



Agriculture & Horticulture
DEVELOPMENT BOARD



Grower Summary

PO 003

Development of safe and effective programmes for the early control of tobacco whitefly on poinsettia crops

Final 2011

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Before using all pesticides check the approval status and conditions of use.

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Further information

If you would like a copy of the full report, please email the HDC office (hdc@hdc.ahdb.org.uk), quoting your HDC number, alternatively contact the HDC at the address below.

HDC
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2TL

Tel – 0247 669 2051

HDC is a division of the Agriculture and Horticulture Development Board.

Project Number: PO 003

Project Title: Development of safe and effective programmes for the early control of tobacco whitefly on poinsettia crops

Project Leader: John Buxton and Andrew G S Cuthbertson

Contractor: ADAS UK Ltd and The Food and Environment Research Agency (Fera)

Industry Representative: Russell Woodcock, Bordon Hill Nurseries

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Headline

Intensive spray programmes using a range of chemically and physically acting insecticides applied four times within the first 21 days after potting poinsettia cuttings showed excellent efficacy against *Bemisia tabaci*. In the same trial the newly approved bio-pesticide 'Naturalis' also proved to be very effective. Crop safety tests of the same programmes on a nursery in the Midlands under commercial conditions, using four varieties of poinsettia, showed no signs of phytotoxicity.

Background

Bemisia tabaci continues to be a major pest of economically important crops worldwide. Within the UK *B. tabaci* remains a notifiable pest subject to a policy of eradication if found on propagators premises and plants moving in trade, and containment/eradication if outbreaks occur at nurseries.

There are numerous 'types' of *Bemisia*, of which two are sometimes associated with poinsettia production. The 'B-biotype' is of specific economic concern because it is an effective vector of over 110 viruses from several families, particularly geminiviruses. The second, 'Q-biotype' is more invasive than the 'B-biotype' and has also shown more resistance to the range of pesticides currently used for whitefly control.

The current work was undertaken following a *Bemisia* outbreak at a commercial nursery during 2009. This population of *Bemisia* proved extremely difficult to eradicate, and was later found to be the 'Q biotype'. Specimens were collected and transported securely and maintained under strict license requirements in Defra's Plant Health Insect Quarantine Unit at Fera. Subsequent work tested the efficacy of different control products applied alone and in sequence in laboratory and semi-field trials against this population of *Bemisia*. Chemical control programmes developed for this type of *Bemisia* should be equally suitable for use against the 'B-biotype'.

To complement the efficacy work in the quarantine facility at Fera, the same sequential spray programmes were tested on a nursery so that any phytotoxic effects could be quantified. The aim of the project was to determine programmes for *B. tabaci* control that were both effective against the pest and safe to the poinsettia crop.

Summary

Poinsettia plants were infested and specimens of whitefly at the desired life-stages for testing were obtained using established methods and data from previous Fera work. In the first trial products were tested using the leaf dip technique against three life stages of *B. tabaci*; eggs, second instar larvae and adults.

All products tested caused some degree of mortality of *B. tabaci* eggs. There was a significant difference in the mortality of eggs after leaf dipping with the different active ingredients. Exposure to Saf-T-Side Oil at 2% (product awaiting UK approval at present) produced total mortality of *B. tabaci* eggs. The following products; SB-Plant Invigorator, Gazelle, Dynamec and Spraying Oil at label rates all produced high percentage egg mortalities (96.6, 88.8, 84.1 and 67.8% respectively) that were all significantly higher than the water control. This is extremely promising as the egg stage of *B. tabaci* has always proved difficult to control in the past.

Efficacy of products against the second larval instar stage also produced promising results. The bio-pesticide Naturalis (*Beauveria bassiana*) produced the highest mortality (73.1%). This product has recently been approved for the UK horticultural market. Saf-T-Side Oil, Agri 50-E and SB-Plant Invigorator also gave over 70% control of second instar scales.

Naturalis and two of the petroleum oil based products (Saf-T-Side, Spraying Oil) gave 100% mortality of the adult stage of *B. tabaci* (see images below).



Adult *B. tabaci* infected with Naturalis and *B. tabaci* adults trapped on Saf-T-side treated leaves

To determine the compatibility of the biological fungal agent (Naturalis) with the chemical products, direct tank-mixing tests were undertaken. Conidia of the fungus (*Beauveria bassiana*) were suspended in insecticide solutions which had been diluted to their recommended rates. After a period of 24 hours, the solution was plated out onto agar and incubated to determine spore survival. Saf-T-Side showed the best potential to be used as a tank-mix following 100% germination of the Naturalis spores. Therefore, Naturalis and Saf-T-Side could be successfully applied as a tank-mix for whitefly control. Other products, including Addit, Dynamec, Gazelle and Spraying Oil showed no significant reduction in spore germination and so could potentially be tank mixed with Naturalis.

Sequential treatments were also applied as sprays to poinsettia cuttings within the first 21 days after potting. They included a range of physically acting products as well as chemical insecticides, and were intended to overcome insecticide resistant *Bemisia* strains likely to be encountered by UK growers. Trials were started using plants with just the egg stage present, and in a second trial, with only the second instar scale stage present. By counting the number of adults that finally emerged, the success of each treatment could be assessed. The full range of treatments tested is shown in the table on the next page.

In the trial when treatments started at the egg stage, complete control was obtained from all the sequential treatments tested. Adults emerged from the water only control, showing that the experimental technique was valid. The second trial, starting at the second scale instar stage, showed that some larvae survived to reach the 3rd or 4th instar: but no adults emerged, unlike the control where adults readily developed. Sequential treatments of Naturalis also gave excellent control of *Bemisia* eggs and second instars with no adults developing.

Sequential application programmes* tested for *Bemisia tabaci* control.

*All the products listed have either label approval or a SOLA for use on ornamentals. Agri 50-E and Spraying Oil are exempt from CRD registration as they act by physical means only. SB-Plant Invigorator is not classed as a pesticide.

Crop Stage	3 days after potting	7 days after potting	14 days after potting	20 days after potting
Likely <i>Bemisia</i> life-stage	Eggs	Eggs + 1st Instar scales	1st + 2nd Instar scales	2nd + 3rd Instars scales
Programme 1	Water only	Water only	Water only	Water only
Programme 2	Majestik	Oberon + Mycotal + Addit	Spraying Oil	Dynamec + Chess
Programme 3	SB-Plant Invigorator	Oberon + Mycotal + Addit	Oberon + Mycotal + Addit	Spraying Oil
Programme 4	Spraying Oil	Majestik	Savona	Agri 50-E
Programme 5	Savona	Spraying Oil	Dynamec + Chess	Gazelle
Programme 6	SB-Plant Invigorator	Majestik	Dynamec + Chess	Gazelle
Programme 7	Naturalis	Naturalis	Naturalis	Naturalis

The sequential programmes listed in the table above were applied to newly potted cuttings of the poinsettia varieties 'Infinity', 'Infinity White', 'Scandic' and 'Champion' on a nursery, and no detectable phytotoxicity was observed. However, Spraying Oil in particular can cause scorch to poinsettias and so should always be tested on a limited scale before widespread usage. All of the products tested in the current trials have reasonable IPM compatibility. Therefore, biological control agents such as *Encarsia* and *Eretmocerus* parasitoids could be used by growers after the intensive spray programme applied to the cuttings has been completed.

The worst scenario for the poinsettia grower is to have *B. tabaci* identified at a late stage in the crop, possibly when coloured bracts have formed and sprays are likely to damage them, leading to downgrading of the crop and loss of income. Therefore, the early spray programmes tested here, applied when plants are small, are likely to achieve better spray coverage and better control than applications made later, when crop canopy is well developed and under leaf coverage is very difficult to attain. The sequential applications gave excellent control of *Bemisia*, and so any of the treatment schedules tested could be recommended to poinsettia growers for control/eradication of *B. tabaci*.

Financial Benefits

Current grower estimates suggest there are around 3.5 million poinsettia plants produced in the UK each year with a wholesale value of around £7 million. A further 3.5-1.5 million plants are also currently imported each year, so issues with crop pest contamination and downgrading could lead to product substitution and a greater number of plants being imported.

Direct savings arising from this project are difficult to quantify, but potential financial benefits are considerable. These include:

- Eradication of *B. tabaci* at an early stage prevents any loss of poinsettia crop sales later on and any associated loss of customer confidence.
- Early control negates the need for expensive and often ineffective and potentially damaging clean up sprays (which may be demanded by PHSI) and/or labour to clean up the plants from *B. tabaci* infestation.
- The spray programme is easier to apply when plants are small, resulting in savings in chemical and labour for application.

Action Points

- Poinsettia growers should assume that imported cuttings are infested with *Bemisia* and apply a control programme within the first 4 weeks after potting, when plants are small and under leaf coverage from sprays is likely to be effective.
- A sequential programme from the list in the table should be selected and applied at the suggested timings. Biological control programmes could be planned to follow.
- If using the bio-pesticide Naturalis, tank-mixes with Saf-T-Side Oil, Addit, Dymamec and Gazelle are possible without harming spore germination. This could help to improve control of difficult pests such as *Bemisia*, although Naturalis performed well as a stand alone treatment.