



De Ruiter®



Malling™ Ace

GROWER GUIDELINES



A VERY HIGH YIELDING EVERBEARER



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Launched at Fruit Focus in July 2021, everbearing variety Malling™ Ace has exceptional fruit quality, matching that of the best June-bearer varieties, and is proving to be the variety of choice for those wishing to grow an everbearer of Junbearer quality. There is a remarkable level of interest in Malling™ Ace. As more growers experience this great new variety, we will doubtless see that interest continue to rise.

With economic challenges, it is becoming increasingly difficult for farmers to achieve satisfactory gross margins. Therefore, they require more support than ever before, and cultivars such as Malling™ Ace can help them increase their profits. Not only does Malling™ Ace provide high yields, but it also produces fruits of the highest quality - mostly Class 1, with a great appearance and size. In addition, the fruits are easy and fast to pick, which further assists growers in accomplishing their goals.

In this quickly evolving industry, which is suffering from economic difficulties, having the right tools is essential. Malling™ Ace is a great choice for growers, as it produces high yields and top-notch fruit quality, as well as decreasing labour costs due to its well-displayed fruits and easy picking. In fact, Malling™ Ace is one of the most suitable varieties for automatic picking (picking robots) because of its compact and open plant architecture, with long fruit trusses that yield large, non-aggregated fruits outside the canopy.

Malling™ Ace is known to be vulnerable to powdery mildew, yet three years of agronomic work have demonstrated that it can still be cultivated effectively with a stringent mildew management plan administered regularly every seven days. Furthermore, the new UVC robots can provide additional support for the variety and give farmers more resources to combat powdery mildew. Ultimately, if you devote the right amount of attention to Malling™ Ace, it will reward you with large harvests of high-quality fruit.

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SUMMARY

Malling™ Ace is a very high yielding everbearer, which was launched at Fruit Focus in July 2021.

Fruit quality

Malling™ Ace has a sweet, juicy flavour and high average Brix of 9.2°. It is very uniform in shape with conic berries and excellent fruit size. Fruit weight is maintained throughout the whole season.

Growth habit

This variety has compact plants, with long flower trusses that give excellent fruit display and make picking very easy. Fast picking speeds of up to 40 kg/hour can be achieved in table-top systems. Early trials data suggests that the variety works well in lower density plantings of 5-6 plants/m.

Production period

Malling™ Ace starts producing fruit in May from the first spring-initiated flowers, followed by peak production in August. It is a very high yielding variety with yields in excess of 2 kg/plant of Class 1 fruit when planted at the recommended density of 5-6 plants/m.

Disease resistance

Preliminary tests indicate Malling™ Ace has resistance to crown rot (*Phytophthora cactorum*) but with some susceptibility to powdery mildew (*Phodosphaera aphanis*). It is important that a robust powdery mildew control strategy is followed starting shortly after planting.

HIGH-YIELDING POTENTIAL

EXCEPTIONAL FRUIT QUALITY

GREAT FRUIT SIZE, FIRM, SWEET AND JUICY

WELL-PRESENTED FRUITS FOR FAST PICKING



INTRODUCTION

Malling™ Ace is an everbearer strawberry variety that offers high yields and excellent fruit display for easy and fast picking. It has potential yields in excess of 2kg/plant and a high Class 1 yield with more than 90% of the fruit being Class 1, with large sized fruit of around 24g/fruit on average.

Malling™ Ace is a mid season variety, with its first fruit being produced as early as May, from spring initiated flowers, and a second peak in August, from summer initiated flowers. Additionally, the variety has a more consistent production curve than other everbearer varieties, allowing for continuous summer production.

Although quite a robust variety, in production Malling™ Ace can be susceptible to powdery mildew and for that the variety should be managed carefully and slightly differently from other varieties.



Figure 1: Malling™ Ace in production

PLANT PROPAGATION

The choice of plant type is critically important to maximizing yield in production, so it is necessary to comprehend the various plant types and how they affect output. By selecting the correct option, production can be boosted to a considerable degree, thereby resulting in higher profitability. Over the course of three years, Delphy BV (NL) investigated plant propagation and it was established that the variety could be cultivated successfully whether utilizing light mini tray plants (130cc), heavy mini tray plants (130cc) or tray plants (250cc). The output potential of the three plant types is nearly the same, with the heavy tray plants displaying the greatest yield potential.

Malling™ Ace has been noted for its production of runners, due to a swift expression from the mother plants, allowing for a high rate of multiplication. To further increase the runner yield, depending on the type of plant desired, harvesting of the runners may be done twice during the summer.

For heavier plants, the runner harvest should be done in July to allow more time for plant development. For the production of light mini tray plants, the runner harvest can take place up until the end of August due to the faster rooting time.



Figure 2: Tray plants of Malling™ Ace (source Delphy BV)

At times, particularly when using mother plants derived from tissue culture, the runner production may be slightly delayed until later in the summer, but the overall number of runners produced is generally high. To ensure successful runner production, it is essential to monitor the mother plant growth and address any potential delays.

When considering fertilisation (**Figure 3**) of tray fields, the amount of nitrogen should be dictated by the type of plant:

// for lighter mini-tray plants, N input of 124 kg/ha is suggested,

// for heavier plants, a higher N input of 184 kg/ha is advised

Malling™ Ace tips have demonstrated quick rooting and minimal pre-flowering upon transplanting.

Additionally, heated misted tips and fresh plants are also viable alternatives that work in conjunction with the aforementioned three types of plants.

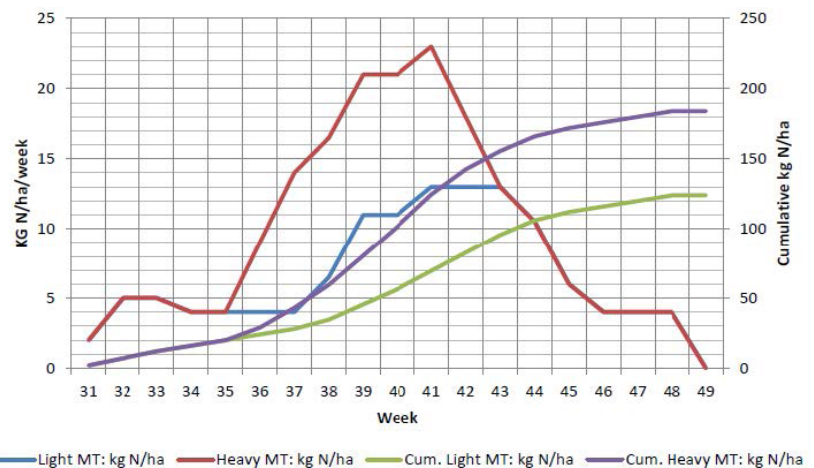


Figure 3: Nitrogen fertilisation strategy during propagation (source Delphy BV)

PLANT PHYSIOLOGY

Malling™ Ace is an everbearer variety that flowers during long day conditions, exhibiting a compact and balanced plant habit. Its erect leaves allow lengthy trusses to protrude from the canopy, thereby providing an optimal display for quick and easy picking with a potential of up to 45 kg/hour.

It is a generative variety, meaning it can generate new flowers to ensure a steady supply of fruit over the summer. In addition, it has high heat tolerance, as proven by trials in 2022, which demonstrate that it is able to stay active even during a heatwave. The fruit size averages 24g and remains consistent regardless of the temperature.

During short natural winter photoperiods of 8-10 hours, plants are more likely to grow vegetatively than to produce flower buds. To optimise conditions for flower bud development, rather than runner production, artificial lighting is recommended for early spring planting and glasshouse winter production (**Figure 4**).

Furthermore, under-chilled plants of Malling™ Ace can be prone to fruit pollination disorders, and for that cold storage is an important factor to ensure optimum fruit quality. Research conducted by PCF in Belgium confirms that a storage temperature of -1.5°C is effective in reducing the risk of pollination disorders in Malling™ Ace plants. Even if only stored for four weeks, this temperature proved to be sufficient in reducing the disorder. After a 17-week period of cold storage, the pollination disorder decreased further.

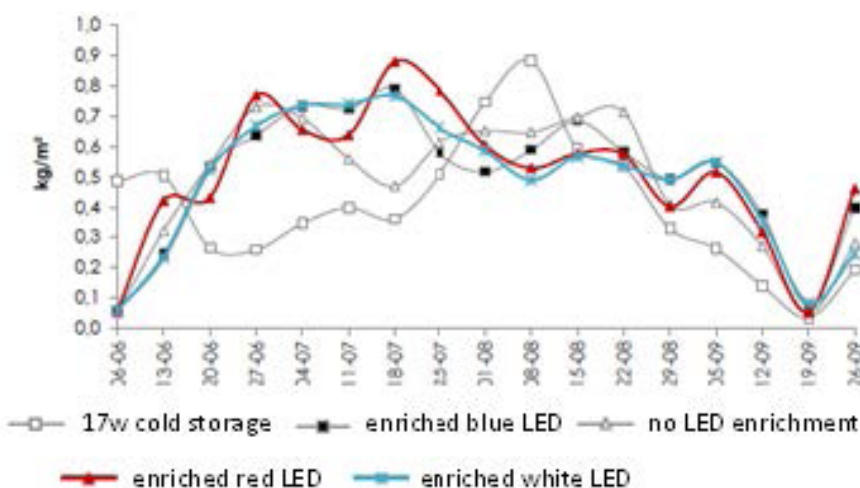


Figure 4: Early spring production pattern using artificial light (source PCF)

NUTRITION

Planting Time

Malling™ Ace is a versatile variety that can be used in many production systems and environments. Planting time depends on the production system and production period.

For early spring production, under glass, Malling™ Ace can be planted as early as the 1st or 2nd week of December, provided that the plants have spent at least 4 weeks in the cold store. Artificial lighting should be employed to support the plants and encourage early flowering; however, in the absence of artificial lighting, it is recommended that they spend a minimum of 17 weeks in the cold store.

For tunnel production, the ideal planting time should be determined once the risk of frost has passed. This is to ensure that the plants are able to establish themselves properly and reach their full potential. Planting too soon might result in plant damage due to frost, so it is important to wait for the ideal timing before planting.

The exact planting time for autumn /winter glasshouse production depends on the desired production period. For example, to achieve fruit production during December, planting should be delayed until mid-end September. Planting as early as August is possible but it is recommended to avoid periods of high temperature to help ensure successful plant establishment.

Plant Type

Plant selection plays a crucial role in achieving maximum yield potential in production. With the right selection, crop yields can be significantly increased, leading to higher levels of productivity

and efficiency, resulting in higher returns (**Figure 5**).

After 3 years of agronomic trials, it was established that successful production could be accomplished with light mini tray plants, heavy mini tray plants or tray plants. The yield potential of the three plant types is quite similar, though the conventional tray plants (250cc.) offer the highest output.

Moreover, each plant type follows a different production curve (**Figure 6**), with the conventional tray plants and heavy mini tray plants having more pronounced peaks and troughs, as opposed to the light mini tray plants that have a more consistent output.

For an early production system, heavier plants are more advantageous as they have a greater yield potential in the initial phase of production. Conversely, for a summer production system, lighter plants are preferred as they offer a more consistent production curve throughout the season. Consequently, it is essential to choose the correct plant type for your specific production system in order to maximize the production potential.

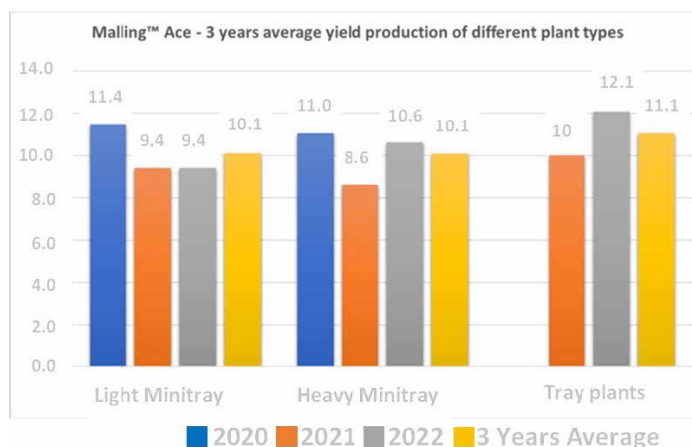


Figure 5: Three year average yield production of different plant types in kg/m (6pl/m for light minimini-tray and heavy mini mini-tray, and 5pl/m for tray plants)

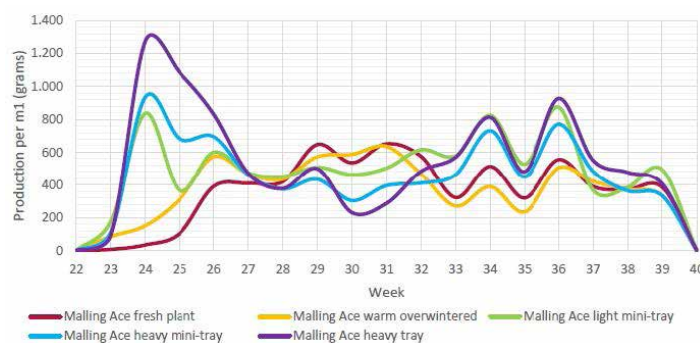


Figure 6: Malling™ Ace—Production trendline for different plant types (source: Delphy BV)

CULTIVATION PHASE

To ensure a good spread of harvest, misted heated tip plants or fresh plants can also be effectively included in a continuous fruit production system. By combining these two plant types, growers can ensure a consistent supply of fruits over the course of the season. For instance, when the yield from heavy tray or mini tray plants decreases, the high output of misted heated tips plants or fresh plants could compensate for it, thus maintaining an uninterrupted stream of fruit during the growing season.

Moreover, for autumn/winter production, in addition to long term cold stored plants, fresh plants can be successfully utilized to expand the options available to growers.

Plant Establishment

For optimal results when planting Malling™ Ace, a density of 5-6 plants per linear meter should be utilised. This holds true for both glasshouse or tunnel production and soil or substrate growing systems. With a lower planting density, air circulation is improved, which helps to reduce disease and increases light exposure for the plants, helping them to reach their full growth potential. Additionally, by reducing competition for resources between plants, root development is enhanced and yields are improved.

Cooler temperatures are generally more favourable for successful establishment, so the climate should be taken into account when deciding when to plant. After planting, it is essential to ensure the plants are able to develop their roots gently.

For early greenhouse production, it is suggested to maintain a lower temperature during the first 10 days, and keep the heating pipe running at a low temperature until mid afternoon to help the plants grow. Once their roots begin to develop (10-14 days), artificial lighting can be switched on. When the petioles have grown to an adequate length, the lighting can be switched off again. With the lighting turned on, the temperatures should be increased accordingly, aiming for a daily average temperature of 16°C. Exceeding this temperature standard too much can cause the plants to expend a great deal of energy, which leads to a decrease in yield and quality. Also, the temperature should not rise too quickly in the early morning, so that plant growth can remain in balance.

When cultivating crops in tunnels, it is more challenging to maintain the climate, necessitating close monitoring of ventilation practices. The target is to maintain a well-regulated atmosphere without excessive humidity throughout the day, to avoid the risk of powdery mildew infection. During summer planting in hot conditions, using sprinklers to maintain a relative humidity of 60-75% and using shading nets can significantly boost plant establishment.

Plant Management and Fruit Production

Plant development should be carefully monitored, particularly during early stages, in order to ensure a balanced plant. A slow and balanced approach should be pursued rather than over-forceful techniques such as excessive feeding or heating. As this variety is highly susceptible to powdery mildew, it is important to restrict the volume of young and fast-growing plant tissue.

Early de-blossoming could be beneficial in some cases, especially when plants are too light, as this helps to minimise plant stress and to promote a more balanced plant.

Malling™ Ace is a type of everbearing strawberry that has a relatively low leaf area, so minimal de-leafing is needed during the growing season. It is important to time this activity correctly to encourage flower formation. It is best to target leaf removal when the crop is at the end of a peak or in between flushes as this will promote re-flowering. In addition, growers may want to think about further de-leafing during periods of low light intensity as this will help to open up the plant canopy and allow additional light to stimulate flower re-initiation. It is important to target old and senesced leaves since they provide very little, if any, benefit in terms of photosynthesis. Moreover, these old leaves obstruct the light from reaching younger leaves and new flower trusses.

Producing few runners during the production phase, the time taken for de-runnering is only 2 minutes/linear metre over the season. However, they are particularly vulnerable to powdery mildew, so they should be removed at the earliest opportunity to prevent infection.

During the warm and humid conditions of the year, Malling™ Ace is more prone to powdery mildew, so optimum environmental management is essential to combat this (e.g. improved aeration and heated pipes during flowering). Growers need to be alert to the risk of infection and carry out preventive treatments on a regular basis. Inspect the fruit daily and be prepared to use curative treatments at the first signs of infection. In a greenhouse setting, sulphur evaporators can be used for 4-6 hours every evening, commencing 10 days after planting.

Malling™ Ace performs very well in soil production as well as substrate. The variety is high yielding, with a good percentage of Class 1 fruit (**Figure 7**) and excellent fruit size (24g/fruit on average across the season). Fruit weight is consistent and persists throughout the season (**Figure 8**).

Malling™ Ace plants display longer trusses than other varieties and are more susceptible to kinking. To prevent this, the truss support tape should be shifted upwards and outward, or a supplementary truss tape should be used. Truss pulling is not essential, but if it is done, it's important to do it before they become too long to prevent avoidable damage.

Fruit is attractive, very glossy, with a consistent Brix and a long shelf-life of up to seven days.

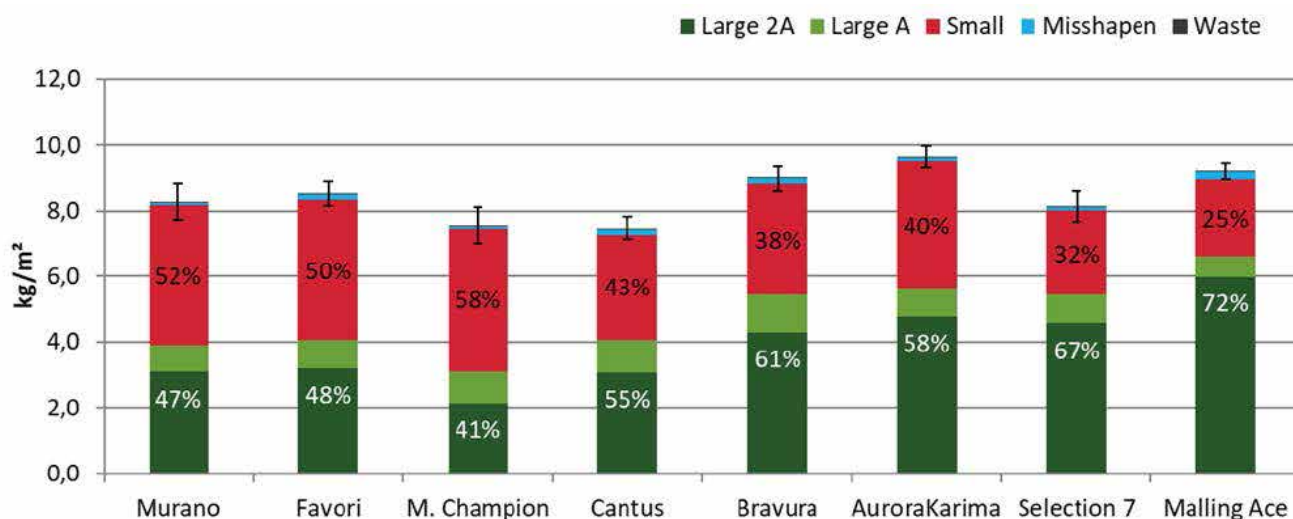


Figure 7: Protected cultivation on table tabletop - production pattern (Source PCH, planting date: 31 March 2021, 6 plants/m, minimini-tray plants)

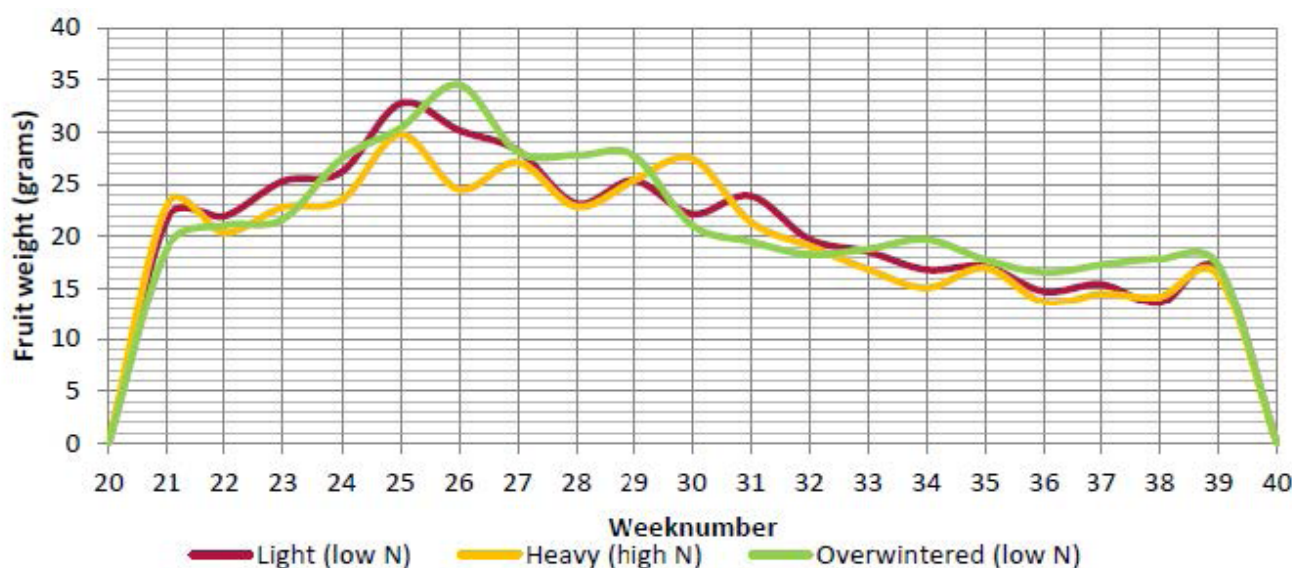


Figure 8: Malling™ Ace—fruit size during production season (Source Delphy BV)

NUTRITION

Fertilisation for substrate cultivation

Every variety is different in terms of nutritional requirements; by understanding these requirements and adjusting fertiliser rates accordingly, growth, quality, and yields can be maximised. Correct management of nutrition, and the availability of it, will ensure the production of a top top-quality berry.

Investigations to date have not highlighted any special nutritional requirements for Malling™ Ace. Excessive irrigation, especially during hot spells, should be avoided, as this can adversely affect the fruit quality by causing soft skin and a watery texture.

Whilst conducting trials for Malling™ Ace, Delphy BV have been running experiments with Malling™ Ace and following a particular protocol in regards to EC sums (drip+drain): starting off with 2.0 2.0-2.2 mS/cm in the initial stages, then increasing to 2.2 2.2-2.4 mS/cm when flowering, and further to 2.4 2.4-2.6 mS/cm during the fruiting phase and finally to 2.6 2.6-2.8 mS/cm at its peak plant load in the second flush.

Using this protocol, the nutrient balance in cultivation is generally good. However, sap analysis has indicated that sulphur can be on relatively high while the nitrogen levels can be relatively low, yet this is not something to be alarmed about considering Malling™ Ace's susceptibility to mildew, which can be exacerbated in plants with high N status. The use of potassium is critical when working with Malling™ Ace, as the fruits tend to be larger and require sufficient potassium to optimise fruit firmness, so it's essential to regulate the K+ levels in accordance with the fruit load and Ca++.

To guarantee that the crops receive the optimum nutrition, regular and planned assessments of the base water, feed sources, runoff, and substrate must be made. **Figures 8 and 9** can be employed as a reference to ensure that the nutrients are provided to the crops in a sufficient and effective manner.

Basic scheme for vegetative feed

NH4 ⁺	NO3 ⁻	P	SO4	K ⁺	Ca ⁺⁺	Mg ⁺⁺	Fe	Mn	Zn	B	Cu	Mo
	12	1,3	1,5	4,5	4,5	2	0,055	33	11	15	0,75	0,5
	Mmol	Mmol	Mmol	Mmol	Mmol	Mmol	Mmol	Umol	Umol	Umol	Umol	Umol
	168	40	48	175	180	48	3,07	2,5	0,72	0,165	0,1	0,05
	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l

Figure 8: Basic guide for vegetative feed (Source Berry Gardens Growers)

Basic scheme for fruiting feed

NH4 ⁺	NO3 ⁻	P	SO4	K ⁺	Ca ⁺⁺	Mg ⁺⁺	Fe	Mn	Zn	B	Cu	Mo
	11	1,0	1,5	6,5	4	1,65	0,05	26	11	15	0,75	0,5
	Mmol	Mmol	Mmol	Mmol	Mmol	Mmol	Mmol	Umol	Umol	Umol	Umol	Umol
	154	38,5	48	254	160	40	2,8	1,43	0,72	0,165	0,05	0,05
	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l

Figure 9: Basic guide for fruiting feed (Source Berry Gardens Growers)



CROP PROTECTION

Disease Management

Crown Rot (*Phytophthora cactorum*) Preliminary data is suggesting that Malling™ Ace has tolerance to crown rot. However, since *Phytophthora* spores are abundant in the environment, infection should not be ruled out and growers ought to follow the guidance of their local advisors in managing their crops.

Botrytis (*Botrytis cinerea*) While Malling Ace is not particularly susceptible to Botrytis, there is still a risk of infection during cooler months, which may affect both flowers and fruit. Additionally, uncontrolled irrigation during propagation may cause a crown infection. Therefore, growers should follow proper procedures to minimize the risk of Botrytis infection.

Powdery Mildew (*Phodosphaera aphanis*)

Preliminary research indicates that Malling™ Ace is vulnerable to powdery mildew and it can be hard to identify in the early stages, when it first infects the newly grown fruit, then later on the leaves and shoots. Initial infection can spread rapidly, so it is best to begin powdery mildew control as soon as the plants are established and to implement a rigorous prevention plan.

Extensive experiments conducted with growers from 2020 to 2022 revealed that a systematic preventive spraying program implemented on a weekly basis, can dramatically decrease the chance of powdery mildew infection. Over the two years of trials, the use of a preventive spray program helped to reduce the number of sites with serious powdery mildew.

In 2021, with the exceptionally high powdery mildew pressure, two thirds of the sites had either none or slight powdery mildew, and this figure decreased even more in the following year.

Evidence from testing at NIAB in 2021 suggested that a managed program incorporating 10 rounds of fungicides and 8 rounds of bio-fungicides was just as effective as the 7-day routine which included 17 rounds of fungicide and 3 rounds of bio-fungicide in controlling mildew. The decision on when to spray and the product to be used in the managed program was based on assessing the existing mildew on leaves and fruit, along with other disease risks and predicted weather conditions. The same trial was repeated on a larger scale with commercial growers in 2022 and the same results were obtained (**Figure 9**).

For managing powdery mildew successfully, the infection must be identified early through regular crop walks, and then be treated using the appropriate products, such as proquinazid, fluopiram+trifloxystrobin, penconazole, and

cyflufenamid, potentially alternating with Pot Bicarb every four to seven days, depending on the regulations surrounding such products (based on experience from commercial production in 2022). When risk of infection is low, usually early in the season, make use of bio bio-fungicides and protectant fungicides. Withhold the most reliable protectant and curative products until periods of high infection risk.

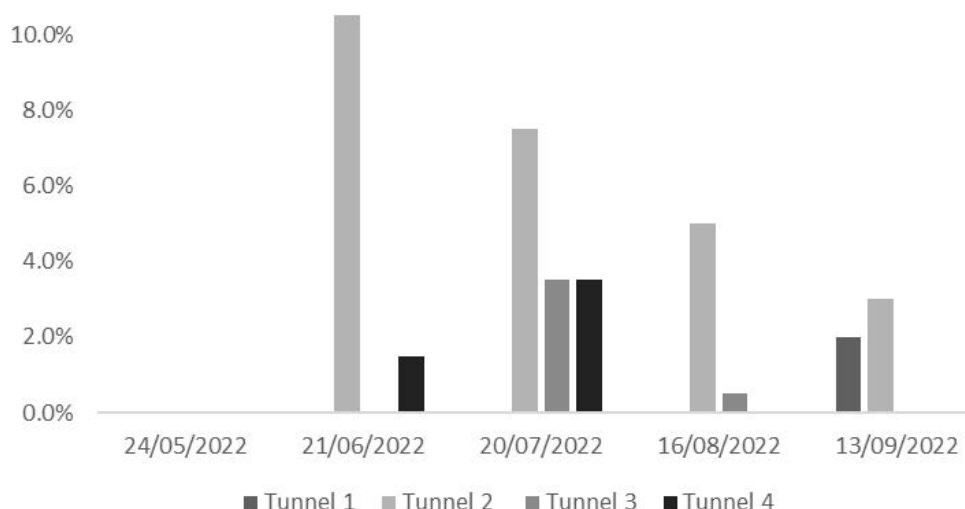


Figure 9: Malling Ace—Evolution of powdery mildew in commercial production in 2022 (Tunnel 1 = Conventional chemistry 6pl/m, Tunnel 2 = Conventional chemistry+Biofungicides 6pl/m, Tunnel 3 = Conventional chemistry 5pl/m, Tunnel 4 = Conventional chemistry+Biostimulants 6pl/m)

CROP PROTECTION

Delphy BV have been working with Malling™ Ace for the past 4 years, and they have seen positive results in controlling powdery mildew utilizing a consistent weekly spraying schedule that alternates between a traditional fungicide and a biobio-fungicide. In addition to traditional chemistry, other advanced techniques such as UVC have also proven to be highly successful in the management of powdery mildew. Commercial experiments conducted over the past 2 years have demonstrated that a program utilising UVC treatments twice a week (applied with an UVC robot) throughout the cultivation period is very effective in preventing the development of mildew. When combined with a fungicide spray every two weeks, the mildew is almost eradicated from the crop (**Figure 10**).

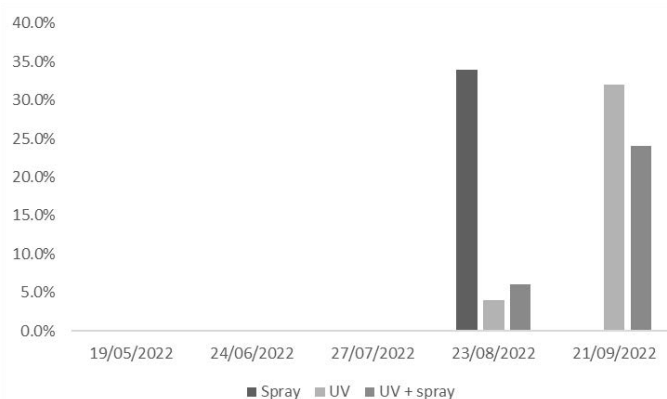


Figure 10: Powdery mildew incidence in commercial production under 3 management programmes (Spray only, UVC only and UVC+Spray)

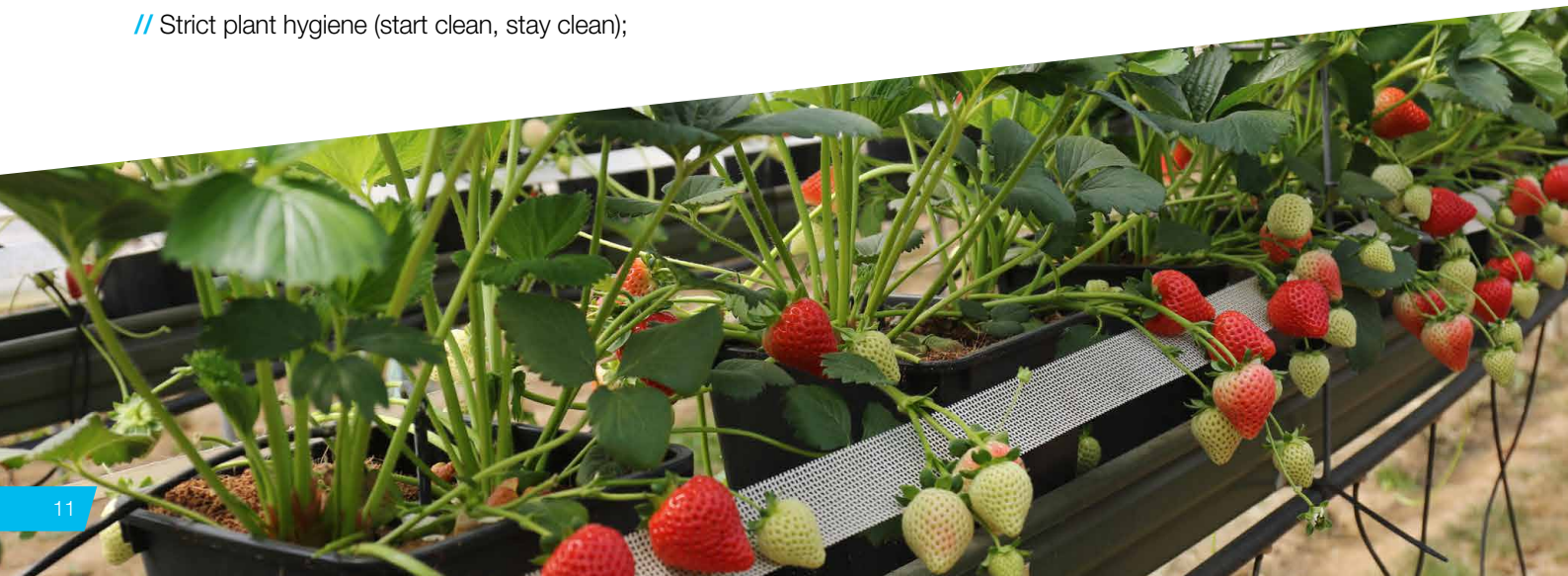
However, in order to achieve desirable outcomes in any disease management program, optimum farm practices must be implemented, including good plant husbandry, climate control, and field sanitation. To ensure best results with Malling™ Ace, some of the good farm practices should always employ:

- // Adequate plant densities (5-6 plants/m);
- // Good management of plants (slow/steady growing to allow for a balanced plant; de-leafing and de-runnering done in time);
- // Strict plant hygiene (start clean, stay clean);

- // Avoid overfeeding nitrogen (during fruit production, consider using liquid calcium which contains lower N compared to calcium nitrate);
- // Consider using biostimulants to boost natural plant defensive mechanisms (e.g. silicon);
- // Good field management (grass management, weeds management, etc.);
- // Good climate management (venting management, airflow direction management, etc.);
- // Proper fruit hygiene (pick clean and remove diseased fruit as soon as they are seen);
- // Preventive spraying programme for mildew control (start soon after plant establishment following a strict 7 day spraying routine);
- // Adequate spray timing and rotation of products used considering the disease risk;
- // Good Spray quality (medium/fine droplets, high water volume and airflow set in line with plant canopy; configurations should be adjusted to provide enough spray coverage and penetration to fruit held on long trusses).

Other Diseases

The emergence of diseases is generally determined by the climatic conditions (e.g. Mucor), the field/area in which the plants are grown, cropping history, as well as the conditions the plants have been subjected to before being planted. Although no other disease issues have been reported for Malling™ Ace, it doesn't follow that it is immune to other pathogens. To steer clear of further issues, it is recommended to adhere to the best agricultural practices, with the help of a specialist consultant.



FRUIT QUALITY AND SHELF LIFE

Malling™ Ace has all the high-quality fruit attributes of Malling™ Centenary in everbearer form, providing a prolonged season. Fruit quality is consistent throughout the season, with high Class 1 yields and large fruit size. It has a sweet, juicy flavour and a high average Brix of 9.2°.

Within quality screening trials held at PCH (Belgium) in 2020, Malling™ Ace scored highest of the varieties assessed (**Figure 11**). Malling™ Ace performed very well in shelf-life assessments, maintaining its freshness for an extended period after picking (**Figure 12**).



Figure 11: Quality assessments of Malling™ Ace (source PCH, Belgium)

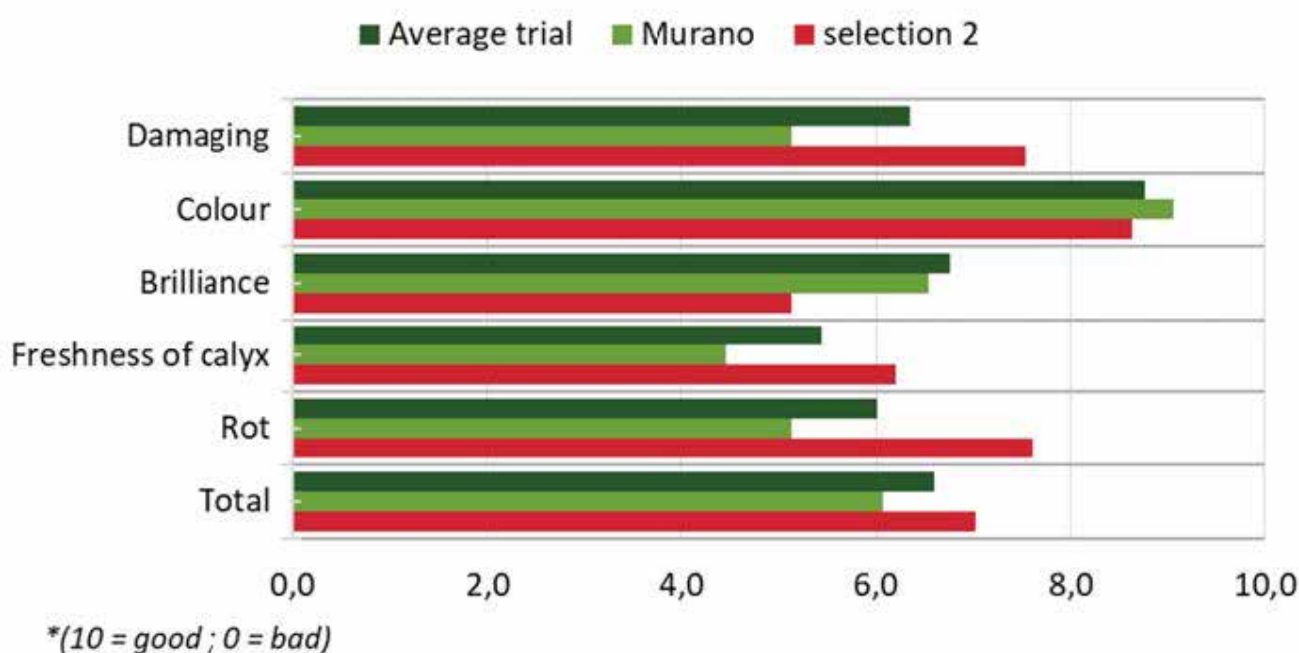


Figure 12: Shelf life assessment of Malling™ Ace (source PCH, Belgium)

RETAILER ACCEPTANCE AND FEEDBACK

The variety stands out for fruit quality and is well-received across the major European retailers*

* For up-to-date variety listings always check with your marketing agent or retail customer.

ACKNOWLEDGEMENTS

These guidelines have been revised by: Alin Borleanu, Bayer, Scott Raffle, NIAB

