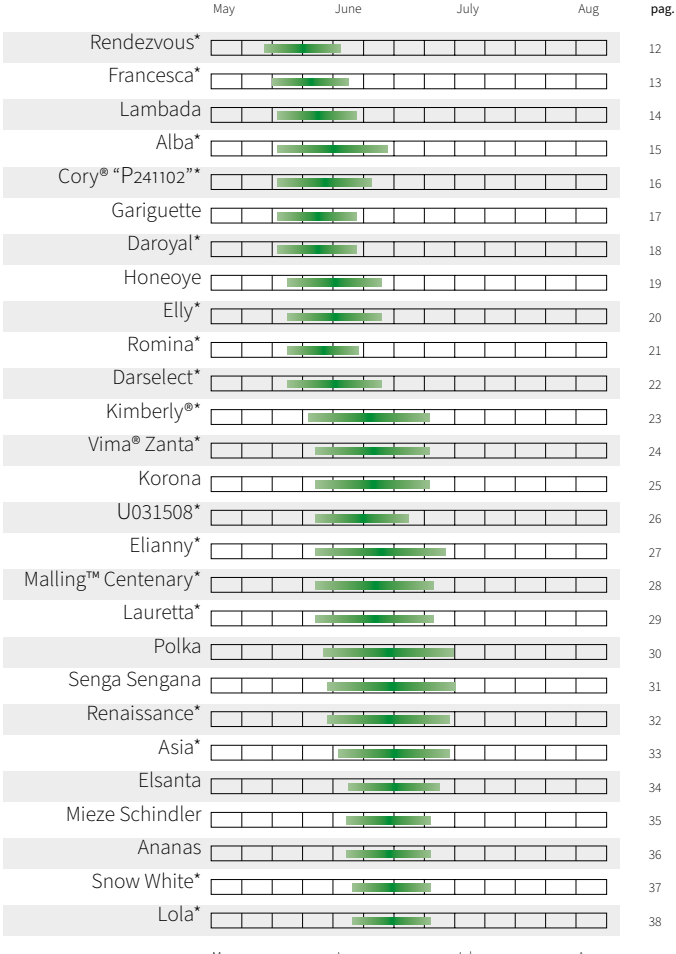
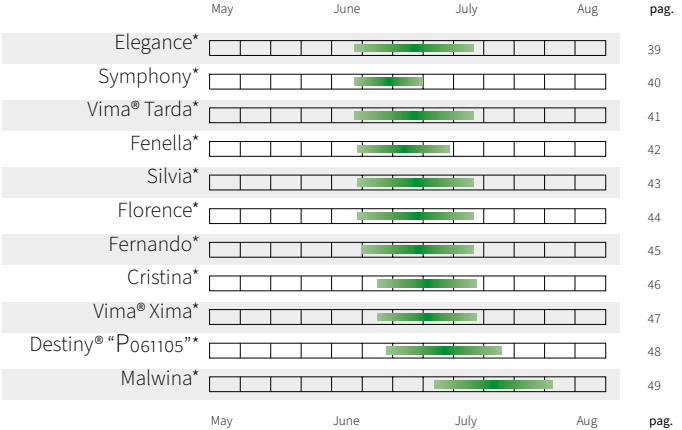


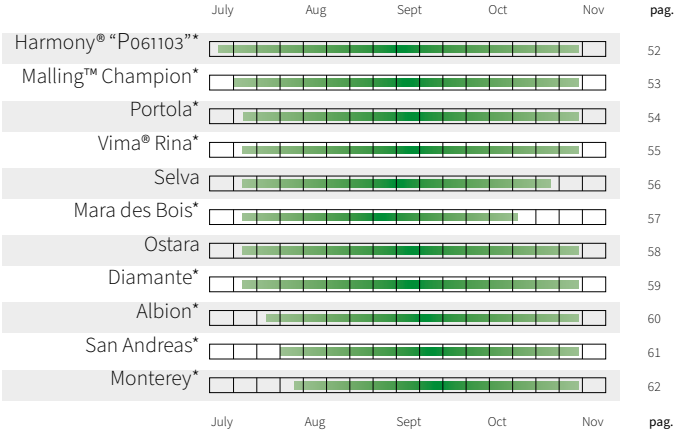

VISSERS PLANT INNOVATORS

Short day / June bearer strawberry varieties





Day neutral / everbearer strawberry varieties



VISSERS PLANT INNOVATORS

Introduction

We are proud that we again can present the new catalog of Vissers Aardbeiplanten BV. In this catalog we provide an overview of our extensive delivery program of our own varieties, licensed varieties from third parties and free varieties.

You can contact us for:
1. Strawberry plants
2. Asparagus crowns
3. Raspberry plants

Our strawberry plant delivery program consists of a wide range of June and everbearers that are suitable for various climate zones and cultivation systems.

We produce and supply different plant types, for example:
- trayplants
- mini-trayplants
- waiting bedplants (light, medium, heavy)
- frigoplants (A+ extra, A+, A and B)
- modules (fresh and frigo)
- fresh plants
- unrooted tips

For questions, please feel free to contact us,

Kind Regards

Ard, Leon Vissers and employees
Vissirs Plant Innovators

2021

JANUARY

53	1	2	3	4
	4	11	18	25
	5	12	19	26
	6	13	20	27
	7	14	21	28
1	8	15	22	29
2	**9**	**16**	**23**	**30**
3	**10**	**17**	**24**	**31**

FEBRUARY

5	6	7	8
1	8	15	22
2	9	16	23
3	10	17	24
4	11	18	25
5	12	19	26
6	**13**	**20**	**27**
7	**14**	**21**	**28**

MARCH

9	10	11	12	13
1	8	15	22	29
2	9	16	23	30
3	10	17	24	31
4	11	18	25	
5	12	19	26	
6	**13**	**20**	**27**	
7	**14**	**21**	**28**	

APRIL

13	14	15	16	17
	5	12	19	26
	6	13	20	27
	7	14	21	28
1	8	15	22	29
2	9	16	23	30
3	**10**	**17**	**24**	
4	**11**	**18**	**25**	

MAY

17	18	19	20	21	22
	3	10	17	24	31
	4	11	18	25	
	5	12	19	26	
	6	13	20	27	
	7	14	21	28	
1	**8**	**15**	**22**	**29**	
2	**9**	**16**	**23**	**30**	

JUNE

22	23	24	25	26
	7	14	21	28
1	8	15	22	29
2	9	16	23	30
3	10	17	24	
4	11	18	25	
5	**12**	**19**	**26**	
6	**13**	**20**	**27**	

JULY

26	27	28	29	30
	5	12	19	26
	6	13	20	27
	7	14	21	28
1	8	15	22	29
2	9	16	23	30
3	**10**	**17**	**24**	**31**
4	**11**	**18**	**25**	

AUGUST

30	31	32	33	34	35
	2	9	16	23	30
	3	10	17	24	31
	4	11	18	25	
	5	12	19	26	
	6	13	20	27	
	7	**14**	**21**	**28**	
1	**8**	**15**	**22**	**29**	

SEPTEMBER

35	36	37	38	39
	6	13	20	27
	7	14	21	28
1	8	15	22	29
2	9	16	23	30
3	10	17	24	
4	**11**	**18**	**25**	
5	**12**	**19**	**26**	

OCTOBER

39	40	41	42	43
	4	11	18	25
	5	12	19	26
	6	13	20	27
	7	14	21	28
1	8	15	22	29
2	**9**	**16**	**23**	**30**
3	**10**	**17**	**24**	**31**

NOVEMBER

44	45	46	47	48
1	8	15	22	29
2	9	16	23	30
3	10	17	24	
4	11	18	25	
5	12	19	26	
6	**13**	**20**	**27**	
7	**14**	**21**	**28**	

DECEMBER

48	49	50	51	52
	6	13	20	27
	7	14	21	28
1	8	15	22	29
2	9	16	23	30
3	10	17	24	31
4	**11**	**18**	**25**	
5	**12**	**19**	**26**	

2022

JANUARY

52	1	2	3	4	5
	3	10	17	24	31
	4	11	18	25	
	5	12	19	26	
	6	13	20	27	
	7	14	21	28	
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Vissers Aardbeiplanten, the Plant Innovators!

Breeding of strawberry varieties

Vissers has been researching new strawberry varieties that are interesting for professional growers in Oud Gastel for years. Breeder is Albert Konings. Breeding strawberry varieties is a time-consuming activity. First, the father and mother must be determined on the basis of a profile. The profile depends on a list of wishes that people would like to see reflected in the new variety. Think of harvest time, fruit characteristics, disease susceptibility, etc.

The cross is made and the pollinated plants are separated from others, whereby pollination by foreign varieties must be prevented. The seed of the pollinated fruit is sown and each plant is a new variety. These must be planted and selected intensively. The trick is to distinguish the good from the bad.

The selected varieties are then propagated and assessed again. Only the best strawberry varieties remain in this way. It often happens that no seedling stands up to the test of criticism. The entire process takes at least ten years.
Even then it happens that a selected variety does not have all expectations. Varieties come and go over the years. This catalog describes some of the varieties launched by Vissers. There are continuously new varieties that are assessed, partly on the farm itself and partly by growers who match the profile of the variety in question.

Selection

The main properties on which potential strawberry varieties are selected:

- Appearance and taste of the fruit;
- Disease susceptibility to fungal diseases;
- Deviating plant characteristics;
- Yield potential;
- Firmness of the fruit and shelf life;
- Levels of vitamins and antioxidants.

Then the selected varieties are tested for their possibilities in the different cultivation systems, such as very early cultivation in the greenhouse and late cultivation with waiting bed plants, and the different climates and soil types within Europe and beyond.

tray plant

Plug *mini-tray* *tray*

waiting bedplant
(light, medium, heavy)

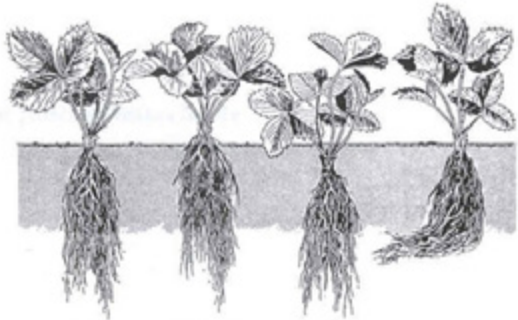
frigoplants
(A+ extra, A+, A and B)

mini-trayplant

module

fresh plant

unrooted tip



Plant depth

Sketch of correct planting method
The correct planting depth is important. Planting too deeply increases the risk of leathery rot, while planting too shallow increases the risk of drying out.

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SHORT DAY/JUNE BEARER STRAWBERRY VARIETIES

Remark

*)These varieties are protected and may only be used for the production of fruits. Illegal growing is prohibited, even if the plants are for private use.

RENDEZVOUS*

HANSABRED GMBH&CO KG, GERMANY

NEW

A really early strawberry!
Rendezvous* ripens as early as Clery it has not only a higher% class1 fruit, but also a higher fruit weight than Clery. The strawberry is round, medium to large and has a nice shine. The taste is good, even after storage. The variety is suitable for both trading channels, home sales and wholesale. In short, an all-round variety! Rendezvous* can be susceptible for mildew.

Flavour	★★★★☆	**Productivity**	★★★★☆
Shelf life	★★★☆☆	**Shape**	★★★★☆
Quality	★★★★☆	**Disease resistance**	★★☆☆☆

FRANCESCA*

UNIVERSITÀ POLITECNICA DELLE MARCHE, ITALY

NEW

The new early Italian variety.
Francesca* is ripens as early as Clery. The strawberries have a nice sweet taste due to their high sugar content. The strawberries have a nice appearance, a good fruit size and the average fruit weight is higher.
The percentage of class 1 fruits is average. Francesca* is somewhat more pressure sensitive. The plant grows vigorously and has an open growth. This makes the fruits easy to pick. Susceptibility to certain diseases is currently unknown.

Flavour	★★★★☆	**Productivity**	★★☆☆☆
Shelf life	★★★☆☆	**Shape**	★★★☆☆
Quality	★★★★☆	**Disease resistance**	★★★☆☆

LAMBADA

PRI, THE NETHERLANDS

Lambada is a strawberry with a good taste.
The fruit has a delicious full strawberry aroma and a pleasant consistency. Lambada is because of its good taste, very bright red colour, beautiful fruit shape and good fruit size a beautiful strawberry not only to eat, as well as very suitable for bakeries and restaurants. In brief, Lambada is a pronounced strawberry for the gourmets. The production is moderate because the variety produces few flower trushes. The yield is moderate. The variety is susceptible to mildew.

Flavour	★★★★★	**Productivity**	★★☆☆☆
Shelf life	★★☆☆☆	**Shape**	★★★☆☆
Quality	★★★★☆	**Disease resistance**	★★★☆☆

ALBA*

NEW FRUITS, ITALY

A very early ripening and productive variety from Italy.
Alba* strawberries are large, long and uniform. The shape is attractive, very firm and bright red. The strawberries have a good smell and an average taste. Alba* plants are very strong, they are immune to almost all common diseases. The plants have a good, short ripening period. The strawberries are easy to pick. The plants are susceptible to some herbicide.

Flavour	★★☆☆☆	**Productivity**	★★★★☆
Shelf life	★★★☆☆	**Shape**	★★★★☆
Quality	★★★★☆	**Disease resistance**	★★★☆☆

CORY® “P241102”*

VISSERS AMERICA BV, THE NETHERLANDS

Cory® "P241102"*, a variety with beautiful fruits and high yield.

Cory® "P241102"* is an early selection of Vissers America BV. The strawberries are quite large in shape and have a beautiful red colour which is also coloured from the inside, beautiful red. The taste is good and the fruit has a good appearance. It is a strong and healthy plant, characterized by a very high percentage of class 1 fruits.

Flavour	★★★☆☆	**Productivity**	★★★★☆
Shelf life	★★★★☆	**Shape**	★★★★☆
Quality	★★★★☆	**Disease resistance**	★★★★☆

GARIGUETTE

INRA, FRANCE

Gariguette, an old French breed with a very good taste.
The variety is suitable for early cultivation. Gariguette has quite long and intense red fruits. The variety is known for its fragrant fruits, is juicy and has a very good taste. A real strawberry for the gourmets. The fruit is more vulnerable. The variety is widely grown in France.

Flavour	★★★★★	**Productivity**	★★☆☆☆
Shelf life	★★☆☆☆	**Shape**	★★★☆☆
Quality	★★★★☆	**Disease resistance**	★★★☆☆

DAROYAL*

DARBONNE, FRANCE

The fruits of Daroyal* are beautiful, large, shiny and conically shaped.
The fruits colour, also on the inside, dark red. The taste is good. Daroyal* strawberries are limited durable. This selection is suitable for direct sales and short trading channels.
Daroyal* are strong growing strawberry plants with up-right dark green leaves. The plant is strongly rooted and has a high need for water. Daroyal* is limited susceptible against fungal disease and slightly more susceptible against botrytis.
The harvest begins very early and the yield is generally high.

Flavour	★★★★☆	**Productivity**	★★★☆☆
Shelf life	★★☆☆☆	**Shape**	★★★☆☆
Quality	★★☆☆☆	**Disease resistance**	★★★☆☆

HONEOYE

ALDWINCKLE, QURECKY, REICH, SANVORD, UNITED STATES

A variety with a characteristic acid accent.
Honeoye is a strawberry that has been developed in the state of New York (United States). The variety is named after Lake Honeoye, a lake in this state. The strawberries are dark red and glossy. The taste has a characteristic acid accent, with little sweetness. The strawberries are quite large and are very suitable for freezing. Honeoye is not susceptible to mildew and red root rot, but more susceptible to verticillium.

Flavour	★★☆☆☆	**Productivity**	★★☆☆☆
Shelf life	★★★☆☆	**Shape**	★★☆☆☆
Quality	★☆☆☆☆	**Disease resistance**	★★☆☆☆

ELLY*

VISSERS AMERICA BV, THE NETHERLANDS

The strawberries with a beautiful red colour.
Elly* is an early variety. This selection has an outstanding growth, with fresh green leaves and is productive, ripens early and the yield is comparable to Clery. The fruit shape looks strongly on Elianny*, with that typically raised crown. The firmness and taste are good. Elly* is suitable for direct sales and short trading channels.

Flavour	★★★★☆	**Productivity**	★★★★☆
Shelf life	★★★☆☆	**Shape**	★★★☆☆
Quality	★★★☆☆	**Disease resistance**	★★★☆☆

ROMINA*

UNIVERSITA ANCONA, ITALY

Romina* has strawberries with a beautiful fruit shape.
The variety has strawberries with a beautiful fruit shape, good fruit size and good taste. Due to its firmness, Romina* has a good shelf life. In addition, the variety is characterized by its earliness. Scientific research shows that the variety has extremely high levels of vitamin C and antioxidants.

Flavour	★★★★☆	**Productivity**	★★★☆☆
Shelf life	★★★☆☆	**Shape**	★★★★☆
Quality	★★★★☆	**Disease resistance**	★★★☆☆

DARSELECT*

DARBONNE, FRANCE

Darselect* produces beautiful, tasty and firm fruits.
This French variety has a lot of advantages at high temperatures and cultivations that need to be advanced. The strawberries are similar in shape to Elsanta, but slightly longer and are slightly carved. The calyx is more voluminous, but gets into glasshouses, quickly dry. In warm conditions the colour becomes more dark and dull. The strawberries have a good sweet taste. Darselect* needs much water during the growth. It is more pressure sensitive than Elsanta. Susceptible to verticillium.

Flavour	★★★★☆	**Productivity**	★★★☆☆
Shelf life	★★★☆☆	**Shape**	★★★☆☆
Quality	★★☆☆☆	**Disease resistance**	★★☆☆☆

KIMBERLY®*

GEBR. VISSERS, THE NETHERLANDS

Kimberly®*, a breed with excellent fruit qualities.
The strawberries ranges from large to very large, strong, beautiful shiny and they will not get any cracks. The taste is good. Kimberly®* ripens a few days earlier to Elsanta. The strawberry plants are highly tolerant for mildew, and therefore a good choice for covered cultivation. The variety is susceptible to colletotrichum. The variety has a good yield, similar to Elsanta. The strawberry plants have beautiful, large flowers and excellent pollen.

Flavour	★★★★☆	**Productivity**	★★★☆☆
Shelf life	★★☆☆☆	**Shape**	★★★☆☆
Quality	★★★☆☆	**Disease resistance**	★★★☆☆

VIMA® ZANTA*

VISSERS INTERNATIONAL BV, THE NETHERLANDS

Vima® Zanta* is a very healthy and consistently growing plant.

Vima® Zanta* originated from a cross between Elsanta and Korona, which is hardly susceptible to verticilium, and little susceptible to mildew. The leaf in pinched form, is a feature of this strawberry variety. The juicy fruits have a very good taste and can be picked quite easily. The strawberries are dark red and have a distinctive neck. Vima® Zanta* has not a very long shelf life, making them suitable for direct sale and self-picking.

Flavour	★★★★★	**Productivity**	★★★☆☆
Shelf life	★★★☆☆	**Shape**	★★☆☆☆
Quality	★★★☆☆	**Disease resistance**	★★★★☆

KORONA

PRI, THE NETHERLANDS

Korona strawberries, large and conical.
They are dark red and very uniform in shape and colour. The fruit flesh is also beautiful red, juicy and very tasty with a good aroma. Korona is a very productive strawberry variety. The yield is large and healthy. The strawberries have not a long shelf life. The variety is suitable for direct sales and self-picking. Korona is a strong plant and therefore little susceptible for diseases.

Flavour	★★★★★	**Productivity**	★★★★☆
Shelf life	★☆☆☆☆	**Shape**	★★★☆☆
Quality	★★★☆☆	**Disease resistance**	★★★★☆

U031508*

VISSERS AMERICA BV, THE NETHERLANDS

U031508*, the new tasteful strawberry.
The variety U031508* is suitable for middle to middle late cultivation. U031508* has thick and slightly less longer shiny red fruits. The fruit is less vulnerable and therefore better suited for trading channels.

Flavour	★★★★★	**Productivity**	★★★☆☆
Shelf life	★★★☆☆	**Shape**	★★★☆☆
Quality	★★★★☆	**Disease resistance**	★★★☆☆

ELIANNY*

GEBR. VISSERS, THE NETHERLANDS

Elianny* is a great strawberry with many great benefits.
Elianny* strawberries were developed by Albert Konings / Gebr. Vissers. The variety has been tested and improved since 1998. The strawberries have a beautiful bright red colour. The fruits are strong and especially delicious. It is not without reason that the Elianny* has often been voted the tastiest strawberry by connoisseurs! The crown sticks up a little bit more. The storage ability and the shelf life are very good. Elianny* ripens a few days earlier then Elsanta. It is a strong and healthy plant, characterized by a very high percentage of class 1 fruits.

Flavour	★★★★★	**Productivity**	★★★★☆
Shelf life	★★★★☆	**Shape**	★★★★☆
Quality	★★★☆☆	**Disease resistance**	★★★★☆

MALLING™ CENTENARY*

NIAB EMR, UNITED KINGDOM

Malling™ Centenary* provides solid, uniform and shiny fruits.

This selection from EMBC's program is early, beautiful and delicious. The percentage of class 1 fruit is high. The variety excels in beautiful strawberries with a beautiful gloss.
The ripening time is a little bit for Elsanta. The variety is easy to pick. Due to the good shelf life, it is a highly demanded variety by the supermarkets. The plant is susceptible to xanthomonas, pestalotiopsis and phytophthora cactorum.
The variety Malling™ Centenary* was released on the occasion of the 100th anniversary of the East Malling Research Institute, hence its naming.

Flavour	★★★★☆	**Productivity**	★★★☆☆
Shelf life	★★★★☆	**Shape**	★★★★★
Quality	★★★★☆	**Disease resistance**	★☆☆☆☆

LAURETTA*

UNIVERSITÀ POLITECNICA DELLE MARCHE, ITALY

NEW

Lauretta* is a early to mid-season variety.
Lauretta* ripens 2 days before Elsanta. The strawberry is large and will remain so throughout the picking season.
The percentage of class 1 fruits is good. The strawberry has a neutral taste. The plants grows vigorously and has an open growth. The flower trusses are long, strong and bloom above the leaves, making picking easy. The fruits are firm and therefore suitable for different trade channels. Susceptibility to certain diseases is currently unknown.

Flavour	★★☆☆☆	**Productivity**	★★☆☆☆
Shelf life	★★★★☆	**Shape**	★★★☆☆
Quality	★★★☆☆	**Disease resistance**	★★★☆☆

POLKA

PRI, THE NETHERLANDS

Polka strawberries, the real old-fashioned strawberry flavour.
The variety is characterized by its constant formed and conical fruits. The taste of Polka is pure and juicy. The strong glossy strawberries are equal red, have a pleasant sweet and sour aroma, but have a relatively low sugar content. Polka is a mid-late variety with very high production. Polka is relatively susceptible to diseases.

Flavour	★★★★☆	**Productivity**	★★★★☆
Shelf life	★★★☆☆	**Shape**	★★★☆☆
Quality	★★★☆☆	**Disease resistance**	★★☆☆☆

SENGA SENGANA

VON SENGBUSCH, GERMANY

The strawberry for industrial processing.
Senga Sengana is an old but still appreciated variety.
The fruit is dark red, as well as the flesh. The taste is good and aromatic, which makes it for the industrial easy to process the strawberry (for exemple marmelade and freezing). Senga Sengana is little sensitive to verticillium but is susceptible to diseases.

Flavour	★★★★☆	**Productivity**	★★★☆☆
Shelf life	★★☆☆☆	**Shape**	★★★☆☆
Quality	★★★☆☆	**Disease resistance**	★★☆☆☆

RENAISSANCE*

HANSABRED GMBH & CO, GERMANY

Renaissance*, the flavour strawberry of Hansabred.
For the selection, Hansabred has been able to retrieve her unique collection of old wild strawberries (Professor Staudt Collection). Renaissance* is characterized by the excellent taste, the beautiful fruit colour, as well as the flesh, the shape and the yield. It is a flavour strawberry with high levels of flavourings. Renaissance* is especially suitable for field cultivation. This variety can be a good addition to growers producing Polka, Senga Sengana and Sonata.

Flavour	★★★★★	**Productivity**	★★★★☆
Shelf life	★★★☆☆	**Shape**	★★★★☆
Quality	★★★☆☆	**Disease resistance**	★★★★☆

ASIA*

NEW FRUITS, ITALY

Asia* is a mid-early variety from Italy.
The fruits are large, somewhat carved, juicy, bright to dark red with bit of a neck under the calyx and its shelf-life is good. The taste is good. Although Asia* is tolerant against most common root-diseases, the variety is somewhat susceptible to mildew and colletotrichum. Asia* gives a very good yield and can be used in several growing systems. Especially suitable for table-top systems. Also, Asia* is easy and fast to pick.
The plants are susceptible to some herbicide.

Flavour	★★★☆☆	**Productivity**	★★★★☆
Shelf life	★★★☆☆	**Shape**	★★☆☆☆
Quality	★★★☆☆	**Disease resistance**	★★★☆☆

ELSANTA

PRI, THE NETHERLANDS

Elsanta has firm strawberries with a good taste.
Elsanta is due to the upright growing plant, the very high production, good firmness and good shelf life of the fruit, very suitable for growers and trade. Elsanta has a good taste and a strong strawberry aroma. It is still one of the most cultivated varieties in Europe. Elsanta is not susceptible to fruit rot, quite susceptible to mildew, phytophthora cactorum, red root rot, colletotrichum and highly susceptible to wilt disease.

Flavour	★★★☆☆	**Productivity**	★★★★☆
Shelf life	★★★★☆	**Shape**	★★★☆☆
Quality	★★★☆☆	**Disease resistance**	★★☆☆☆

MIEZE SCHINDLER

SCHINDLER, GERMANY

Mieze Schindler, world-renowned variety from former East Germany.

Mieze Schindler is a very old variety from former East Germany. It is the very separate taste that makes the difference. Mieze Schindler is male sterile and therefore needs a pollinator. The fruits are small and soft. They look like a raspberry. The variety must be picked very regularly and the fruits must be sold very soon after. A variety for the specialist.

Flavour	★★★★★	**Productivity**	★★★☆☆
Shelf life	★☆☆☆☆	**Shape**	★☆☆☆☆
Quality	★★★☆☆	**Disease resistance**	★★★☆☆

ANANAS

PHILADELPIA, UNITED STATES

Ananas, a strawberry with a different flavour.
The strawberry is white with red seeds. Characteristic is the fresh sweet pineapple flavour. The fruits are smaller and more vulnerable than the normal strawberries. The variety is therefore only suitable for direct sales. The variety is male sterile and therefore needs a pollinator.

Flavour	★★★☆☆	**Productivity**	★★☆☆☆
Shelf life	★★☆☆☆	**Shape**	★★★☆☆
Quality	★★☆☆☆	**Disease resistance**	★★★☆☆

SNOW WHITE*

HANSABRED GMBH&CO KG, GERMANY

Snow White*, the beautiful white strawberry.
Also the inside of the fruit is bright white. The plant is vigorous, fully winter hardy, low susceptible to mildew, botrytis, colletotrichum, verticillium and phytophthora. The ripening time is mid seasons with medium conical fruits. The seeds will turn red when the fruit is ripening. The fruit has a typical sour fruity pineapple flavour. The shelf life of the fruits is not so good. Consumers with a sensibility for red strawberries could try these, often eating white / pink strawberries don't cause a problem.

Flavour	★☆☆☆☆	**Productivity**	★★☆☆☆
Shelf life	★★☆☆☆	**Shape**	★★★★☆
Quality	★★★☆☆	**Disease resistance**	★★★☆☆

LOLA*

HANSABRED GMBH&CO KG, GERMANY

NEW

The new strawberry for direct sale.
Hansabred's new variety, Lola*, is comparable to Elegance* in terms of picking period. The strawberry is glossy red and has a firm skin, which means that there are few pressure spots during picking. Lola* is easy to pick and that is a strong point with the high yield of the variety. The taste is good, with a nice balance between sweet and sour. The variety is suitable for growing in a tunnel or on the field. The tests showed that the variety is not or hardly susceptible to diseases.

Flavour	★★★☆☆	**Productivity**	★★★★★
Shelf life	★★★★☆	**Shape**	★★★☆☆
Quality	★★★★☆	**Disease resistance**	★★★★☆

ELEGANCE*

NIAB EMR, UNITED KINGDOM

Elegance*, a strawberry with a beautiful appearance and good shelf life.

This English variety is very suitable for sale through merchants and auctions. The fruits of Elegance* also retain the bright red colour even after storage. The shape of the fruit is round conical. Elegance* ripens a few days later than Elsanta and the harvest is longer. The yield is higher than Elsanta, with the percentage of small or deformed fruits being very low. Elegance* is susceptible to mildew, phytophthora cactorum, verticillium and must be protected against it.

Flavour	★★☆☆☆	**Productivity**	★★★★☆
Shelf life	★★★★☆	**Shape**	★★★★☆
Quality	★★★☆☆	**Disease resistance**	★☆☆☆☆

SYMPHONY*

MYLNEFIELD RESEARCH SERVICES LTD, UNITED KINGDOM

Symphony*, big, glossy and firm.
The variety is a few days (5-7) later than Elsanta.
The strawberries are very large, glossy and firm. As a result, Symphony* has a good shelf life and is therefore suitable for the various trading channels. The taste is reasonable.
The plants are less susceptible to fungous diseases than Elsanta.

Flavour	★★★☆☆	**Productivity**	★★★☆☆
Shelf life	★★★☆☆	**Shape**	★★★☆☆
Quality	★★☆☆☆	**Disease resistance**	★★★☆☆

VIMA® TARDA*

VISSERS INTERNATIONAL BV, THE NETHERLANDS

Vima® Tarda*, the crossing of Vima® Zanta* and Vicoda.
The strawberries are similar to those of Symphony* but they are more susceptible for wet bruises. The ripening time is almost identical to that of Symphony*and the production of Vima® Tarda* is in most cases higher. The plants are dark green and low.

Flavour	★★☆☆☆	**Productivity**	★★★☆☆
Shelf life	★★★☆☆	**Shape**	★★★☆☆
Quality	★★☆☆☆	**Disease resistance**	★★★☆☆

FENELLA*

NIAB EMR, UNITED KINGDOM

Fenella* is an English, mid-late variety with a good taste.
The fruits are next to beautiful, glossy and fresh, also very uniform. Fenella* is resistant against rain. The skin is firm, which is also noticeable during long storage. The yield is equal to Florence*. The variety can be used well to bridge the traditional gap between June bearers and ever bearers.
The flower trusses are long which makes the fruit easy to pick. Fenella* has a good resistance strong against verticillium and phytophthora.

Flavour	★★★☆☆	**Productivity**	★★★☆☆
Shelf life	★★★☆☆	**Shape**	★★★★☆
Quality	★★★☆☆	**Disease resistance**	★★★★☆

SILVIA*

UNIVERSITÀ POLITECNICA DELLE MARCHE, ITALY

NEW

An late season variety.
Silvia* ripens 10 days after Elsanta. The strawberries have a firm skin and the taste has a pleasant acidity. The variety produces very large strawberries at the first harvest. Fruit size remains good during the growing season. The production is high with a high% of class 1 fruit. The growth of the plant is vigorous and compact with short to medium flower trusses. Susceptibility to certain diseases is currently unknown.

Flavour	★★★☆☆	**Productivity**	★★★☆☆
Shelf life	★★★★☆	**Shape**	★★★☆☆
Quality	★★★★☆	**Disease resistance**	★★★☆☆

FLORENCE*

NIAB EMR, UNITED KINGDOM

Florence*, suitable for perennial crops.
Florence* strawberries are red to dark red, large to very large, firm and well-flavoured. The ripening time is late, 10 to 12 days later than Elsanta. The yield is good and the plants are growing strong and is hardly susceptible to root diseases and mildew.

Flavour	★★★☆☆	**Productivity**	★★★☆☆
Shelf life	★★★☆☆	**Shape**	★★★★☆
Quality	★★★☆☆	**Disease resistance**	★★★★☆

FERNANDO*

VISSERS AMERICA BV, THE NETHERLANDS

Fernando*, beautifully formed fruits and delicious.
Fernando* is a mid-late selection which ripens similar to Florence*. The plant grows vigorously and flowers are large with double row pollen. The colour of the fruit and also of the flesh is deep red. The firmness is similar to Kimberly®*. The taste is good. Fernando* is hardly susceptible to the most common diseases.

Flavour	★★★★☆	**Productivity**	★★★★☆
Shelf life	★★★☆☆	**Shape**	★★★☆☆
Quality	★★★☆☆	**Disease resistance**	★★★★☆

CRISTINA*

UNIVERSITA ANCONA, ITALY

Cristina* is a late variety from Italy.
Cristina* is a late variety, which can be grown on fields on which strawberries have been grown before. The yield is good, the berries are large and nicely shaped. The taste is good.

Flavour	★★★☆☆	**Productivity**	★★★★☆
Shelf life	★★★★☆	**Shape**	★★★★☆
Quality	★★★★☆	**Disease resistance**	★★★★☆

VIMA® XIMA*

VISSERS INTERNATIONAL BV, THE NETHERLANDS

Vima® Xima*, a variety with late ripening time.
Vima® Xima* is ripening 14 days later as Elsanta with big dark red fruits, high yield and with a round fruit shape. The fruit is dark red and the taste is good. The plants are dark green and is hardly susceptible to diseases.

Flavour	★★★☆☆	**Productivity**	★★★★☆
Shelf life	★★★☆☆	**Shape**	★★☆☆☆
Quality	★★☆☆☆	**Disease resistance**	★★★★☆

DESTINY® “P061105”*

VISSERS AMERICA BV, THE NETHERLANDS

Destiny® "P061105"*, a mid-late selection of Vissers America BV.
The variety gives a very high percentage of class 1 fruits. The selection is characterized by strong growth with sturdy leaves and stems. The colour of the leaf is dark green. The beautiful big sturdy fruits are good after storage in the cold store. The ripening is a little bit later than Florence*, but with a longer harvest time. The variety is little susceptible to mildew on the fruits, but is not susceptible to fruit rot. In rain the fruit does not tear at the calix. This selection is suitable for all trading channels.

Flavour	★★★☆☆	**Productivity**	★★★★☆
Shelf life	★★★★☆	**Shape**	★★★★★
Quality	★★★☆☆	**Disease resistance**	★★★★☆

MALWINA*

PETER STOPPEL, GERMANY

Malwina* is a very late variety with a very good taste.
The plants are very robust, grow vigorous with medium-sized, dark green blinking leaves. The flowers are under the leaf but pollinate themselves. Malwina* is very tolerant against verticillium. The fruits are large, firm (if picked in time) and inside and out, bright red. The ripening time is 23 days after Elsanta and is the variety with the latest ripening time.
This late flowering time will demand for special attention to the strawberry blossom weevil and thrips.

Flavour	★★★☆☆	**Productivity**	★★★☆☆
Shelf life	★★★★★	**Shape**	★★★☆☆
Quality	★★★☆☆	**Disease resistance**	★★★☆☆

DAYNEUTRAL STRAWBERRY VARIETIES

Remark

*)These varieties are protected and may only be used for the production of fruits. Illegal growing is prohibited, even if the plants are for private use.

HARMONY® “P061103”*

VISSERS AMERICA BV, THE NETHERLANDS

Harmony® "P061103"* continues to produce under almost all-weather conditions.

Harmony® "P061103"* is the selection of Vissers America BV which also continues to produce good, even under worser climate conditions. Unlike other varieties, there is no flower rejection. The fruits have a very beautiful gloss and colour. The firmness and taste are good. The seeds are a bit deeper in the skin, which means there is a risk of pressure spots. The variety is little or no susceptible to mildew, phytophthora and botrytis and even has little trouble with thrips.

Flavour	★★★☆☆	**Productivity**	★★★★★
Shelf life	★★★★☆	**Shape**	★★★★☆
Quality	★★★★☆	**Disease resistance**	★★★★☆

MALLING™ CHAMPION*

NIAB EMR, UNITED KINGDOM

NEW

The new everbearer with a high percentage of class 1 fruits.

Malling ™ Champion* is the new everbearer of NIAB EMR. The strawberries have a uniform conical shape and a beautiful shine. The plant has a compact growth and the picking speed for this variety is high. The fruit is firm, making it suitable for multiple trade channels. The taste is quite neutral. The variety is not very susceptible to phytophtora cactorum, verticillium and is more susceptible to mildew.

Flavour	★★☆☆☆	**Productivity**	★★★★☆
Shelf life	★★★★☆	**Shape**	★★★★☆
Quality	★★★☆☆	**Disease resistance**	★★★☆☆

PORTOLA*

UC DAVIS, UNITED STATES

Portola*, a variety with strong day-neutral aspects.
Portola* can be used in many growing systems due to its strong flowering response. Plant vigour is stronger than Albion* for which reason the plant density can be lower. The fruits have a similar size then Albion*, are slightly lighter of colour but somewhat less tolerant against rain. The taste is reasonable and consistent throughout the season. Portola* has a good shelf life. Portola* appears to be somewhat susceptible to phytophthora.

Flavour	★★☆☆☆	**Productivity**	★★★★☆
Shelf life	★★★★☆	**Shape**	★★★★☆
Quality	★★★★☆	**Disease resistance**	★★★☆☆

VIMA® RINA*

VISSERS INTERNATIONAL BV, THE NETHERLANDS

Vima® Rina*, a variety with distinction.
This remonting fruiting variety has many of the external features of the Selva variety. It differs in that it is less firm and that it has a better taste. The production curve is higher at the beginning of the picking time and after the peak of Selva, also higher. The production is therefore somewhat larger than Selva.

Flavour	★★★☆☆	**Productivity**	★★★☆☆
Shelf life	★★★☆☆	**Shape**	★☆☆☆☆
Quality	★★☆☆☆	**Disease resistance**	★★★☆☆

SELVA

UC DAVIS, UNITED STATES

Selva, easy to cultivate.
Selva has been one of the most remonting varieties in Northern Europe in the past and has proved to be very suitable for export. The fruits are very firm and well transportable. The taste is neutral. The plants are easy to cultivate without extra susceptible.

Flavour	★★☆☆☆	**Productivity**	★★★☆☆
Shelf life	★★★★☆	**Shape**	★☆☆☆☆
Quality	★★☆☆☆	**Disease resistance**	★★★☆☆

MARA DES BOIS*

MARIONNET, FRANCE

Mara des Bois*, a variety for lovers.
This variety has the characteristics of a forest strawberry. The taste is very special until sometimes perfumed like a forest strawberry. The fruits are larger than a forest strawberry, but smaller than a common strawberry variety. The strawberry is not really firm and therefore well suited for direct sales.

Flavour	★★★★★	**Productivity**	★☆☆☆☆
Shelf life	★★☆☆☆	**Shape**	★★☆☆☆
Quality	★☆☆☆☆	**Disease resistance**	★★★☆☆

OSTARA

PRI, THE NETHERLANDS

Ostara, long flowering time.
Fruits are medium sized, regularly conical shaped and bright red. By thinning out of the flowers it is possible to delay the crop till November. The first flower thrushes must be removed so that the young plant can develop.

Flavour	★★☆☆☆	**Productivity**	★★★☆☆
Shelf life	★★☆☆☆	**Shape**	★★☆☆☆
Quality	★★☆☆☆	**Disease resistance**	★★★☆☆

DIAMANTE*

UC DAVIS, UNITED STATES

Diamante* gives a high percentage of class 1 fruits.
The fruits are glossy and look good. The plant is compact and has quit resistance against mildew.

Flavour	★★★☆☆	**Productivity**	★★☆☆☆
Shelf life	★★★☆☆	**Shape**	★★★☆☆
Quality	★★★☆☆	**Disease resistance**	★★☆☆☆

ALBION*

UC DAVIS, UNITED STATES

Albion*, the variety with a very pleasant taste.
Albion* develops a homogeneous, strong, compact plant with sturdy dark green leaves and flowers of excellent quality. The yield per plant is lower than Selva, but the smaller plant offers opportunities to plant at a higher density, which means that the yield per ha levels out. The fruit sorting is with 70% class 1 fruits, good. The fruits are at the beginning of the harvest, long and conical and later somewhat wider and stump. The taste is very pleasant, the fruits are crisp and the shelf life is good.

Flavour	★★★★☆	**Productivity**	★★★☆☆
Shelf life	★★★★☆	**Shape**	★★★★☆
Quality	★★★☆☆	**Disease resistance**	★★★★☆

SAN ANDREAS*

UC DAVIS, UNITED STATES

San Andreas*, for a good and consistent production.
San Andreas* is a moderate day-neutral variety with a production pattern very similar to Albion*. San Andreas* has a low chilling requirement. During the harvest, the variety makes less runners. The plant grows slightly stronger when picking. The fruits are strong, uniform and with a beautiful appearance. The colour is lighter than Albion*. The taste is good during summer, but later in autumn less sweet. San Andreas* is less susceptible to disease.

Flavour	★★★☆☆	**Productivity**	★★★★☆
Shelf life	★★★★☆	**Shape**	★★★★☆
Quality	★★★★☆	**Disease resistance**	★★☆☆☆

MONTEREY*

UC DAVIS, UNITED STATES

Monterey* is a variety with moderate day-neutrality. The variety is slightly stronger flowering than Albion*, with a similar production pattern. The plant is more vigorous and may require more space than Albion*. The fruits are large, firm, slightly carved and dark red. The taste is good with a distinct sweet aftertaste, something that does not occur often in California varieties. Monterey* is quite resistance to fungal diseases but can get mildew, so must be treated against it.

Flavour	★★★☆☆	**Productivity**	★★★★☆
Shelf life	★★★☆☆	**Shape**	★★★☆☆
Quality	★★★☆☆	**Disease resistance**	★★★☆☆

ASPARAGUS CROWNS

IF YOUR DESIRED VARIETY IS NOT LISTED, NO PROBLEM!
PLEASE CONTACT US FOR THE POSSIBILITIES.

PRIUS

BEJO ZADEN B.V., THE NETHERLANDS

Prius is a very early variety from Bejo Zaden. This selection is also nicely formed, white and not very sensitive to rust flakes. Moreover, the yield is very high, the start goes very smoothly and grows very quickly to a high daily yield. Recommended planting density: 4 plants per meter.

Earliness	★★★★★	**Yield**	★★★★☆
Diameter	★★★☆☆	**Tip closure**	★★★★☆
Shape	★★★★☆	**Disease resistance**	★★☆☆☆

FRÜHLIM

LIMGROUP B.V., THE NETHERLANDS

Frühlim is a 100% male hybrid and extremely suitable for the cultivation of white asparagus in a moderate climate. Frühlim combines its very early production with stem thickness and quality. The product is white and is not or hardly susceptible to hollow stems, breakage and physiological rust. The excellent tip closure makes Frühlim ideally suited for covered and forced cultivation. Frühlim thrives best on sandy soils that are well-drained. The good foliage characteristics also make Frühlim ideal for organic cultivation. Recommended planting density: 3,5 - 4 plants per meter.

Earliness	★★★★☆	**Yield**	★★★★☆
Diameter	★★★★☆	**Tip closure**	★★★★★
Shape	★★★★☆	**Disease resistance**	★★★★☆

GIJNLIM

LIMGROUP B.V., THE NETHERLANDS

Gijnlim F1 is a 100% male hybrid and extremely suitable for the cultivation of both white and green asparagus in the moderate climate. Gijnlim has a very high production potential and excellent quality. The main grading is in the 16 - 24 mm class. Gijnlim has a very good tip closure, is straight, smooth and hardly susceptible to rust. The variety is very early and combines that with a very high production. Gijnlim thrives on both sandy and clay soils. The more vigorous the soil is, the more vigorous the stem thickness will remain the same, later in the season. Gijnlim is ideally suited for extra forcing techniques. The variety is particularly well appreciated for home sales. Recommended planting density: 3,5 - 4 plants per meter.

Earliness	★★★★☆	**Yield**	★★★★☆
Diameter	★★★☆☆	**Tip closure**	★★★★☆
Shape	★★★☆☆	**Disease resistance**	★★☆☆☆

CUMULUS

BEJO ZADEN B.V., THE NETHERLANDS

Cumulus is a 100% male very white hybrid. Suitable for cultivation under black/white film in Southern, Central and Northern Europe. The hybrid is early and has a high yield. The hybrid produces uniform thick stems of very good quality with well-closed tips. The crop has a large size and a fairly open structure. Recommended planting density: 4 - 5 plants per meter.

Earliness	★★★★☆	**Yield**	★★★★☆
Diameter	★★★★☆	**Tip closure**	★★★★☆
Shape	★★★★☆	**Disease resistance**	★★★☆☆

ROBBEMS

NUNHEMS NETHERLANDS B.V., THE NETHERLANDS

Robbems is a 100% male hybrid that comes from the breeding program of Nunhems. The harvest starts mid-early and continues constantly, making it possible to steer. Robbems is characterized by a high yield potential with a high proportion of stems thicker than 20mm. The stems are nice and straight and not very susceptible to hollows and/or cracks.
The tip closure is good. Robbems is suitable for cultivation on sandy soils as well as on heavier soils. In short, Robbems is a profitable variety in the mid-early segment, easy growth combined with high yields. Recommended planting density: 4 - 5 plants per meter.

Earliness	★★★☆☆	**Yield**	★★★★☆
Diameter	★★★★☆	**Tip closure**	★★★★☆
Shape	★★★★☆	**Disease resistance**	★★☆☆☆

CYGNUS

BEJO ZADEN B.V., THE NETHERLANDS

The Cygnus variety is a medium-early and robust white variety, which is distinguished by its resistance to foliage diseases. The variety is suitable for the cultivation of white asparagus in Northern Europe. It has beautiful closed tips, is characterized by its uniformity and shows itself against hollow stem development. Recommended planting density: 5 - 6 plants per meter.

Earliness	★★★☆☆	**Yield**	★★★★☆
Diameter	★★★★☆	**Tip closure**	★★★★☆
Shape	★★★★☆	**Disease resistance**	★★★★☆

GROLIM

LIMGROUP B.V., THE NETHERLANDS

Grolim F1 is a 100% male hybrid and is suitable for the cultivation of white asparagus in both temperate and warmer climates, comparable to Southern Europe. Grolim thrives best on vigorous soils that are well drained. Good results are achieved on both sandy and clay soils. Grolim shows hardly any pink discoloration, grooves or crooked stems and has an good tip closure. Grolim contributes to an improved yield due to the exceptionally high stem weight and therefore a high harvesting performance. The variety is early and has an above-average production. Recommended planting density: 5 plants per meter on sandy soil and 6 – 8 plants on clay soils.

Earliness	★★★☆☆	**Yield**	★★★★☆
Diameter	★★★★☆	**Tip closure**	★★★☆☆
Shape	★★★☆☆	**Disease resistance**	★★★★☆

BACKLIM

LIMGROUP B.V., THE NETHERLANDS

Backlim F1 is a 100% male hybrid and is particularly suitable for the harvest of white asparagus in the temperate climate. Backlim is a variety that can be grown on all well-drained asparagus soils. Backlim produces a beautiful, straight asparagus. The variety produces asparagus with a good tip closure that is hardly susceptible to hollow, pink discoloration or rust. Backlim is also used satisfactorily for the cultivation of green asparagus. The variety is very well suited for harvesting in the second half of the season in combination with early varieties such as Avalim and Gijnlim. Backlim has become the standard variety in greenhouse cultivation. Backlim is reliable in terms of yield and quality, both in the greenhouse and in the field. Recommended planting density: 4 – 5 plants per meter.

Earliness	★☆☆☆☆	**Yield**	★★★★☆
Diameter	★★★★☆	**Tip closure**	★★★☆☆
Shape	★★★☆☆	**Disease resistance**	★★★☆☆

XENOLIM

LIMGROUP B.V., THE NETHERLANDS

Xenolim is a 100% male anthocyanin-free hybrid and ideal for growing anthocyanin-free green asparagus in areas with a moderate climate. Xenolim has a very high production potential, excellent quality and very good thickness. The tip closure of Xenolim is also excellent under warm conditions during the harvest. Xenolim combines a mid-early production with very high yields and a long profitable life. Recommended planting density: 4 plants per meter.

Earliness	★★☆☆☆	**Yield**	★★★★☆
Diameter	★★★★☆	**Tip closure**	★★★★☆
Shape	★★★★☆	**Disease resistance**	★★★☆☆

RASPBERRY PLANTS

ALL VARIETIES ARE AVAILABLE AS PLUG PLANTS.
GLEN AMPLE, GLEN DEE AND TULAMEEN AVAILABLE AS LONGCANE IN POT

GLEN AMPLE

JAMES HUTTON LIMITED, UNITED KINGDOM

Glen Ample is a medium early variety. The variety is very productive and the fruits are firm. The fruits of Glen Ample are well filled and weigh an average of 4 to 5 g. The shape is conical to round and the taste is good. Glen Ample's stem has no thorns and grows very vertically. The upward growing side branches result in a good presentation of the fruits. The variety is not very sensitive to phytophthora but is sensitive to rust.

Flavour	★★★☆☆	**Productivity**	★★★★☆
Shelf life	★★★★☆	**Shape**	★★★☆☆
Quality	★★★☆☆	**Disease resistance**	★★★☆☆

GLEN DEE

JAMES HUTTON LIMITED, UNITED KINGDOM

Glen Dee is a summer raspberry which is later than Glen Ample. The variety is more productive than Glen Ample and has large fruits. The raspberries have an even shape, are firm and have a good taste. The fruits weigh up to 12 grams. The stem of the Glen Dee is thornless and the plant grows very vertically. The raspberries are not easy to pick, which means lower production costs. Glen Dee is known for the high percentage of top quality raspberries. The variety is somewhat susceptible to root rot.

Flavour	★★★★☆	**Productivity**	★★★★☆
Shelf life	★★★★☆	**Shape**	★★★★☆
Quality	★★★☆☆	**Disease resistance**	★★★☆☆

TULAMEEN

--, CANADA

Tulameen, a variety with good results. This variety is generally known for being productive with beautiful, thick and tasty fruits. The fruits are firm so that they can be stored for a long time. This variety is suitable for almost any soil and is resistant to diseases.

Flavour	★★★★☆	**Productivity**	★★★☆☆
Shelf life	★★★☆☆	**Shape**	★★★☆☆
Quality	★★★☆☆	**Disease resistance**	★★★☆☆

MEEKER

WASHINGTON UNIVERSITY, UNITED STATES

Meeker is a summer raspberry that produces delicious raspberries. Meeker has dark red fruits with a high sugar content and good taste. The fruits can be used for fresh consumption, freezing and canning. The plant is a strong grower and does best in lighter soil. The variety has some resistance to botrytis.

Flavour	★★★★☆	**Productivity**	★★★☆☆
Shelf life	★★★☆☆	**Shape**	★★☆☆☆
Quality	★★☆☆☆	**Disease resistance**	★★★☆☆

PRIMEBERRY® SUGANA

LUBERA®, SWISS

This autumn raspberry is a step into a new raspberry era. Primeberry® Sugana combines good fruit firmness, a fresh light red colour, a good taste with an average fruit weight between 6 and 7 grams and an extremely high percentage of first class of 98%. The fruits can withstand cold storage without any problems. In addition to the possibility that this variety offers to produce top quality raspberries in the autumn, there are also possibilities to achieve better results in the spring with overwintered shoots than with Tulameen, whereby an earlier and higher production can be achieved.

Flavour	★★☆☆☆	**Productivity**	★★★★☆
Shelf life	★★★★☆	**Shape**	★★★★☆
Quality	★★★☆☆	**Disease resistance**	★★★☆☆

HERITAGE

--, UNITED STATES

Heritage is a high yielding fall raspberry. Heritage can produce many fruits that are on average slightly smaller. The fruits are bright red and taste sweet. The plants are not very susceptible to diseases and grow easily.

Flavour	★★★★☆	**Productivity**	★★★★★
Shelf life	★★★☆☆	**Shape**	★★★☆☆
Quality	★★★☆☆	**Disease resistance**	★★★★☆

PEST AND PLANT THREATS

Strawberry plants are susceptible to threat from various pests and diseases. A number of precautionary and protective measures are required in order to achieve maximum production.

Mycosis

Leathery rot | PHYTOPHTORA CACTORUM


Test centre Hoogstraten

The fungus penetrates into the plant at the moment when there are wounds. The root neck of the affected plants shows a reddish brown discolouration. The progress of the disease may be quick; the plants will be wilting and die. Remarkable thing is, that the roots are still fully healthy then. To prevent similar attacks you are advised to use healthy planting material. In case susceptible varieties will be planted, you should immerse them before planting.

Red root rot | PHYTOPHTORA FRAGARIAE


Test centre Hoogstraten

Growth of the plants will slow down and they will become dull bluish green. In spring the plants will convalesce somewhat. An affected plant will form no or only few flowers. The small fruits will dry out. The root-hair of the roots is lacking. When cutting the main roots, it will appear that the central cylinder has discoloured red. To prevent this harmful effect you should buy certified planting material.

Colletotrichum | COLLETOTRICHUM ACUTATUM


Test centre Fruitteelt vzw pcfruit

Colletotrichum is a water-loving fungus species, which may strongly spread, especially at higher temperatures (20°C is optimum). The fungus will spread from the soil through splashing water drops to fruit and crop. Consequently, preventive control should be carried out before rainfall. The first symptoms can be observed on the leaves. All three leaves will curl up. On the runners and leafstalks the attack can be observed in the form of ellipse shaped sunk small black spots. On the damaged fruit round sunk brownish black spots will appear. In an infected plant the fungus will spread. By observing utmost hygiene during activities in the fields quick spreading in the establishment can be avoided. If an infection should be established on a parcel, it should be worked or picked, as the case may be, at the end of the day.

Wilt disease | VERTICILLIUM ALBO-ATRUM

The fungi of this vascular disease will penetrate into the plant through its roots or through its stolons. Damaged plants lag behind in growth, which manifests itself especially on hot, scanty days. The damaged plants will be slack then. In a later stage the plant will creep as it were into the soil and the fruits it will still bear are small and dry. Diseased leaves will discolour dull yellowish green.

Rhizoctonia | RHIZOCTONIA FRAGARIAE
The type of rhizoctonia which will be described here may not be mistaken for black root rot, which is also caused by a Rhizoctonia fungus. In principle Rhizoctonia can occur throughout the year, however, no spreading will take place when it will be freezing. If a plant has been attacked, it will show reddish brown discolouration. In almost all cases erwinia is involved, as a result of which the entire heart will disappear and the sleeping eyes will start coming out. This will result in the formation of a bushy plant. To prevent this, planting should be done not too deep and not on wet parcels.

Blossom-end rot and stem rot | GNOMONIA COMARI

This fungus occurs especially in long-range crops. In an early stage small brown spots can arise on the buds. After flowering the calyx tails will turn brown, the fruits will discolour brown and will dry. The fungus will hibernate on dead parts of plant above ground level. Spreading will occur by precipitation.

Grey mould | BOTRYTIS CINEREA

Botrytis is a wound parasite. Stamina, which are breaking off and petals falling off prematurely are ideal attacking points for Botrytis. Characteristic is the whitish grey fungus fluff on the attacked fruits. They are traces of the fungus germs at high humidity of the air and temperatures ranging from 15 to 20 C. They are spread by the wind.

Mildew | SPHAEROTHECA APHANI

In case of an attack coming on, the leaves will curl, forming white fungus fluff on the underside. Subsequently light purple spots will form. Also the fruits can be attacked by mildew.

Especially during hot weather the fungus can spread quickly. Some varieties are especially sensitive. In growing tunnels mildew can be avoided partly by preventing from arising. Aeration should be done by opening just the side that is out of the wind.

Purple spot disease | ALTERNARIA ALTERNATA

Typical characteristic of this type of fungous disease are the purple spots which appear on the leaves of the attacked plants. These round spots, measuring 2 to 5 mm, are having a red or brown spot in the middle. Just a single spot on the stem of a leaf or a cluster of flowers will be enough to let it die.

Pestalotiopsis spp.

Since 2014, a new disease has been found in strawberry plants, which is caused by the fungus Pestalotiopsis spp. This fungus attacks the rhizome of the strawberry plants and ensures that the plants lag behind in terms of growth with the risk of loss. The symptoms of this disease are very similar to those of Phytopthora cactorum.

Animal parasites

Every year again various kinds of insects can cause much damage in strawberries. To obtain a crop with good results, effective fighting of these parasites should be part of the necessary measures to be taken. Eelworms, caterpillars, plant lice, red spiders, bugs, thripses and beetles should be controlled in the best possible and most correct way. Besides insect pests also snails are often a nuisance, to which much attention should be paid. Especially in glasshouse cultivation various biological killers of insects can be put into action. To this end the best thing you can do is to contact your local supplier.

Nematodes

- ***Foliar nematodes***- Foliar nematodes do not only live on strawberries but they also occur on a large number of plant species. They are especially in the centre of the plant. At the outside of the plant they can not live very long. The leaves are deformed, scalloped, minor and have sharp points. The leafstalks are considerably thinner than they ought to be. The number of flowers is poor and sometimes the whole production of new buds is lost. The buds on the side often sprout (the plant is falling apart as it were).

- ***Stem nematodes***- In contrast to foliar nematodes, stem nematodes can live for a long period of time without host plant. If a sensitive plant will be planted on infected soil, it will be attacked. If stem nematodes are involved, the attack can be best observed in spring. The leafstalks and flower stems will remain short and are strongly thickened and bumpy. The leaf rims will curl up and the leaves are covered with a bluish bloom and often strongly deformed.
  The flowers remain small and produce deformed fruits.
  The infection often occurs spot wise. To make sure about the actual presence of the infection, a soil sample is necessary

- ***Free living root nematodes*** - (Longidorus elongatus and Xiphinema diversicaudatum) - Both species of nematodes have an extensive series of host plants. Plants which have been attacked by root nematodes, lag behind in growth. The root system has badly developed, the roots are stunted and have swollen root tips. What is more important than this direct damage, is the carrying on of viruses. In this way strawberry plants can be infected with viruses.

- ***Root cystnematodes*** - (Pratylenchus penetrans) - The root cyst nematode can live on a large number of plants. For strawberries it is the most dangerous nematode species. Nematodes spend their entire life cycle in the roots of the plants. One generation will last about six or seven weeks. Attacked plants show interrupted growth, produce fewer runners and will die. As a result of this, so-called eelworm patches form in the crop. Especially on light soil this eelworm may cause damage. The development of the roots of attacked plants is far poorer. The ends of the roots are thickened and the root hair is lacking. An attacked plant is growing as it were on the soil and can be easily pulled out of the soil. Through the damaged roots fungi - for example black root rot - can penetrate into the plants.

- ***Root-knot - (Meloidogyne hapla)*** - This nematode can be found especially on light soil. It provides a thickening (small tuber) on the fine roots. Plants which have been seriously attacked, are strongly lagging behind in growth and are worthless for future use. So far this nematode causes hardly any problems in strawberry plants.

Subterranean caterpillar | AGROTIS SPECIES
Subterranean caterpillars are round, grey, twisted caterpillars, the size of which varies from a few millimeters to 3 centimeters. They can be found all the year round. They are caterpillars of different kinds of owl butterflies. Most species have one generation per year. If the caterpillars are still small, they live aboveground on young leaf green. However, they pass on rather quickly to a way of living underground. They eat from roots and different underground young parts of plant. Besides, they eat from the aboveground parts of plant during the night time. Subterranean caterpillars can often be easily found in the soil, because they take along parts of plant to their places of shelter.

Leather jacket | TIPULA SPECIES
Leather jackets are the larvae of the daddy longlegs.
This insect is present especially in ploughed up grassland.
One daddy longlegs will lay three or four hundreds eggs.
Leather jackets do not have legs and they are measuring a few millimetres to 3 centimetres. Young leather jackets are white.
As they grow older they, colour grey and their form is getting flat. Their head is not clearly visible.

Wire worms | ELATERIDAE VARIETIES
Wire worms are the larvae of the click beetle. Because of their yellowish brown colour wire worms are also referred to as click beetles. They eat themselves into the rhizome of the strawberry plant, as a result of which the strawberry plant will start to become slack. They occur, just like leather jackets, especially in ploughed up grassland. The beetles do not do any harm.

Plant lice

Plant lice live on plant juices and exude honeydew. As they suck plant juices, leaf deformations and sometimes fruit deformations are caused. Besides, some lice pass on viruses. The strawberry aphid and the shallot aphid are the major plant lice species, occurring on strawberries. Both species pass on virus diseases. Plant lice are having many natural enemies. The best-known are: ladybirds, lacewings, syrphus ribesii, earwigs and ichneumon flies.

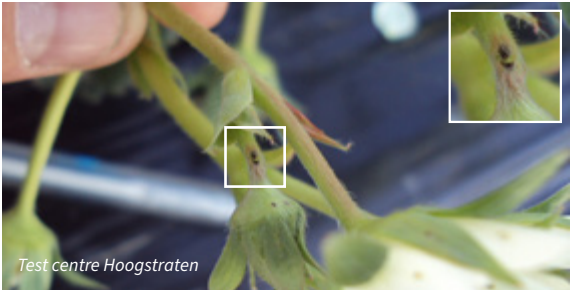
- ***Strawberry aphid*** - (Chaetosiphon fragaefolii) -
  The strawberry aphid is a small whitish green louse, which exclusively occurs on strawberries. The club-shaped hair on the back of this plant louse species can be easily observed under a magnifying glass. Besides, its dark eyes are conspicuous. There are several generations per year.

- ***Shallot lice*** - (Myzus ascalonicus) - Shallot lice are small and bluish green. These plant lice suck on leaves and young flower stems, thus producing a bushy plant. The fruits are formed on short fragile stems close to the plant. Sometimes they are deformed. In summer plant lice infect different crops. In autumn they fly back to the strawberry again.

Beetles

Beetles are insects which have two pair of wings. The first pair is not really a set of wings, but it is armoured. The second pair is situated under these wing covers. Both the beetles and the larvae have biting mouth parts. Consequently they are causing damage. The larvae have a distinct head and three pair of legs. The larvae of snout beetles and those of the strawberry blossom weevil are exceptions in this respect. They do have a distinct head but no legs.

- ***Strawberry blossom weevil*** - (Anthonomus rubi) -
  The strawberry blossom weevil is a small dull black beetle (3-4 mm). The beetle feeds on leaves and pollen. In spring the beetle lays its eggs in the flower buds. When doing this, it pierces the flower stem at the same time, just under the flower. Consequently the flower will bend and start hanging. From the egg a legless white larva will develop, which will pupate in the flower. After some time the beetle will appear. In September the beetles will take shelter under the ground or under dead plant material.
  Comment: *during the flowering season you should not use any pesticides that are harmful for bees!*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- ***Strawberry seed beetle*** - (Harpalus rufipes) -
  The strawberry seed beetle is a black beetle having a length, ranging from 10 to 17 mm, with yellowish red legs. It is a nocturnal animal which can often easily be found under black plastic. The beetles feed on the seeds that are on the strawberries. As a result of this damage the strawberries will become worthless.


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- ***Strawberry rhynchites*** - (Rhynchites germanicus) - Considering its size (2.5 - 3 mm) and form this beetle resembles the strawberry blossom weevil very much. However, its colour differs somewhat; dark, bluish green and glossy. Besides, the strawberry rhynchites has bent antennae and a short snout. The female will lay 1 to 4 eggs in the flower cluster stem. Subsequently she cuts the flower cluster stem off, as a result of which the whole cluster will die. The difference with the strawberry blossom weevil is, that this species cuts the flower stem and the strawberry rhynchites cuts the flower cluster stem.

- ***Nettle weevil*** - (Phyllobius pomaceus) - This beetle is measuring bout 8 mm and its colour is yellow to bluish green with golden glossy patches. After their hibernation the yellowish white legless larvae will pupate in April. After a couple of weeks the adult beetles will come out. Eggs will be laid in May. The larvae feed on plant roots. The damage is comparable to that caused by the black vine weevil.

- ***Black vine weevil*** - (Otiorhynchus species) - The grooved black vine weevil is a snout beetle of about 8 to11 mm long with dark, greyish brown, grooved wing covers. The beetles eat round bites from leaf rims. The actual damage is caused by the larvae, which are living subterraneously. The larvae are white to pinkish in colour, legless and have brown heads. They feed on the young roots of plants, as a result of which plants will die. The larvae overwinter in the soil or in the rhizome of the plant. In the latter case the plants will die.

Mites

Just like insects, mites are arthropods. They have a skin of chitin. This skin serves as external skeleton. Although we can distinctly discern in insects their head, thorax and rump, in mites the corpus is forming one whole. Insects always have 6 legs and mites have 4 legs. We can distinguish three species of mites: 1) harmless species, which feed on moss, algae and fungi, for example: moss mites; 2) harmful species, which suck the leaves of plants. Important species occurring in strawberry

plants are the strawberry mite and the two spotted spider mite; and 3) useful species, which feed on harmful mites. They are the so-called predatory mites. If there is no animal feed (read mites) available, they will live on pollen, fungi, etc.

- ***Strawberry mite*** - (Phytonemus pallidus spp. fragariae) - Strawberry mites are living exclusively on strawberries. They are very small (0.25 mm) and stay in curled up leaves in the centre of the plant. Looking through a magnifying glass they look like fine water droplets. However, they are moving! The adult females overwinter in sheltered places in the centre of the plant. If temperature rises about mid March, the mites move to the young leaves which are still folded. Subsequently, transparent eggs are laid in long lines along the vein of the leaf. The larvae which come out the eggs shed their skin e few times. After two or three weeks the adult mites appear. Mites can be observed in the folded young leave in the centre of the plant. This young leaf will shrink. The growing point of the plant will become dull and bluish green in color. The centre of the plant will turn brown. Attacked plants will produce short, stocky flower stems, which will not develop.

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- ***Two-spotted spider mite*** - (Tetranychus urticae) - The two-spotted spider mite can live on strawberries, but also on numerous different crops. It is also present in different weeds, such as Black Nightshade, small stinging nettle and gallant soldier. The adult females overwinter in sheltered places in the crops. In spring they become active. From mid April eggs are laid on the underside of the leaves. The larvae vary in color, from yellow to light and dark green. Sometimes they are even orange in color. Recognizing them, not the color is decisive but rather the two black spots on their body. The larvae and the mites will prick in the plant cells on the underside of the leave and suck them out. An initial attack is observed as yellow patches on the top of the leaf.

Thrips

Thrips are also referred to as thysanoptera. This name refers to their wings, which are fringed with setae, small hairs. They are also known to be specially active in flying during sultry weather. Their size is maximum a few mm so that they

can only be accurately observed when using a magnifying glass. Thrips have a few generations per annum. They are present in a large number of crops.


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Many kinds of thrips occur in The Netherlands, however, one single species is responsible for problems in horticultural crops. The problems they cause vary from sucking out of plant cells, as a result of which leaves die. Besides, a plant can react to this by providing rampant growth of tissue, which results in deformations of leaves. When leaves are sucked out, also viruses can be carried on. In strawberries especially Californian thrips (Frankliniella occidentalis) causes major damage.

Besides Californian thrips also tobacco thrips (Frankliniella fusca) and rose thrips (Thrips fuscipennis) occur in strawberry cultivation, however, these species are less harmful. It is hardly possible to recognize with what species of thrips you have to do in specific cases. This is only possible if the thrips involved will be enlarged 250 times. Eggs are laid in plant tissue, both

in flower bottoms and in leaves. Subsequently, the larvae develop in stages. This development also occurs both in the leaves and in the flower bottoms of the plant.
In the prepupating stage the greater part of the thrips drop on the ground and look for some dirt or creep under plastic to pupate. When the pupae have come out, the adult thrips will move to the plants again and after a number of days they will start laying eggs. The best way to find thrips is by removing petals and the stamina of the flowers. Larvae and adult thrips will be sucking on the fruits. This causes brown scaly sucking patches round the seeds.

Asian fruit fly, (Suzukii fly) | Drosophila suzukii
The Suzukii fly is a growing problem for the strawberries. The fruit fly female has a kind of saw at their leg drill that


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allows the hair to penetrate the hard, unripe fruit to turn off their eggs. The larvae eat the flesh, resulting in soft spots. This makes the fruit worthless for the market. The fruit fly also flies at lower temperatures, making it also noticeable in the fall.

Bacterial diseases | Xanthomonas Fragariae
This bacterial disease mostly occurs in the hot climate of southern Europe. However, it can also occur in central Europe. A very infectious bacterial disease is involved here, which can destroy complete plantings, unless stringent hygiene measures are taken in good time. The attack can be recognized as angular light green almost transparent patches on leaves, which will produce mucus after some time on the underside of the leaves.

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FERTILIZATION

Introduction

Fertilization is an important concern in the cultivation of strawberries and strawberry plants. But still can the fruits and plants not grow as desired. The following pages briefly discuss the external characteristics that a plant can display when there is a lack or excess of a particular mineral. When in doubt, engage an advisor who can conduct further investigation.

Nitrogen

Nitrogen in the plant has many functions. It ensures growth and photosynthesis of the plant and is a building block of proteins and DNA. More than 50% of the nitrogen uptake is involved in the photosynthesis in the leaves. The plant can absorb some forms of nitrogen; urea, nitrate and ammonium. Strawberry plants can also absorb organic nitrogen from the soil.

Urea is converted in the soil and substrate into ammonium, then into ammonia and then into nitrate. These processes are very complex and depend on pH, temperature, sufficient oxygen and moisture in the substrate or soil, the activity of soil life and plant activity. The disadvantage is that ammonia can volatilize during the conversion, ammonia is an intermediate step in the conversion of urea to ammonium.

Ammonium (NH_4^+) is actively absorbed by the plant, which means that this process requires energy and is temperature dependent. The plant itself can also convert part of nitrate into ammonium. The ammonium is built into the cell of the roots or is transported through the wood vessels to the sprouts.

The actively absorbed nitrate (NO3-) is transported by the wood vessels to the sprouts in the form of nitrate, ammonia and amino acids.

The absorption of nitrate causes an increase in the pH and the absorption of K +, Ca2 + or Mg2 + causes a decrease in the pH.

Deficiency symptoms
This is reflected in the overall yellowing of the plant.
The leaves between the veins discolour (chlorosis). In a very serious stage, the leaf edges will dry out and turn brown.
The roots develop less so the absorption of other minerals is also delayed. Hollow fruits can also develop.

Lack of nitrogen

Excess symptoms
Excess of nitrogen leads to larger leaves, more chlorophyl production, strong stretching of stems (weaker plant), longer growth period (susceptibility to frost) and is more attractive to harmful insects and mites. In addition, too much nitrogen can cause the plant to be less generative (less fruit production).

Phosphate

Phosphate has a stimulating and positive effect on root growth. Especially immediately after planting, the need is great and a large part of the phosphate is absorbed, which is only needed later in the season. A good root system also ensures good development of the above-ground plant parts.

Phosphate is part of a molecule that provides energy transport within the plant. By light on the plant, energy is stored and transported to the chlorophyl grains in the leaf. This energy is released again to make sugars. These sugars are used in the plant for all kinds of processes such as respiration and growth. Phosphate plays an important role in this.
Bound phosphate can dissolve through acids produced by the root. Part of the bound phosphate can eventually dissolve because it is less strongly bound to organic parts, for example. The majority of the phosphate stock in the soil is strongly bound to iron, calcium or aluminium and is therefore not absorbable by the plant.

Phosphate absorption takes place actively and is therefore temperature dependent. Because phosphate is difficult to move in the soil, the importance of a well-developed root system is crucial for good absorption. When the soil pH is between 5.0 and 6.0, most of the phosphate is available to the plant. A pH of more than 6.0 or less than 5.0 ensures that there is less absorbable phosphate for the plant.

Deficiency symptoms
If the soil temperature is too low and the weather is sunny, especially in spring, it can easily lead to a phosphate deficiency. This is reflected in the older leaves in a darker coloured leaf which has a coarse purple / red colour at the edges. Root growth is much less and fruit abnormalities

such as albinism can develop. The plant first replenishes deficiencies by removing phosphate from the vacuole in the cell of the older parts. To increase availability, phosphate must therefore be applied close to the roots.

Lack of phosphate

Excess symptoms
An excess of phosphorus does not damage plant health. The absorption of iron and zinc is reduced, which can lead to a lack of iron and zinc and as a result shows these symptoms.

Potassium

Potassium is the most abundant positive element in the plant cell, which plays an important role in various processes in the plant. It regulates the opening and closing of the stomata and thus the absorption of CO2 and it also regulates the water in the plant (osmotic pressure). It also activates enzymes that make the energy carrier ATP and is important in almost all steps of protein synthesis and thus directly determines plant growth and ensures the displacement of sugars in the plant.

The uptake of potassium is particularly high during vegetative growth. It is absorbed by the plant both actively and passively. Passive absorption means that potassium is also absorbed by the evaporation of the leaves.

Deficiency symptoms
Potassium deficiency is manifested by the brown discolouration of the leaf margins and yellowing between the veins of older leaves. Root growth is delayed and the stems turn brown. In the fruit, potassium promotes hardness, colour and taste. The plants are less resistant to frost and more sensitive to various diseases because the cell wall is more easily accessible to fungi. If there are shortages, the potassium moves from the plant cell in the old leaf to the young leaves.

Lack of potassium

Excess symptoms
An excess of potassium is also not good. During the absorption it competes with calcium, ammonium and magnesium, so that these 3 minerals are absorbed less and can cause deficiency symptoms.

In the soil, more than 90% of the potassium is very strongly bound to soil particles. Very little of this will become available to the plant.

The rest is bound to, for example, (clay) minerals and is slowly becoming available. A small portion of the total potassium stock in the soil (up to 2%) is readily available and is dissolved in the soil solution or bound to minerals and organic matter. Exchange can then take place with hydrogen, calcium and magnesium.

Magnesium

The fourth main element, magnesium, is the most abundant in the plant after potassium and plays a central role in the chlorophyl, literally and figuratively. Magnesium regulates the activity of important enzymes involved in photosynthesis and is important in the production of proteins by enzymes. More than 300 different enzymes in the plant depend on magnesium.

Magnesium easily leaches into the soil.

Deficiency symptoms

Defect symptoms can be recognized by the yellowing of the old leaves. In very serious deficiency, the leaves turn brown. The leaf yellowing is a result of processes that do not go well in the plant; starch and then sucrose accumulation takes place and photosynthesis is reduced because the photosynthetic molecule is damaged. This damage is irreversible, even after magnesium fertilization, there is no recovery. The root system is smaller and the fruits are softer. Magnesium, like potassium, is stored in the plant cell.

Lack of magnesium

Excess symptoms
An excess of magnesium does not immediately lead to symptoms. It can be stated that an excess of magnesium leads to deficiencies of calcium and potassium.

Sodium

Sodium is considered as mineral that the plant does not need. The strawberry plant is very sensitive to sodium.

Excess symptoms
As the sodium content increases, the overall plant development is less and the leaf margins can burn. Salinization can cause growth problems in field grown crops. Due to high concentrations in the soil moisture, the plant can hardly absorb water and at the same time the loss of water from the leaves accelerates due evaporation. The plant absorbs a lot of sodium, which is toxic in the plant and therefore absorbs less potassium, which causes a lack of potassium in the plant.

Chloride

The plant requires very little chloride. It plays a role in photosynthesis, uptake of water into the cell and suppressing plant diseases.

Deficiency symptoms

Field grown crops will not suffer from shortages.
There is already enough chloride in the soil or in the fertilizers. Groundwater also contains chloride and chloride is deposited from the atmosphere by precipitation. In protected crops it is important that chloride is added with fertilizers, especially if rainwater or reverse osmosis water is used.

Excess symptoms

Chloride accumulates in the leaves and is therefore toxic.
The leaf margins of the older leaves and the tips turn yellow. If the chloride content in the plant becomes too high, this will lead to leaf drop. If the crop is irrigated with water with a high chloride content, damage to the leaves can occur.

Calcium

The last main element is Calcium. This is mainly built into the cell wall and is therefore difficult to measure with plant juice analyses. Calcium is actively and passively absorbed by the tip of the hair roots. The rest of the hair root does not absorb calcium.

In cultivation in the open ground, a shortage of calcium will rarely occur. A high pH of the soil or poor basic saturation of the soil particles can cause a calcium deficiency in field grown cultivation.

Deficiency symptoms
Crops on substrate can easily have calcium deficiencies. This can have a number of causes; there is too little calcium in the nutrient solution, calcium competes with other elements due to an incorrect ratio or coco substrate is insufficiently buffered. It is also possible that the root system has not developed properly, so there are too less hair roots that can absorb calcium.

If the plant can evaporate little (passive absorption) and there is no plant activity due to low temperatures (active absorption), no or too little calcium will reach the strongly growing tissues such as leaves and fruits. Brown leaf tips are the result. This is called tip burn. The leaves warp and take on a bumpy appearance. Root growth lags underground. Because the plant cells do not grow well from the fruit, the seeds are closer together and the fruit size is smaller. Increased humidity or too much rain can also cause calcium deficiencies.

Lack of calcium

Excess symptoms
An excess of calcium in the root environment can lead to phytotoxicity. Stains from calcium salts can form around the sepals. This can be aggravated by high humidity and extra calcium fertilization.

Sulphur

The need for sulphur is low but very important for all kinds of processes. Sulphur is offered as a fertilizer in the form of sulphate. Sulphate is actively absorbed in the root and converted into sulphide by enzymes in the root and chlorophyl granules. Then it is built into a large number of amino acids (methionine) that are the building blocks of proteins, vitamins and antioxidants. Some proteins protect the plant against environmental stress and pests.
At high levels of sulphite or hydrogen sulphide in the air, the plant can absorb this via the leaf. Very high values are again phytotoxic.

Deficiency symptoms
A lack of sulphate first manifests itself in the youngest leaves and quickly turns from light green to yellow. The leaves that grow out are also smaller than normal and the plant is compact. If the shortage continues, the older leaves will also turn yellow. The leaf can also deform and produce fewer sprouts. If the sulphate fertilization is too low and there are no visible symptoms, there may still be a loss of yield.

Excess symptoms
Excess sulphate is rarely, or never, found.

Iron

The trace element iron is part of various enzymes and ensures the formation of chlorophyl, the respiratory processes and photosynthesis. Iron is immobile in the plant. This means that iron must be supplied continuously. The plant absorbs iron in the form of Fe2 +. The trivalent iron Fe3 + (iron rust) cannot be absorbed directly by the plant, but is converted at the plant root into absorbable Fe2 +.

The reason that iron is used in various chelate forms is because iron easily reacts with other (in) organic substances and is therefore no longer soluble and absorbable by the plant. The pH of the dripping water, the composition of the water and the pH of the substrate determine which type of chelate to choose. The most common chelates at a pH between 3 and 6.5 are EDTA and DTPA. As the pH increases, sulphate will bind with iron and precipitate. For crops with recirculation it is important to know how the iron chelate is produced. The 6% DTPA is made with ammonium. 3% DTPA is made with sodium, which is also in the solution. The content of sodium in 3% DTPA can be more than 10%. This sodium accumulates in the system, increasing the need to flush more drain water. All chelates are sensitive to degradation by UV light. This means that entry of UV light into the A-bin must be avoided.

Deficiency symptoms

A lack of iron can be seen by the yellow discolouration of the youngest leaves that have yet to develop. The leaves can even turn almost white. The markings are sharp with the veins that still remain green. The root volume is greatly reduced.
The cause may lie in a low soil temperature, resulting in less active uptake, a too high pH, a too high level of phosphate resulting in iron phosphate or in a fast-growing crop.

Growing in a medium that is too wet results in a lack of oxygen, which causes stagnation in uptake. A high content of zinc, manganese or magnesium in the soil or substrate also leads to an iron deficiency. A shortage can be eliminated by spraying ferrous foliar fertilizers over the crop.

Lack of iron

Excess symphoms
An excess of iron can lead to a lack of manganese.
The deficiency diseases are very similar. Manganese deficiency is also noticeable on the somewhat older leaves.

Manganese

Manganese plays a role in photosynthesis, protein metabolism and cell division. This means that it can move somewhat in the plant. The plant absorbs Mn2 +. In some enzymes it can replace magnesium. Manganese strengthens the cell walls.
At a pH> 6.5, too little is absorbed by the plant and at a too low pH, a lot of manganese dissolves, making it phytotoxic.
The sensitivity depends on the variety.

Deficiency symptoms
Manganese deficiency symptoms are reduced growth and yield and the plant is more susceptible to pathogens. The symptoms are yellow spots between the veins in the leaf and then brown leaf edges. The symptoms resemble iron deficiency. Manganese deficiency is visible on both the youngest and older leaves, in contrast to iron deficiency, which only shows itself in the top of the plant.

Lack of manganese

Excess symptoms
Excess symptoms are common. Especially when the pH is too low, the veins in the older leaf turn brown, brown spots appear on the leaf and the leaf edges turn brown.

Zinc
Zinc is part of enzymes that, among other things, make the plant hormone auxin. This hormone controls plant growth and development; formation of new roots, leaves and flowers. It also ensures that roots grow down and the plant cells are strong.

Therefore, the concentration of zinc in the stem tip is greatest and young leaves need more zinc than older leaves.

Deficiency symptoms
Rosette formation is a result of zinc deficiency because the distance between the internodes is less stretched; the leaves are clustered around the stem. Also, the plant as a whole can be smaller (dwarfism) with smaller leaves that turn yellow and show red spots. The leaves are narrower and wavy. The root system and fruit size are also smaller.

Lack of zinc

Excess symptoms
An excess of zinc is also expressed in growth inhibition, discolouration of the veins and yellowing in the top. Usually this yellowing is caused by a shortage of iron because an excess of zinc displaces the iron.

Boron

Boron is a negatively charged ion and cannot be applied in chelated form. The plant takes up boron in the form as boric acid or as boron hydroxide. It is not mobile in the plant, so just like with iron, it must be applied continuously.
Boron has a function in cell division, ensures the transport of carbohydrates within the plant to growing plant parts and ensures the proper functioning of growth substances.

During the flowering period, it ensures good fruit set and seed development.

Deficiency symptoms
A shortage of boron causes bad pollen in the flower or even the absence of pollen and fewer flowers, the petals of the flowers are smaller. The fruit therefore has a misshapen appearance. The root system is highly branched, the overall plant growth may be less and growth points may die. The passive absorption of boron means that a low soil temperature in combination with a high RH (Relative Humidity) contribute to the deficiency, due to little or no evaporation the absorption comes to a standstill.

Excess of boron
An excess of boron causes brown leaf tips and brown spots on the leaf. If the boron content is too high for a long time, the entire plant can die. Certain fertilizers can contain a high level of boron which can be phytotoxic.

Excess of boron

Copper

Copper ensures that stems are lignified and is essential for various enzymes that make proteins, vitamins and sugars. A more intense odour and colour is also caused by copper. Copper is immobile and the defects are therefore first manifested in the youngest leaves.

Deficiency symptoms

The typical symptom of copper deficiency is the spherical leaf position and a slight yellow discoloration between the veins of the young leaf. At a more advanced stage the leaf margin turns brown. New leaves are smaller and lose their shine and may eventually dry out. The top of the stem dies and the growth of the side shoots is inhibited. The plants have a compact growth and the colour of the flowers is lighter than normal.

Excess symptoms

An excess of copper is phytotoxic and often occurs in combination with an iron deficiency. An excess of copper impedes iron absorption.

Molybdenum

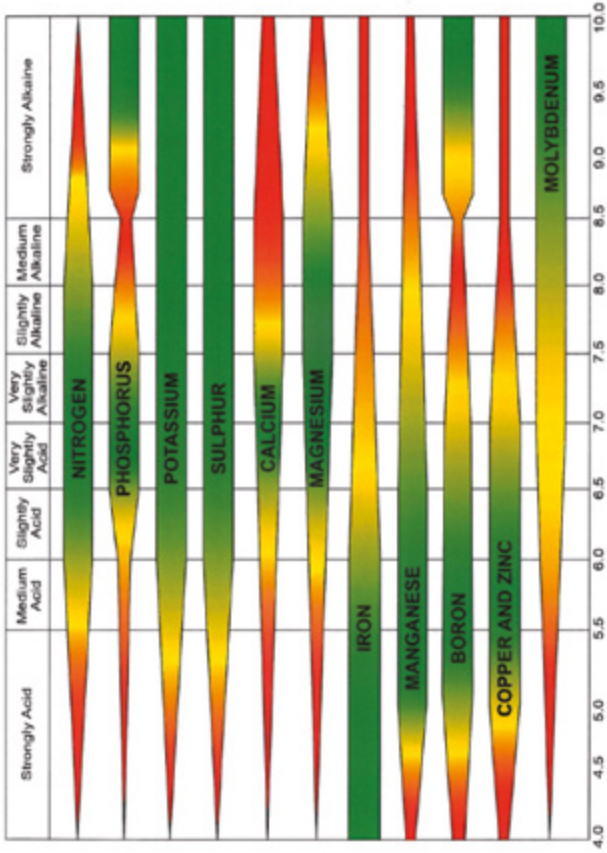
The last essential element is molybdenum. This element cannot be applied in chelated form either. The plant needs the least of these. This is involved in the formation of various essential enzymes. Some prominent enzymes with molybdenum are involved in the conversion of nitrate, sulphate and phosphate and in the energy supply in the plant cell. Molybdenum is difficult to absorb at a low pH.

Deficiency symptoms
Molybdenum deficiency first manifests itself in the young leaves. Brown dry spots appear on the leaves. The leaves stay small, curl and the leaf edges can dry out afterwards.
The symptom is very similar to nitrogen deficiency. The pollen is less viable and the fruit setting is poor. By eliminating the molybdenum deficiency, nitrate is converted better and the nitrate deficiencies within the plant are eliminated.

Excess symptoms
An excess of molybdenum is rare.

Influence of the pH on the availability of minerals to the plant.
The image opposite shows the interaction between 11 of the essential plant elements in combination with the pH level of the soil. The thickness of the line indicates the availability of the element. So the thicker the line, the greater the availability. It shows that if the soil pH is not in the correct range - 6.2 to 7.2 for most crops - mineral uptake is inhibited. That does not mean that the mineral is not in the soil, it just means that the pH of the soil is too high or too low for the mineral to be absorbed. Influence of the pH on the availability of minerals to the plant.

Mulders chart



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