

“Rosy” future – thanks to Flint!

Cut flowers from Kenya are a real export success story. But without chemical crop protection, this success wouldn't have been possible. Bayer CropScience has a first-class product that's set to take off: Flint®, a fungicide from the strobilurin group.

Kenya: the first thing that comes to mind is the wonderful wildlife – elephants, zebras and lions. Or the fascinating, varied landscape – savannah, semi-desert and tropical rainforest. This rich natural heritage attracts visitors from around the world to this east African land. Indeed, tourism is one of Kenya's main sources of income. But most people are unaware of the fact that the cultivation and export of cut flowers is now of equal importance to Kenya's economy. This equatorial country is currently the world's second biggest exporter, after the Netherlands, of roses, carnations etc. It is Europe's biggest supplier.

Enormous Growth

Seventy percent of the total cultivation area in this market segment is now under roses, because these achieve the highest export prices. In second place, at about 10% of the area, are carnations, which used to play a much greater role. Cultivation takes place in the high-

lands around Lake Naivasha in the Great Rift Valley. Here, areas lying between 1,400 and 2,000 meters above sea level have climatic conditions that are optimal for the cultivation of ornamental plants. A total area of about 2,500 hectares is currently devoted to ornamentals, 90% of it under glass or plastic sheeting.

Cut flower production has been increasing by 15 to 20 percent a year since 1991. And the contribution made to agricultural exports has grown from 16 percent in the nineteen-eighties to 30 percent today. This equates to up to 130 million dollars a year, and means that the export of ornamentals is now one of the most important sources of earnings for the Kenyan economy, after the tea trade, and alongside tourism. More than a hundred thousand people work directly or indirectly in the sector.

Strict environmental and social codes

This enormous growth has been possible because of the optimal local conditions: a favourable climate, and sufficient land and water. But the way the Kenyan cut flower industry is structured has also made it internationally competitive. Here, the implementation of relatively strict environmental and social codes has been particularly important: these were introduced in response to parallel developments in the European ornamentals sector, and to increasingly critical scrutiny from domestic and international non-governmental organisations. With the help of international specialists, an effective auditing system was put in place. The Kenya Flower Council (KFC), founded in 1997 by independent Kenyan breeders and exporters, is committed to making it work. KFC-members are obliged to undergo audits twice a year: at the moment, 37 growers have their businesses audited in this way.

Since 2002, the KFC has been working to meet the „Milieu Project Sierteelt (MPS)“-labelling criteria. MPS is a certification system that was founded by ornamental plant growers in Benelux countries in 1995. It aims to encourage environmentally-compatible production through a set of standards. MPS also considers social conditions. Products carrying the label achieve higher prices in the Dutch flower market: so the MPS label represents an incentive to Kenyan farmers to observe the environmental and social rules.

Crop Protection is essential

The marketability of ornamental plants obviously depends on their appearance, which can be spoilt by bacterial, fungal and viral diseases. In Kenya, rose mildew and carnation rust are a particular problem. Infected plants tend to have unattractive deformations and spots that make them impossible to sell. Controlling these diseases depends on the availability of reliable, highly effective fungicides.

Since 2002, Kenyan growers have had a first-class product at their disposal: Flint 50 WG (500g trifloxystrobin/kg), from Bayer CropScience. This strobilurin fungicide, which has already proven itself in many crops (for example pome fruit and grapevine) in numerous countries, pos-

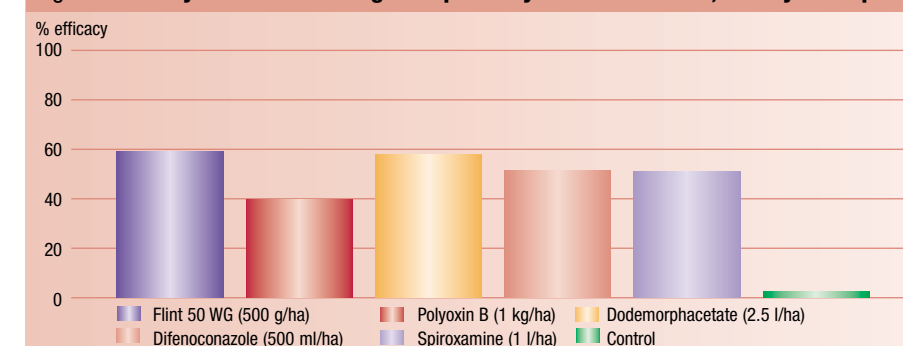
sesses so-called mesostemic properties. What this means is that after spraying, the active substance trifloxystrobin forms a stable depot on the leaf surface, from which it gradually and continuously enters leaf tissues via the gaseous and aqueous phases. Along with its high weather-resistance, this allows Flint to express a prolonged duration of action.

Protect with Flint!

The highly active Flint is therefore the ideal solution for protective control of powdery mildew in roses as well as of rust, leaf spot and ring spot in carnations. It fits extremely well into the Kenyan ornamentals growers' disease control strategies, because these involve predominantly protective use of fungicides, i.e. before infection can take place.

Numerous field trials have demonstrated Flint's strengths. As *Figure 1* shows, when used to control mildew in the rose variety "Europa", it achieved an efficacy rating of 60%, even under high infection pressure (disease rating 25%, i.e. 5 of 20 leaves with established infections). And: none of the standard products with which it was compared gave better control, whether applied curatively – when plants were already infected – or eradically – when symptoms were already visible.

Fig. 1 Efficacy of Flint 50 WG against powdery mildew in roses, variety "Europa"



During testing of the use of Flint against powdery mildew on the rose variety "Dream", its efficacy was assessed at two time-points: three weeks after treatment, and again a week later. At the first assessment, the Bayer strobilurin had achieved, in a situation of high disease pressure (35 percent) an efficacy rating of about 60 percent – which roughly equalled that of the standard products. However, after four weeks, Flint was doing conspicuously better than the other compounds: over the longer period, Flint's protective properties had started to cut in (Figure 2). A series of trials to test the efficacy of Flint against carnation rust in the variety „Hermes“ gave similar results: despite high disease pressure (30 percent), trifloxystrobin achieved a greater than 60 percent efficacy rating. And this value clearly increases if the treatment is repeated after a week (Figure 3), thanks to the excellent protective properties of Bayer CropScience's fungicide.

Already established after a single year

The results of these field trials, and various other demonstrations of Flint's efficacy, led to registration being granted in 2002 for the use of Flint 50 WG on ornamental plants. In practice, the strobilurin is used in the spraying program in alternation with active substances from other chemical classes. Four hundred to 500 grams per hectare are applied preventatively up to four times a season, at 7- to 10-day intervals. This can be done in blocks of two consecutive sprays, or in alternation with protective or curative fungicides with different modes of action. For controlling powdery mildew, successive treatments with Flint must be separated by two applications with a non-strobilurin fungicide(s).

The fact that Flint shows very good plant compatibility is consistent with the above-mentioned environmental standards. This also means that it is extremely flexible with regard to timing of application. Moreover, this strobilurin is IPM-compatible, because it has a very favourable toxicological profile, and is harmless to beneficial insects.

No wonder Flint has already become a key product within a year of its introduction – particularly in the control of rose powdery mildew and carnation rust. The product will help to support the continuing increase in the economic importance of ornamentals cultivation. Perhaps Kenya will come to be more and more associated with the colour and beauty of its roses and carnations... ■

Fig. 2 Efficacy of Flint 50 WG against powdery mildew in roses, variety "Dream"

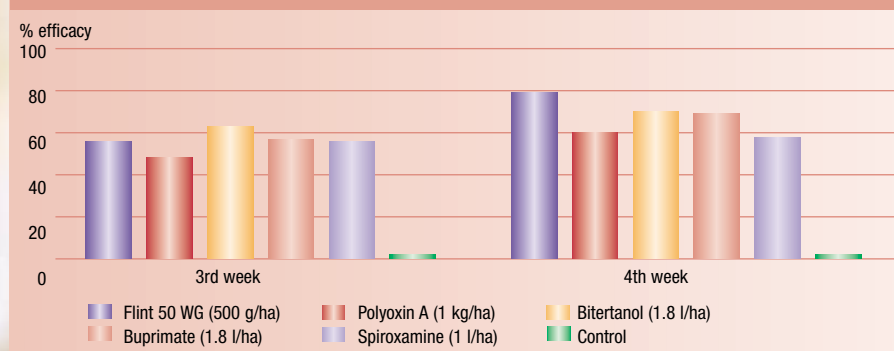
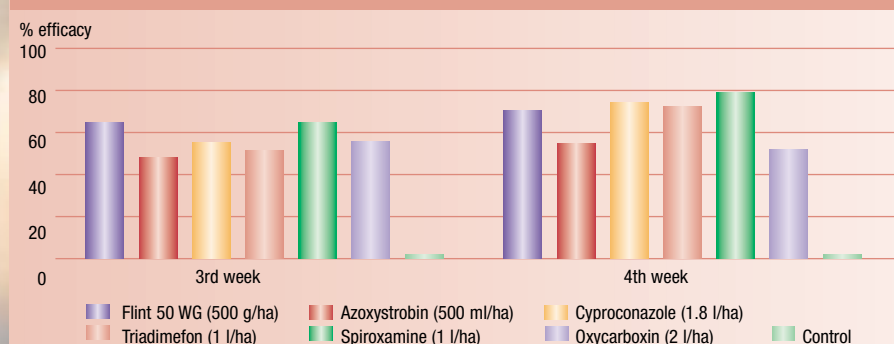


Fig. 3 Efficacy of Flint 50 WG against rust in carnations, variety "Hermes"



Varieties, cultivation conditions, diseases

Roses

- **Varieties:** More than 60 commercial rose varieties are currently available on the Kenyan market; the three main types are: Sweethearts, Hybrid Teas and the many-flowered Sprays.
- **Yield:** 1.5 to 2 million blooms per hectare.
- **Area of cultivation:** Great Rift Valley around Lake Naivasha, in highland areas between 1,400 and 2,500 meters above sea-level.
- **Temperature requirements:** Yearly average between 18 and 25 °C; deviation from this leads to losses in bloom quality. At higher temperatures, blooms are too small and pale, and they develop fewer petals. At lower temperatures, the blooms grow more slowly, and develop malformations.
- **Relative humidity:** Increased likelihood of infection if there is more than 90 percent humidity for longer than eight hours.
- **Soil:** Free-draining soils with a high organic matter content are optimal. Hydroponics is being increasingly used.

Diseases

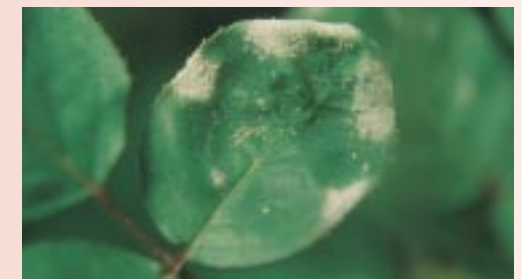
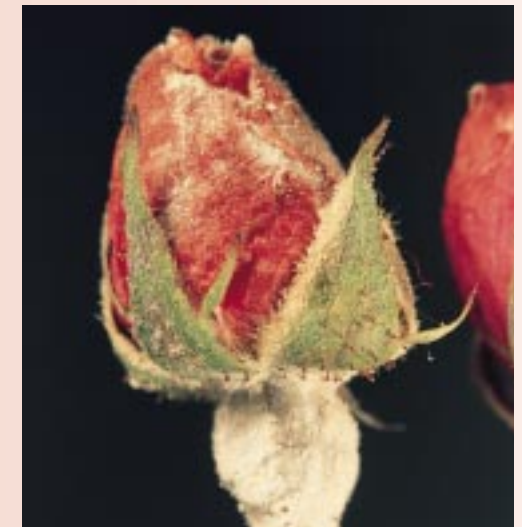
- **Rose powdery mildew (*Sphaerotheca pannosa*):** Survives in dormant buds, infected leaves and shoots. Under favourable conditions (dry, warm days followed by cool, damp nights) spores are produced from infected plant parts; these are then carried on the wind to new leaves and shoots. If infected during development, leaves and shoots become distorted and deformed. Infected flower buds often fail to open. Severely-infected plants often respond by shedding leaves.
- **Further diseases:** Rust (*Phragmidium mucronatum*), black spot (*Diplocarpon rosae*), downy mildew (*Peronospora* spp.), grey mould (*Botrytis cinerea*).

Carnations

- **Types:** mainly single-bloomed Standards and many-bloomed Sprays.
- **Area of cultivation:** Standard varieties grow best in the upper highlands, sprays, in contrast, at intermediate heights.
- **Temperature requirements:** Spray varieties, for example, require day temperatures of between 24 and 30 °C and night temperatures of between 10 and 15 °C. Deviations from this reduce the growth rate, and negatively affect the post-harvest quality of the blooms.
- **Soil:** Free-draining sandy-loam soils are most suitable. In saturated soils, disease is much more likely to take hold.

Diseases

- **Carnation rust (*Uromyces dianthi*):** Develops most strongly at lower temperatures. Leaves and stems can become infected at any time of the year. First symptoms are small, yellowish spots on the leaves that later expand. The epidermis swells and eventually bursts in round pustules. If infection is severe, pustules also develop on stems, which then remain short and thin.
- **Further diseases:** Ring spot (*Didymellina dianthi*, *Heterosporium echinulatum*), Alternaria-rot or leaf spot (*Alternaria dianthi*), Fusarium-wilt (*Fusarium oxysporum* f. sp. *dianthi*), grey mould (*Botrytis cinerea*)



Powdery mildew (*Sphaerotheca pannosa*) on rose bud and leaf



Rust on rose (*Phragmidium mucronatum*); typical pustules on the lower leaf surface



Black spot on rose (*Diplocarpon rosae*)



Rust on carnation (*Uromyces dianthi*)