BAYER

BULLETIN

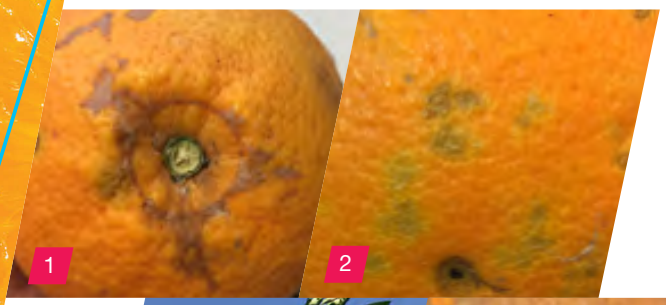
Sap feeding pests in Citrus

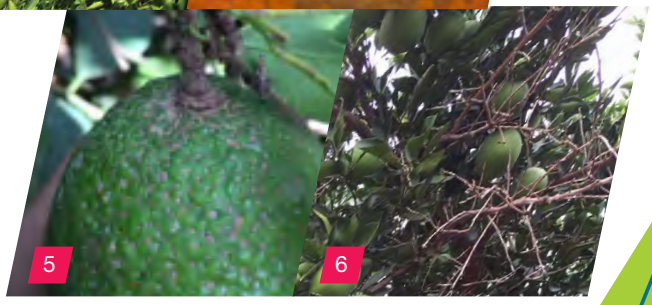
Pest status and control measures

Each citrus producing area in South Africa has its own complex of major and minor pests. There are more than 20 major pests listed in South Africa on citrus (Bedford et al.), with most of them not of economic importance due to its sporadic appearance. However, some of the most destructive pests in citrus are from the orders Thysanoptera (picture 1) and Hemiptera (scale and mealybug) (picture 2).

Damage, by thrips, to young citrus trees is normally limited to foliage damage (picture 3) that may lead to stunted trees (delayed production). The major impact of thrips is when they feed on developing fruit during production which influences the marketability of the crop by scarring the fruit (picture 4). These fruits are then downgraded in export value. Thrip control form the basis of a pest control program on many citrus farms as even low infestation levels might lead to economic losses. This control is normally based on the use of agrochemicals with a good knockdown of the thrip population. However, the control strategy might lead to secondary pest outbreaks (scale and mealybug) as their natural enemies are also eliminated.

A high population density of California red scale (picture 5) may defoliate and eventually kill a tree due to the toxins that the feeding scale produce (picture 6). It may furthermore influence the marketability of the crop as pitting might occur with early damage on developing fruit.





Pest status and control measures *continued*

Additional to the damage of mealybug to the fruit (picture 7), it could also lead to the rejection of the fruit because it is a phytosanitary pest.

The chemical control measures in citriculture in Southern Africa have gone through different phases over the past few decades from the use of mineral before-parathion era through the parathion and repercussions era up to the oils, pyrethroids and IGRs era. More IPM compatible sprays for thrips were introduced and the citriculture has entered a new phase in promoting IPM.

The challenge therefore is to have compounds registered which provide and acceptable degree of pest control without disrupting the natural balance in the orchard. This necessitate an integrated approach with the least impact on beneficials in an orchard.

The Bayer offer against sucking insects cover the key species (Table 1) that might occur at different plants growth stages.

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Trichogrammatoidea cryptophlebiae

Chilocorus nigritus

Aphytis lingnanensis

Table 1

Some of the key sucking pests in *citrus* (Bedford et.al. 1998)

ORDER	FAMILY	SCIENTIFIC NAME	COMMON NAME
Thysanoptera	thripidae	*Scirtothrips auranti* (Faure)	Citrus thrips
Hemitera	diaspididae	*Aonidiella auranti* (Maskell)	Red scale
Hemitera	pseudococcidae	*Plannococus citri* (Risso)	Citrus mealybug
Hemitera	pseudococcidae	*Nipaecoccus viridis* (Newstead)	Karoo thorn mealybug
Hemitera	pseudococcidae	*Paracoccus burnerae* (Brain)	Oleander mealybug
Hemitera	pseudococcidae	*Pseudococcus longispinus* (Targioni-Tozzetti)	Long tailed mealybug
Hemitera	aphididae	Various spp.	Aphids
Hemitera	cicadellidae	*Empoasca Distinguenda* (Paoli)	Green citrus leafhopper
Hemitera	cicadellidae	*Penthimiola bella* (stål)	Citrus leafhopper
Hemitera	triozidae	*Trioza eryteae* (Del Guercio)	Citrus psylla

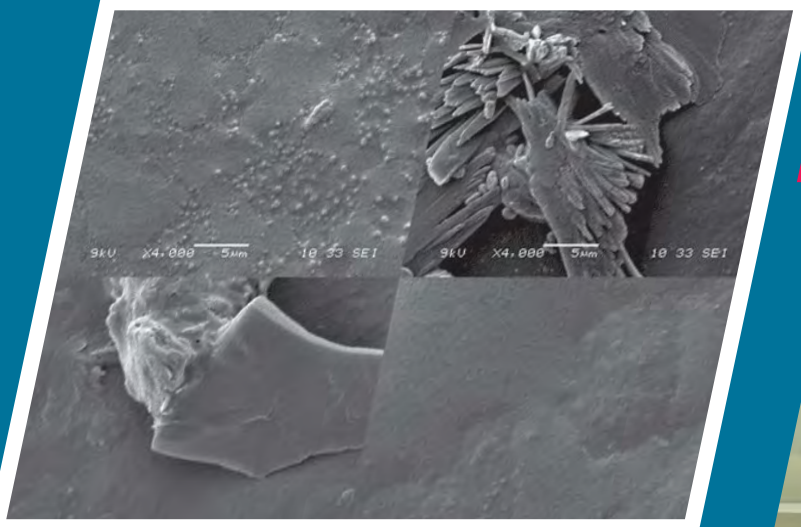
*The choice of product used in the spray program (Figure 1) should not have a negative impact on the environment as beneficial insect could play a major role in pest control. The Bayer offer (**Confidor® 70 WG** and **Movento® 240 SC**) enables the producer to tailor-make his program depending on the pest and growth stages for different production units.*

Figure 1

Growth Stage

July - August	September	Begin Mid October	End October Begin November	End November Mid December	December	January	February	March	April
Green tip	White balloon stage	80 - 100% Flower	50 - 100% Petal fall	6 weeks later	6 weeks later	Fruit expansion	Fruit expansion	Colouring	Colouring
Confidor				MOVENTO					

SEM studies of different formulations of imidacloprid's on *Citrus leaves*



non-crystalline and best in the penetration test

Structure at the edge of the drop deposit - Magnification 10 microns

Plant development 51 DAYS after treatment with with different imidacloprid formulations

Figure 3

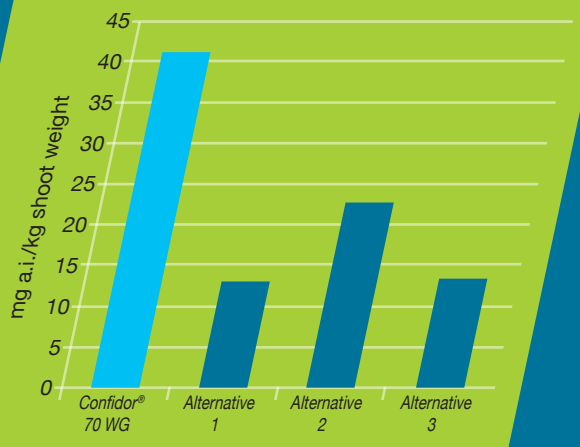
Up-take of the same active ingredient is directly related to the formulation in citrus plants

Active ingredient per shoot weight in Citrus maxima

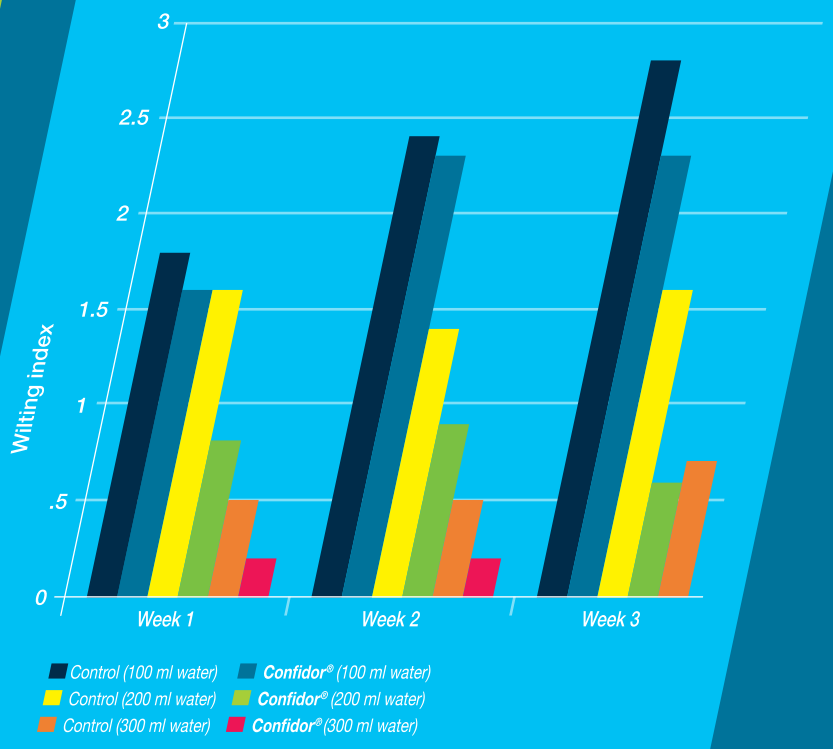
***51 DAYS** after application*

Figure 2

Formulation have a direct impact on the structural properties of a products, even if the active ingredient is the same



***Confidor® 70 WG** can contribute to tree vigour due to its stress shield effect additional to its insecticidal effect (Figure 3)*



***Movento® 240 SC** is active by ingestion, against immature insect pests feeding on treated plants, such as red scale (Aonidiella aurantii) and various citrus mites. The toxological profile of **Movento® 240 SC** allows the product to be used in a IPM program without the possibility of repercussion pest development.*

Control program should consist of products belonging to different IRAC mode of actions

CLASS OF CHEMISTRY	IRAC MOA	KEY ACTIVE INGREDIENTS
Carbamates & Organophosphates	1A, 1B	thiodicarb, methomyl, azinphos-methyl, acephate, chlorpyrifos, etc
Pyrethroids	3	deltamethrin, beta-cyfluthrin, lamda-cyhalothrin, cypermethrin, etc
Spinosyns	5	spinosad
Chloride channel activators	6	abamectin, emamectin-benzoate, etc
Benzoylureas (IGR)	15	triflumuron, novaluron, etc
Diacylhydrazines (IGR)	18	methoxyfenozide, tebufenozide
Sodium channel blockers	22	indoxacarb
Diamides	28	flubendiamide, chlorantraniliprole

Effect of Movento 240 SC on beneficial s in Citrus

- ***Chilocorus nigritus*** - Harmless
- ***Coccidoxenoides peregrinus*** - Harmless
- ***Trichogrammatoidea cryptophlebiae*** - Harmless
- ***Aphytis lingnanensis*** - Slightly harmful
- ***Euseius citri*** - Harmless
- **Bees** - No risk to honeybees at the maximum recommended rate.

Basis for an effective pest program:

- Plan ahead – consider when pest will be present and ensure pesticides are available
- Built a pest management plan for individual crop, but take into account pest movement from adjacent fields
- Make use of local registered products according to window approach
- Rotate chemicals with different mode of actions – involve area with the same plan of action to avoid resistance
- Follow the manufactures recommendations
- Avoid parallel or sequencing of host crop with the same pests

Correct use of Agrochemicals in a program

Using a window approach:

- Treatment window should not be longer that 30 days with a group of chemicals
- Period between treatment windows should not be shorter than 35 days preferably 60 days
- Never expose two consecutive generations to the same group of chemistry!
- Implement IPM – plant early, rotate crops, etc.
- Using insecticide mixtures but each product in mixture must be effective on its own
- Protect beneficial organism – choose products with least impact on beneficial's
- Monitor during pre-plant period and if pest are present apply control strategy

Bayer (Pty) Ltd. Reg. No. 1968/011192/07.
27 Wrench Road, Isando, 1601
PO Box 143, Isando, 1600, **Tel:** +27 11 921 5002.

www.cropscience.bayer.co.za
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