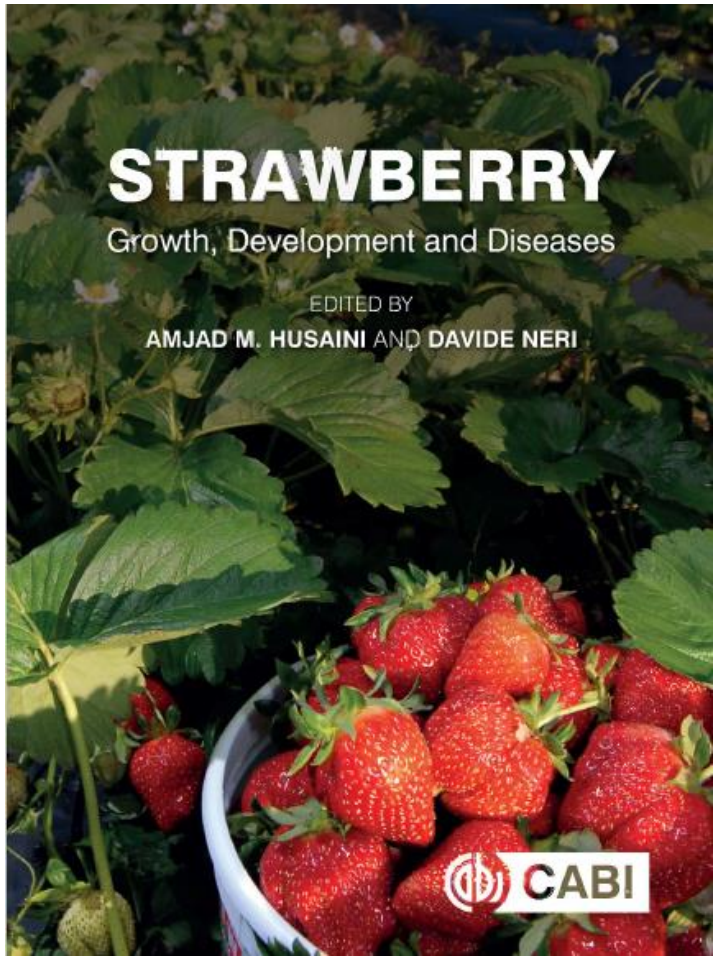

Strawberry



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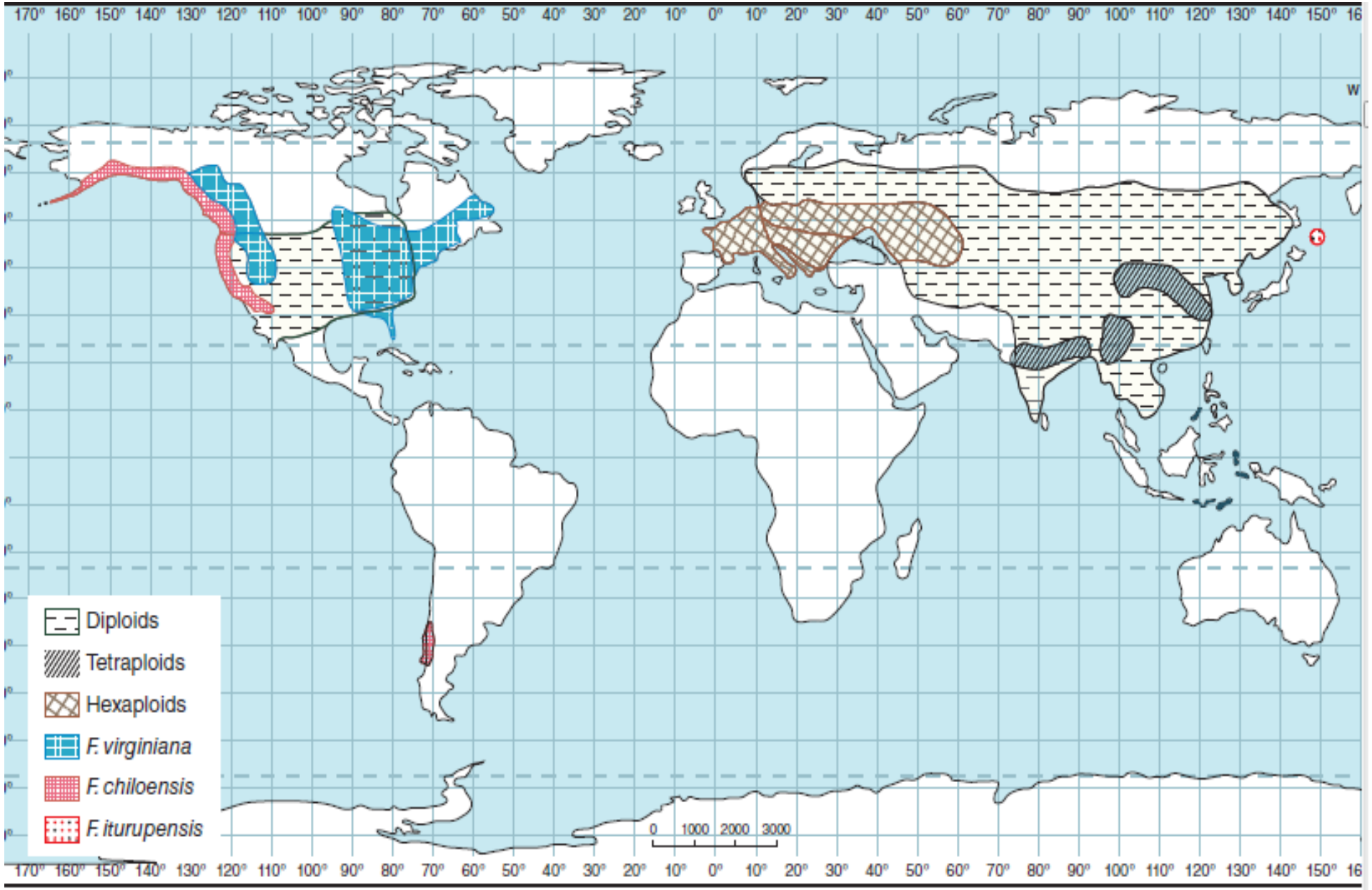


g. 2.1. World distribution of *Fragaria* spp.

Fragaria chiloensis (میوه درشت)

Fragaria vesca L.

قدیمی ترین (اوایل 1300)

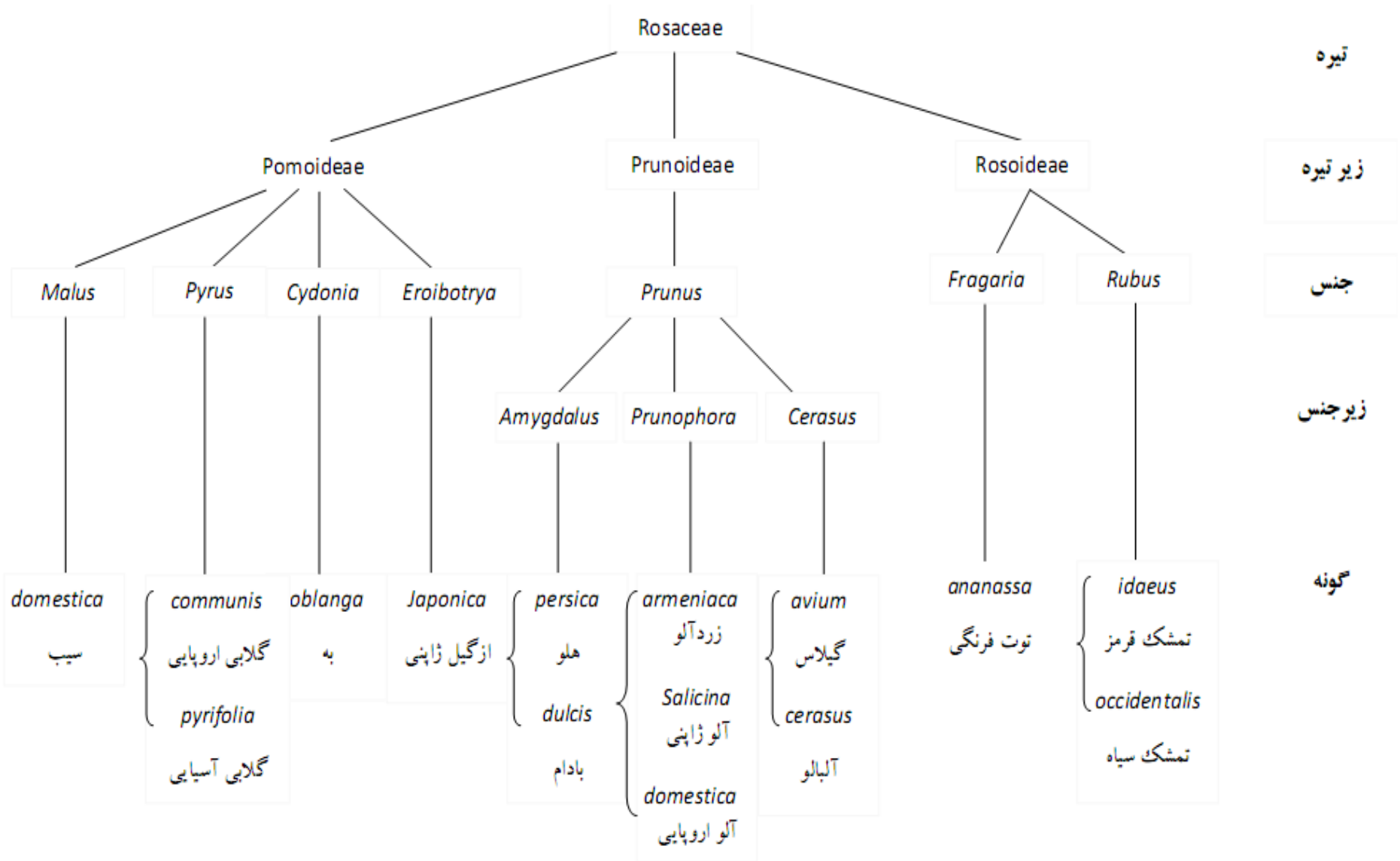
Fragaria moschata

عطر و بوی شبیه به انگور موسکادین

Fragaria virginiana

مقاوم به سرما و خشکی

نام علمی؟



از 34 گونه، تنها دو گونه (musky , woodland or alpine) در سطح کم کشت و کار می شوند

Strawberries

- Types of strawberries
  - Junebearing
  - Day neutral
  - Alpine
  - Ornamental

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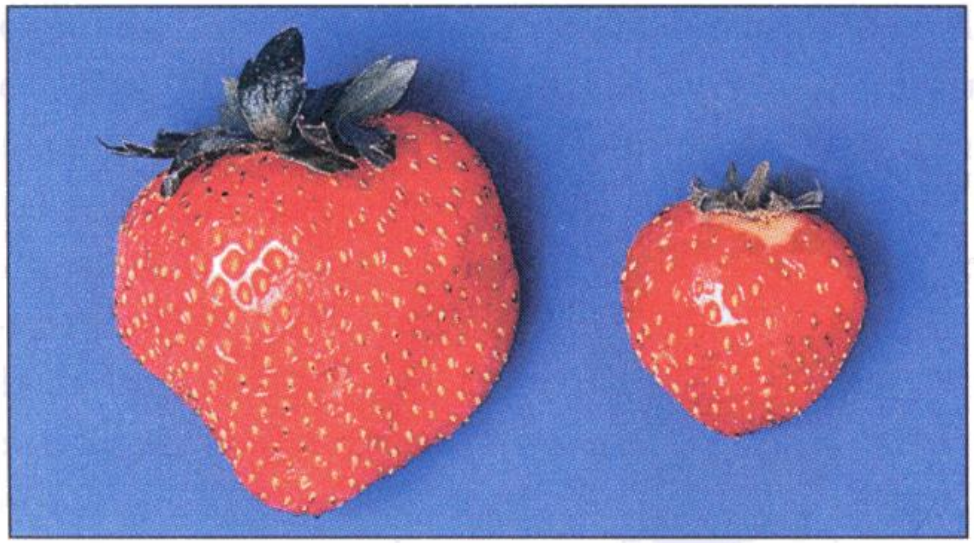
Strawberries

- Self fruitful
- Cultivars
  - Junebearing
    - Early season: 'Earliglow', 'Annapolis'
    - Midseason: 'Honeoye', 'Allstar', 'Redchief', 'Guardian', 'Darselect'
    - Late season: 'Lateglow', 'Winona'
  - Day Neutral: 'Albion', 'Seascape', 'San Andreas'
  - Alpine: 'Alexandria', 'Alpine Yellow', 'Reugen'
  - Ornamental: 'Pink Panda'



8*x*

?

?

2x

F. vesca

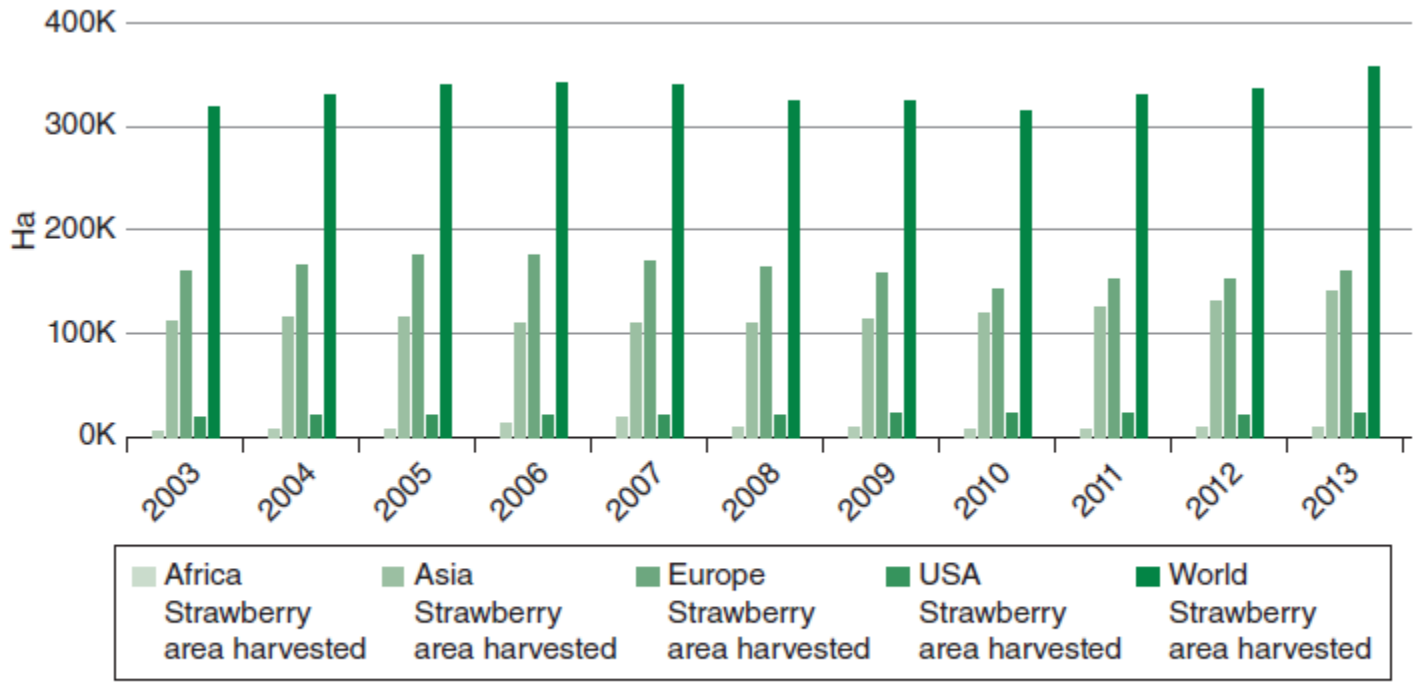


Fig. 1.1. Trend in strawberry area harvested across major regions. K, thousand.

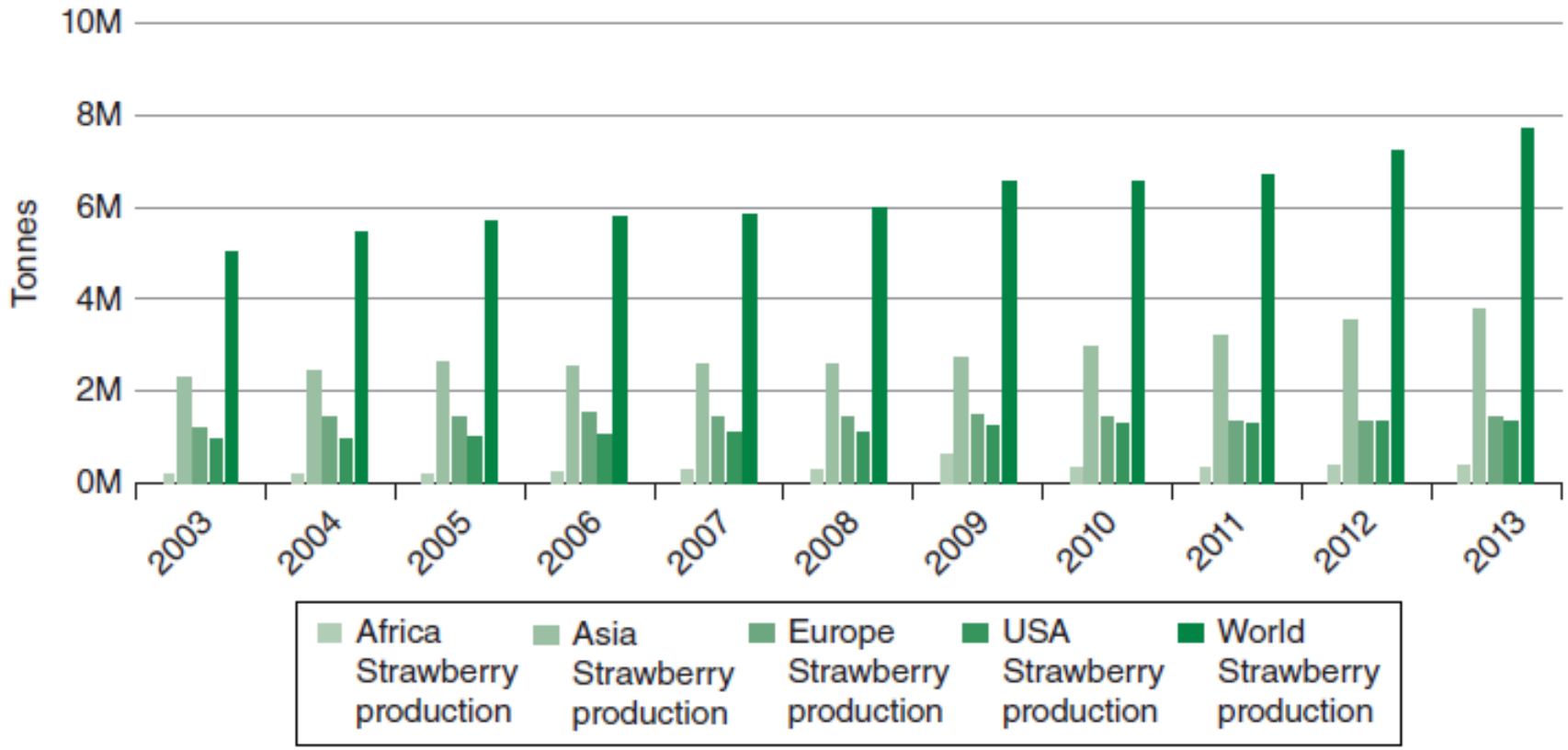


Fig. 1.3. Trend in strawberry production across major regions. M, million.

NO.1 Green Strawberry 50 seeds

NO.2 Black Strawberry 50 seeds

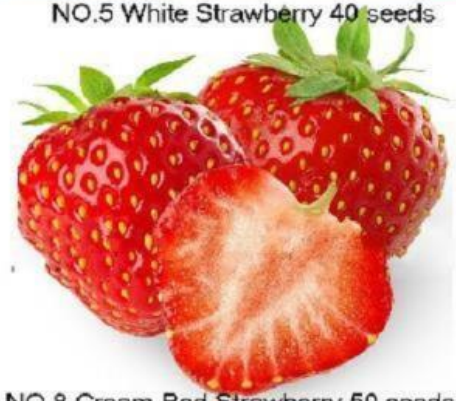
NO.3 Red Climbing Strawberry 50 seeds

NO.4 Pineberry 80 seeds

NO.5 White Strawberry 40 seeds

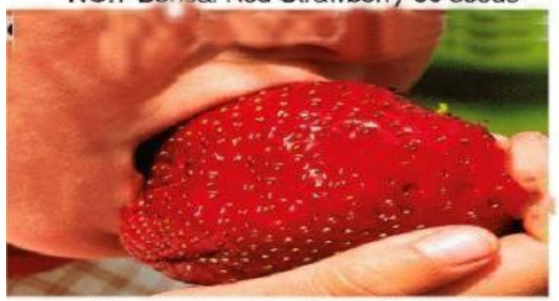
NO.6 Normal Red Strawberry 50 seeds

NO.7 Bonsai Red Strawberry 50 seeds



NO.8 Cream Red Strawberry 50 seeds

NO.9 Perennial Red Strawberry 40 seeds



No.10 Giant Strawberry 50 Seeds

NO.11 Mini Red Strawberry 50 seeds

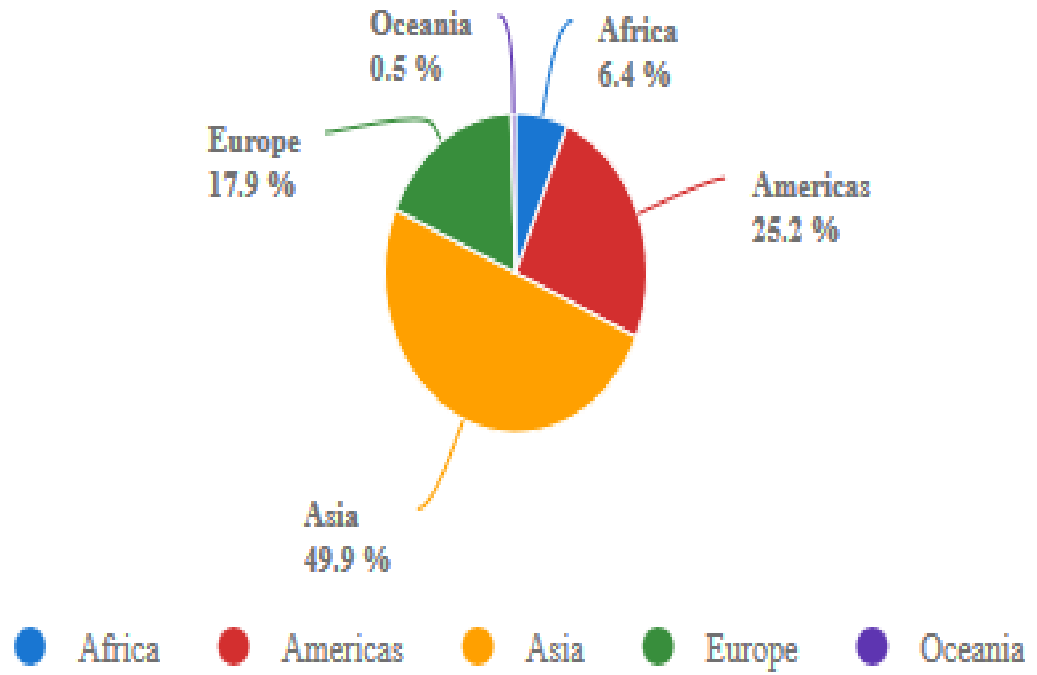
NO.12 African Blue Strawberry 50 seeds

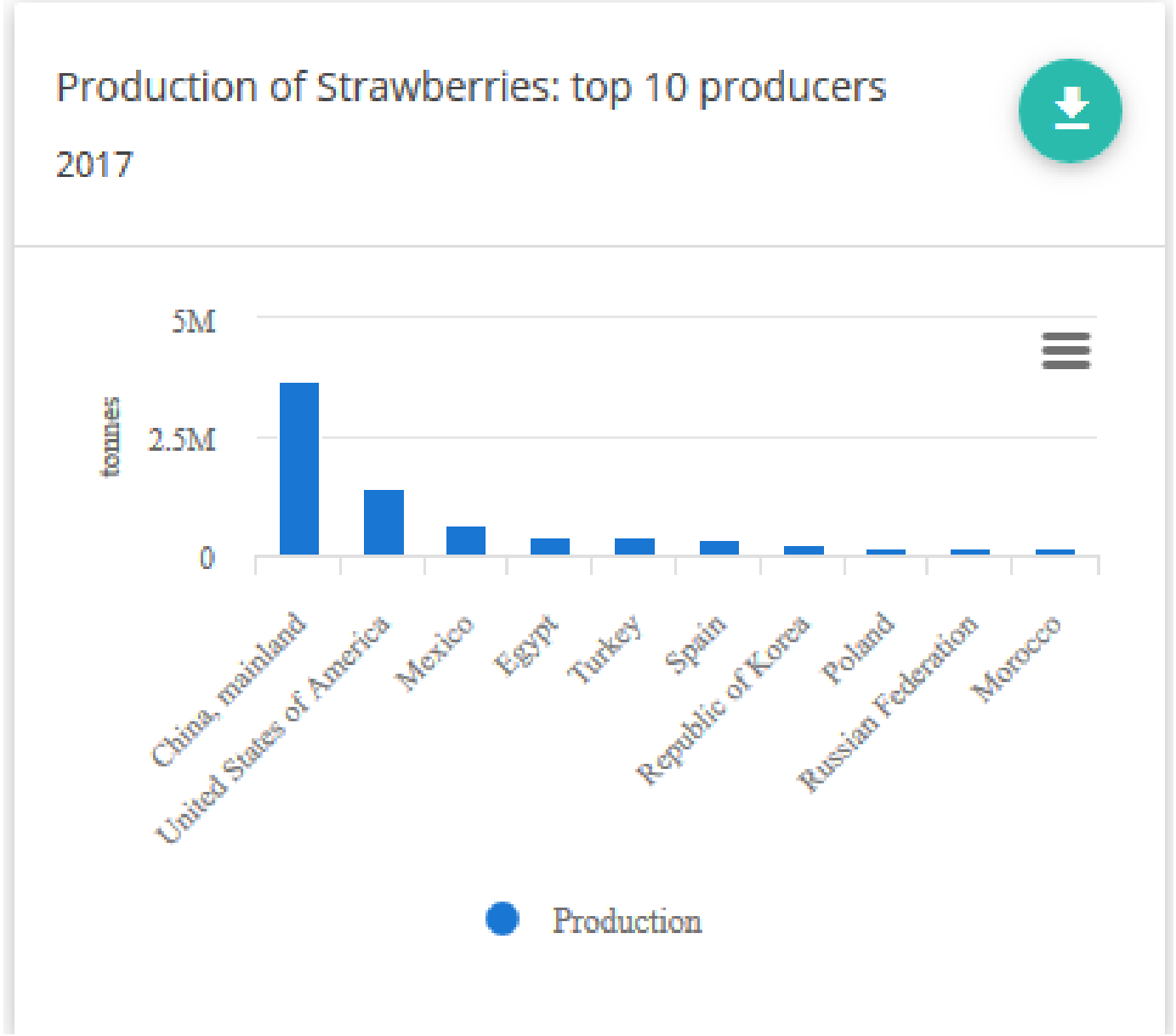
Fig. 4.1. (a) White strawberry culture in Contulmo, Región del Bio-Bio, Chile. (b) Infected plant. (c) Commercialization of white and red strawberry at the Putu market, Región del Maule, Chile. (a, b) From Rudi Montenegro (Universidad Austral de Chile, Chile); (c) from Cristina Theoduloz (Universidad de Talca, Chile).

China, mainland	2997504
United States of America	1382096
Mexico	379464
Turkey	372498
Spain	312466
Egypt	262432
Republic of Korea	216803
Poland	192647
Russian Federation	188000
Japan	165600
23. Iran (Islamic Republic of)	39296

Production share of Strawberries by region

2017





22	QC	Crops	102	Iran (Islan	5510	Productio	544	Strawberr	2017	2017	tonnes	55621	

Table 1.2. Nutritional composition of strawberry (*Fragaria* × *ananassa* Duch.). (From US Department of Agriculture: http://ndb.nal.usda.gov/ndb/search/list?qlookup=09316&format=Full.)

Component	Per 100 g	Standard error	Component	Per 100 g	Standard error
Nutrient			Lipids		
Water (g)	90.95	0.214	Fatty acids, total saturated (g)	0.015	–
Energy (kcal)	32	–	16:00 (g)	0.012	–
Energy (kJ)	136	–	18:00 (g)	0.003	–
Protein (g)	0.67	0.026	Fatty acids, total monounsaturated (g)	0.043	–
Total lipid (fat) (g)	0.3	0.047	16:1 undifferentiated (g)	0.001	–
Ash (g)	0.4	0.021	18:1 undifferentiated (g)	0.042	–
Carbohydrate, by difference (g)	7.68	–	Fatty acids, total polyunsaturated (g)	0.155	–
Fibre, total dietary (g)	2	0.152	18:2 undifferentiated (g)	0.09	–
Sugars, total (g)	4.89	–	18:3 undifferentiated (g)	0.065	–
Sucrose (g)	0.47	0.328	18:4 (g)	0	–
Glucose (dextrose) (g)	1.99	0.194	20:4 undifferentiated (g)	0	–
Fructose (g)	2.44	0.198	20:5 *n*-3 (EPA) (g)	0	–
Lactose (g)	0	0	22:5 *n*-3 (DPA) (g)	0	–
Maltose (g)	0	0	22:6 *n*-3 (DHA) (g)	0	–
Galactose (g)	0	0	Cholesterol (mg)	0	–
Starch (g)	0.04	0.029	Phytosterols (mg)	12	–
Vitamins			Amino acids		
Vitamin C, total ascorbic acid (mg)	58.8	2.473	Tryptophan (g)	0.008	–
Thiamin (mg)	0.024	0.003	Threonine (g)	0.02	–
Riboflavin (mg)	0.022	0.008	Isoleucine (g)	0.016	–
Niacin (mg)	0.386	0.037	Leucine (g)	0.034	–
Pantothenic acid (mg)	0.125	0.003	Lysine (g)	0.026	–
Vitamin B-6 (mg)	0.047	0.012	Methionine (g)	0.002	–
Folate, total (µg)	24	5.465	Cystine (g)	0.006	–
Folic acid (µg)	0	–	Phenylalanine (g)	0.019	–
Folate, food (µg)	24	5.465	Tyrosine (g)	0.022	–
Folate, DFE (µg)	24	–	Valine (g)	0.019	–
Choline, total (mg)	5.7	–	Arginine (g)	0.028	–
Betaine (mg)	0.2	–	Histidine (g)	0.012	–
Vitamin B-12 (µg)	0	–	Alanine (g)	0.033	–
Vitamin B-12, added (µg)	0	–	Aspartic acid (g)	0.149	–
Vitamin A, RAE (µg)	1	0.031	Glutamic acid (g)	0.098	–

Retinol (µg)	0	–	Glycine (g)	0.026	–
Carotene, β (µg)	7	0.22	Proline (g)	0.02	–
Carotene, α (µg)	0	0	Serine (g)	0.025	–
Cryptoxanthin, β (µg)	0	0	Minerals		
Vitamin A, (IU)	12	0.625	Calcium (Ca) (mg)	16	0.562
Lycopene (µg)	0	0	Iron (Fe) (mg)	0.41	0.026
Lutein + zeaxanthin (µg)	26	8.04	Magnesium (Mg) (mg)	13	0.222
Vitamin E (α-tocopherol) (µg)	0.29	0.024	Phosphorus (P) (mg)	24	0.72
Vitamin E, added (mg)	0	–	Potassium (K) (mg)	153	4.073
Tocopherol, β (mg)	0.01	0.002	Sodium (Na) (mg)	1	0.1
Tocopherol, γ (mg)	0.08	0.01	Zinc (Zn) (mg)	0.14	0.013
Tocopherol, δ (mg)	0.01	0.005	Copper (Cu) (mg)	0.048	0.004
Vitamin D (D2 + D3) (µg)	0	–	Manganese (Mn) (mg)	0.386	0.018
Vitamin D (IU)	0	–	Selenium (Se) (µg)	0.4	–
Vitamin K (phylloquinone) (µg)	2.2	0.29	Fluoride (F) (µg)	4.4	0.4
Anthocyanidins			Flavonols		
Petunidin (mg)	0.1	0.1	Isorhamnetin (mg)	0	–
Delphinidin (mg)	0.3	0.28	Kaempferol (mg)	0.5	0.01
Malvidin (mg)	0	0.01	Myricetin (mg)	0	0.04
Pelargonidin (mg)	24.8	0.69	Quercetin (mg)	1.1	0.04
Peonidin (mg)	0	0.05	Isoflavones		
Cyanidin (mg)	1.7	0.05	Daidzein (mg)	0	0
Flavan-3-ols			Genistein (mg)	0	0
(+)-Catechin (mg)	3.1	0.19	Glycitein (mg)	0	–
(–)-Epigallocatechin (mg)	0.8	0.35	Total isoflavones (mg)	0	0.005
(–)-Epicatechin (mg)	0.4	0.13	Formononetin (mg)	0	–
(–)-Epicatechin 3-gallate (mg)	0.2	0.02	Coumestrol (mg)	0	–
(–)-Epigallocatechin 3-gallate (mg)	0.1	0.06	Proanthocyanidin		
(+)-Gallocatechin (mg)	0	0.005	Proanthocyanidin monomers (mg)	3.7	0.8
Flavanones			Proanthocyanidin dimers (mg)	5.3	1.89
Hesperetin (mg)	0	0	Proanthocyanidin trimers (mg)	4.9	2.27
Naringenin (mg)	0.2	0.25	Proanthocyanidin 4–6mers (mg)	28.1	6.47
Flavones			Proanthocyanidin 7–10mers (mg)	23.9	3.47
Apigenin (mg)	0	0	Proanthocyanidin polymers (>10mers) (mg)	75.8	13.36
Luteolin (mg)	0	0.001			

Strawberries Varieties

Junebearing strawberries produce fruit from early June through late July and are generally overwintered

- Junebearing plants set flower buds in the fall of the year prior to fruiting when the day is relatively short, about 12 hours

Photoperiod: < 14 h or temp. < 15 C
Most sensitive to temp.

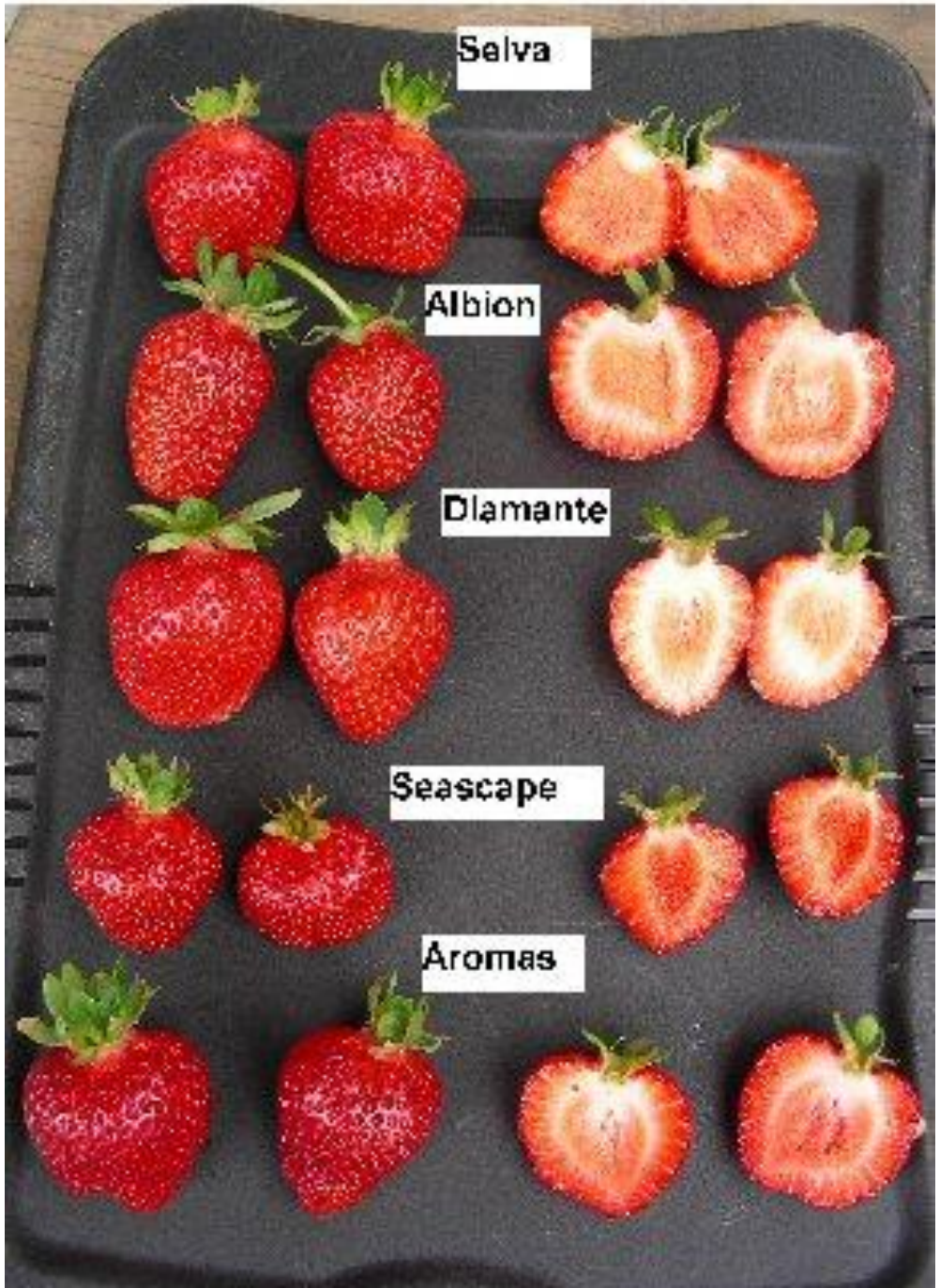
Strawberries Varieties

- **Everbearing** strawberries produce two to three harvests of fruit intermittently during the spring, summer and fall and do not send out many runners.

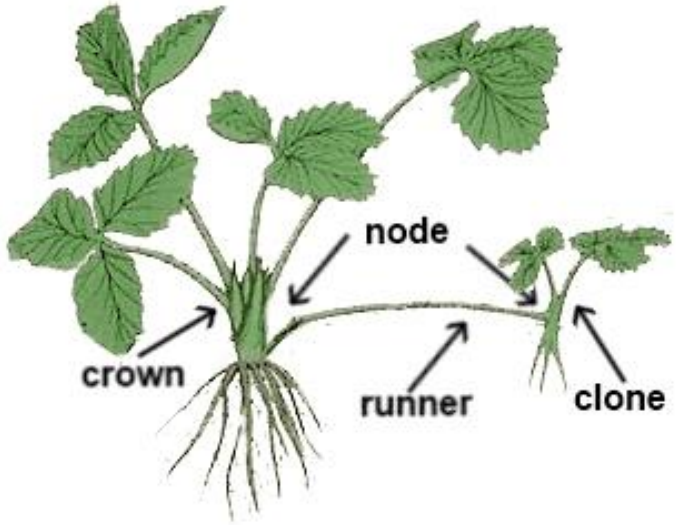
- **Day Neutral** strawberries produce fruit throughout the growing season. These strawberries also produce few runners.

کمترین مساسیت به دما

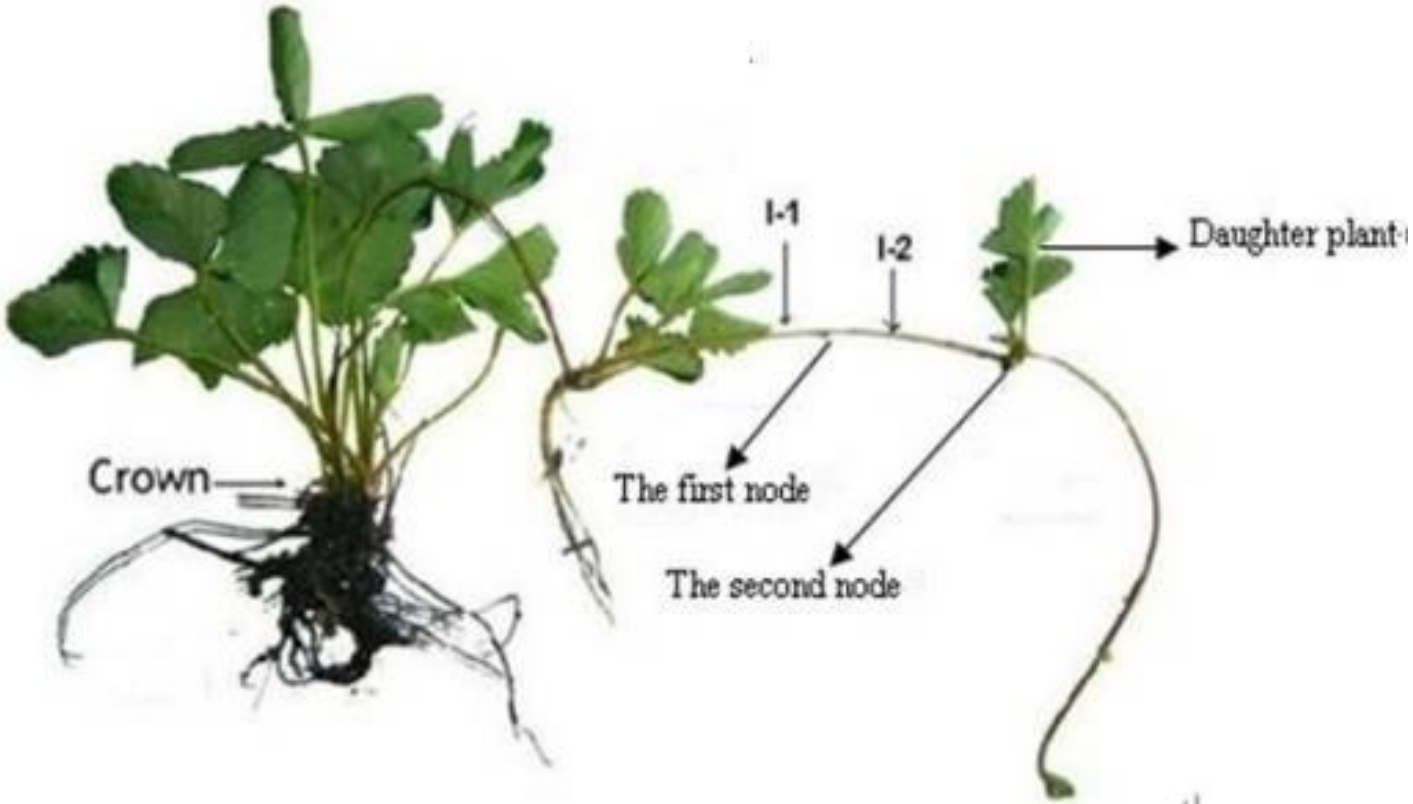
- **Long day** long day induces flowering (high temp. is limiting)



زمانی که دما در محدوده ۲۲/۱۵(شب/روز) درجه سانتیگراد باشد، توت فرنگی بدون توجه به طول روز گلدهی خواهد داشت.



Perennial
herb
runner
triplet denticulated leaves
crown (compact stem in the center)
doughter plant

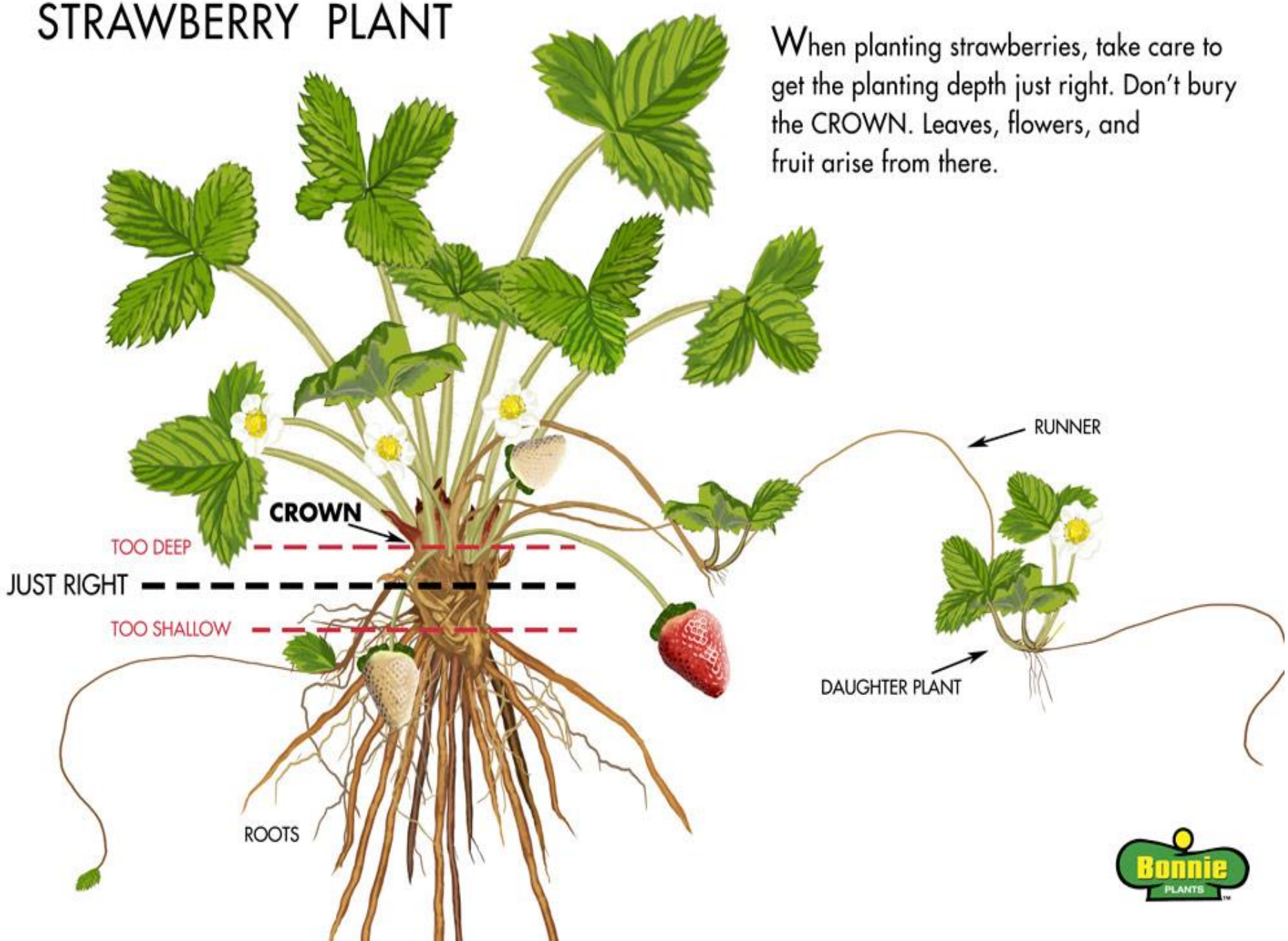


Modified Stems

- A **stolon** is a horizontal stem that is fleshy or semi-woody and lies along the top of the ground.
- A runner is a type of stolon. Strawberry
- It is a specialized stem that grows on the soil surface and forms a new plant at one or more of its nodes.
- The leaves on strawberry runners are small but are located at the nodes which are easy to see.

STRAWBERRY PLANT

When planting strawberries, take care to get the planting depth just right. Don't bury the CROWN. Leaves, flowers, and fruit arise from there.

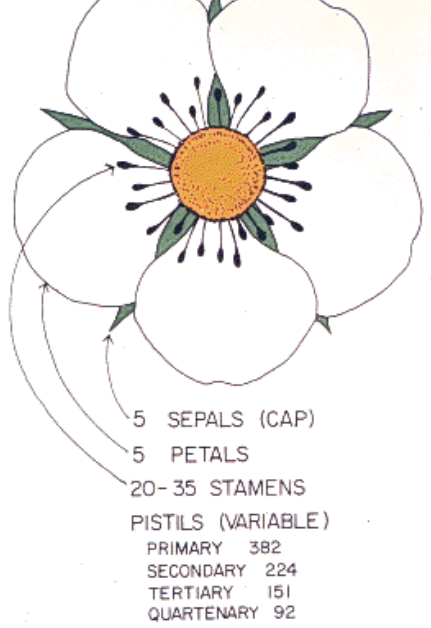


Bonnie PLANTS

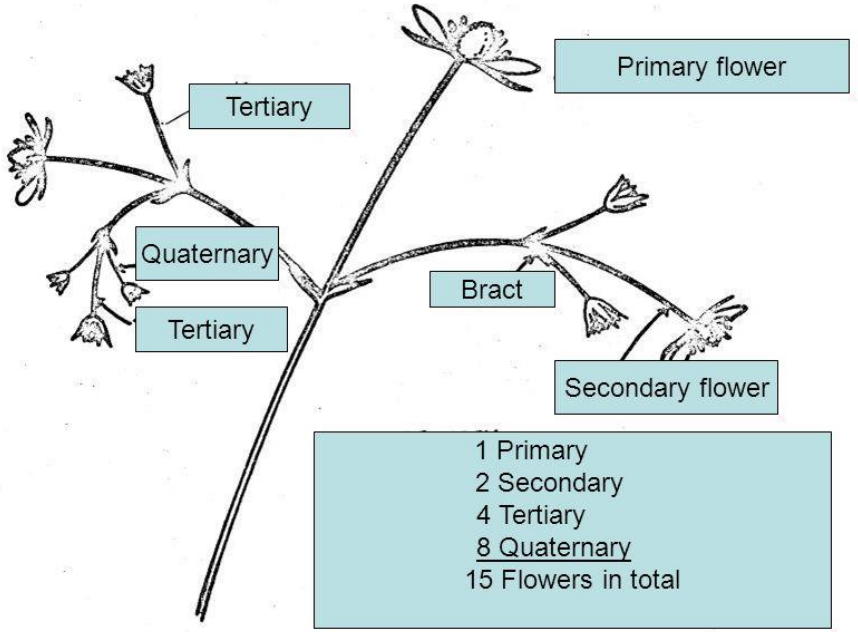
The Crown

- The crown is a short stem.
- New leaves develop with a bud in the axil of each leaf (auxiliary buds).
- The auxiliary buds will either remain undeveloped, grow and form runners or grow to form a side or branch crown.
- Environmental factors like day length and temperature influence the development of auxiliary buds.
- The buds of June bearers develop into runners during the summers long 14 to 16 hour days. Once the days grow shorter in August and September, the buds no longer form runners. Instead they form branch crowns and flower buds.
- The more branch crowns that are formed, the greater the potential for fruit production during the next year since each crown can produce one flower stalk on which fruit is borne.
- The buds of day neutrals can initiate flowers under any day length. For the Prairies this can range from mid June to October.

White
2.5 cm
50-500 pistils on a pulvinate yellow receptacle



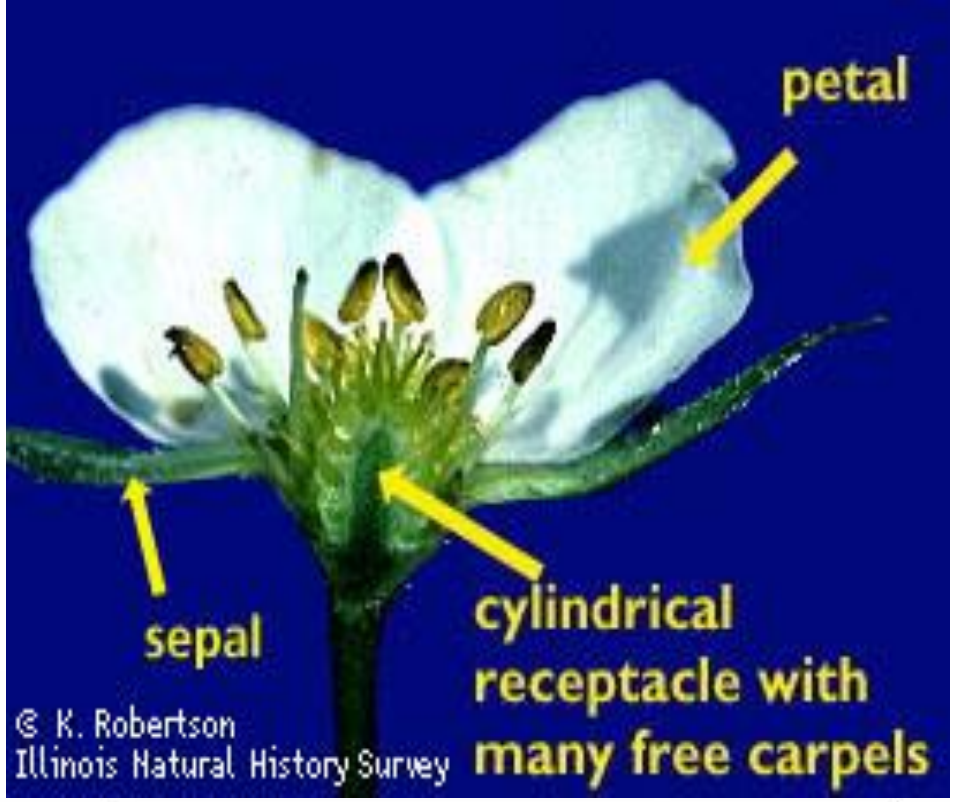
cyme inflorescence

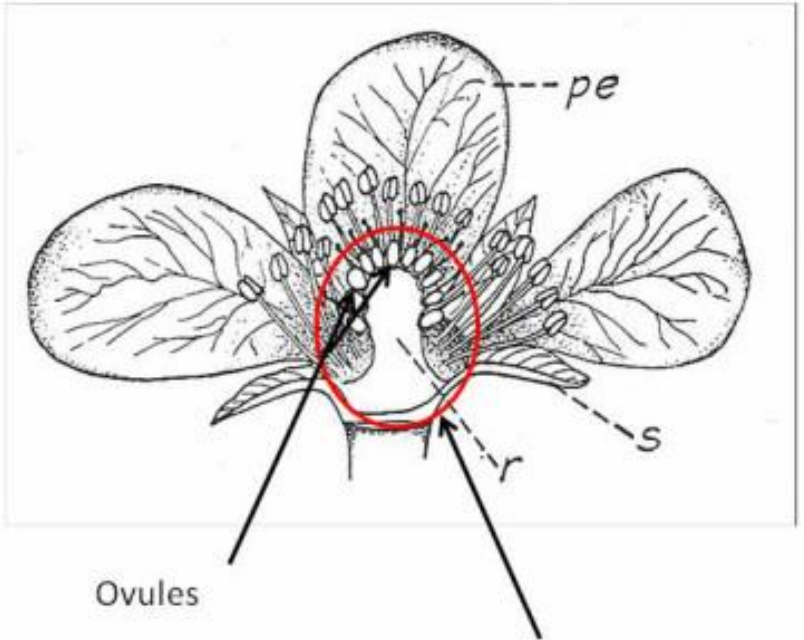


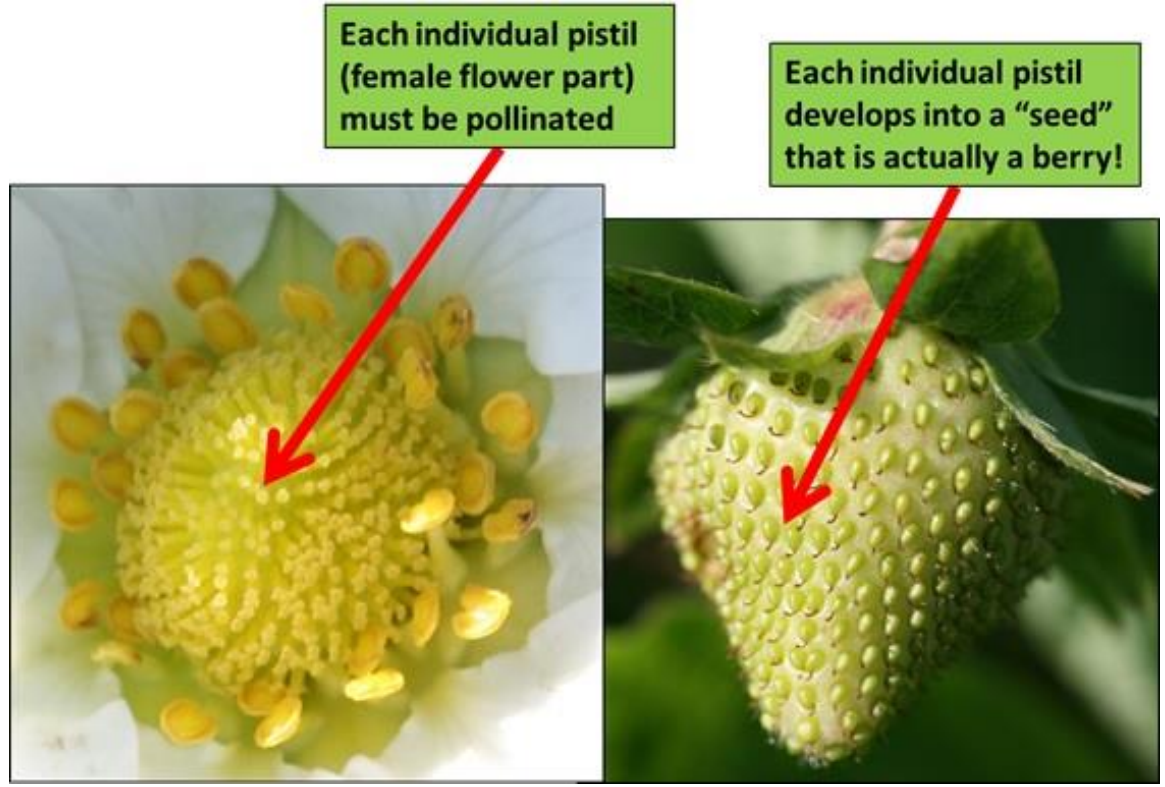
Strawberry inflorescence

The inflorescence develops a central or primary flower that opens first. This is followed by smaller secondary, tertiary and quaternary flowers opening up in sequence. The large primary flower develops into the largest berry, known as the "king" berry.

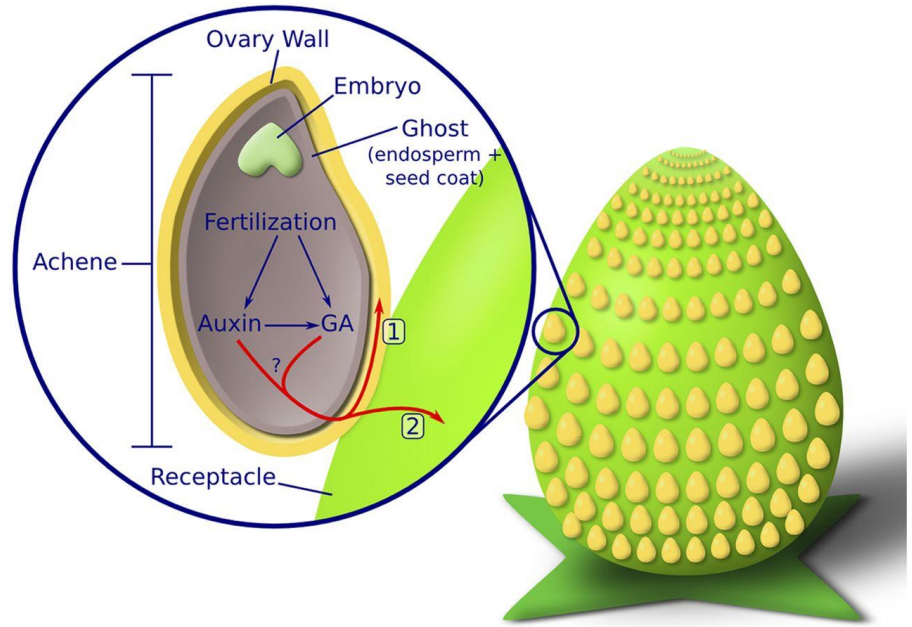
It usually takes about 30 days for flowers of June bearers to develop into fruit. This period may be reduced to 18 days with good growing conditions and high temperatures. Adverse conditions like cool weather could extend development to 40 days or more.







Self fruit full
preferably bee

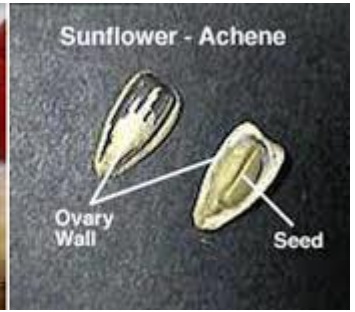


Cross-pollination by insects

vs.

Self & Wind pollination

The edible part of strawberries is the false fruit (accessory), resulting from the development of the receptacles, once fertilization occurred. The true fruits of strawberries are achenes, dry indehiscent fruits that remain attached to the fleshy false fruit. However, as we intend and eat strawberries, the fruit of the plant of strawberries is the edible part, characterized by a surface, covered with many yellow and brown small dots.

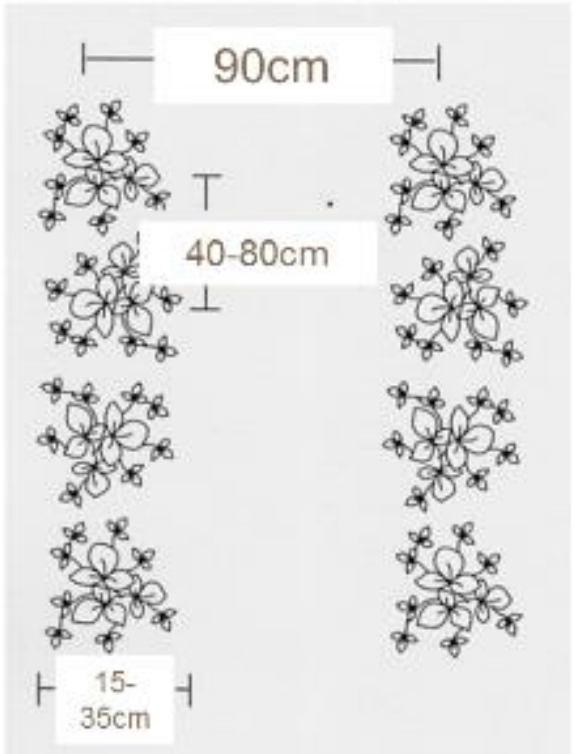


The Root

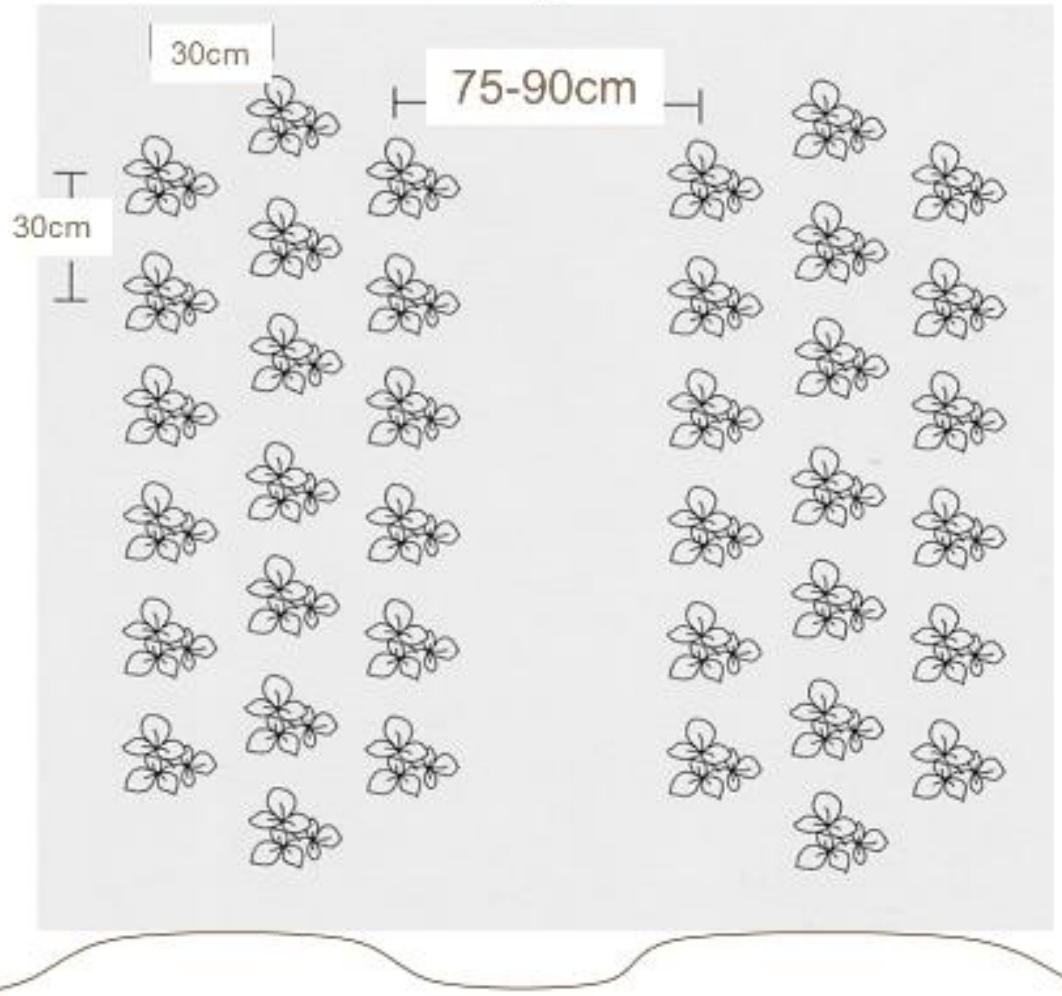
The strawberry plant is shallow rooted. Most of its roots are contained in the top 6 in (15 cm) of soil.
Day neutral plants have a shallower root system with most roots in the top 3 to 4 in (8 to 10 cm).

Planting Systems

Matted Row System



Hill System



The hill or plasticulture system uses the crowns to produce fruit with any runners removed to encourage the plant to focus on production.

Open Field Production Systems

	Hill	Matted Row
Winter temperatures	Mild	Cold
Planting dates	Summer or winter	Spring
Bed height	Raised	Flat
Mulch	Clear or black plastic	Straw
Irrigation	Trickle	Overhead
Production seasons	1–2	3–5
Cultivars	Everbearing	June bearing

Plastic covered hills ready for planting

Matted rows are planted at a lower density

Tunnel and Glasshouse Production

Tunnel production – utilizing polythene film supported by semi-circular steel frames to cover the raised beds – is widely used in Europe and the USA and helps to bring forward harvest by around 1 month and also to extend the season.

"High tunnels" - taller structures that are also enclosed against the elements - are usually passively heated and cooled, so operating costs can be minimal. Drip irrigation and plastic mulches are commonly used in crops planted into soil at high plant densities. In tunnels or glasshouses, strawberries are usually produced using the annual hill production system, spaced 30cm apart in staggered rows, with 2-4 rows in each bed (Figure 4).

Coir or coco peat – a waste fiber from coconut husks – is increasingly popular for use as a substrate in bags, slabs or pots. It needs to be prepared to remove fines and salts such as sodium chloride, which limit root development. Coir provides a better, more stable, growing media than peat and a higher level of production consistency – it is also less acid than peat at a typical pH of 4.5-6, compared to peat at 3.5-4.5. It requires an adapted fertigation programme with higher levels of calcium to balance the naturally high potassium levels in the coir, which depending upon product grade can vary from 1.6-2.0% on a dry weight basis. Coir can be used for up to four seasons and because of its more open structure water management around the roots is easier to control.

Plastic tunnel framework

High plastic tunnels

Look at all these tunnels!

How many tunnels can you see?

Matted row system of planting

- 2 feet between plants
- 3-4 feet between rows
- Watch runner placement
- Flower bud removal the 1st year for June bearing and first 60-80 days for ever-bearers

Plant in spring March-April-May

Runners develop during summer

Full "matted row" by fall

Planting depth - crown at soil level

Remove flowers during planting year

Removing the runners to maintain rows and decrease disease problems

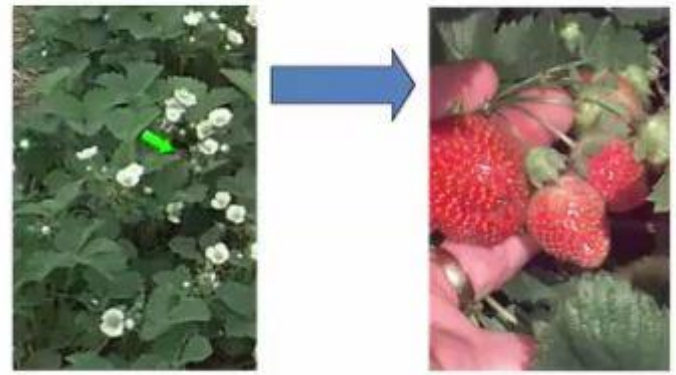
Getting strawberries ready for winter with mulch

Mulching strawberries

- Spread clean straw in late November or December
- 3 nights in the low 20's
- 4-6 inches deep -300 to 400 small straw bales per acre
- Rake into row when growth begins in spring
- Put back on for early frost protection-hard to do on a larger scale

Frost protection

30 days from bloom to harvest



Frost protection

- Watch for frost warnings whenever flowers are present
- The real need for irrigation
- Keep an eye on the Dew Point each night
- What do frosted flowers look like – black flower centers two days after a frost

Floating row covers

-earlier fruit harvest

-also an alternative to mulch

Renovating strawberries after harvest

1st - Mow off leaves

2nd - Narrow rows to 8-10 inches

3rd - Fertilize

Summary

Strawberries

- Junebearing culture, Year 1
  - Plant early in the spring
  - Remove flowers
  - Position runners to fill the row
  - Keep weeds under control
  - Fertilize in August
  - Mulch in late fall

Strawberries

- Junebearing culture, Year 1
  - Mulching materials
    - 4-6 inches of clean straw
    - Spunbonded row covers
  - Mulch after ground is cold (late November-December)

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Strawberries

- Junebearing culture, Year 2 and beyond
  - Remove mulch in March-April
  - Harvest fruit in May-June
  - Renovate after harvest
  - Fertilize in August
  - Control weeds
  - Mulch in late fall

First, the farmer makes soil mounds.

The mounds are called beds.

Some farmers use a machine to do this.

The machine is called a bedformer.

Next, the beds are covered with plastic.

The farmer makes holes in the plastic and plants the strawberry

The plastic keeps the strawberries warm and helps them grow.

The strawberry plants grow small white flowers.

The flowers die and fruit grows in their place.

Can you see the strawberries?

What colour are they?

When the strawberries turn red, they are ready to be picked.

Climate

- وجود زمستانها و تابستانهای معتدل (cool temperate)
- دمای بهینه کمتر از سایر میوه ها (بهترین دما: ۱۰ تا ۲۶ درجه سلسیوس)
- کاهش کیفیت میوه با افزایش دما، افزایش تولید برگ و رانر
- احداث تونلهای پلاستیکی درمناطق سردسیر برای محافظت از یخبندان زمستانه
- استفاده از آبیاری بارانی در تابستان در مناطق گرمسیری برای محافظت از دمای بالا
- حداقل شش ساعت آفتاب کامل
- شرایط دمایی با ثبات
- از بادهای شدید در امان باشد
- در نیمکره شمالی بهترین مکان برای تولید زمینی است که شیب ملایمی (کمتر از ۱۰ درصد) به سمت جنوب دارد.
- توت فرنگی های تازه کاشته شده به سرمای زودرس پاییزه یا بهاره حساس اند به ویژه زمانی که در مرحله رشد فعال رویشی (در مقایسه با حالت رکود زمستانه) باشند. بنابراین توصیه می شود تا عملیات پوشش گیاهان با مالچ به ویژه درمناطق سردسیرتر انجام گیرد. زمانی که دما به کمتر از ۶ درجه سانتیگراد زیر صفر برسد، باید روی بوته های توت فرنگی را با پوششی از کاه وکلش پوشاند و پس از چند هفته مقدار بیشتری کاه و کلش روی گیاهان اضافه کرد (به اندازه یک پوشش ۷تا ۱۴ سانتیمتری). این پوشش گیاهان (به ویژه جوانه ها و طوقه) را از آسیب سرما حفظ می کند.
- حساس به یخ بندان بهاره ...

Chilling requirement

- ✓ نیاز سرمایی پایین
- ✓ حدود 200 تا 300 ساعت دمای پایین بین صفر تا ۷ درجه سانتیگراد
- کاهش نرخ رشد رویشی و زایشی (سطح برگ کوچکتر، تعداد روندکهای کمتر، کاهش تعداد گلها و گل آذینها، نرخ رشد پایین ریشه ها) در زمان رکود زمستانه
- از بین رفته طوقه در دمای ۶- تا ۱۲-
- میتوان گیاهان دختری که نیاز سرمایی آنها برطرف شده است را از مناطق سردسیرتر (مثال کردستان) تهیه کرد و سپس درمناطق گرمتر (استانهای جنوبی) کشت نمود.

Soil

- Sandy loam- sand- sandy clay
- Well drainage
- pH 5.5-6.5 (pH 5-7)

depth: Not important (short life cycle- shallow roots)

sensitive to waterlogging (on 15 to 25 cm hills, not heavy soils)

sensitive to different pest and disease (not heavy soils)

sensitive to salinity

توت فرنگی نباید در مزرعه ای که در طی چهار سال گذشته در آن توت فرنگی، تمشک، یونجه، سیب زمینی، فلفل، بادمجان، لوبیا، هویج و بامیه پرورش یافته کشت گردد مگر آنکه عملیات تدخین خاک انجام شده باشد.

در کشت هیدروپونیک محلول تغذیه ای باید pH ۵/۷ و هدایت الکتریکی در حدود ۱/۵ محدوده ۱/۷ دسی زیمنس بر متر تنظیم گردد.

Strawberry site selection

- Full sun best
- Well-drained loam to sandy loam soil
- Not after some vegetables, other berries, or sod
- Vegetables include tomato, potato, green pepper and eggplant
- Weed free area

جدول (۲): ویژگی‌های بهینه خاک برای کشت توت‌فرنگی

ویژگی خاک		مقادیر	
pH		۵/۵–۶/۵	
EC (دسی‌زیمنس بر متر)		۱/۵	
مواد آلی خاک(درصد)		۲–۳	
		در دسترس (کیلوگرم در هکتار)	قابل تبادل (کیلوگرم در هکتار)
فسفر		۶۷–۹۰	–
پتاسیم		–	۳۱۵–۳۶۰
منیزیم		–	۲۸۰
بور		۱/۷–۲/۲۵	–
روی		۱۱–۱۳/۵	–

Soil fumigation is necessary
(soil texture is important)
Solarization
methylbromide

Weeds are a problem in strawberries

Irrigation

- آبیاری با آب باکیفیت
- رطوبت دایمی در منطقه ریشه(حدود 90 درصد ریشه هادر عمق ۷/۵ تا ۱۵ سانتیمتری سطح خاک قرار دارند)

جدول (۳):ویژگی‌های بهینه برای آب آبیاری توت‌فرنگی

ویژگی آب	سطح بهینه
pH	۶/۵-۸/۵
هدایت الکتریکی (EC)	۱> دسی‌زیمنس بر متر
میزان نمک‌های محلول	۴۵۰> میلی‌گرم بر لیتر
نرخ جذب سدیم (SAR)	۳۰> میلی‌گرم بر لیتر
غلظت کلر	۱۳۰> میلی‌گرم بر لیتر
غلظت بور	۰/۷> میلی‌گرم بر لیتر
غلظت نیترات	۵> میلی‌گرم بر لیتر
میزان بی‌کربنات	۱/۵> میلی‌اکی‌والان بر لیتر

جدول (۴):غلظت عناصر مختلف در تجزیه برگی توت‌فرنگی

غلظت عناصر پر مصرف (٪)	کمبود	بهینه	زیادی
نیتروژن	<۱/۵	۱/۹-۸/۲	>۴
نیترات		<۰/۸	
فسفر	<۰/۲	۰/۲۵-۰/۴	>۰/۵
پتاسیم	<۱/۲	۱/۶-۲/۵	>۳/۵
کلسیم	<۰/۶	۰/۷-۱/۷	>۲
منیزیم	<۰/۲۵	۰/۳-۰/۴۹	>۰/۸
گوگرد	<۰/۲	۰/۴-۰/۶	>۰/۸
سدیم		<۰/۱	
کلر		<۰/۵	
غلظت عناصر کم مصرف (میلی گرم بر کیلوگرم)			
منگنز	<۴۰	۵۰-۲۰۰	>۳۵۰
آهن	<۳۰	۶۰-۲۵۰	>۳۵۰
روی	<۱۵	۲۰-۴۹	>۸۰
مس	<۵	۷-۱۹	>۲۰
بور	<۱۹	۳۰-۶۴	>۹۰
مولیبدن	<۰/۵	>۰/۵	

Some farmers grow strawberries in large plastic tunnels.

The tunnels protect the strawberries from bad weather.

When the strawberries are ready, they are picked by hand.

Can you see the pickers?

They have to be picked by hand because they are too soft to be picked by machine.

Harvest

- 28 تا 34 روز پس از بازشدن گلها (درصورت بهینه بودن تمام شرایط این زمان حتی کمتر است و به حدود 24 روز میرسد)
- فاصله زمانی بین اولین گلها تا مرحله گلدهی کامل بین 11 تا 12 روز
- برداشت میوه ها به صورت یک روز در میان
- بلافاصله پس از برداشت میوه ها باید خنک شده و در انبار سرد نزدیک به صفر درجه سانتیگراد نگهداری شوند.
- میوه نافرازگراست
- شاخص های برداشت: زمانی که
90درصد سطح میوه رنگ قرمز) .
درصد . میزان مواد جامد محلول
مواد جامد محلول به اسیدیته ک

Physiological disorders

- Fruit malformation
  - گرده افشانی ضعی‌ف
  - صدمه به آکن ها در مراحل اولی‌ه رشد
  - کمبود بر
  - دماهای خی‌لی بالا ی‌ا خی‌لی پای‌ی‌ن (ی‌خ بندان بهاره)
  - حشرات مکنده
  - صدمات مکانی‌کی

Tarnished plant bug, *Lygus lineolaris*, feeds on the flowers, causing the berries to deform when they grow

Light frost injury will sometimes cause deformed berries, but this is usually associated with blackened centers in at least some adjacent flowers.

- Boron is the most commonly deficient micronutrient in strawberry plantings as it is very prone to leaching

stubby roots

- Poorly pollinated berries tend to be small with a rough, dimpled, seedy appearance similar to that of boron deficiency

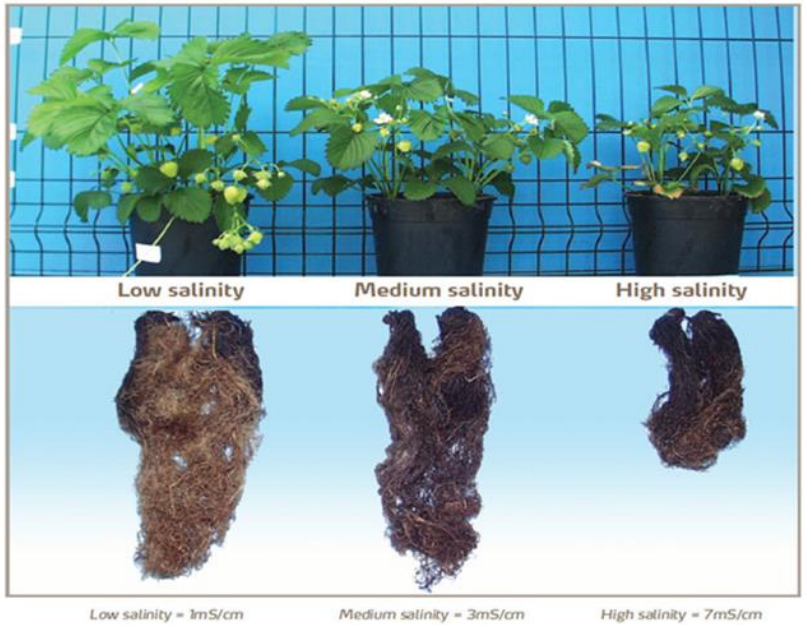
- Heat stress
  - در هوای گرم و به خصوص نور مستقیم آفتاب سلول ها آسیب می بینند
  - دمای بالا (بیش از ۲۵ درجه سلسیوس) سبب افزایش سرعت تنفس و محدودیت اندازه و کیفیت میوه می شود
  - تولید میوه های نرم و تیره و مستعد پوسیدگی

✓ سایبان، سرد [illegible] های منا

- هدایت الکتریکی بالای محلول خاک، شوری، آبیاری کم و هر بیماری ریشه که جذب آب را محدود کند، میوه کوچک و بسیار سفت ایجاد خواهد کرد.

- وجود آب خیلی زیاد، میزان کم پتاسیم و کلسیم و دمای بسیار بالا منجر به تولید میوه های نرم می شود.

Effect of salinity on strawberry growth



Propagation

- Asexual
- Sexual (several monthes, low yield in first year)
  - خریداری رانرهای تازه ریشه دار شده
  - گیاهان نشایی پیش تیمار شده (سرمادهی رانرهای تازه کشت شده موسوم به Frigo (فریگو)

Recent Advances in Strawberry Plug Transplant Technology

Edward F. Durner, E. Barclay Poling, and John L. Maas

Table 1. Definitions of terms specific to the commercial strawberry industry.

Term	Definition
Runner tip	An unrooted plantlet on the tip of a stolon (runner)
Plug plant Moduled plant Tip-raised potted plant	Small containerized plants produced from runner tips, generally grown for 3–5 weeks in 50-cell plastic trays with cell depths of 5–6 cm (1.9–2.4 inches), average crown diameter 8–11 mm (0.3–0.4 inches).
Tray plants	Containerized plants produced from runner tips, typically grown over a 5-month period (late July–December) in 8-, 12-, or 16-cell plastic trays with individual cell depths of 8–9 cm (3.1–3.2 inches), average crown diameter of 15–18 mm (0.6–0.7 inches).
Waiting-bed plants	Fresh-dug nursery plants with a crown diameter of 17 mm (0.7 inches) or more.
Fresh-dug bare-root plant	A field nursery-grown strawberry plant that is dug and transplanted to the production field within several days.
Frigo plants	Dormant strawberry plants stored for several months at –1.5 °C (29.3 °F).

Figure 1 Strawberry Plug Plant

Producing the runner tips

Site selection and establishment

The first step in producing strawberry plug plants is to produce the runner tips. Runners are produced from mother plants, which can be grown either in a greenhouse or field. Plants can be grown in the soil or in peat-filled grow bags placed on the soil or on benches. Runner production is favored by high temperatures and long days, hence outdoor production would be limited to the summertime. With either system (outdoor or greenhouse) care should be taken to prevent runners from coming in direct contact with soil. In the greenhouse, suspended growing systems (Figures 2 & 3) are used to prevent runners from coming in contact with soil. In the field, a combination of straw mulch between rows and plastic mulch within the row will prevent runner tips from contacting the soil. In the greenhouse, the first runner tips can be expected about 8 to 10 weeks after establishing the mother plant.

Greenhouses provide the ideal setting for runner production. Greenhouses can be managed to provide ideal day time temperatures (above 75°F =24 C) and long photoperiods (about 16 hours). With supplemental heat and light, runner production can occur year round.

Figure 2 Suspended growing system

Figure 3 Suspended growing system with hanging runners

Runner tips should be harvested when root initials (little white or brown pegs, Figure 4) are present on the runner tip. Root initials should not be longer than ½ inch. Additionally, at least two trifoliate leaves (first leaves that appear from the runner tip) are needed and should be between 2½ and 4 inches in length (Figure 5). Runner tips where the oldest trifoliate leaf is larger or smaller will have limited success in establishment. Depending on individual needs and desire for uniformity of runner tips, tips are generally harvested every 10 to14 days.

Figure 4 Root Pegs on Strawberry Runner Tips

Figure 5 Properly sized runner tip. Note 2 fully expanded trifoliate leaves as well as extra ½" of runner that is used to anchor the plant (arrow).

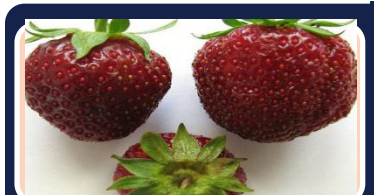
کردستان روز کوتاه، میوه هایی با بافت نرم تولید میکند و بیشتر برای مصرف در بازار محلی مناسب است

پاروس روز کوتاه، میوه های آن بزرگ، مخروطی با رنگ قرمز روشن متمایل به نارنجی است. نسبتا میانرس بوده و به ویژه در شرایط گلخانه عملکرد خوبی دارد

کاماروسا روز کوتاه، دارای برگهای بزرگ ، میوهای خوشمزه و مخروطی شکل که در اوایل باردهی وزن آن تا ۴۴ گرم هم میرسد. برای کشت در مناطقی با زمستانهایی با روزهای کوتاه مناسب است. برای شهرهای شمالی کشور مناسب تر از نواحی جنوبی است. نسبت به کمبود کلسیم حساس است و در مقابل سفیدک و ورتیسیلیوم مقاوم میباشد

سلوا روز خنثی با بوتهای قوی و پرمحصول، همیشه بار و چهارفصل دارای میوه های سفت، بسیار خوش فرم و خاص که شکل و طعم آن مورد قبول هر سلیقه ای است.

کوییناليزا روز کوتاه، میوههای آن بسیار درشت، سفت، با رنگ قرمز کم رنگ، مخروطی شانه دار با نوک نسبتا باریک است که در زمان رسیدن میوه ها سفید رنگ باقی میماند. ماندگاری بالا و و طعمی مطلوب دارد



پاجرو روز کوتاه، نوک میوه قرمز نسبتا تیره است. میوه ها درشت و مخروطی شکل می باشند.

Cultivars	Number of flowers/plant	Number of fruits/plant	Number of leaves/plant	Yield/plant (g)	Fruit volume (cm^3)	Leaf length (cm)	Leaf width (cm)
Kordestan	3.5 bc	3 bc	7.75 a	28.74 d	12.3 c	3.75 b	2.8 abc
Parose	3 cd	2.75 c	6.25 bc	36.23 cd	13.9 a	3.7 bc	2.7 cb
Marak	5 a	4.5 a	6.75 abc	54.27 a	13.57 ab	3.95 a	3.05 a
Queen	4 b	3.75 ab	7 ab	43.08 bc	11.93 c	3.55 cd	2.58 c
Selva	2.25 d	2.25 c	5.5 c	26.38 d	14.07 a	3.45 d	2.75 abc
Camarosa	4.25 ab	4 a	6.5 abc	50.05 ab	12.73 bc	3.76 ab	3 ab

Means in the same column with different letters are significantly different ($P<0.05$).

Cultivars	TSS (%)	TA (%)	TSS/TA	Fruit firmness (N)	Vitamin C (mg/100g juice)	pH
Kordestan	7.60 c	7.98 d	0.95 c	3.05 c	4.66 d	3.55 ab
Parose	6.38 d	9.08 b	0.70 e	3.65 b	6.16 b	3.68 a
Marak	7.38 c	6.85 e	1.08 b	3.75 ab	4.60 d	3.45 b
Queen	10.00 a	8.50 c	1.18 a	3.75 ab	7.05 a	3.62 a
Selva	8.05 b	9.23 b	0.87 d	3.73 ab	6.16 b	3.58 ab
Camarosa	6.43 d	9.58 a	0.67 e	3.85 a	5.28 c	3.64 a

Means in the same column with different letters are significantly different ($P<0.05$).

Potentilla fruticosa

Strawberry 'Pink Panda'