Cultivation and seed production of tomato

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AND SEED PRODUCTION

X. Tomato Growth **and** Development

The tomato is an annual that requires about 100-150 days to complete a seed to seed life cycle.

Seed germination

Seed of most varieties germinate at an optimum temperature range of 26-32°. Under optimal conditions seedlings break through the soil surface about four days after sowing. Seed sowing depth should be about 1-2 cm.

Shoot Development

After emergence, the cotyledons expand rapidly and the first true leaves develop at the growing point. Leaves grow alternately (2/5 phyllotaxy). Most varieties develop 7-11 leaves below the first inflorescence. After the first cluster, indeterminate varieties typically develop three leaves between flower clusters and six or more flower cluster on a single branch. Determinate types usually show two leaves between flower clusters and up to 5 clusters per branch. Side shoots arise from each leaf axil that lead to new branches, leaves, and flower clusters.

Flowering

Tomato is a day neutral plant, meaning that day length does not affect the number of days to flowering. The first flower of the first cluster starts to open about 55-60 days after sowing. The second cluster flowers about one week after the first and so on for determinate varieties; duration from first flowering to completion of flowering is about 45-60 days for determinates. Time length between flowering of sequential flower clusters for indeterminates is 10-14 days.

Fruit Development

Fruit require 40-60 days from flowering to full ripening. Full fruit size will be achieved in 20-30 days after flowering.

IL Plant Characters

Growth habit

Growth habit refers to the pattern of plant development and tomato plants can be classified into two major types (Figures 1 and 2):

A. *Indeterminate*

The terminal bud or the stem remains vegetative and will continue to produce leaves and stein from the growing tip. Flower clusters are formed after every three leaves. Plants can grow almost indefinitely and consequently indeterminates tend to be much taller than determinates.

B. *Determinate*

The growing point in the axil of the last-formed leaf transforms into a flower cluster, after which vegetative growth on that stein ceases. Flower clusters are formed about every two leaves. Semi-determinates have six or more clusters with two leaves between clusters. Strong determinates tend to be bushy and short compared to indeterminates. The height of semi-determinates is intermediate between determinates and indeterminates.

Growth habit has important implications for crop production and management:

	Indeterminate	Determinate
Pruning	1-2 steins/plant	None in dry season Wet season-pruning to 4 or 5 stems recommended
Plant Density*	33,000 pl/ha	" 15,000 pl/ha
Staking	Yes	Wet season-yes Dry season-usually no
Harvest Period	>5 weeks*	4-5 weeks
Mechanical Harvest	No	Yes with some varieties

*Plant densities in AVRDC tomato trials. Indeterminate varieties are pruned to 1 (dry season) or 2 sterns (wet season) per plant and staked so higher plant densities are double those of determinates which usually are not pruned.

Harvest duration for indeterminates depends upon the number of plant stems and the number of fruit clusters maintained per stein.

M. Tomato Market Types

There are three major market types in tomato based primarily on fruit type and intended use:

A. Fresh market

Fresh market tomato is used for cooking or eating raw. Most consumers prefer dark red tomatoes, globe or deep-glove shape, and 50-125 g size. However, fresh market tomatoes can vary greatly in color, shape, and size.

B. Cherry tomato

Cherry tomato fruit is small-sized (< 30g), and borne on long clusters (> 10 fruit/cluster). Cherry tomato is often sold in the fruit market rather than the vegetable market and good taste is particularly important.

C. Processing tomato

Processing tomato is produced for processing into paste, catsup, sauce, diced or whole-peel tomato. Particular fruit quality such as dark red color, high solids (brix) content and pH <4.5. In addition to the fruit characters, processing varieties are usually of determinant growth type and some have compact vine and jointless pedicel to facilitate machine harvest.

IV. Fruit Qualities (see Figure 4)

Color

The red colored fruit of most tomato varieties is due to a carotenoid called lycopene. Lycopene synthesis is temperature sensitive and little is produced at temperatures >28 C. Tomato fruit ripened under high temperatures often develop a condition called "blotchy ripening" where lycopene does not form properly. Varieties grown in the off-season should develop adequate leaves (canopy or vine cover) to shade the fruit from the sun.

Size

Depending upon the variety, average fruit range can range in size from 5->300 grams. Fruit borne on lower clusters tend to be larger than those on the upper clusters; on a given cluster, proximal fruit (those closest to the stein) tend to be

larger than distal fruit. Production of large-fruited varieties is difficult under high temperatures and. heat tolerant varieties tend to be small-fruited. At the AVRDC we have found that fruit size of heat tolerant varieties is reduced by 30% or more when grown in the summer compared to the dry season.

Shape

Fruit shape ranges from almost flat to elongated types. In most countries, consumers prefer globe, deep globe, oblong, or pear shapes (Figure 5).

Firmness

Fruit firmness can be defined as the resistance of the fruit pericarp to pressure and thick walls are often associated with firmness. Finnness is a critical quality character because it determines whether or not *fruit can* be shipped to distant markets. Tomato fruit soften as they develop from immature green to full red color.

Solids (°brix)

Tomato fruit is about 95% water, and 4-5% organic compounds called solids. The solids portion consists of about 50% sugar (glucose and fructose) found mostly in the fruit wall; 25% is alcohol insoluble solids which. include pectins, cellulose, proteins, polysaccharides; and organic acids, mostly citrate and malate. The remainder of the solids consists of carotenoids, volatile compounds, amino acids, and inorganic compounds.

A high solids content is important for processed tomato, especially paste. However, yield and solids content are negatively correlated (the higher the yield the lower the solids). In general, indeterminate varieties tend to have higher fruit solids contents compared to determinate types.

Acidity ((Xi citrate)

Most acid in the fruit is contained in the locules and acidity ranges in pH from 4-5 in tomato. A pH <4.5 is required for processed tomato because microbial growth is inhibited. A high acid content imparts a sour taste that is desirable in some countries.

V. Cultural Practices

Seedling Production

About 250 g of seed is required to produce enough seedlings to plant one hectare. Seed germination should be greater than 80%. Seedlings grown in individual containers produce healthier and more vigorous seedlings compared to seedlings grown in flats or seedling beds. Seedlings grown in beds or flats suffer root damage when the plants are pulled for transplanting.

Seedling container method

- Fill a 10-cm-diameter pot or seedling tray with holes for individual plants with a well-drained medium such as 2:5:1 (sand, compost, burnt rice hull).
- Maintain the pots/trays off the ground in sheltered area such as a plastic covered rain shelter.
- Plant 2-3 seeds/pot and thin to one plant 2- 3 days after emergence of the first true leaves.

Seedbed method:

s Choose a well-drained area not recently cropped with tomato. A site where air circulation is good will be advantageous.

- In soils where soilborne pathogens are a problem, burning rice straw on the seedbed or soil fiunigation may be needed.

e Broadcast and incorporate fertilizers at the rate of 40 g ammonium sulfate, 50 g calcium superphosphate, 30 g potassium chloride, and 2 kg of compost for each 1 mn^2 of bed area.

e Prepare raised seedbeds at a width of 0.8 m and a height of 15 cm or higher to allow good drainage. Plant the seeds in rows 6 cm apart at a depth of 0.5 - 1.0 cm. Cover the bed surface with a thin layer of compost or ash before thinly mulching with rice straw and covering with mesh screen at 30 cm high. About 60 g of seeds are required per 250 m^2 seedbed.

®Care must be taken to prevent the soil from drying out and forming a crust on the soil surface. This crust often prevents seedling emergence, resulting in poor stand. Sprinkler irrigation of the seedbed is preferable to surface irrigation.

* Seedlings must be thinned within 2 or 3 days after the first true leaves appear.

Land Preparation

Soil types. Tomato can be grown on soil textures ranging from sand to heavy clay but silty clay loam soils are preferable. Soil pH should range from 6.0-7.0. Tomato production after paddy rice is advantageous because of lower incidence of bacterial wilt and nematodes.

Beds. Shaping the land. into beds and growing tomato on top of the bed facilitates furrow irrigation of the crop and drainage after rainstorms. Beds can be prepared in many ways. At the AVRDC, beds are made with a. mechanical bed shaper and the beds are about 1 in wide and furrows (ditches) are 50 cm wide. Bed height varies, depending upon the season. In the dry season the bed height is 20 cm and increased to 35 cm in the wet season.

Mulches. Mulching is the use of inorganic materials such as thin plastic sheets, or organic materials such as rice straw to cover the soil surface. Mulches can modify soil temperatures, reduce fertilizer leaching, decrease moisture evaporation, and improve weed control. At AVRDC we use gray plastic mulch for tomato production. The plastic mulch is covered with rice straw in the hot summer to lower the temperature of the plastic.

IV, P and K Management

Three factors determine the quantity of each inorganic fertilizer nutrient that must be applied to make up the difference between that required by tomato and that available from the soil and other unmanaged sources:

® the total quantity of uptake required to achieve the expected tomato yield;

• the portion of that total quantity that is supplied by the soil and other unmanaged sources; and

® the fraction of the fertilizer that will be recovered

The total quantity of N required to achieve the expected total yield (marketable + non marketable fruit) can be estimated by multiplying the total yield in t/ha, by 2.4. P and K uptake is estimated by multiplying N uptake by 0.35 and 1.45, respectively. The estimates are in Kg $_{P2O5}$ and Kg K_2O per hectare. Yield is strongly influenced by the physical environment as well as by management practices. Estimates of expected yield should be

based on local experience and they should be realistic. If an overly ambitious estimate is accepted, fertilizer rates will be too high.

Fertilizer recovery is a function of nutrient availability, fertilizer rate, the form of fertilizer, and crop and fertilizer management practices. At optimum N rates, recoveries can range from about 40% when the soil is depleted of N and the crop is highly productive, to nearly 0% when the soil contains abundant N in available form and or the crop is unproductive. Corresponding recovery rates for P and K are 8 and 45%, respectively. As for N, recovery will approach 0% when the nutrients are abundantly available and or the crop need is small. Irrigation management and planting geometry are among the crop production practices that affect recovery. But more importantly, fertilizer placement practices (e.g., surface *versus* broadcasted-plowed-in *versus* banded) and timing affect the rate of nutrient recovery.

Chemical reagents for extracting available P and K from a soil sample are well established. When soils are tested to determine how much P and K are available, fertilizer recommendations are valid only if the soil tests have been calibrated for representative soil classes. Tests for available N are problematic. Soil fertility specialists familiar with local soils and production practices will be able to advise on methods of placement, sources of nutrients (including the fertilizer N, P and K equivalents of animal manures and composts), and rates of nutrient recovery.

In summary, if a reasonable estimate of the N, P and K requirements of a tomato crop can be established, then the appropriate soil fertility management strategies can be determined by a knowledge of soil properties and the processes that determine a soil's capacities to buffer nutrient removals and the fates of excess nutrients. A discussion of these matters is beyond the scope of this guideline. However, national soil fertility management specialists should have sufficient knowledge of nutrient supplying power for major groups of soil, the effects of past management on nutrient accumulations or depletions, the fractions of fertilizer that a crop will recover, and the effects of soil properties on recovery rates.

Transp ling

Harden the seedlings by slightly reducing water and exposing them directly to sunlight about 6-9 days before transplanting. A good seedling should be about 3-4 weeks old (4 or 5-leaf stage) and vigorous, not thin and etiolated. Transplant in the late afternoon or on cloudy clays to minimize transplant shock. For transplanting, insert the seedling in a hole so the cotyledons appear above the soil surface. Older or etiolated seedling should be buried deeper. Press soil firmly around the root. Top irrigate lightly to settle the soil. After transplanting is completed, irrigate the field as soon as possible.

Irrigation Managementfor Tomato

A water deficit during any crop stage will reduce yields. However, the crop is most sensitive to deficits during flowering, somewhat less sensitive during yield formation (fruit bulking) and immediately after transplanting, and least sensitive during vegetative growth. Because indeterminate flower and form fruit continuously after the first cluster flowers, these varieties remain very sensitive to deficits throughout post-vegetative growth.

Relative to a reference evapotranspiration rate (ETo), the actual ET of an unstressed crop is greatest when the crop canopy is at full development (ET=1.1 x ETo) and least during the slow growth period after transplanting (ET=0.4 to 0.75 x ETo). A coefficient of 0.4 is appropriate for a field that is infrequently irrigated assuming that intervals between rain are long (10 or more days). A coefficient of 0.75 is for a field that is frequently irrigated, assuming that when intervals between rains are short (i.e., the soil surface moisture is maintained by a combination of irrigation and rain). If mulch is applied the coefficient will be smaller.

The total ET of an unstressed 105-day crop which is irrigated at an average interval of about one week (or receives well distributed rainfall) is a function of ETo:

	Average daily ETo, mm/day			
	3	4	5	6
	total ET, mm/crop			
ET	310	415	520	625

Irrigation should be scheduled to assure that water in the root zone is never depleted to a level that causes canopy stress (although mild stress in the early

afternoon may be unavailable when ETo is very large). Root zones are shallow during the slow growth period after transplanting. During that period, therefore, fields should be irrigated frequently but at rates that just recharge the root zone. As the crop develops, the volume of the root zone increases. Therefore the irrigation rate can be greater and the intervals between applications lengthen accordingly.

Although the quantity of irrigation water is a function of unstressed ET, a large percentage of the water that reaches a field is lost by deep drainage, lateral seepage, and surface runoff. The quantity to apply is estimated as ZET/Ea where EET is daily ET totalled from the last date on which the root zone was recharged minus effective rainfall, and Ea is a coefficient between 0.4 and 0.7 that adjusts for irrigation efficiency. Ea varies with ir[r]igation practices and soil properties. Local irrigation management specialists will know the appropriate value of Ea as well as the method used to calculate effective rainfall. The specialists also will be able to provide seasonal estimates of ETo or the coefficients required to compute it from pan evaporation or other agricultural meteorological data.

Trellising */Staking*

Staking or trellising is the use of bamboo, wood, metal poles, or other materials to support the plant and keep the fruit and foliage off the ground. Staking can increase fruit yield and size, reduces the proportion of unmarketable fruit, and facilitates chemical spraying, and harvesting. Indeterminate varieties should be staked in the dry and summer seasons to facilitate pruning, pinching, and other cultural practices. Determinate tomato varieties should be staked in the summer season in order to avoid fruit contact with wet soil which will cause fruit rots.. Many staking ar[r]angements are possible (see Tomato Trellising Arrangements).

Fixing

Plants should be fixed securely to the stake or string supports. Rice stray, plastic strips, horticultural fixing tape, or other materials can be used for fixing. Fixing should be done so fi-uit clusters are well-supported.

Pruning

Pruning is the selective removal of side shoots to limit plant growth. Indeterminate varieties should always be pruned. Pruning may force early fruit maturity, increase average fruit size and uniformity, improve fruit flavor and increase content of vitamins A and `C content. Pruning improves air circulation in the canopy which may hinder development of foliar diseases, facilitates chemical spray applications

and eases harvest Without pruning, indeterminates will set fruit poorly in the wet season because too much photosynthate is diverted into vegetative growth instead of the fruit. The degree of pruning varies according to the season. (See `Pruning Fresh Market and Cherry Tomatoes') In Taiwan, farmers prune indeterminate varieties to one stem per plant, allowing just the main stern to bear clusters. This results in earlier maturing and larger fruit. However, in the summer two branches are maintained, the main branch, and second branch below the first fruit cluster. The reason for two branches in the summer is that the fruit require more vine cover or foliage to protect the fruit from the intense solar radiation.

Pinching

Pinching is the removal of extra flowers on the cluster and farmers may do this in order to increase fruit size. This is an advantage if markets pay a premium for larger fruit.

Hormone application.

High temperatures may drastically reduce tomato fruit-set and consequently, fruit yield. Application of tomatotone (4-Chlorophenoxyacetic acid or CPA) may increase tomato fruit-set under high temperatures.

Steps in Hormone Application

1. Prepare 1 % tomatotone solution by diluting 10 ml tomatotone concentrate per liter of water.
2. Pour the solution into a sprayer bottle and fit a cup over the nozzle large enough to fit over a flower cluster
3. Entire clusters are treated when 3-5 flowers have opened. Fit the cup over the cluster and apply one squirt. Do not treat clusters multiple times.
4. Apply hormone to flowers only, not foliage.
5. Subsequent clusters on the plant should be treated when 3-5 flowers have opened

It is important that the grower apply hormone to each flower cluster only once. Multiple applications to the same cluster may lead to fruit deformities. In order to keep track of which flowers have been sprayed the grower might mix a dye in with the hormone. The dye will remain on the flower cluster and act as a visual aid for the grower.

VI. Fruit Ripening and Maturity

The process of fruit ripening from the "mature-green" stage to the "full ripe" stage involves changes in color, fruit composition, aroma, flavor, texture, all of which are regulated by plant hormones and modified by genetic and environmental factors (Grierson and Kader, 1986). Changes include:

- Starch degradation and glucose/fructose formation
- Loss of fruit chlorophyll
- Increase in citrate and malate
- Lycopene and Beta-carotene synthesis
- Fruit softening due to increase in polygalacturonase & soluble pectins
  Production of flavor and aromatic compounds
e Breakdown of toxic alkaloid a-tomatine

Tomato is a climacteric fruit, meaning that ripening is accompanied by great surges in ethylene and respiration. The height of the climacteric happens at the pink-stage.

Stages of Fruit Maturity

Fruit ripening is a continuous process but certain development stages are generally accepted:

® **Immature** Green: no jelly in locules
- Green-mature: jelly in locules; seeds not cut when fruit cut by shape knife. Fruit will mature normally if picked at this stage

®Breaker: not more than 10% of the surface is tannish-yellow, pink, or red; Color first appears on the blossom end
- Turning: color change has occurred over 10-30% of the fruit

®Pink: 30-60% of the fruit surface has shown pink/red
e Light red: >60% but <90% fruit surface is red/pink
- Red: >90 fruit surface is red (no pink)

VII. Harvest

Tomato can be harvested at a number of ripeness stages, depending upon distance to the market and intended purpose for the fruit. For long distance transport, fruit

should be harvested at the green-mature stage, whereas fruit destined for local sale can be harvested at the pink or breaker stage. Tomato for processing is harvested at the full ripe stage.

Maturity means that the fruit have developed sufficiently so normal ripening will occur. Tomato fruit harvested at the "mature green" stage or beyond will ripen completely. Fruit harvested at the "immature' green stage will not fully ripen. It will be yellowish to pale red and have poor flavor. Green-mature tomatoes: (1) sometimes turn whitish green or develop cream-colored streaks at the blossom end at mature green stage (2) may have a fruit surface showing a waxy gloss and the skin is not readily scraped off with the fingernail (3) brown corky tissue on the stein scar (4) Well-formed jelly-like matrix in the locules and seeds are pushed aside rather than cut after fruit is sliced with a sharp knife

Green-mature fruit need about 1-5 days to reach the breaker stage at 20 °C. Higher temperatures hasten fruit ripening.

Post-harvest loss. Tomato fruit is a living organ and it continues respiration after harvest; starch and sugar reserves are oxidized and heat is produced. Higher temperatures increase the respiration rate. In addition, fruit begin to lose water after harvest. Inadequate skill and care in fruit harvesting and handling, poor packaging for shipment, poor design of shipping containers, lack of good storage facilities, inadequate and untimely transportation, lack of a standard grading system, lack of an organized marketing system all can contribute to high post-harvest losses or lower quality.

Precautions to Reduce Harvest Losses.

Harvest on time and pick selectively. Do not mix healthy and damaged fruit.

• Harvest carefully. Avoid physical injury to the fruit. Wounding and bruising increase water loss via wounds and damaged fruit respire more than healthy fruit.

e Avoid high temperatures. Fruit exposed to long periods of high temperatures will generate alcoholic and off-flavors. Harvest during cool periods such as late afternoon of early morning. Shade the fruit in the field and avoid temperatures >27 °C.

Avoid fruit dehydration. Maintaining fruit in a relative humidity range of 85-90% is ideal. RI-I below 80% will cause high fruit water loss.

• Pack fruit in containers that provide support and allow adequate ventilation to allow heat dissipation.

• Vehicles transporting the fruit to market should have good suspension to reduce jolting, especially on poor roads. Avoid over-loading.

Fruit Grading. Standard grades vary among countries but grading is based on common criteria including fruit appearance i.e. size, color, shape, uniformity; condition and absence of defects.

VIII. HYBRID SEED PRODUCTION

Produce seed in cool, dry environments. The AVRDC produces hybrid seed in the dry season when temperatures generally do not exceed at mean of 28°C and the mean night temperature is 15-20°C

®Grow 4-5 female plants to 1 male plant

• Sow the male parent about 7-10 days before the female parent so that plentiful pollen is available when the female parent is ready

• Spacing for the female parent is 60 cm between rows in a two-row raised bed and 50 cm between hills. The female parent should be staked

• Pollinate 40-50 flowers per female plant. As a rule of thumb, try to obtain 20 fruits per plant from large-fruited varieties, 30 fruits from medium-sized types, and >30 from small-fi uited types

®Plant the male parent spaced 150 cm between rows (single raised bed) and 40 cm between. hills. To promote good pollen production, grow the male in a sunny part of the field

Pollen Collection. It is best to collect pollen from freshly opened flowers in the morning. For small - it is easiest to collect pollen by use of a vibrator

equipped. with a glass collection cup. The vibrator shakes the pollen from the anther cones and it is collected in the cup.

Pollination. Flowers emasculated 2 clays earlier should be ready for pollination. With a pair of scissors, cut the corolla and the calyx of the emasculated flower buds to expose the stigma and mark the hybrid pollinations. Dip the stigma into the pollen. Remove selfed flowers from the female or clearly indicate those flowers

Typically, the pollination period will last about 30 days. The time from pollination until fruit harvest is about 45 days, depending upon the temperatures. Allow the fruit to ripen on the vine until the pink or red stage. Collect ripe fruit in a nylon mesh bag. Fermentation can be done in the same bag

Seed Extraction. Tomato seeds are enveloped in a mucilaginous sheath and fermentation hastens rotting of the gel. Harvest the fruits in nylon bags or another suitable container. Stomp on the fruit until fully crushed and the gel from the fruit is squished out. Gather bags in a large container for fermentation. If ambient temperatures are >25°C, then 1 day of fermentation is sufficient. If <25°C, then allow 2 days fermentation. HCL can be used for extraction of large seed quantities instead of fermentation. At the AVRDC, 0.7% HCL or 7ml HCL per kg wet seed is added for 20-30 minutes

Seed Washing. Loosen the net bag and pour the fermented pulp into *a* pail *so* that it occupies less than half the pail space, then fill the pail with water. Stir the mixture to break up caked portions of the -fermented pulp. The seeds will sink while the fermented remnants will float. Pour out the refuse but do not pour out the seeds. Add fresh water and repeat the procedure several times

Seed Drying. Place clean wet seeds into a nylon bag and dry using an electric dehydrator or clothes tumble dryer. Sun drying is also acceptable. Spread out the seed on an aluminium or plastic flat pan and enclose the container in a nylon bag. Dry the seeds at 28-30°C in an air drier for 2-3 days, making sure to turn the seeds several times a day. Moisture content of the dried seeds should be about 6%. Keep seeds in a cool dry place until packed into containers or packages. Seeds can remain viable for 10 years if stored at 5°C at 40% RH.

Seed Yields: one ton of fruit produces about 10 kg seed

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Figure L Anatomy of the to a o

Determinate tomato

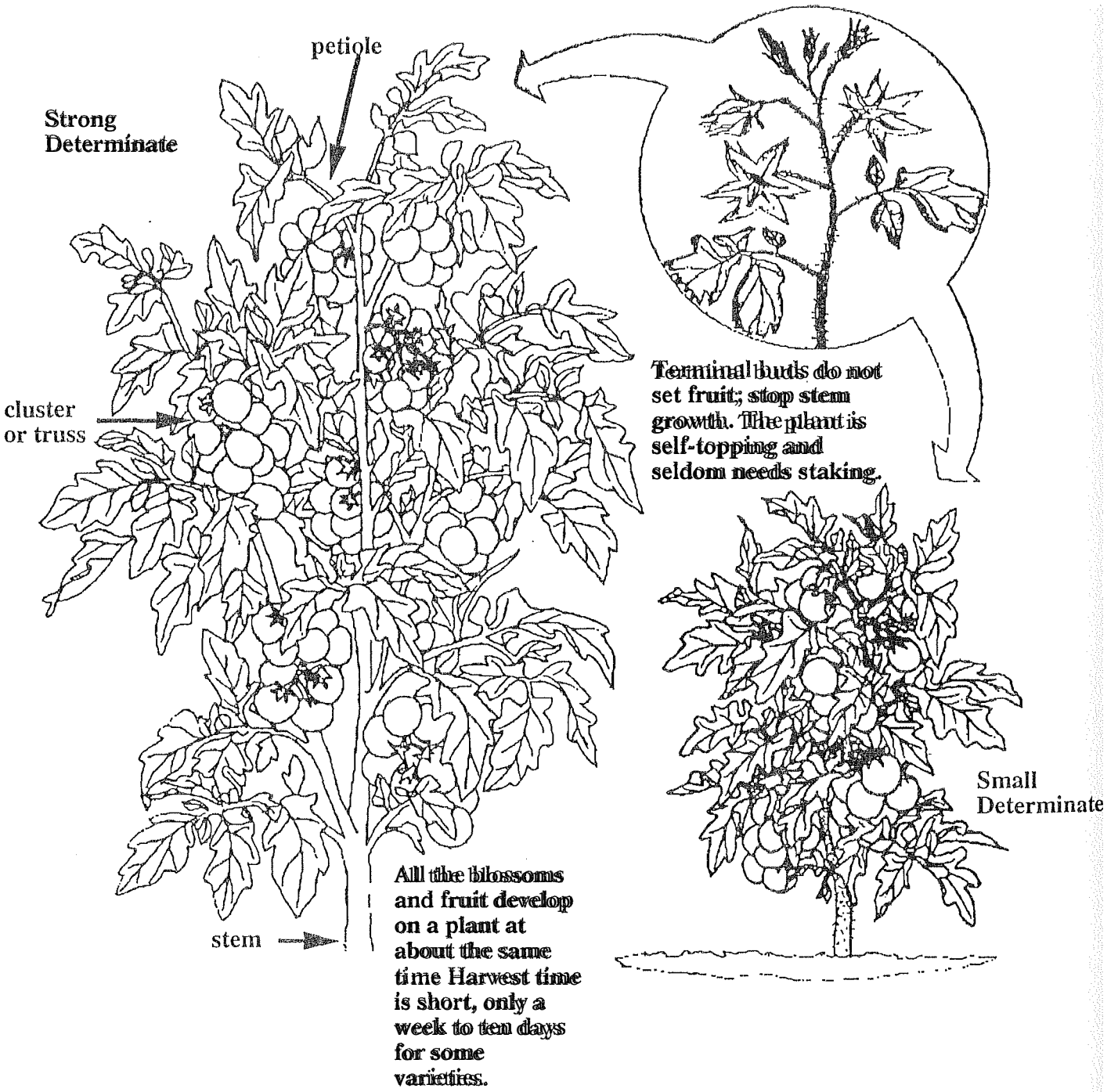
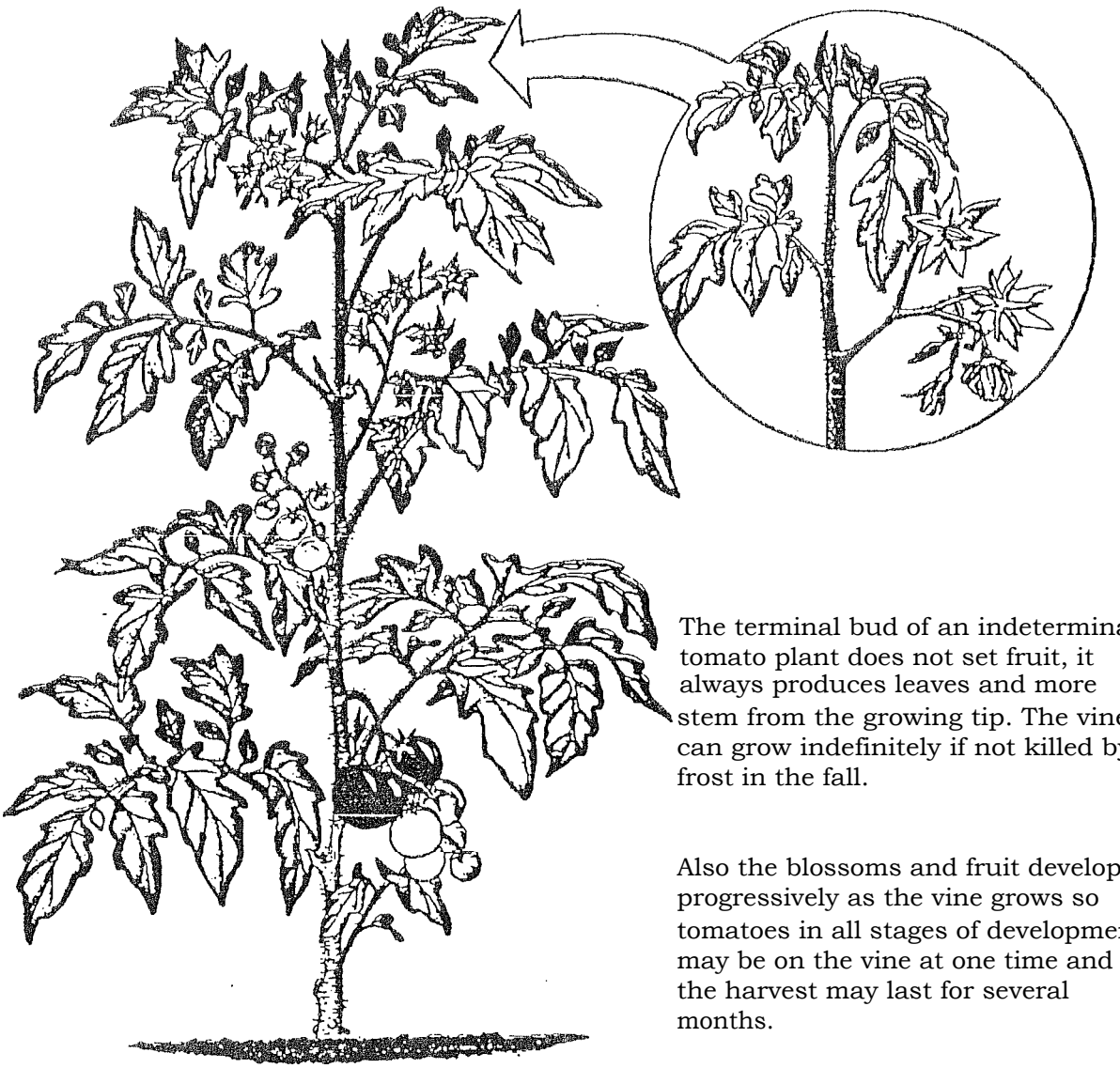


Figure . Indeterminate Tomato



The terminal bud of an indeterminate tomato plant does not set fruit, it always produces leaves and more stem from the growing tip. The vine can grow indefinitely if not killed by frost in the fall.

Also the blossoms and fruit develop progressively as the vine grows so tomatoes in all stages of development may be on the vine at one time and the harvest may last for several months.

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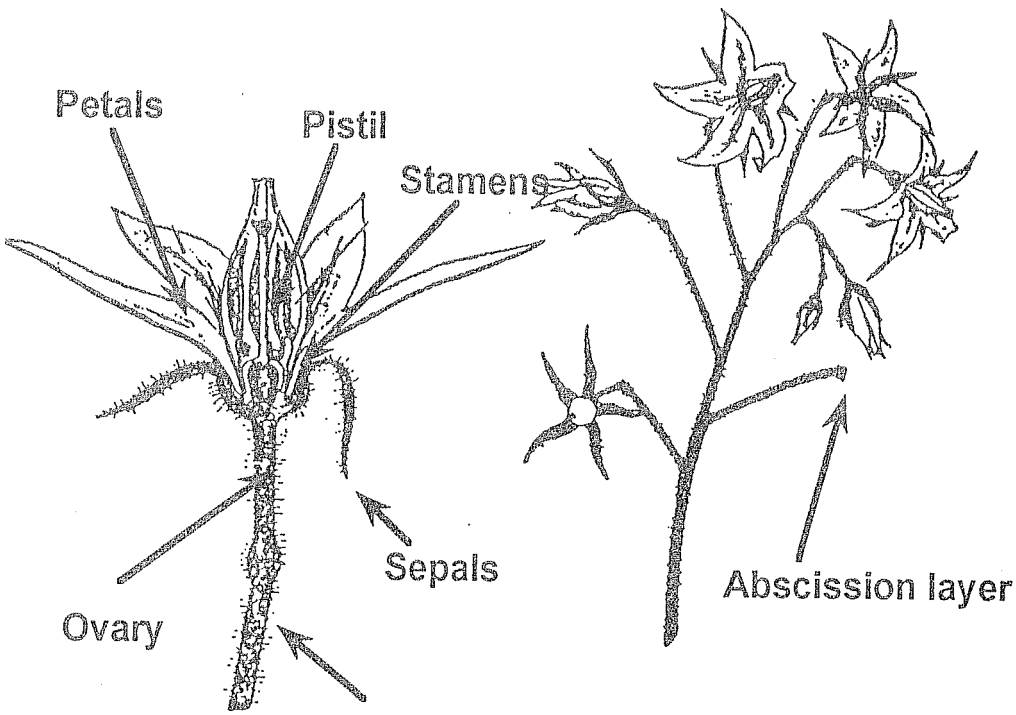
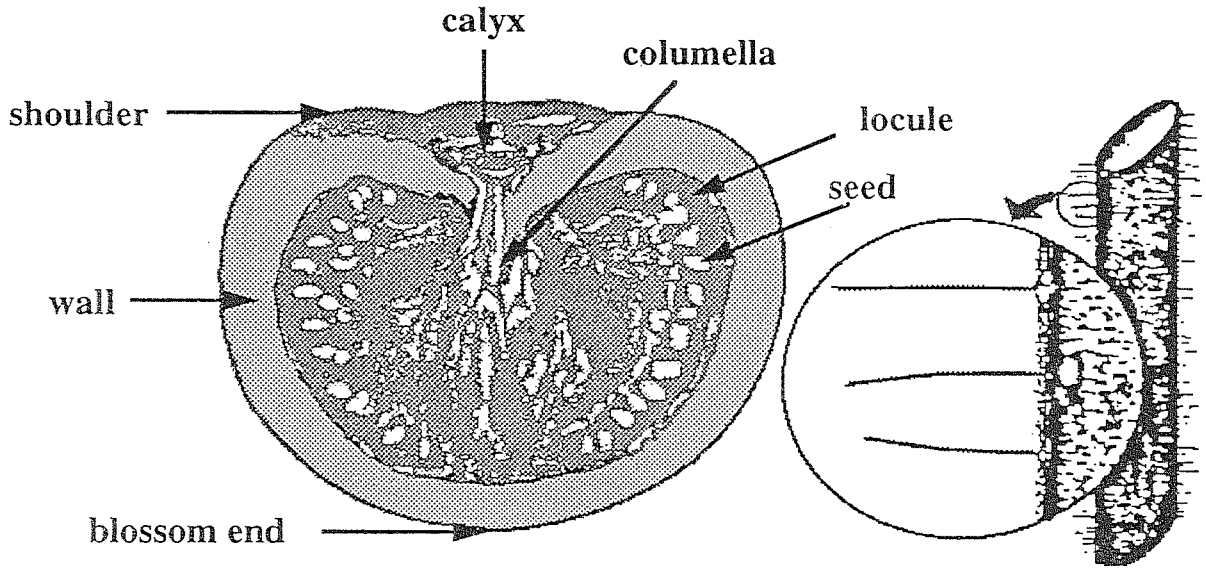


Tomato flowers are c mplete with both male and female organs and are sfly self-fertilizing. When fruit fails to set and blosso drop the abscission Layer is where it happens.

Figure 4. Tomato fruit anatomy



The fruit has two or more chambers called "locules". Large-fruited varieties have 5 to 10.
A gelatin-like substance surrounds the seeds.

Glandular hairs are found on stems and leaves.
When bent they give off the oil tht give tomatoes their characterstic odor.

Figure 5. Different shapes of tomato fruits

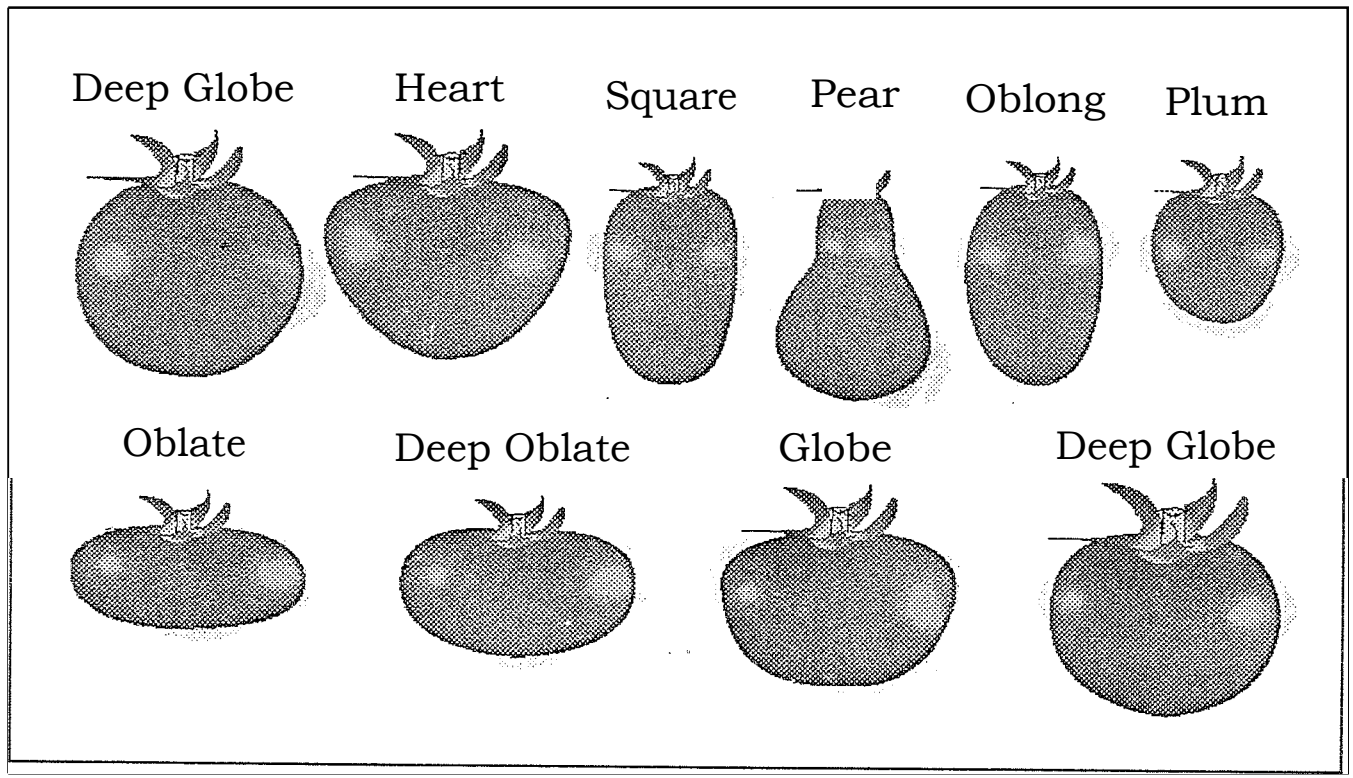
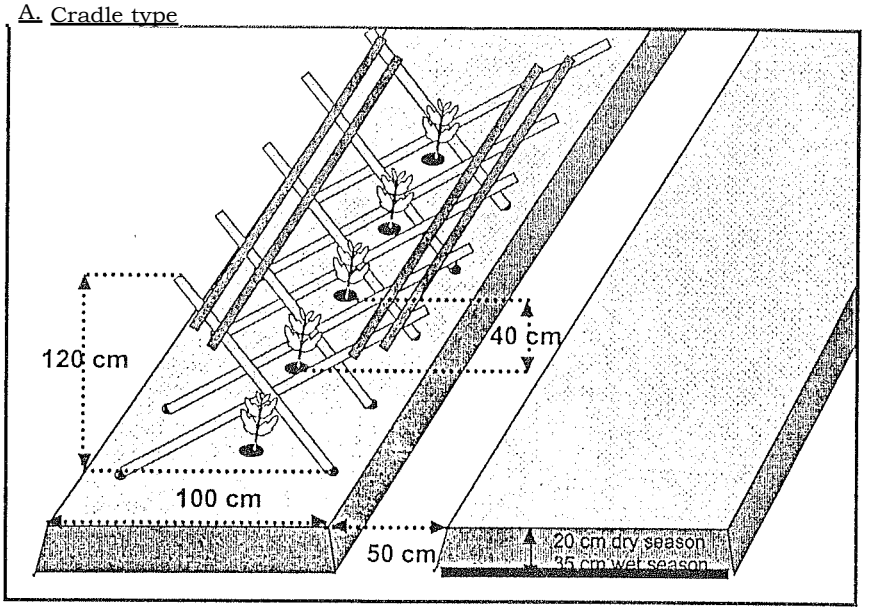
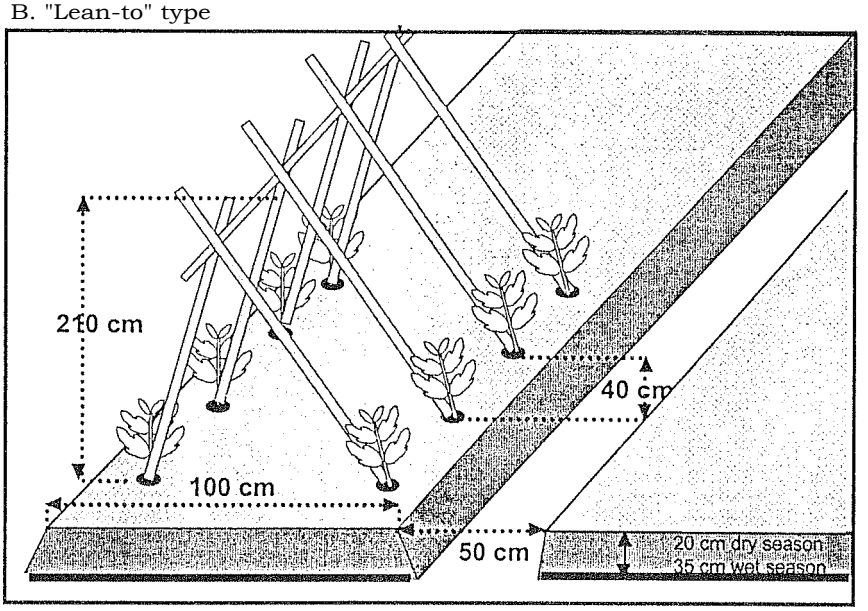


Figure 2. Tomato Trellising Arrangements

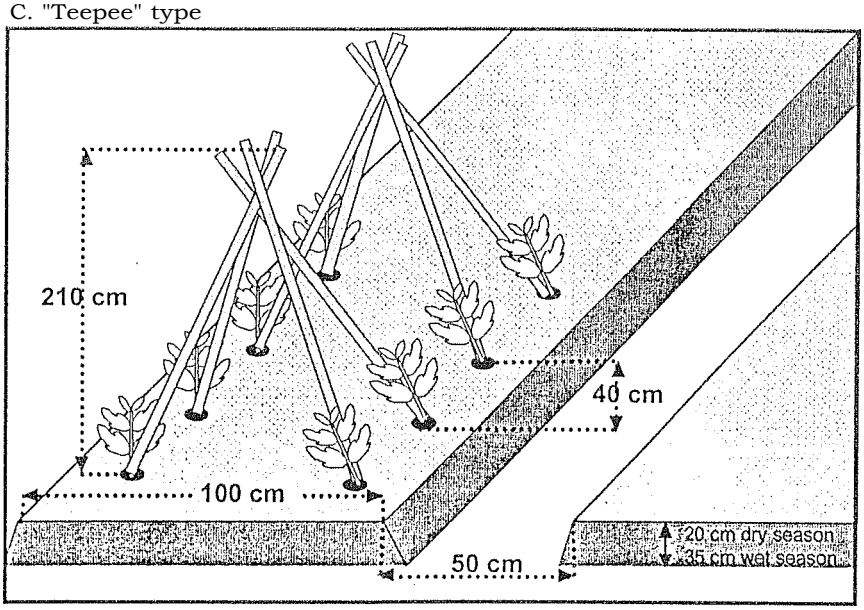
A. Cradle type



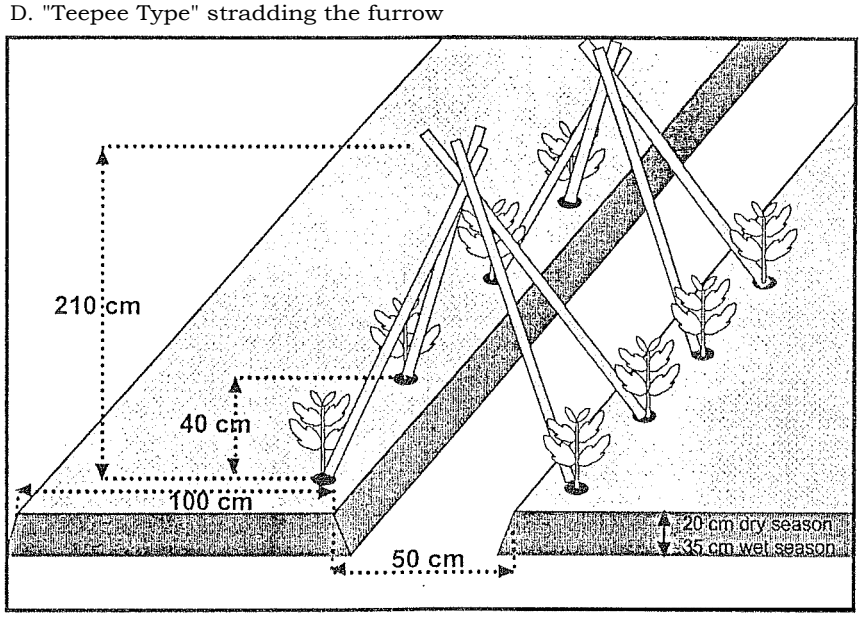
B. "Lean-to" type



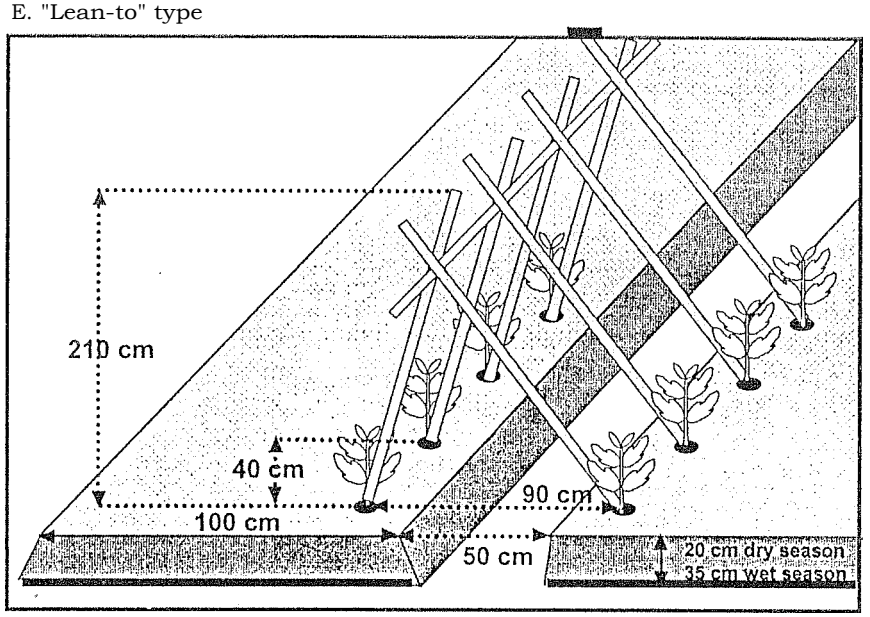
C. "Teepee" type



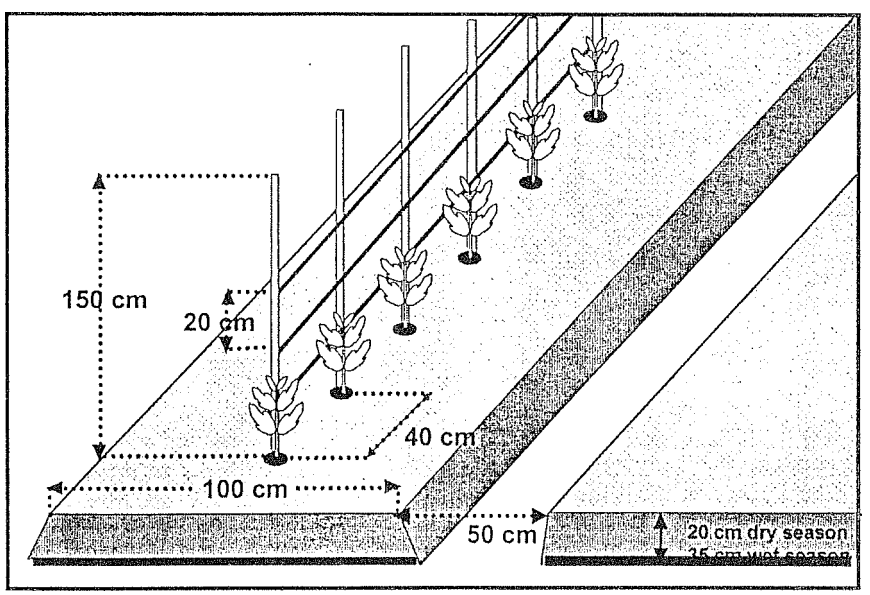
D. "Teepee Type" stradding the furrow



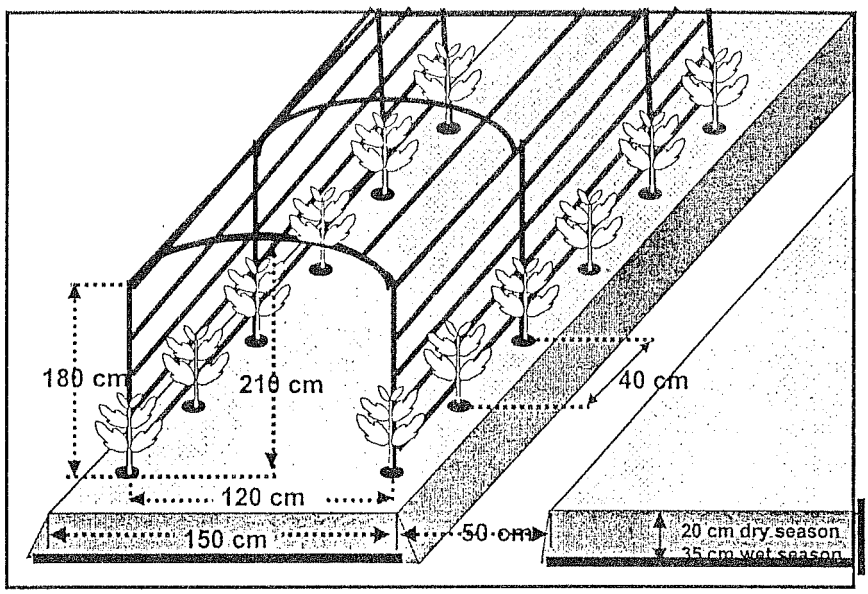
E. "Lean-to" type



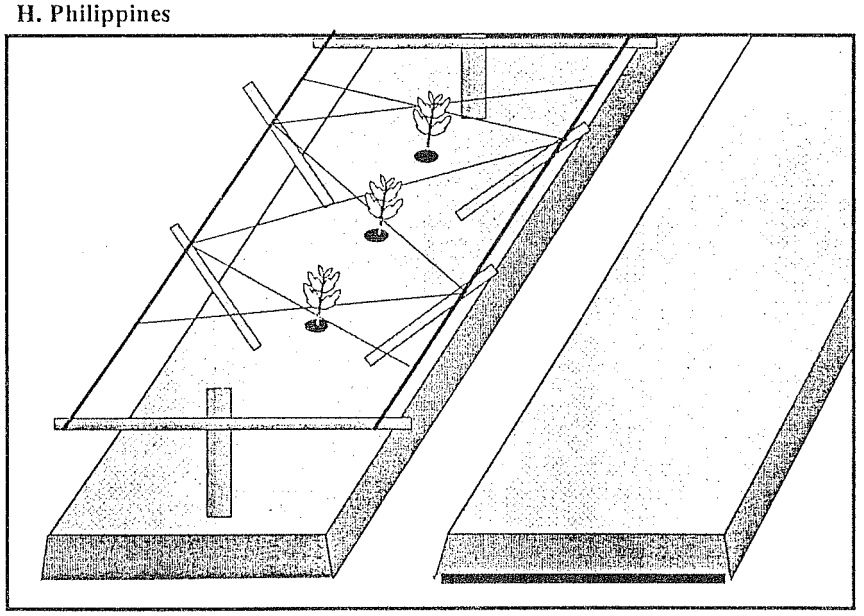
F. French type



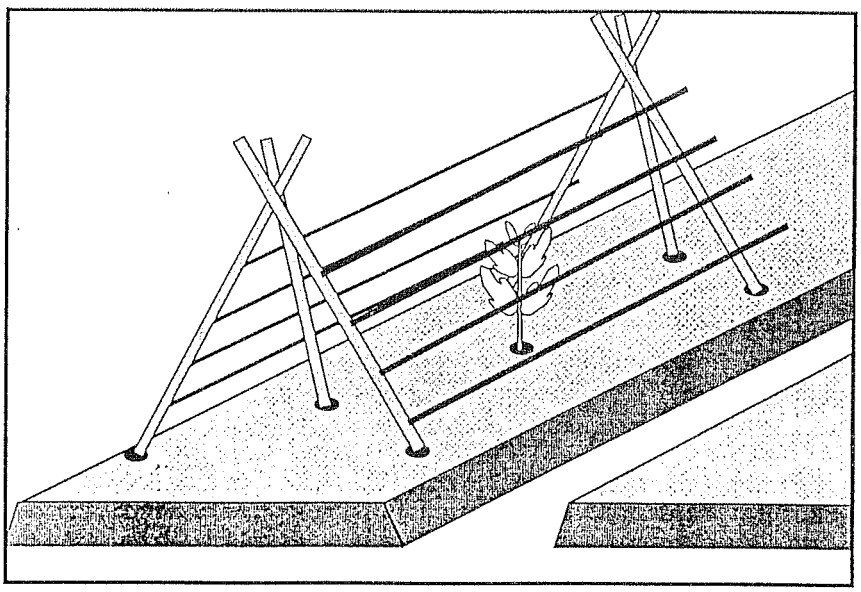
G. Tunnel type



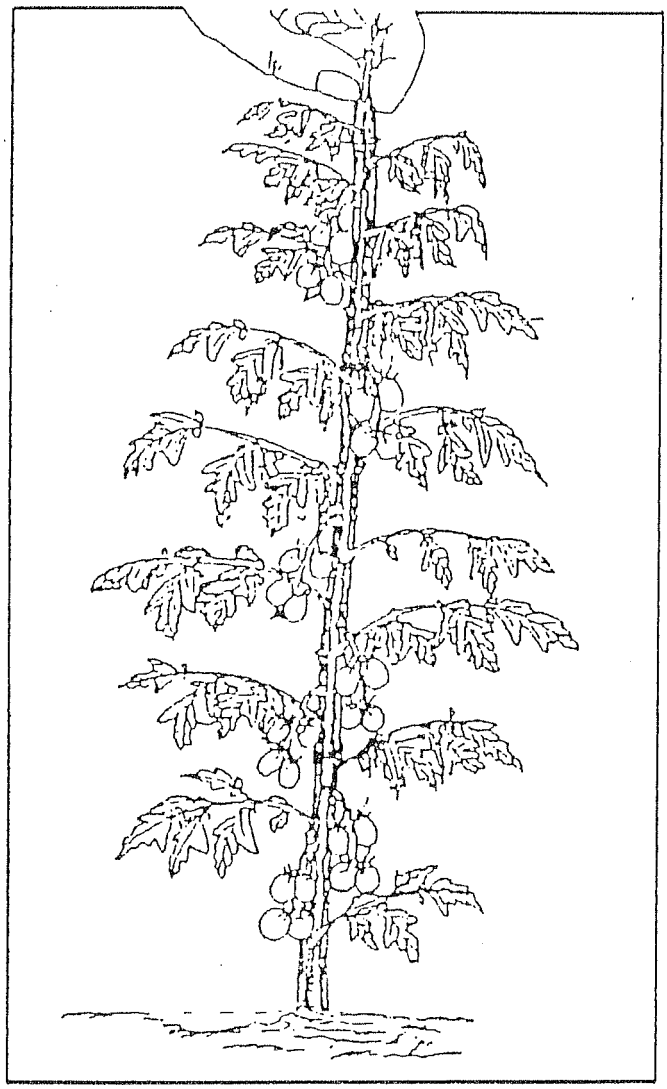
H. Philippines



I. Brazil



Pruning Fresh Market and Cherry Tomatoes



Training Office

Asian Vegetable Research and Development Center

Shanhua, Tai an, Taiwan

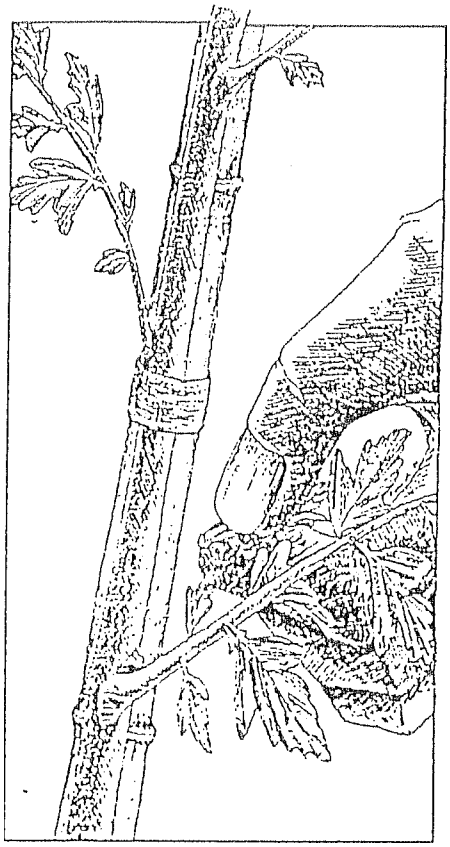
Pruning and staking are techniques commonly practiced by tomato growers in Taiwan and other countries. Farmers usually prune indeterminate tomato enitivars by removing side shoots and leaving one or two stems depending upon the season and growth habit of the variety.

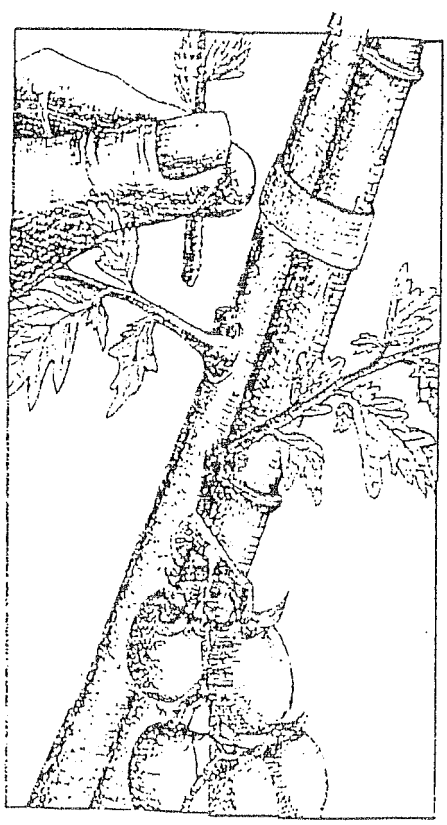
Pruning of side shoots forces early fruit maturity and results in larger fruits because the plant's nutrients are diverted to flower clusters and fruits on the main stein instead of lateral branches. By removing of shoots that arise from the basal and lower portion of the stem and staking the plant, direct contact between the soil and fruit clusters is prevented. Fruit rotting and the spread of fiungal diseases is reduced..

This an other benefit of shoot and folia^{g}e removal. More efficient air circulation. Pruning of side shoots may reduce total yield but it enhances early and marketable fruit yield. Yield reduction by prunin^{g} can be offset by reducing the distance between plants.

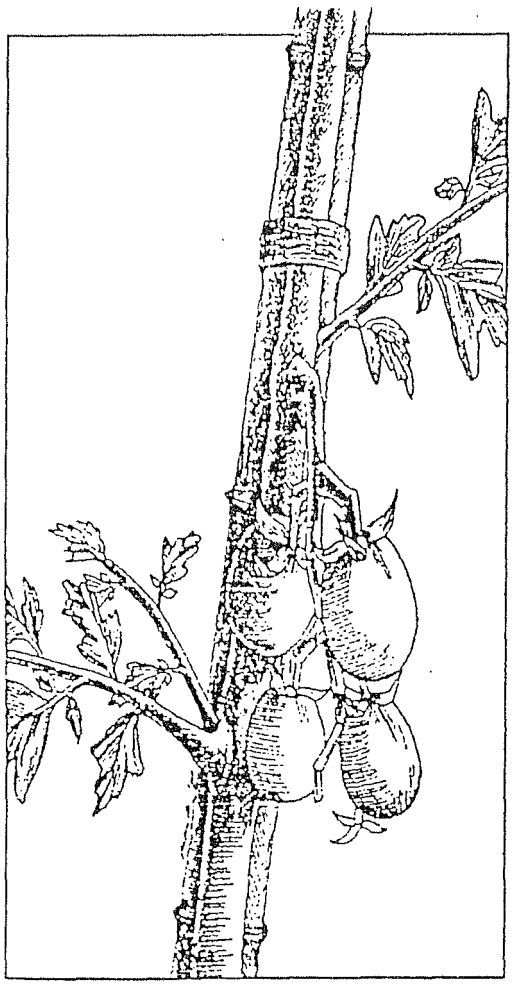
Although pruning and staking involve additional costs for labor and staking material, the high returns of early harvest and better quality of fruits will compensate for these. Generally. the benefits of tomato pruning can be. realized when the crop is grown under temperatures of 35°C. At hi/ßller temperatures. pruning and staking may cause yield losses due to sunscald of fruits. lionnever, if plants are trellised so that the stem is at a slight an^{g}le to the be surface, clusters will han^{g} in the shade below the canopy as they develop. thereby reducing sunscald.

It is important to understand how to prune and how much to prune in different types of tomato to gain maximum benefits from pruning. The pruning procedure practiced in Taiwan is outlined and illustrated here. Prunin^{g} practices differ according to season, so please take note.

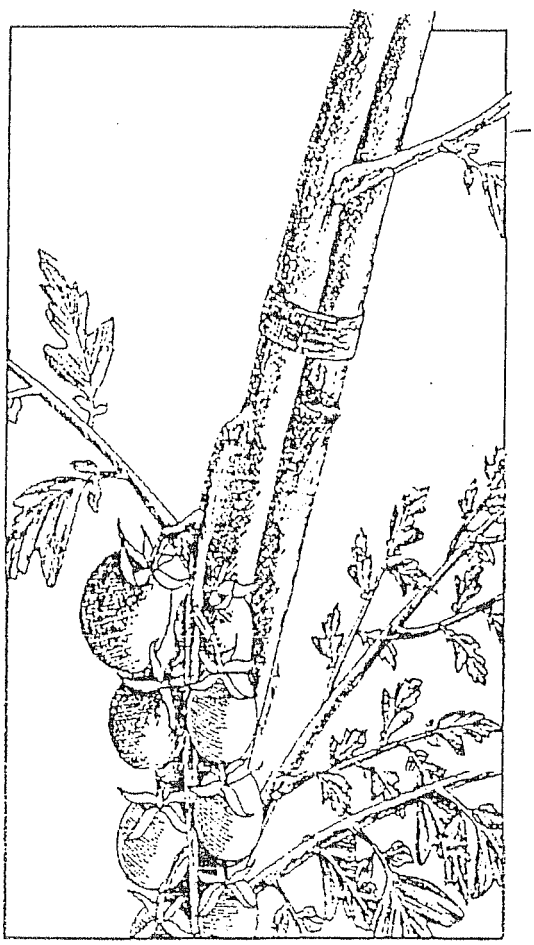




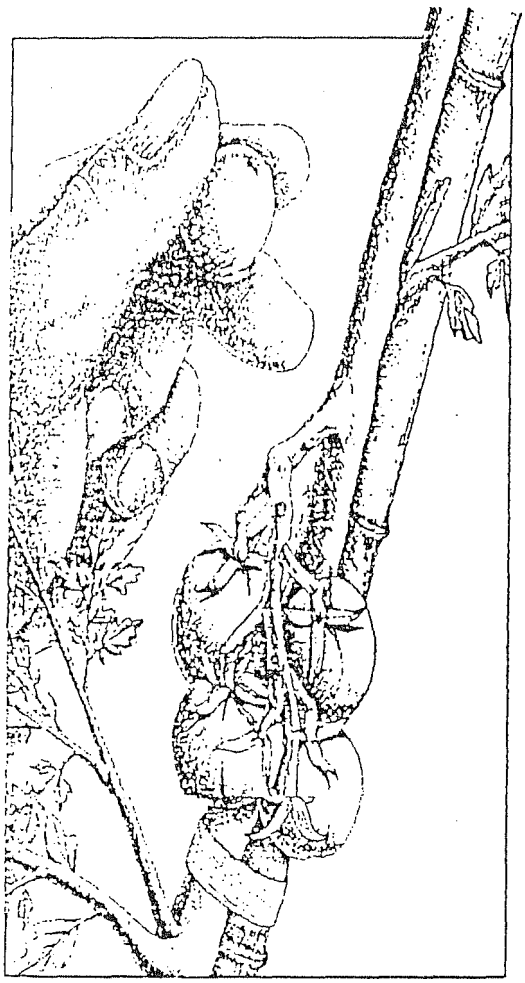
During autumn and winter production, pinch off the sprouted lateral buds and shoots when they attain a length of about 5 centimeters to maintain a single stem on each plant in indeterminate (tall growing) tomato cultivars in autumn and winter. Never allow shoots to grow beyond 10 centimeters



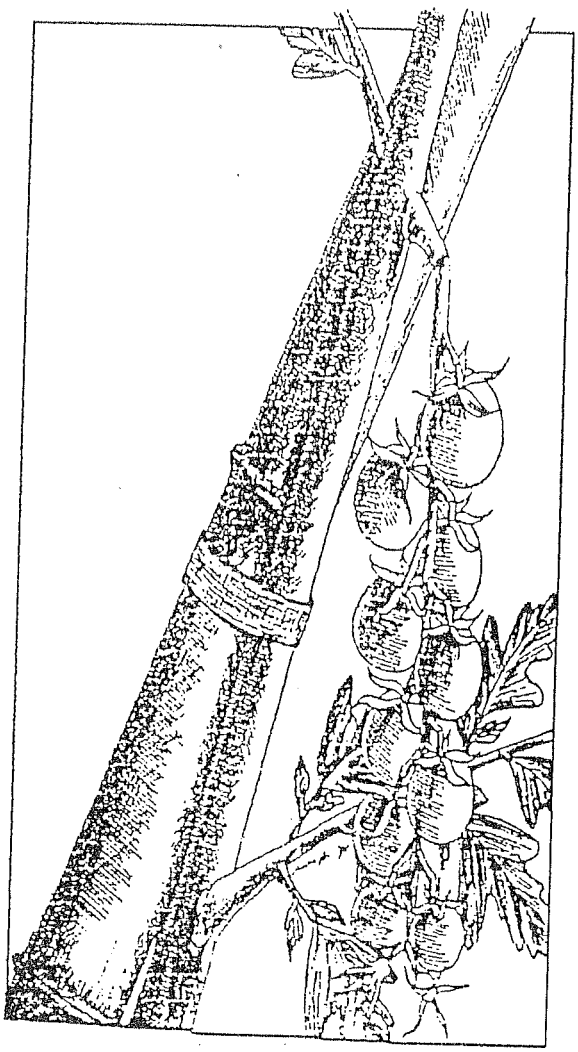
During the summer growing season or at mean temperatures above 25°C, allow the lateral bud developing immediately below the first cluster develop as a second stem. Pinch of all lateral shoots on both stems



In cherry tomato (all seasons), allow the lateral bud arising below the first cluster to develop as a second stem. Pinch off lateral buds on both stems.



Maintain four fruits per cluster and pinch off any other small or irregular shaped fruits in tall growing tomato varieties. Keep only fruits with similar sizes.



In cherry tomato, maintain all fruits in the cluster.

If a severe disease attack occurs, pinch off or cut all leaves below the first cluster after seven or eight fruit clusters have set. You may start pinching earlier if a serious disease attack is foreseen. Care should be taken while pinching so that the leaves and shoots are cut close to the stem.

Maintain five to ten fruit clusters for the whole growing period on tall growing tomato cultivars. Maintain fewer clusters (5) on short plants that titi111 not be maintained for a full season.

In cherry tomato maintain seven or more clusters for the whole growing period depending on the demands of the market.

After the last fruit cluster, allow two to three leaves to grow and cut or pinch off the growing point to promote uniform maturity.