues on/in fruit must be lower than the established/accepted MRL set by regulatory agencies and importing countries.

Use re-usable or re-fillable pesticide containers, proper waste disposal system.

IPM practices including the use of environment friendly pest control agents, cultural pest/disease control practices.

33. *Does the Philippine government and/or industry have an environmental policy for addressing environmental concerns with banana production?*

➤ Yes. The Environmental Compliance Certificate of the DENR.

Regarding the Environmental Policy for addressing environmental concerns with banana production, the reply implies that the Environmental Compliance Certificate (ECC) of the DENR is the environmental policy. Apart from the ECC is there a set of environmental standards or a policy for addressing environmental concerns with banana production?

Other than the ECC, there are no other set of environmental standards addressing environmental concerns in the production of bananas.

34. *Is information available on the occurrence in Philippines of hitchhikers (snails, frogs, snakes, geckos, rodents, spiders, etc.) in packed bananas and associated with packing cartons and shipping containers, etc.?*

➤ There is information available but there are no reported cases.

The reply indicates that hitchhikers are present but there are no reported cases. Please explain the reply to this question regarding the occurrence of hitchhikers of bananas in the Philippines. Provide details of all interceptions of hitchhikers prior to shipping and at the destination port inspection.

Based on record, there are no cases of interception of hitchhikers both on "prior to shipping" and at "destination port inspection."

35. *What is the prevalence and distribution of feral and native banana plants in the Philippines?*

➤ Feral and native banana plants inhabit forested areas but they do not exist in the vicinity of commercial plantations.

The RAP during their Philippines visit saw feral and native banana plants in close proximity to commercial plantations. The Philippines reply states these do not exist in the vicinity of commercial plantations. What is the regulatory policy regarding the distance of feral and native backyard bananas from commercial plantations and how is it policed?

Native bananas and, to a lesser degree, feral bananas are found outside of established cavendish banana plantations. To date, there are no set regulatory standards defining the distance between native/feral bananas and established commercial cavendish banana plantations. Nonetheless, native/feral bananas within the boundaries of cavendish banana plantations are eliminated.

36. *Is true viable seed found in the banana varieties nominated for export to Australia, particularly when commercial plantations are in the vicinity of pollen source from wild seeded species?*
- No. Natural crossing will not happen due to the natural sterility of the male and female gametes of cultivars nominated for export to Australia and other parts of the world.
37. *Does Philippines import bananas and, if so, what are Philippines' import conditions for bananas?*
- Yes. We are importing only planting material for tissue culture and banana plantlets that had been certified virus-free. The imported plant material has to be placed under post entry quarantine to observe pest incidence and for future indexing
38. *What are the other importing countries' requirements/protocols for the importation of Philippines bananas to address their quarantine concerns?*
- Different countries have different requirements although all require phytosanitary certification.

Provide details of all importing countries requirements/protocols/work plans for the importation of Philippine bananas to address their quarantine concerns?

Please see [attachment 1](#), on Bilateral Quarantine Agreement with Importing Countries. Japan, China, ME, Singapore, Hongkong and Korea, require the bananas to be in matured green stage when they reach the destination, as well as accepted level of inspection in the Philippines (2%) and at the port of destination to address their quarantine concerns. For New Zealand, sampling protocol agreed between RP-DA and NZ-MAF requires 600 units as sample size for one consignment containing 1,000 units or more covered by one phytosanitary certificate. One unit is equivalent to one cluster of bananas.

39. *What have been importing countries quarantine concerns with banana imported from the Philippines?*
- Mostly mealybugs and scale insects.

List all quarantine concerns from all importing countries of bananas from the Philippines. What measures do they require for fruit flies and other pests, diseases, weeds and hitchhikers?

Please see [attachment 2](#), on the requirements of Importing Countries

Please see [attachment 4](#) on the Inspectional Requirements for Green Bananas for Hawaii.

Quarantine Concern	Measures to address the concern
Fruit Flies	Phytosanitary Certificate (PC), BPI commodity
	inspection, inspection at the port of destination,
	non-host stage (Matured green stage of banana)
	Reference attached.
Weeds	Phytosanitary Certificate (PC), BPI commodity
	inspection, inspection at the port of destination,
Diseases	Phytosanitary Certificate (PC), BPI commodity
	inspection, inspection at the port of destination,
Other insect pests	Phytosanitary Certificate (PC), BPI commodity
	inspection, inspection at the port of destination,
Hitchhikers	Phytosanitary Certificate (PC), BPI commodity
	inspection, inspection at the port of destination,

All Philippine banana importing countries require the same measures.

40. *How is Philippines meeting importing countries quarantine requirements?*

- Follow recommended farm pest control, procedures and inspection process and observe the bilateral quarantine agreements.

Please provide detailed information. e.g. work plans, procedural manuals and/or instructions that the BPI staff are required to follow to ensure that importing countries quarantine requirements are duly met?

Please see [attachment 1](#), on Bilateral Quarantine Agreements with Importing Countries.

41. *Does the Philippines maintain records of interceptions and non-compliance reports by importing countries?*

- Yes

Records of interceptions and non-compliance being kept by the Philippines. Provide a complete list of interceptions and non-compliances years reported by the importing countries?

Please refer to [attachment 3](#), on Interceptions and Non-compliance records by importing countries.

42. *Does the Philippine government operate any pre-clearance arrangements for bananas or other commodities to meet other countries import requirements?*

- No. Government ascertains inspection is done prior to issuance of the phytosanitary certificate.

Provide details of inspection procedures prior to the issuance of the Phytosanitary Certificate.

BPI -PQS Inspection

1. Inspections are carried out on a consignment basis at the time of packing

2. At least 2% sample are taken at random from every consignment
3. Fruits found to be infested, with mechanical damage, and those showing color break more than 25% shall be rejected.
 - Date
 - Number of units inspected
 - Packing station number/s
 - Units of ripening fruit/quarantine pests found
 - Phytosanitary Certificate number

All records are held by BPI -PQS and will be made available for inspection anytime.

The BPI -PQS ensures that all packing stations are regularly practicing sanitation.

43. *What quality assurance systems are used in the Philippines for banana fruit, including harvesting, cleaning, treatment, sorting, packaging, storage, transport, identity preservation and trace-back of produce to the farm?*
- Philippine Banana operation uses maturity age markings, use of conveyor and styropad for fruit movement, deflowering, use of alum and chlorine, cutting of defective fruits, and packaging in cartons with poly-liners, storage at 13-14 deg C, and use of refrigerated container vans or vessels.

The reply states the methods of quality management rather than the QA system. Are all potential exporters operating under a certified and independently audited QA system, for example, ISO 9002?

Branded fruits like Del Monte, Dole, Chiquita, Hiro, Unifruitti, Estrella, Mabuhay, Aloha, StaReyna and others have a minimum of ISO 9002 certificate. Other brands mentioned are undergoing SQF 2000 certification.

44. *What is the efficacy of post-harvest banana fruit surface disinfection treatment (chlorine plus alum) in killing surface-borne inoculum of the Black Sigatoka and freckle fungi and the Moko bacterium?*

Below are the results of in vitro-efficacy of Chlorine plus Aluminum sulfate (Alum) used for wash water treatment in packing houses against causal agents of Moko, freckle and Black Sigatoka. **Please refer to attached Annexes A1 to A3.**

- a) **Moko bacterium** – No bacterial growth was observed in treatments with Chlorine plus Alum at all concentrations (from T-2 to T-6) while it was observed in the untreated (T-1).
- b) **Black Sigatoka** – No observation of any complete spore structures due to rupture of spores by Chlorine in all treatments with Chlorine plus Alum; while spores with normal germination was observed in the untreated as shown in table below:

Treatment	No. of germinating spores / plate			
	Rep. 1	Rep. 2	Rep. 3	Mean
Untreated	11	16	17	15
Chlorine 1ppm+Alum 200ppm	0	0	0	0
Chlorine 2ppm+Alum 200ppm	0	0	0	0
Chlorine 4ppm+Alum 200ppm	0	0	0	0
Chlorine 8ppm+Alum 200ppm	0	0	0	0
Chlorine 16ppm+Alum 200ppm	0	0	0	0

c) **Freckle fungi** – No observation of any complete spore structures due to rupture of spores by Chlorine in all treatments with Chlorine plus Alum; while spores with normal germination was observed in the untreated as shown in table below:

Treatment	No. of germinating spores/plate			
	Rep. 1	Rep. 2	Rep. 3	Mean
Untreated	21	30	15	22
Chlorine 1ppm+Alum 200ppm	0	0	0	0
Chlorine 2ppm+Alum 200ppm	0	0	0	0
Chlorine 4ppm+Alum 200ppm	0	0	0	0
Chlorine 8ppm+Alum 200ppm	0	0	0	0
Chlorine 16ppm+Alum 200ppm	0	0	0	0

Has the Philippines conducted any further trials to verify the efficacy of fruit surface disinfestation treatments in killing surface-borne inoculum of black Sigatoka fungus, freckle fungus and the Moko bacterium on fruit itself? Demonstration of efficacy of the surface disinfestation treatments in commercial scale operations is required. The work should be conducted following an acceptable experimental design(s) in a manner that the results would be accepted for publication in a refereed journal. The efficacy of the chlorine and alum treatment in killing the Moko bacterium in the form of dried ooze on the fruit surface is also required, particularly if viable bacteria are present in the dried ooze.

Some Australian stakeholders have raised the issue of recontamination of fruit with pathogens after the surface disinfestation treatment has been applied. Are any measures used by the Philippines to address such concerns?

The vessels are disinfested prior to loading the banana boxes. We plan to ship our fruits in vacuum pack.

45. *Would ozone treatment of fruit during transit kill surface-borne inoculum of banana pathogens? If so, what are the treatment details and how much efficacy data are available?*

➤ Principally, Ozone could give the same disinfecting strength as Chlorine against banana plant pathogens since it acts in the same way as Chlorine i.e. oxidative reaction of microbial cell membrane. Most vessels used in the transport of bananas are equipped with ozone generators for general shiphold disinfestation.

46. *Is the Panama disease found on Cavendish banana plants in the Philippines?*

➤ Yes, Panama disease is found affecting Cavendish banana in the Philippines.

47. *Is the Panama disease fungus found on the crowns of banana hands and fingers?*

➤ Panama disease has been found affecting aboveground parts of the banana plant but fruit fingers had never been observed to be affected. Advanced Panama disease in plants is characterized by drying of all the leaves, fruit bunch peduncle remained healthy. **Please refer to attached Annex B.**

48. *How many races and vegetative compatibility groups of the Panama disease fungus occur in the Philippines?*

➤ Two races are reported to occur in the Philippines: race 2 and race 4 (Ploetz, 1990). Three vegetative compatibility groups were identified in the Philippines as follows: VCG 0122 (Cavendish), VCG 0123 (Latundan), and VCG 0126 (Cardava) (Magnaye, 1999). **Please refer to attached Annex C.**

49. *Is race 4 or tropical race 4 of Panama disease fungus found in the Philippines?*
 ➤ The reported VCG's are not the same as the tropical race 4 (VCG 01213) as found in Indonesia, Malaysia, Taiwan and Australia. **Please refer to attached Annex D.**
50. *Is freckle found on Cavendish banana plants and fruit?*
 ➤ Yes.
51. *What is the prevalence of freckle in banana plantations?*
 ➤ Freckle disease is observed in some commercial banana plantations.
52. *Is freckle a more important disease than Black Sigatoka on Cavendish?*
 ➤ Freckle disease is generally considered a minor disease compared with Black Sigatoka.
53. *What are the chemicals and pesticide spray schedules required for the control of freckle?*
 ➤ The fungicides (triazoles, strobilurin, tridemorph, mancozeb and chlorothalonil) are used to control freckle disease.
54. *Are the chemicals and pesticide spray schedule used for the control of Black Sigatoka effective against freckle?*
 ➤ Such fungicides enumerated in No. 53 are also used to control Black Sigatoka disease. Spray schedule ranges from 1-3 weeks interval depending on the prevailing weather conditions and disease status.
55. *Does freckle require any ground sprays in addition to aerial sprays?*
 ➤ No
56. *How many strains of freckle have been recorded in the Philippines?*
 ➤ No report available. The freckle pathogen in the Philippines infects all banana cultivars.
57. *How do the Philippine's strains of freckle compare with strains in other parts of the world particularly in terms of their pathogenicity on various banana genotypes?*
 ➤ No report available.
58. *What is the latency of freckle in banana fruit?*
 ➤ Freckle disease does not have latency.

Regarding the latency of freckle disease in banana fruit, the meaning of latency in the context of the risk analysis is the period between infection and the appearance of symptoms. The latency period could vary depending on climatic conditions, for example, a prolonged latency period may be experienced under cooler conditions. What is the period of latency for freckle disease under different climatic conditions?

So far, only the incubation period has been reported. There is no literature that reports any latency period. Latency means the infection has been there but the symptom expression is delayed. Incubation period on the other hand is what the risk analysis panel is referring to. In hot, humid climate, the incubation period is 20 days but in cold and dry condition it is 60 days.

59. *What are the Occupational Health and Safety measures used by banana industry?*
 ➤ Refer to FPA Regulatory Policies and Implementing Guideline , Chapter 4.5 and 5.6., specifically on:
 a) Certification and Accreditation of Pesticide Applicators, Professional Pesticide Adviser, Responsible Care Officer, Researchers, Pesticide Dispenser, etc.; and
 b) Product Stewardship and Responsible care, importantly covering the occupational health aspect

60. *Are there any human or animal health issues associated with the production and consumption of Philippines bananas?*
- There would be human and animal health issues associated with the production of Philippine bananas specifically in the usage of fertilizers which is under the strict monitoring of the Fertilizer & Pesticide Authority as seen in its FPA Regulatory Policies and Implementing Guideline , Chapter 6.3 and 6.4. Specifically FPA required compliance in Monitoring of Product Stewardship and in Pesticide Residues (MRL Establishment).

It appears this question has been misunderstood. Our understanding of this 'issue' is that there may be a 'problem'. The Philippines reply appears to suggest there are no problems. Have any ill effects been recorded on humans and animals exposed to chemicals used in banana plantations and how are such health hazards managed?

The only worst case experienced is skin allergies to identified chemicals used before like Trifmine (Triflumizole) that was discontinued since 8 years ago. The odor of some nematicides was also raised by nearby communities but due to poke hole method (sub-surface nematicide application by burying the granules) the issue has stopped.

So far there is no proven ill effect on humans. Offensive odor and potential fish kill in seashores or rivers nearby banana plantations is prevented by sub-surface nematicide application by burying the granules we term as poke hole method.

We are regulated by our local Fertilizer and Pesticide Authority (FPA) in our pesticide usage. We also abide with established international code of conduct in pesticide use. More so that the importing countries have their own specific requirements. Plantations also conduct regular safety seminar on pesticide use and handling. Cholinesterase level on the blood of workers is determine before, during and after the use of nematicide. Moreover, management provide personal protective equipment to pesticide applicators.

61. *What are the quality defects found in the Philippines bananas, particularly those that could be confused with pest and disease symptoms?*
- Physiological - Mechanical defects, scabs, bruises, discoloration, maturity stain and sun burn.
62. *What pests, diseases and hitchhikers have been intercepted by the Philippine authorities during pre-export inspections of bananas?*
- Mealybugs and Scales

The reply has not nominated any hitchhiker or disease interceptions in Philippine bananas during pre-export inspection of bananas; please refer to text under question 6 above and provide a comprehensive response.

Based on records there are no interceptions of hitchhikers or diseases during pre-export inspection of bananas.

63. *Does the Philippines grow any genetically engineered bananas?*
- No.
64. *What are the methods used in the Philippines for the identification of banana cultivars?*
- Based on Stover and Simmonds' (1987) morphological and genetic characterization.
65. *Is breeding of bananas for pest and disease resistance conducted in the Philippines and, if so, how successfully?*
- No.

66. *What are the current geographic boundaries of the proposed export areas and when were the former Davao, Cotabato and Bukidnon subdivided?*

- The Philippine application named the provinces of Davao, Cotabato and Bukidnon as the geographic boundaries of the proposed export areas. The private sector, specifically the PBGEA wanted to be explicit by citing that Davao is composed of Davao Province, Davao del Sur and Davao Oriental (Republic Act 4867, May 8, 1967). However in January 31, 1998 President Fidel V. Ramos signed Republic Act No. 8470 creating Compostela Valley out Davao Province, and the remainder of Davao Province now becoming Davao del Norte.
- The province of Cotabato had likewise been divided into North Cotabato, South Cotabato, and Sarangani and the PBGEA simply wanted it documented that by citing Cotabato, it would refer to these areas.
- Bukidnon remains the same.
- Recent developments however reveal that President Gloria Arroyo re-aligned the Mindanao regions. Please refer to attached newspaper clipping. This simplifies the geographic locations because **Socsargen Region** will now cover South Cotabato, Sarangani, General Santos, North Cotabato and Sultan Kudarat; **Davao Region** will now cover the provinces of Compostela Valley, Davao del Norte, Davao del Sur and Davao Oriental; **Bukidnon** remains a part of the Northern Mindanao (Reg. X). **Please refer to Local newspaper clipping dated September 24, 2001 attached as Annex E.**

[Let it be noted at this point that the private sector stakeholder (PBGEA) had requested for the inclusion of Agusan in the geographic export area. A meeting with this particular group of stakeholder resulted in its agreement to exclude same.]

67. *What is the current usage of Calixin in banana plantations and has any Black Sigatoka resistance been detected to this fungicide?*

- Calixin is used for a maximum of 12 applications per year. Sensitivity of Black Sigatoka population up to the present has been within acceptable levels. No shift in population sensitivity has been detected.

The answer maybe interpreted as yes to the question of resistance by black Sigatoka to Calixin, though it is within acceptable levels. However, it is stated that no shift in population sensitivity has been detected. The Philippine experts advised the TWG Chairs that no resistance to Calixin has been detected. Please clarify this issue.

To emphasize, no resistance to Calixin has been detected under Philippine condition up to today.

Calixin until now is providing effective control based on standard parameters in black leaf streak survey. Since the control is at acceptable level, the pathogen is sensitive to Calixin. Therefore, there is no shift in population sensitivity.

68. *What is the prevalence and distribution of Moko in Mindanao?*

- Moko disease is distributed throughout Mindanao. Its prevalence in commercial plantations has ranged from 0 - .05% cases/year/hectare.

69. *Has Moko been identified in other islands and provinces of the Philippines?*

- There is no Moko report outside of Mindanao.

70. *What are the costs of the Moko eradication program in Mindanao?*

- PHP 750.00 - PHP1,150.00/case, which includes labor and rehabilitation materials.

71. *What is the prevalence and distribution of Bugtok on cooking bananas throughout the Philippines and specifically in Mindanao province?*

- Bugtok is distributed throughout the Philippines on cooking banana including the Island of Mindanao.

72. *Is Bugtok endemic throughout Cavendish banana production areas in Mindanao?*

➤ No.

According to the information from the Philippine literature, bugtok is endemic in backyard and feral banana plants surrounding the commercial Cavendish production areas. Please clarify this issue.

Bugtok is not found in any Cavendish cultivar planted under commercial plantation.

Bugtok is not always endemic or present in backyard and feral banana plants surrounding Cavendish production areas. Its presence is limited to areas where the grower does not implement proper cultural practices.

73. *Have any of the insect vectors of Bugtok and Moko disease been identified? Is there any current work in progress on insect transmission of Moko and Bugtok diseases in the Philippines?*

➤ No confirmed report of insect vector of Bugtok and Moko pathogens but there is a current work on insect transmission.

Please refer to text under question 21 above and provide a response. Also, are any results available for the study mentioned in the BPI response?

Chances of an insect vector visiting the inflorescence of the bunch is nil to none at all because of the practice of bunch spray, deflowering and bagging as part of the cultural practice on fruit care for Philippine Cavendish bananas.

No confirmed report of insect vector of bugtok and Moko pathogens. The insects observed feeding on the flowers are just suspected as the carrier. There is current insect transmission studies between Bugtok and Moko being conducted by BPI Davao and UPLB.

74. *Has Moko or Bugtok infection in Cavendish banana been observed in Mindanao? If so, is this the result of insect transmission or systemic infection?*

➤ Moko (but not Bugtok) infection in Cavendish banana has been observed as a result of systemic infection not insect transmission.

What evidence is there that the mode of transmission of the causal bacterium for Moko or bugtok in Cavendish banana is systemic infection and not insect transmission? The response is not consistent with the literature on the epidemiology of the B strain.

Today there is no evidence that the mode of transmission of Moko and Bugtok is systemic or insect transmitted. Under natural condition, Moko is transmitted through mechanical injuries.

75. *What is the explanation for occurrence of random pattern of outbreak sites of Moko in commercial plantations? Is this due to insect-transmission at very low rates or something else?*

➤ The occurrence of the random pattern of outbreak of Moko in the commercial plantations is a consequence of mechanical transmission due to occasional lapses in disinfecting cutting tools (deleafing, desuckering, harvesting) used by farm workers.

Again, what evidence is there of exclusive systemic transmission of the causal bacterium producing Moko in Cavendish cultivars? The pattern of infection as seen from aerial inspection by the TWG Chairs would suggest a random pattern more indicative of insect transmission than a soil borne/or worker lapse in disinfestation of cutting tools.

An experiment to confirm that insect transmission is indeed happening in the spread of Moko is required to answer the observation of the TWG Chairs.

76. What methods are used to identify virus infections in field plants in the plantations?
 ➤ Viral infections in the field are detected visually by trained disease surveyors based on symptomatology. Early detection by appearance of initial symptoms is the basis for implementing prompt eradication.
77. Do you have protocols that define “hard green” fruit maturity standard and how does the industry ensure that only mature bananas in the “hard green” condition are packed for export?
 i Physiological age: nine (9) to twelve (12) weeks after bagging for bananas planted in the lowlands and a maximum of eighteen (18) weeks for bananas planted in the highland (a highland being a minimum of 400 meters above sea level.
 ii Calibration : 38/32 of an inch to 49/32 of an inch reckoned from the average of the middle three (3) fingers of the outer whorl of the 2nd hand.
78. What is the status in the Philippines of the following organisms that have been recorded to occur in the Philippines according to the CABI Global Crop Protection Compendium but were not included in the pest lists in the Issues Paper?
- | | |
|---|------------------------------------|
| <i>Aspergillus niger</i> | collar rot |
| <i>Botryodiplodia theobromae</i>
(<i>Lastodiplodia theobromae</i>) | finger rot |
| <i>Ceratocystis paradoxa</i>
(<i>Chalara paradoxa</i>) | corn rot; Black end; fingertip rot |
| <i>Cochliobolus lunatus</i> | mould |
| <i>Cucumber mosaic virus</i> | banana mosaic |
| <i>Guignardia musicola</i> | freckle |
| <i>Helicotylenchus multicinctus</i> | banana spiral nematode |
| <i>Hoplolaimus seinhorsti</i> | lance nematode |
| <i>Pratylenchus coffeae</i> | |
| <i>Pratylenchus multicinctus</i> | |
| <i>Rotylenchus reniformis</i> | reniform nematode |
- The following fungi: *A. niger*, *B. theobromae*, *Ceratocystis paradoxa* and *Cochliobolus lunatus*, are saprophytic in nature and are commonly associated with rotting parts of banana plant. *Cucumber mosaic virus* has not been observed in the commercial banana plantations in Mindanao. For *Guignardia musicola*, please refer to the factsheet on freckle. The five nematode species listed are scarcely observed in the plantation. These are of No economic importance.
79. What is the status of *Fusarium pallidoroseum* in the Philippines?
 ➤ No report of *Fusarium pallidoroseum*.
80. How many sooty moulds and post harvest rot organism are recorded on banana plants and bananas (please provide a comprehensive list)?
 ➤ Postharvest rot organisms observed are the following: *Fusarium moniliforme* Sheldon, *Colletotrichum musae* (Burk. And Curt.) Arx, and *Lasiodiplodia theobromae* (Pat.) Griffon and Maubl. Sooty mold associated with aphid or mealybug infestation is observed but genus or species has not been identified.

*Some supplementary questions are somewhat repetitious. Further questions may be added to the list following comments from the TWG/RAP member