

Final Report

National Banana Bunchy Top Virus Program - Phase 3 - NSW

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Project:

National Banana Bunchy Top Virus Program -Phase 3 - NSW BA15007

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Content

Content	3
Summary	4
Introduction	5
Methodology	6
Outputs	7
Outcomes	11
Monitoring and evaluation	11
Recommendations	12
Refereed scientific publications	11
Intellectual property, commercialisation and confidentiality	12
Acknowledgements	12
Appendices	13

Acronyms:

- NSW – New South Wales
- BBTV – Banana Bunchy Top Virus
- NNSW – Northern New South Wales
- HIA – Horticulture Innovation Australia
- NSW DPI – New South Wales Department of Primary Industries
- NBBTVP – National Banana Bunchy Tip Virus Project
- QAAFI – Queensland Alliance for Agriculture and Food Innovation
- R&D – Research and Development
- DAFQ – Department of Agriculture and Fisheries Queensland
- GPS – Global Positioning system
- QLD -Queensland
- APVMA – Australian Pesticides and Veterinary Medicines Authority

Summary

Banana Bunchy Top Virus (BBTV) causes the most serious viral disease found in banana plants. It can have extremely devastating effects on commercial banana farming operations and can readily exist in private backyard banana plants within the known bunchy top zones in South Eastern Queensland and Northern New South Wales (NSW). There are only two known modes of spread of this disease the first being by the movement of infective banana aphids from plant to plant and the other being by the movement of infected planting material by humans. In Northern NSW within the known bunchy top zone there are 233 known commercial farms operating which are regularly inspected and infections detected are destroyed. Following recent changes in State government legislation, access to properties and farms in rural, urban and peri urban areas to carry out surveillance and control activities of BBTV can occur on an invitational only basis.

Commercial farms are placed into various categories determined by their known bunchy top status;

- Category A farms – No BBTV recorded
- Category B farms – No BBTV recorded for 2 years or more
- Category C farms – No more than one BBTV recorded in the past 12 months
- Category D farms - More than 1 but less than 10 BBTV recorded in the past 12 months
- Category E farms – More than 10 BBTV recorded in the past 12 months

These categories determine the frequency of inspections that occur on the farms and is based on advice from the supporting virology team based in South East Queensland (Dr John Thomas and Dr Kathy Crew) and based on current epidemiological knowledge. Category D and E farms are inspected monthly, and category C farms aimed to be inspected at 3 monthly intervals, but often more frequently. Category A and B farms are inspected usually only once per annum, but sometimes more frequently as situations permit. Overall, due to the very limited funds available, the category D and E farms received the most attention. Unlike other parts of Australia, most banana farms in Northern NSW are situated on hillsides (predominantly eastern facing) in very rugged hazardous terrain. Inspection is carried out by teams of inspectors (usually 2 to 3 persons) who walk the rows within the banana plantations inspecting all plants to detect the bunchy top infections. When detected the plant is marked with pink tape and its position recorded by GPS. It is then treated using both a herbicide and an insecticide directly injected into the stem of the plant, and over sprayed with a paraffin oil to contain the infectious (possibly winged and infectious) aphids that may be present on the plant. If one stem in a clump of banana plants displays symptoms the whole clump will be deemed infected (even if it does not display visual symptoms at the time) and so is destroyed. The plants usually die in 3 to 4 weeks and are then no longer infectious. The virus does not survive in the soil.

This project has been highly successful in protecting commercial growers from BBTV epidemics and keeping their operations viable. Unfortunately eradication of this disease has not been possible. It has been attempted in the past, but would require a very large investment and government support to have a chance of success. Many of the farms only have very small numbers of infections from time to time with successive seasons having different levels of infections. Only a very small number of farms have consistently had higher numbers of infections. One in particular continues to be very difficult to manage. All growers have been very appreciative of the services and support provided by the team in helping to keep their operations viable. They appreciate the difficulties encountered by the inspectors who consistently survey the farms and destroy detected infections. Many farmers find it very difficult to detect and identify BBTV and in most cases have relied on the inspectors to carry out this work.

With every BBTV infection detected and treated, data is also collected which is added to a main dataset that has history back to 2009. During 2018, these data were contributed to a data modelling project (BA17001) undertaken by an epidemiology team from University of Cambridge in the United Kingdom. Computer simulation models were developed to examine the spread of BBTV in farms and backyards, and to predict the effects of varying control parameters. The models will also have useful predictive capacity for managing potential BBTV incursions in north Queensland. The data provided by this project was considered some of the best available for this type of disease modelling.

BBTV continues to be a threat to the broader banana industry. It is recommended that work continue to maintain commercial banana viability in the southern Queensland and northern NSW, and to limit the risk of spread of disease to other banana-growing regions, especially north Queensland. A lapse in the control program would allow a cryptic epidemic situation to develop, threatening the broader industry, and would waste the considerable effort and resources that have resulted in effective management to date.

Introduction

Banana bunchy top virus (BBTV) causes the most serious viral disease of bananas worldwide. Infected plants do not produce fruit and a plantation will become completely infected if the disease is not controlled. Bunchy top is spread in planting material and by the banana aphid, *Pentalonia nigronervosa* – and no other means. Varietal resistance or tolerance to bunchy top is not present in commercial banana cultivars and has not been recognized in bananas generally. Hence the basic elements of control, based on research and experience are:

- Preventing movement of infested planting material between areas;
- Establishing new blocks using virus-free planting material;
- Protecting blocks from infestation from outside by removing disease sources; and
- Inspecting blocks and destroying diseased plants on a frequency determined by the rate of symptom development and the sensitivity of detection
- Removing infected blocks, to accomplish eradication.

Bunchy top was introduced to Australia from Fiji in 1913 in infected planting material. At the time, the banana industry was based in NSW and southern QLD. The disease spread rapidly and had a severe impact, requiring large scale disease management programs with regulatory backing, to enable production to continue. The southern industry has declined, and the relative impact of bunchy top on the industry as a whole reduced, but its local impact in parts of southern QLD and northern NSW remains high. Also, bunchy top poses a threat to uninfected districts. Bunchy top is currently confined to southeast QLD and northern NSW, and thus over 95 percent of the Australian banana industry (far north Queensland, Bundaberg, southern NSW, Western Australia and Northern Territory) is free of the disease.

Earlier phases of the bunchy top project had the following aims:

- Eradication of BBTV from all commercial banana plantations, and adjoining buffer zones;
- Eradication of BBTV from urban areas in NSW and QLD;
- Declaring the banana growing regions of southeast QLD and northern NSW a Pest Free Area for BBTV;
- Declaring Australia a Pest Free Area for BBTV.

During the current phase (September 2016 to April 2019) following a review of all of the data captured since 2009 it became apparent that without substantially increased funding and government and industry support, eradication of this disease was not possible. As a result to the project has aimed to:

- Control, reduce and maintain bunchy top virus on commercial farms;
- Reduce the incidence of BBTV in buffer zones (including backyards) that may contribute to re-infection of commercial farms;
- Focus on containment preventing further spread into uninfected banana growing areas in northern NSW and southeast QLD

Methodology

Personnel

This project commenced during September 2016 following a project restructure from the previous Banana Bunchy top phase 3 project (BA14011). Part of the restructure separated one national project into two State projects, BA15006 (southeast, Queensland) and BA15007 (northern New South Wales)).

Existing staffing was used for project BA15007 including four inspectors (Grant East, Wayne Shoobridge, Bernard (Tom) Maher and Josh Chapman) divided into two inspection teams. A fifth inspector was employed during February 2017 to assist both teams, with the idea of eventually having a third team on-ground to carry out many more backyard and private property inspections (in collaboration with DPI NSW). The two original inspection teams had both worked on previous BBTV projects, and one inspector (Bernard Maher) has worked on Bunchy Top programs for 33 years. The staff have an excellent knowledge of the various areas and maintain a good rapport with the growers. Many growers are very accustomed to Bunchy Top inspectors visiting their farms and in many cases the teams carry out their regular inspections with little or no contact with the growers. Following each inspection an inspection docket is left for the growers detailing the results of the inspection. The fifth inspector (Leanne Davis) came from a horticultural/agricultural background working in the area of surveillance and following some training learnt very quickly to identify the symptoms of bunchy top and became a very capable inspector during her time with the team. She has since moved on to another banana-related project with the NSW DPI.

Inspections

The known bunchy top zone in NSW is an area from the Queensland border south to approximately Lismore. In this area there are 233 farms across 59 different locations that are regularly inspected.

All inspection work has been based on best practice techniques based on available current scientific information. All chemicals used to carry out the destruction of infected plants are listed on an APVMA minor use permit (<http://permits.apvma.gov.au/PER14850.PDF>) and is based on scientific efficacy testing. The method of application is by injection using a custom made needle on an NJ Phillips type injection gun. Off target damage to other plants is minimized through this application method.

The process for inspections is as follows:

- The senior inspectors maintain a list of the farms and the inspections schedules.
- Each week they plan inspections based on the farms' BBTV status category and priority. The farms are grouped into geographical areas for inspection to minimize travel and maximize inspection efficiency.
- Some growers require prior notification by phone of inspection while others allow access at any time.
- The inspectors leave a written inspection report with the growers or at their packing sheds when inspections are complete.
- The teams mostly work separately but in some cases they come together to work on larger farm inspections to complete them more efficiently.
- All detected infections are treated immediately (as described below) when found, and simultaneously the plant's location and details are mapped and logged into the data base.
- Monthly inspection pressure has been maintained on category D and E farms destroying all infected plants immediately when detected across known BBTV region
- 3 monthly inspection pressure on category C farms has been maintained (as often as possible during their inspection rounds)
- Inspection of category A and B farms once per annum.
- Backyard inspections. based on buffer zones around existing commercial banana farms, have been carried out from time to time as time permits. They are targeted at mostly 1 to 2km buffer zones adjacent to commercial banana farms plus the occasional ad-hoc notification inspections.
- Properties are entered through the front gate to the front door of the residence. We explain to the property owner who we are and why we are visiting their property. We then ask the owner if they have banana plants and, if so, could we inspect them. In most cases we are then invited to inspect the banana plants on the property.

- If no infections are detected we record the site in the database and leave the property.
- If infections are detected we then explain the process of treatment and require a form be signed to allow us to treat the plants immediately. When the form is signed we then inject the plant with herbicide and overspray with paraffin oil. We do not use insecticide on back yard bananas. In most instances we will reinspect again in 4 to 6 weeks to treat any regrowth.
- In situations where nobody is home or we cannot access the property we leave an information brochure with our contact details and request that we be called to arrange a more suitable time to access the property. (Very few actually call us back).
- All inspections are mapped and logged into the database and demonstrates a record of time spent carrying out the inspections. Early in the project Personal data Assistants (PDAs) were used to capture the data and later the project moved onto an app (Konect) used on the staffs' smart phones.

In some cases growers have requested that samples be confirmed by laboratory diagnosis. These samples were tested by Dr Kathy Crew (DAFQ) and Dr John Thomas (QAFFI) at the Eco Science Precinct in Brisbane. The scientists carry out both visual inspection (in the first instance) of the sample followed by a molecular test (if required) and document their findings that we pass back to the grower. No samples identified as infected by the inspectors have ever been disputed by the lab.

Other tasks carried out included the destruction of one semi abandoned farm that threatened to infect neighboring farms and had been in a process of being destroyed for many months prior to the commencement of this project.

Notifications received through Banana Bunchy Top telephone hotline are dealt with when received. Often they are situated adjacent or close to commercial banana farms. Properties are inspected and infections treated when found.

Some extension activities were carried out with the team being involved in the Murwillumbah show where they had the opportunity to discuss Bunchy Top virus to visitors to their display. Articles relating to the project have been included in the ABGC banana magazine from time to time also.

A bunchy top information brochure was developed and used for the project and also after treatment information and with compliments slips were used for backyard and private property inspections.

This project has been overseen by a Project Steering Committee (PSC) that includes banana growers, researchers, state government personnel, ABGC staff, Hort Innovation staff and the project leader. The committee met at 6 monthly intervals and also attended teleconferences when required. At the meetings the project leader was required to present updates and progress reports about the project and this provided a forum for active discussion about progress and direction.

Outputs

Upon commencement of the project in September 2016, data has been captured during all aspects of inspection operations throughout the northern NSW growing districts (Table 1). This included:

- Number of farms inspected
- Number of BBTV infections detected
- Treatment details including numbers of clumps, numbers of stems in clumps and number of symptomatic leaves. The leaf data allows estimation of the time of infection which is important for associated epidemiological modelling studies.
- Chemicals used for treatment
- Communications with the grower (i.e. by report form or by speaking with the grower)
- Number of yards inspected
- Number of infections detected in private yards and treatment details
- Number of yards visited that could not be accessed (nobody home) or did not have banana plants. (All inspections are recorded)

Table 1 Disease surveillance details (treatment details not shown) between September 2016 and April 2019.

Time Period	Inspections	BBTV infections	73031 Newrybar	All infections minus 73031	Yard inspections	Yard infections
Sept 2016 to Nov 2016	73	580	482	98	53	6
Dec 2016 to Feb 2017	115	837	367	470	33	16
Mar 2017 to May 2017	147	591	478	113	15	12
June 2017 to Aug 2017	304	595	432	163	471	46
Sept 2017 to Nov 2017	368	531	425	106	154	43
Dec 2017 to Mar 2018	94	1008	692	316	46	35
Apr 2018 to June 2018	249	560	389	171	36	25
Jul 2018 to Sept 2018	202	168	117	51	18	5
Oct 2018 to Jan 2019	237	1353	1026	327	43	28
Feb 2019 to Apr 2019	59	458	316	142	16	1
Total	2158	6681	4724	1957	885	217

Table 2 shows the BBTV infection status categories of the farms. As the surveillance program continues the infection categories vary over time. The farm categories list is used as a tool that can assist to determine the inspection frequency of the farms based on their respective categories. It does fluctuate somewhat as new farms are added to the list (database continually gets updated with new farms or farm changes over time) and the infection status can change often. Category D and E farms are targeted for the most inspections (monthly) with Category C farms targeted 3 monthly (or as often as possible) with Category A and B farms targeted once per year and as resources have allowed.

Table 2 Farm category data as per reporting periods during the project.

Time period	Category A	Category B	Category C	Category D	Category E	Total (calculated against farm numbers)
September 2016 to November 2016	40	58	28	27	12	165
December 2016 to February 2017	61	67	36	38	12	214
March 2017 to May 2017	57	63	41	40	13	214
June 2017 to August 2017	61	62	54	40	14	231
September 2017 to November 2017	53	115	19	29	16	232
September 2017 to March 2018(6 month report)	53	111	19	33	16	232
April 2018 to June 2018	53	111	19	33	16	232
July 2018 to September 2018	46	101	28	39	18	232
October 2018 to January 2019	45	98	31	38	20	232
February 2019 to April 2019	45	94	31	38	24	232

Backyard inspection data is shown in Table 3. The presence of uninfected plants and the absence of banana plants is also recorded as this is important information in determining potential reservoirs of infection around commercial properties

Table 3 Yard inspections counts from September 2016 until April 2019

Plants (clump/stems)	count
Present and infected	217
Present and uninfected ?	273
Not present	215
Unknown	180
Total	885

Farm 73031 Newrybar

Since September 2016 one farm in the Newrybar area has consistently revealed high BBTV numbers. The farm is an 11 hectare block of Cavendish banana plants that are grown in quite thick rows comprising of approximately 1500 plants per hectare situated on a slight slope.

The farms' first detections were in December 2014. Although there were low numbers of infections detected the virus inoculum must have, been present for some time as plants were found with up to 10 symptomatic leaves, implying infection for at least 10 months. Despite regular monthly inspections following all the best practice procedures to control the virus, and inspection assistance from the southeast Queensland project, the number of detected infections increased steadily, reaching very high levels in the 2016/2017 summer (figure 1). The number of infections plateaued but has remained high on an annual cyclical basis since then, with maximum infections occurring each summer. Detections on this farm represent 82.4% of all northern NSW infections.

This management problem has been regularly discussed with researchers in Brisbane and is the subject of some epidemiological computer modelling studies and field research conducted independently by the scientific team. On a number of occasions the problems related to this farm have been presented to the project steering committee and the NSW Department of Primary Industries, but due to legislative constraints and a lack of resources to further intensive eradication efforts, this problem farm remains. The grower has been consulted extensively also but progress has been slow and very difficult.



Figure 1 Graph of infection numbers on farm 73031 since the first detection in December 2014.

BBTV-infected plant material has also been provided to researchers at the Ecosciences Precinct, Brisbane, for use in associated research, which has helped maintain a close link with research ultimately aimed at improved BBTV detection and control.

Outcomes

The National Banana Bunchy Top program NSW phase 3 achieved 2158 Farm inspections and 885 yard inspections since September 2016. This project has made a significant contribution to maintaining the viability of the northern NSW banana industry. At the end of the previous BBTV control program (BA 12006), the BBTV incidence across the industry was ca 62.00%. As a result of the more than 6681 eradications performed in the current project, we have maintained this excellent level of control (current incidence 61.37%).

A strategic backyard program in areas just north of Lismore were inspected to confirm confidence that spread of the disease further south has not occurred.

The situation at one farm at Newrybar (no. 73031) has had a dramatic effect on the apparent success of the program. It alone was responsible for 82.4% of all detection for the State, and it highlighted the difficulties associated with limited funding for inspection and control activities and the increasing difficulties associated with lessening legislative support.

The continuous maintenance of the commercial farms database and the constant updating of the BBTV detection data, including number of plants and leaves displaying symptoms, and their location coordinates has provided a valuable epidemiological resource. Sharing these data with researchers from the University of Cambridge (Prof. Chris Gilligan and Dr Hola Adrakey), DAFQ (Dr Kathy Crew) and UQ (A/Prof. John Thomas) has allowed the development of epidemiological models which have already been used to assess the efficacy of current and proposed control strategies (Hort Innovation Project BA17001). The models also have the potential to devise pre-emptive containment and control strategies for potential incursion into currently BBTV-free regions such as north Queensland.

We maintained good relationships with all stakeholders including the NSW Department of Primary Industries, Australian banana growers council, the virology research team and the banana growers. The growers indicated confidence in the project throughout the period

Monitoring and evaluation

The focus of this project has been the containment of BBTV to within the known infection zone and the reduction where possible and management of known farm infections to allow commercial banana growers to remain viable. This was achieved through active inspection pressure and the immediate treatment of detected infections when found.

The success of this project has been through the dedicated hard work carried out by the inspection teams in often adverse and difficult working conditions. The inspection teams' vast experience and knowledge of the northern NSW banana growing area and their knowledge of the geographic location of each farm and the commercial growers has been instrumental to this success.

The teams have built an excellent rapport with the commercial growers and have gained their trust, allowing them access to their properties as often as required to carry out inspection duties. Although the teams have passed on information about the disease to the growers, in some cases many times, including pointing out infected plants on their farms, most growers still have great difficulty identifying the infected plants especially during early stages of infection. The growers greatly appreciate the teams' assistance over the period for assisting them to control BBTV infestations on their farms. They understand that it is a very difficult task requiring professionally trained inspectors to detect symptomatic plants.

During the program there was 2158 inspections conducted across the 233 commercial farms in the area.

Carrying out backyard and buffer zone inspections when possible has also been instrumental to the success of the project. By reducing the possible outside infection pressure from properties adjacent to the farms, this may have assisted to reduce the infection numbers on the commercial farms themselves. This is a very labor intensive, time consuming process that requires a lot of communication with many property owners. Another benefit from the yard inspections is raising the awareness of BBTV within the community. While many property owners have indicated that they know of some rules around the growing of banana plants, many do not understand what those rules are and the reasons why they exist. A yard inspection creates the perfect opportunity to pass on information directly to a landholder about growing banana plants and more importantly information about banana diseases including BBTV. Information brochures are handed out to landholders during this process with relevant BBTV information. In many cases future BBTV hotline telephone calls have been generated as a result of this process.

Due to NSW DPI legislative changes backyard inspections are carried out only by invitation of the property owner. In most cases the inspectors have been welcomed onto the properties to inspect their banana plants and treatment has been allowed when BBTV detections have occurred.

During the project period there have been a number of growers who have been non-compliant with regards to keeping their plantings clean and free of weeds which hinder the inspection process. In some cases farms have become abandoned or unworked. The NSW Department of Primary Industries has been notified about a number of these farms after unsuccessful efforts by the inspectors to encourage the growers to comply. The department has run a number of programs to assist the project and remedy this problem but in many cases the problem still exists.

The on-going close relationship with the virology research team based at the Eco Science Precinct in Brisbane has been very important to the project. In some cases samples have been collected and the disease presence verified by the research team as requested by growers. Plants deemed infected by inspectors have always returned positive diagnoses when verified by the scientists. Their attention to detail and skill in detecting infections is excellent.

Recommendations

The current control program is based on long-practiced strategies which have proven effective over many decades. Although it is recognised that there are severe constraints to funding nowadays, the effectiveness of the current program is self-evident. The impact of any modification of the current strategies must be carefully assessed. Computer modelling in project BA17001 has shown that relaxation in the application of any component of the current strategy is highly likely to result in increased, and ultimately uncontrollable, disease incidence.

As highlighted above with regards to the continuation of BBTV control/management programs to keep BBTV under control the following recommendations are:

1. The continuation of well-funded active surveillance programs in northern NSW to keep the disease in check.
2. A specific extension program aimed at providing specialized training and extension material to commercial banana growers and encouraging them to become more involved in the control of BBTV so they can assist to keep the disease under control on their farms.
3. Specific well-funded research programs to investigate further the insect vector (aphid), the chemical efficacy of current and potential new chemicals to control the insect, the occurrence of latent infections, and detection tools that can allow earlier detection of the presence of infection.

Refereed scientific publications

Non to report

Intellectual property, commercialisation and confidentiality

No commercial IP generated

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Appendices

Appendix 1: Banana bunchy top information brochure

PREVENT FURTHER SPREAD



Plant infected with Bunchy Top Virus


Bunchy Top has been in Australia for more than 100 years. While it has not been eradicated, it has been contained and its only found in a small part of Australia. To help prevent further spread we encourage growers of banana plants to monitor their plants and if they suspect Bunchy Top Virus may be present to contact the Bunchy Top Virus inspectors or their relevant state primary industry authority for further assistance.

THE NATIONAL BANANA BUNCHY TOP VIRUS PROGRAM

Qualified inspectors conduct home and property inspections as part of the program. Should Banana Bunchy Top virus be detected they can assist with either information on how to treat the infected plants or can treat them on your behalf free of charge (depending on your property location). Community support is vital for the program to be successful.


DO NOT MOVE BANANA PLANTS AROUND

As part of the project we discourage the movement of plant material on and off private properties as this can further spread the disease. If you would like to obtain banana plants please do so via an approved source. Please ask the inspector for more detail or contact your state primary industry authority.



The National Banana Bunchy Top Virus Program is funded by Horticulture Innovation Australia Limited using the banana industry levy and funds from the Australian Government.

WHAT IS BANANA BUNCHY TOP VIRUS?



Plants become very stunted when infected with Bunchy Top Virus.

Banana Bunchy Top virus is the most devastating viral disease found in banana plants worldwide and can affect all banana varieties. It poses a major threat to Australia's commercial banana industry and home grown bananas too. This brochure has been developed to provide information about the virus, its identification and control.

WHAT DOES BANANA BUNCHY TOP VIRUS LOOK LIKE?

In its early stages the symptoms are difficult to see to the untrained eye. The first symptom is short dark dot-dash lines appearing along the veins of the youngest leaf starting from the mid-rib. You can see the dot-dash lines best when you look upwards towards the sunlight through the bottom side of the youngest leaf. Dark green stripes running along the mid-rib of the infected leaf may also be present.

When the disease is more advanced each new leaf becomes shorter, narrower and stands more upright giving a bunched leaf appearance that's why it is called Bunchy Top. Plant growth is stunted and the leaf edges roll slightly upwards and tend to become yellow or lighter green. Bunches can become small and deformed also.

Healthy leaf.



Infected leaf.



Bunchy Top Virus is particularly difficult to identify in its early stages. All varieties of banana plants are susceptible and so if you suspect you might have the disease in your banana plants please contact a Banana Bunchy Top inspector for assistance. The inspector can confirm if you have the disease in your banana plants and can assist with the correct treatment if necessary. This service is free of charge.

How is it spread?

Banana Bunchy Top Virus can only be spread in two ways:



Banana Aphids

- 1: By the Banana aphid - a small black insect which looks like other aphids you see in your garden, but only the banana aphid can spread Bunchy Top Virus, after it has fed for many hours on an infected plant. All banana plants have banana aphids but not all aphids are carriers of the disease.
- 2: By the movement of infected planting material well meaning people who give away young plants or suckers to neighbours or friends risk spreading the virus. Please don't move plants on or off a property and only access clean planting material from an approved source. Please talk to the Banana Bunchy Top Inspector regarding accessing clean planting material or call or your state primary industry authority for more information.

Do not disturb the plants

If you think your banana plants may be infected with Banana Bunchy Top Virus, seek more information first before disturbing the plants. Chopping off the plants will not destroy the virus and may cause further spread and future emerging suckers will also be infected with the virus.

What can I do?




Infected banana plant displaying many infected leaves.

To verify if your banana plants have Banana Bunchy Top Virus symptoms please call or text our inspectors or your state primary industry authority and if possible provide some clear pictures showing the overall plants and some close-ups of the sicker leaves (with the sun shining through them if possible). An assessment can be made and if necessary an inspection can be arranged for your property. If the virus is detected in the plants they will never recover and will need to be destroyed. This is done by first over spraying the plants with a non-toxic paraffinic oil to prevent the aphids from moving onto another banana plant and then by injection of a herbicide to destroy the plants. Other non chemical methods are available if need be (but this is much harder work).

For further information please call

Appendix 2: Example of a BBTV inspection report


PROPERTY BANANA BUNCHY TOP -- DETECTION REPORT → 100009

Date of inspection: _____

Plantation Number _____

Property Details: _____

→ → _____

Property Owner/Grower: _____

Area inspected: _____ (ha) OR _____ (no. plant)

Number of infected plants: _____


DETAILS

Owner/Grower's Signature: _____ Inspector Signature _____

I/ _____ (Owner/Growers Name), give
consent for _____ (Inspectors Name) to
destroy infected plants as listed above.

→ → Date _____ → → Date _____

Appendix 3: Example of after treatment information



National Bunchy Top Project

After Treatment Information Sheet

Banana Bunchy Top Virus (BBTV) is a virus specific to banana plants that can be spread in two ways: The movement of infected planting material or by the banana aphid which is the only insect vector of the virus.

The recognised treatment of the virus in infected banana plants is by the destruction of the plants. The most effective method of destruction is by using a herbicide (Glyphosate 450g/L) and injecting it directly into the plant. This method has very little risk of off-target damage. It is also beneficial to overspray the banana plant with a paraffin oil solution (Biopest Oil @ 10ml/L). This helps to control the movement of the aphids and stop them from leaving the plant to infect other banana plants. This product is organically approved and has minimal impact on the environment.

Below is a list of items to be aware of following the treatment of plants on your property:

- Please do not disturb the treated banana plant/s until they have completely browned off and died. This includes cutting, shaking or pushing the plant/s. This will ensure that both the herbicide and the biopest oil can have the maximum chance to work through the plant and prevent any infected aphids leaving the plant/s.
- Once the plant/s have browned off completely and died (this may take 4 – 8 weeks), they can be dug out and disposed of at your own will. Often the plant/s will fall over as they start to die. It is safe to use the dead material as compost or mulch.
- If you would like to re-plant bananas in the same location, this is ok, but make sure all of the existing banana plants are completely dead before doing so, otherwise the new plants may become re-infected through contamination of the old material (i.e. virus dies with the plant and is not present in the soil). It is advisable to only use disease-free planting material obtained through a recognised source (i.e. tissue culture planting material). Please contact your local Department of Agriculture and Fisheries for more information (DAF).
- A follow-up inspection will occur by the inspecting officer in the coming months and will re-treat any remaining living banana plant material if required to eradicate BBTV from your property.

If you have further questions regarding Banana Bunchy Top Virus, please contact the Banana Bunchy Top project leader on 0418 696 596. Other information is available on the ABGC website <http://abgc.org.au/projects-resources/industry-projects/banana-bunchy-top-virus/> or the Department of Agriculture and Fisheries website <https://www.daf.qld.gov.au/plants/health-pests-diseases/a-z-significant/bunchy-top>

Thank you for your cooperation.