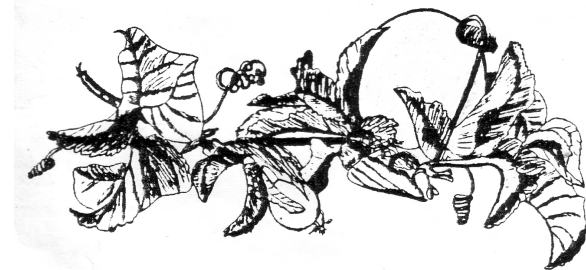


Growing Passion Fruit

In the
West Indies

By:
DYANAND RAJ KUMAR



MAY, 1987

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...is possible for passion fruit to become a significant export crop from the Caribbean. However, in order to compete, CARICOM producers must keep their quality high and their cost of production low.

Growing Passion Fruit In the West Indies

By

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Introduction

The name passion fruit is of Spanish origin and refers to the resemblance of the flowers to certain features of the crucifixion—the corona to the crown of thorns, the stigma to the nails. Passion fruit (*Passiflora edulis*) belongs to the family Passifloraceae which also includes the barbadine or granadilla (*Passiflora quadrangularis*), and the sweet-cup (*Passiflora laurifolia*).

The plant grows as a vine and is native to Brazil. Introduced into the Caribbean more than 100 years ago, passion fruit is now becoming commercially important in CARICOM (Caribbean Community) countries.

The pulp of the fruit makes a which is increasingly in demand internationally. The juice can be used on its own or as a component in many fruit juice blends or fruit punches. Also, it is used in fruit salads, ice creams, cakes, puddings, jams and jellies, sherbets, soft drinks, toppings and fillings, and it makes an excellent cocktail base.

Recent information from Jamaica indicates Europe consumes 23 million kilograms of passion fruit concentrate per year, USA 14 million, Japan 9 million, and Canada 5.5 million.

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Types and varieties

The original plant, found and grown in Brazil, bears a purple coloured fruit. This was introduced into Australia some time in the 1800's and was taken from Australia to Hawaii in 1880. In 1923, seeds of a yellow-fruited type were also introduced into Hawaii from Australia. It is not clear whether this second type originated in Australia or in Brazil.

The two types are distinctly different and have been given different scientific names. "*Passiflora edulis forma edulis*" refer to the purple passion fruit, and *Passiflora edulis forma flavicarpa*, refers to the yellow passion fruit. The purple type is a moderately strong growing vine, which does well in the sub-tropics, such as Australia, Brazil, New Zealand, or in the highland tropics such as Kenya and New Guinea. The vines are susceptible to several soil borne diseases and pests, but the fruit is of good quality with an appealing flavour.

The yellow passion does better at low at low attitudes in the tropics. The plant is a vigorous, prolific vine which bears larger, heavier fruit than the purple and produces higher yields. This type is also tolerant or immune to many of the soil borne pests and diseases of the purple. It produces more juice, with a higher acid content than the purple. However, most consumers feel th epurple has a better flavour.

To try to obtain the disease resistance, vigour and fruitfulness of the yellow and the flavour of the purple, scientists have crossed the two types and produced a series of hybrids. These vary widely in yield and quality, and some have been released as named varieties, such as :Noel's Special" from Hawaii, and "Redlands Triangular" and "Selection E23 from Australia.

In Trinidad, seeds of the yellow type were brought in from Colombia by Mr. L. de Verteuil around the mid 1960's. Around 1978, Mr. S. Bharath brought in fruits of a type that was purple in colour. He collected them from a fruit processing factory in Martinique. Whereas, the yellow is clearly *Passiflora edulis forma flavicarpa*, the botanical identity of the purple-looking type has yet to be established. Clearly, it is not purple passion fruit, *Passiflora edulis froma edulis*. Therefore, this second type is called "Martinique pink," to avoid confusion with the true purple type, which it is not. The growth and fruiting of the "Martinique pink" seem very similar to that of the yellow, so throughout this bulletin, the yellow-type will be referred to unless otherwise stated.

Mechanisation of Production

Mechanisation is possible to varying extents in passion fruit and depends on the size and configuration of the field. It also depends on the topography, soil type, spacing of plants and factors such as availability of equipment.

On small fields, sloping lands or fields with heavy soils in wet areas, it may not be advisable to attempt using tractors except for land preparation and planting/post-hole digging. However, weed control and disease and pest management may be mechanised by using hand held or other small sprayers such as mist blowers, knapsack sprayers or wick applicators.

At the other end of the spectrum, almost all operations could be mechanised or mechanically assisted, such as land preparation, weed control, fertilizing, disease and pest control, and even harvesting. Generally, increasing mechanisation requires increasingly large fields on almost level land with good drainage and irrigation. It also means large capital expenditure and the provision of good maintenance and repair facilities.

In many area, the land can be prepared machanically, and machines used to assist in crop protection, fertilizing and removal of the fruit from the field. The other operations, such as planting, establishing trellises, training, pruning and the collection of fruit will probably continue to be done manually in most of the Caribbean.

Marketing of Passion Fruit.

The majority of the world's passion fruit is processed into juice which is sold either as single strength juice or as concentrate. Both are used mainly in producing mixed fruit juice blends. However, some juice is marketed as passion fruit juice or cordial, and some is used for flavouring other products such as ice cream, alcoholic drinks, etc. One company in Switzerland, has produced a high-priced soft-drink called "Passaia" made from passion fruit.

There is also an international market for the fresh fruit. Both the purple and yellow types are sold in metropolitan as well as local markets as fresh fruit. In addition, there is a small specialised market for the pulp (Juice and seeds), which is used as a topping or filling on some baked or frozen products.

Internally, there seems to be a growing demand for passion fruit. However, the market is rapidly becoming more competitive as more countries, especially large producers like Brazil, become involved in growing the crop . Nevertheless, it

After a certain number of fruit have set along a branch, the newly emerging flowers fail to set until the firsts begin to mature. This results in sections of a branch having fruits at almost every node followed by sections without fruit, and seems to be the natural mechanism of the vine to prevent overbearing.

Harvesting and Yields

Ripe fruit falls from the vine and can be picked up twice or three times per week. This turns out to be one of the most expensive operations in passion fruit growing. Careful thought should be given to maximizing the efficiency of harvesting before the field is planted since factors such as field layout, interrow spacing, trellis design, methods and efficiency of weed control, etc. have great influence on the ease and efficiency of harvesting.

When harvesting, collect only ripe fruits. Never pick partly ripened fruit as these produce off-flavours. Ripe fruits lose weight rapidly, so deliver fruits to the market or processor as soon as possible. If fruits must be stored, keep them in open, slatted boxes in a cool place rather than in bags or cardboard boxes, as these cause overheating, sweating and spoilage. Spoilage increases in wet weather unless the fruit is harvested promptly and stored in a dry place. Even well-stored fruit begins to shrivel in a few days due to moisture loss. Shrivelling does not adversely affect the juice, but it represents a loss in weight of the fruit.

In most Caribbean countries yields of around 10 tonnes per hectare per year should be easily obtained. In Venezuela, 19 tonnes per hectare have been reported after the fourth year, with average yields of around 13 tonnes per hectare being normal. In Fiji, average yields of properly managed vines are around 30 tonnes per hectare. In Hawaii, yields range from 28 to 50 tonnes per hectare per year.

Duration of Vine

The maximum profitable life of the yellow passion fruit seems to be 4 to 5 years, but many vines are replaced after 3 years. Vines which have lost most of their vigour or which have excessive dead or diseased wood should be replaced.

Propagation

Passion fruit can be propagated by seedlings, rooted cuttings, layering and by grafting.

Seedlings:

The first step in producing good seedlings, and therefore good plants, is to select seeds from the most productive vines with the highest quality fruits. The following points help in the selection of fruits for seeds:

1. Select fruits with a strong flavour and high acidity. The aroma of the fruit should be strong and pleasant and the fruit should have that distinctive passion fruit flavour and acidity. Avoid off-flavoured fruit, e.g. woody taste. The pulp should also be orange-coloured, rather than yellow.
2. Select fruits from prolific vines.
3. Fruits should be large, oval, with thin rinds and well-filled cavities. Avoid round fruits, as they yield about 10 percent less juice than oval fruits.
4. Disregard fruits with orange-coloured rinds. They tend to have off-flavours.
5. Select only fully ripe fruits.

Fresh seed, direct from the fruit and with the pulp attached, may be sown. However, such seed may be infected if, for example, the fruit came from a vine affected with *Fusarium*. In such cases, fermentation is recommended. Ferment the seeds for not more than 72 hours, then wash them clean and plant. (Fermentation kills the *Fusarium* fungus).

As an alternative, seed may be stored in the fruit, at room temperature for up to 1 month or at 12.8 °C for up to 2 months. If they are extracted, the seeds should be washed, dried in the shade, and stored in sealed plastic bags, or other waterproof containers in a dark place (such as a desk drawer) that is either air cooled or air conditioned. Such seeds retain their viability for at least 3 months. Passion fruit seeds are killed by freezing or by temperatures above 70°C.

Seeds are generally sown in seed beds or seed boxes and transplanted into bags, pots or baskets or at the two-leaf stage. The author has found that the roots are almost always bent in this transplanting process, so most seedlings in plastic bags, pots or baskets have “goose-neck” or “crook-neck” roots. To reduce this system, sow three to four seeds directly in each bag or pot. Bags or pots should be long and narrow rather than short and fat. After germination, leave the two strongest seedlings and remove the rest. Grow seedlings under shade until they become 20-25 cm tall, then gradually expose them to increasing sunlight (harden them) and finally transplant into the field when 25-30 cm tall. This is normally 6 to 8 weeks after sowing.

The potting compost should be loose and friable, but have good water retaining capacity. Therefore, it should contain a high level of humus or manure. Seedlings respond well to regular doses of dilute fertilizer solution applied to the leaves and stems.

Rooted Cuttings:

Take cuttings from pencil-thick, reasonably mature wood, when the vine is actively growing. Each cutting should have three leaves or nodes. The basal cut should be made at the node and the upper cut should be just above a leaf. Remove the two lower leaves and bury two-thirds of the cutting in a rooting medium, such as sand or vermiculite. Cuttings will normally root within 1 month and should be transplanted into bags soon after rooting. Alternatively, the cutting may be set (to a similar depth as above) directly into long narrow bags or pots. In some places, bamboo joints are used as pots.

Layering:

Vines are usually layered, using either air or ground layering. In air layering, a ring of bark is removed from around a reasonably mature stem and the wood is scraped to removed the light green cambium layer. The area is then wrapped in a damp rooting medium, such as cocoa moss, peat moss or coconut coir dust. Next, enclose the whole mass in a piece of polythene sheeting which is securely tied at the upper and lower ends to avoid water getting in the medium drying out. To avoid the vine breaking at the ring, support it either by tying a piece of stick or stiff wire to the vine across the ring before applying the rooting medium, or by tying the vine above and below the layer to a pole or onto another vine after wrapping with polythene.

Within 1 month, roots should be seen through the polythene. Then, cut the air

....grows rapidly and reaches maximum size within 25 days. However, they are not mature at this stage and should not be picked as the immature fruits contain a toxic (poisonous) substance in their juice. Fruits normally mature within 90 days after pollination.

Pollination is a serious problem and strongly influences yield. The yellow passion fruit is self in compatible. A flower will not set fruit if pollinated by its own pollen. Therefore, flowers must be cross pollinated. This is done by carpenter bees, bumble bees, honey bees, wasps, humming birds and nocturnal moths. Even so, many flowers are not adequately pollinated by these insects and never set fruit, thus reducing yields.

Hand pollination increases fruit set and produces larger fruit, with more seeds and juice. The flowers open around midday and close at night. Unpollinated flowers die. In hand pollination, pollen is collected from a number of flowers, normally by removing the anthers and putting them into a cup or other receptacle. The pollen from this mixture of anthers (Fig.8) is applied to every lobe of the trilobed stigma later in the afternoon, when the stigma is receptive, using a small paint brush or the thumb and forefinger. The more pollen put on the stigma, the larger and juicier the fruit. In Fiji, one person pollinates 600 flowers in an hour. Rain at flowering causes the pollen to rupture, producing poor fruit set. For this reason the pollen collected for hand pollination must also be kept dry. Fruit set is also reduced by too high nitrogen fertilization, dry soil conditions, and unduly high or low temperatures.

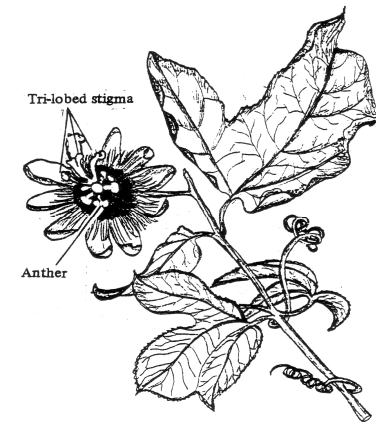
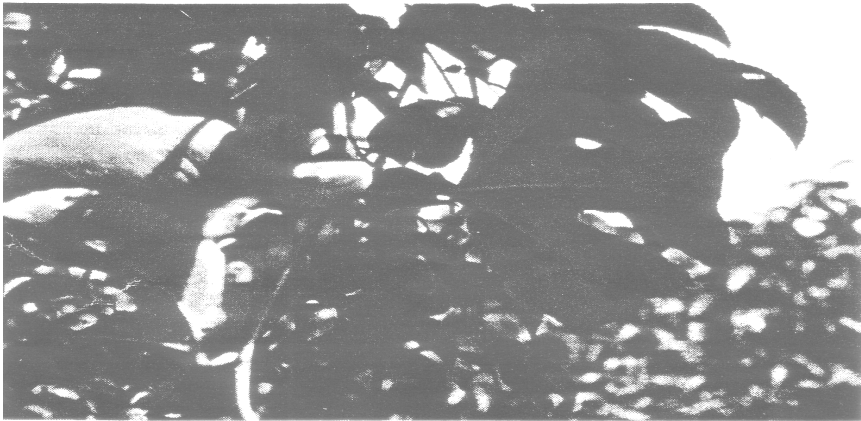


Fig 8. A passion fruit flower showing the parts used in pollination



Fertilizing:

The recommendations for fertilizing passion fruit vary greatly in different countries. Studies are now underway to determine the fertilizer requirements of the plant in Trinidad.

A tentative recommendation, based on research conducted elsewhere, is to apply 700 grammes of 15:5:10 fertilizer per plant three times per year soon after the rains start in late May, in late August and again in late October when 200 grammes muriate of potash per plant should be added. Granular fertilizers should be broadcast around the base of the plant, moving further away from the plant as it grows older. For example, the fertilizer should be applied 1 metre to 1.5 metres away from the base of a 1 year old plant.

In addition, 10 grammes of a soluble fertilizer (normal analysis 20:20:20 plus trace elements) should be added per litre to each crop protection spray. Most mist blowers carry a 10 litre solution tank, so add 100 grammes of soluble fertilizer per "charge," together with not more than five drops of a sticker/spreader.

Flowering, Pollination and Fruiting

Vines come into production within 1 year. Flowers appear in April and continue until November, producing mature fruit from July to January. The young fruit...

...layer from the vine, remove the polythene, remove all young, soft shoots off the cut plant, and plant it into a bag or pot containing a friable medium.

Rooted cuttings and layered plants normally bear earlier and produce more uniform fruits than seedlings, but whether they yield more or live longer is not known.

Grafting:

In places where the true purple passion fruit is grown commercially, it is frequently grafted onto yellow rootstocks to obtain the disease resistance and high vigour of the yellow while retaining the fine quality of the purple. In Cayenne, the yellow has also been grafted onto some of its wild relatives to try to increase its yield. The normal technique is a terminal cleft graft, but saddle grafts and whip-and-tongue grafts have also been used. To date, it has not been necessary to use this method of propagation in the Caribbean.

Planting Site:

The yellow passion fruit does best at altitudes from 0 to 800 metres. It grows on a wide range of soils, but the ideal soil is a deep, light loam, high in organic matter, with a high pH (around 6.0 - 6.5) and good moisture holding capacity. Vines will not stand waterlogging or flooding for any considerable period and they do not grow well on very heavy, poorly drained soils. Acidic soils should be limed to raise their pH and make calcium available to the plant. A guide to the application of limestone to raise pH to 6.5 is shown in Table 1 below.

Table 1. Guide to Application of Limestone

In most CARICOM countries, the Ministry of Agriculture is able to help you de-

Existing pH	Metric tonnes of limestone needed per hectare on		
	Sandy soils	Loams	Clay Loams
4.5-5.0			
5.0-5.5	5.00	6.25	7.50
5.5-6.0	2.50	3.75	5.00
	1.25	2.50	3.75

termine the pH and limestone requirement of your soil. A total annual rainfall of 1000-1500 mm per year is suitable for passion fruit production. Rainfall of 2000 mm per year or greater creates damp soil conditions, so heavy soils require

Proper drainage under such conditions. Rainfall also prevents pollination of the flowers, because the pollen grains burst when wet. Therefore, passion fruit is not well suited to areas of very high rainfall.

Vines also grow better in areas well sheltered from wind, but exposed to full sunlight. Very windy areas should be avoided or windbreaks should be used. These may be living windbreaks (e.g. trees such as mango, casuarina, Honduran pine, sapodilla) or non-living such as saran or other shade netting held vertically on posts. The windbreaks should be established before the crop is planted.

Temperatures in the Caribbean are generally suitable for the production of the yellow passion fruit. Temperatures above 32°C induce luxuriant vegetative growth, but vines set very little fruit.

Land Preparation:

The Land should be ploughed and harrowed or rotavated. If necessary, limestone, manure and /or superphosphate should be broadcast after ploughing and worked into the soil during harrowing or rotavation. Limestone should not be applied at the same time as superphosphate. Where tropical clay or clay loam soils suffer restricted internal drainage, cambered beds may need to be formed. These beds should be wide enough to carry one, two or three rows of plants, depending on the soil drainage and rainfall in the area. On sloping land the plants may be planted on individual mounds rather than on cambered beds.

Spacing, Planting and Intercropping:

In commercial production, passion fruit is normally planted in rows, along trellises. The distance between rows depends on the topography and the management system used. On sloping land the rows should run across the slope (i.e.) with the contour.

The medium distance between rows should be 2 metres. Such narrow spacing should only be used if all operations, e.g. fertilizer, spraying, harvesting, vine removal after pruning, etc. will be done by hand. Otherwise, rows should be 3 to 350 metres apart. Within the row, plants may be spaced 1 to 7 metres apart. On rich soils, plants grow larger and therefore, should be placed further apart. In general, plants spaced further apart bear more fruit per vine, but less fruit per hectare.

Specks, much smaller than a pinhead, can be seen on the underside of the leaf. They are very mobile and will be seen moving between the main veins near the base of the leaf. Sometimes slight webbing, similar to a fine spider's web can be seen. The leaves shrivel, turn yellow and fall prematurely. A heavy infestation of mites can cause defoliation and vine dieback. Mites can be controlled by most of the miticides available such as Kelthane, Pantac, Torque or Vydate L. Insecticides such as Rogor or Dibrom also reduce mites.

In several fields in Trinidad, biting ants have been found in close association with passion fruit vines. In some cases, nests have been found at the base of almost every vine in a field. These ants attack when the nests are disturbed and this can make working near the base of the vine uncomfortable. However, their relationship with the vine and whether they are detrimental, has not yet been determined.

In other countries, a number of other pests have been identified including several fruit flies, scale insects, mealy bugs and weevils. Nematodes have also been reported as a serious problem in passion fruit. Every effort should be made to keep the pests and diseases which affect passion fruit in other places from entering your country. All growers should cooperate in this effort by not bringing in unauthorised fruits, seeds or plants and by discouraging other people from doing so.

In applying pesticides to passion fruit vines, a mist blower or other low volume sprayer should be used. This provides better penetration of the spray into the vines and deposits the spray on both surfaces of the leaf. It is also better for fruit set as the water from high volume sprayers such as knapsack sprayers cause the pollen grains to burst and reduces pollination.

In any pest control programme, the aim must be to control the pest, but do as little harm as possible to other insects, in particular pollinators. Passion fruit suffers severe problems in pollination. Every effort should be made to protect the pollinating insects. Therefore, spraying should be done when there are no flowers on the vine or when the flowers are not open, usually in the early morning in yellow passion fruit varieties.

Remember, many pesticides have a long wait period between application and harvest. The passion fruit vine fruits for a long period each year. During this period, fruits are harvested two or three times per week. Consequently, only pesticides with very short wait periods should be used.

...fices reduce both pests and diseases within the crop.

Chemical Control:

- Apply fungicide at 2 to 4 week intervals using a mist blower. Recommended fungicides for control of these three diseases are mancozeb alternated with bromomyl.
- Since insects also damage passion fruit, it may be necessary to include an insecticide with the fungicide spray. For example, malathion can be used for control of sucking.

Cultural Practices:

- Plant well-spaced vines
- Systematically train and prune vines.
- Remove and destroy infected or diseased material
- Use wind breaks
- Avoid unnecessary wounding of vines during weeding / pruning
- Follow general sanitation practices.

In summary, control of diseases of passion fruit may be successfully achieved by good management practices involving general crop sanitation together with well timed chemical sprays.

Pests:

Major pests which threaten passion fruit include caterpillars, mites, stink bugs and ants. Caterpillars seem to occur two or three times a year and can defoliate entire vines if left unchecked. Control by applying a contact or stomach poison insecticide such as malathion or carbaryl. Stink bugs seem to suck the young fruits and maybe also the vines. They can be controlled by the same insecticides used against caterpillars.

Mites cause a light coloured speckling and chlorosis of the leaves, usually near the base where the three lobes meet. On close examination, tiny white or red

Research is in progress to determine the optimum relationship between yield and spacing under Trinidad conditions. Until results become available, space rows 3.5 metres apart and plants 1.5 metres apart in the row. Remove alternate plants and poor yielding vines after the first year's crop. Alternatively, a 3 m x 2.2 m spacing may be established at the beginning and left for the life of the vines (3-5 years).

Young plants must get a good start in the field. Open a hole twice the depth of the bag or pot, and three times its width. Incorporate about half a bucketful (approximately 6 litres) of compost or manure with the soil from the hole, mix well and refill the hole. This should produce a mound. Remove the plant and column of soil from the bag or pot and plant in the middle of the mound. Half fill the hole with soil / manure mix. Firmly press or ram the soil against the root ball to ensure contact between the two and exclude air pockets from around the roots. Flood with water. Then add the rest of the soil / manure mix to the hole and press firmly again. Smooth the mound to remove any depressions which might hold water. Water well. After planting, ensure that the plant is at the same depth in the soil as it was in the bag.

Unless irrigation is available, plant during the rainy season, preferably between June and September. This will allow the plant enough time to grow and vine before the dry season, and should produce a vigorous plant before flowering starts in April.

The interrow spaces may be used to produce other crops, especially during the first year. Crops which can be grown successfully include beans, beets, cabbage, lettuce, pakchoi and other spinarchs. Avoid cucurbits such as cucumbers, water melon, squash, pumpkin and karaili as they may carry a virus disease which affects the passion fruit. Also, avoid crops such as sweet potato which may cause water accumulation near the passion fruit or disturbance of the passion fruit roots during harvesting of the intercrop.

Trellising:

Trellising is one of the most difficult and expensive parts of growing passion fruit. If not done properly, it could ruin your crop. Basically there are three types or trellises:

The *vertical or 1 trellis*, (**Fig.1**) where one, two or even three horizontal wires are strung along upright posts;

2. The *horizontal* or *T trellis*, (Fig. 2) where a cross piece (60-100 cm long) is attached near the top of each post and two horizontal wires run, one at either side of the cross piece with or without a third one on top of the up rights;
3. The *arbour* or *invited U trellis*, (Fig. 3) where two rows of posts support cross bars 2 to 3 metres long carrying four to six strands of wire.

In all types, the end upright posts must be heavy, deeply set and well braced or anchored. Wires can be anchored at the ends of the rows in three ways: they can be passed over or through the end post and tied to a stout peg or to a "dead man" or they can be tied directly to the end post which is then securely braced (**Fig 4**). It is better to run the wires through holes drilled through the posts or cross pieces, but if this not convenient, grooves can be cut and the wires stapled to the posts. In a T trellis, the wires are run from the cross piece directly to the end post as this is stronger than using a cross piece directly on the end. (**Fig. 2**).

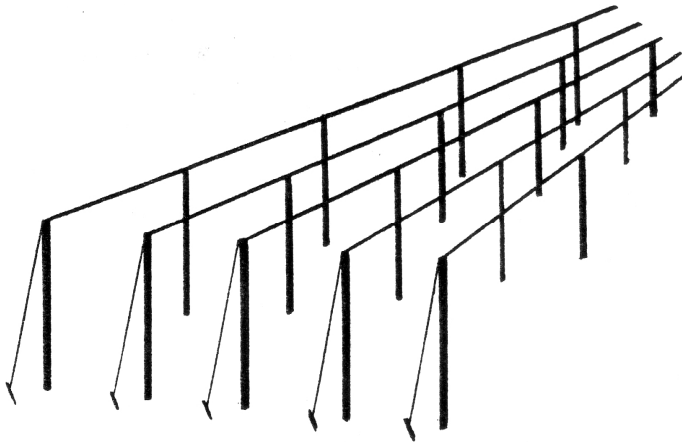


Fig. 1 Vertical or "I Trellis

.....desirable under our conditions as it leaves the ground loose and bare and also damages the shallow roots of the passion fruit vine.

Diseases and their Control

Several diseases have been recorded on passion fruit, but only a few of these have been observed under local conditions.

These diseases include:

- Nursery diseases
- Brown spot disease
- Anthracnose disease
- Septoria leaf spot disease

In the nursery, young passion fruit seedlings are attacked by several soil inhabiting fungi resulting in death and damping-off of seedlings. Damping –off diseases may be controlled by:

- drenching the nursery soil with a one percent metalaxyl or benomyl fungicide to control the fungi or
- using sterile soil for sowing seeds, and
- reducing the amount and frequency of water applied.

In the field, diseases may attack leaves, stems, flowers and fruit. Brown spot disease-caused by a fungus *Alternaria spp.*– induces leaf spotting, leaf yellowing, leaf fall and dieback of the vines, and a severe fruit rot. Death of the vines may also occur. Brown spot occurs both during the wet and dry seasons.

Anthracnose disease is caused by a fungus, *Colletotrichum spp.*, which attacks the stem and fruits. Heavy losses may occur if this disease is not controlled.

Septoria leaf spot is caused by a fungus, *Septoria spp.*, which induces leaf spotting which may lead to defoliation.

These three diseases can best be controlled by an integrated programme consisting which may lead to defoliation.

These three diseases can best be controlled by an integrated programme consisting of cultural methods together with chemicals sprays. The following prac..

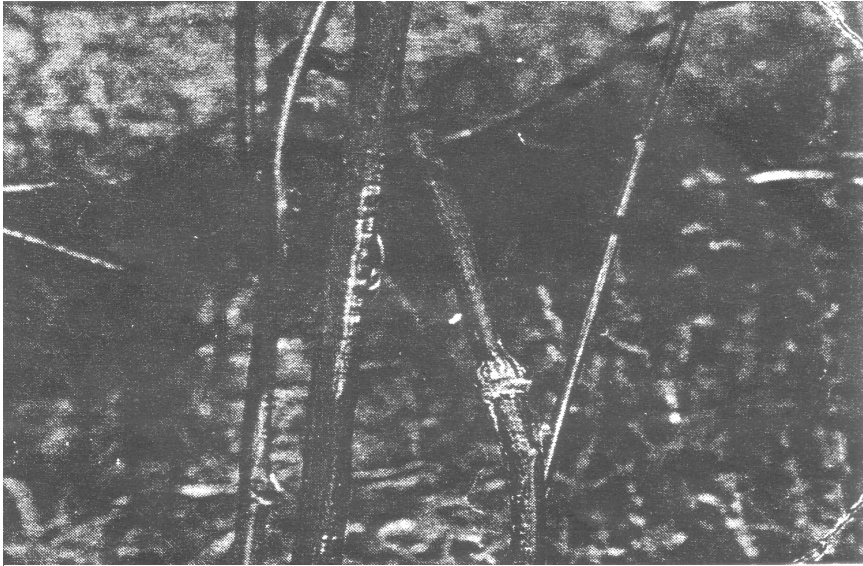


PLATE 3: A shoot ringed by a tendril of another shoot.

Always prune during periods of active growth rather than when the vine is dormant. Since many diseases are spread by pruning tools, keep pruning tools clean and sharp.

Sometimes it is better and easier to leave the pruned shoots in the mat of vines until they dry and then break and remove the dried branches and leaves. Under Trinidad conditions, many wasps ("Jack Spaniards" and "Maribone") make their nests in the vines, so care must be taken during pruning and removal of the shoots.

Weed Control

Passion fruit as a perennial crop should last at least 3 years in the field. Because it is a surface rooting vine, do not bare the soil, particularly in the interrows, as this causes erosion as well as compaction and heating up of the exposed soil. If the area is not used for growing other crops, it should be covered with a mulch or left in a low-growing fallow which is cut regularly. Instead of cutting, the fallow may also be retarded by contact herbicides such as paraquat. Cultivation, either by shallow rotavating, harrowing or by hoe, is not

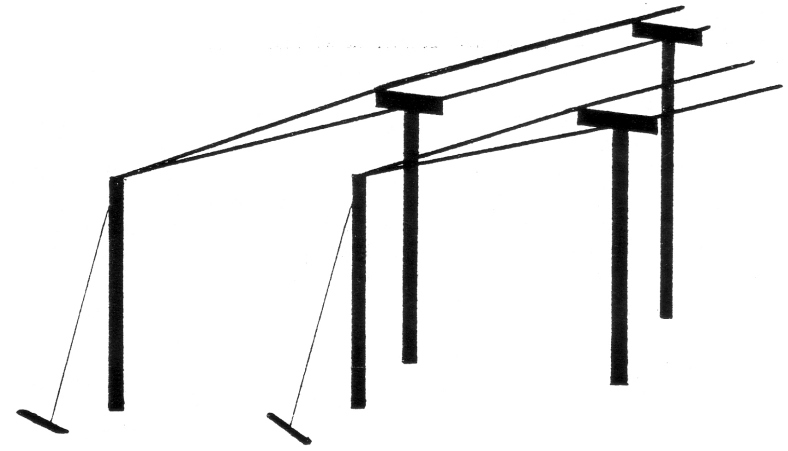


Fig. 2 Horizontal or "T" Trellis

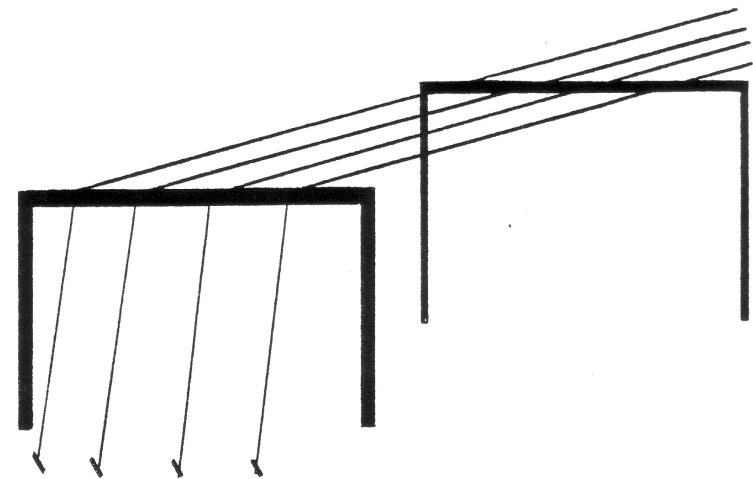


Fig. 3 Arbour or Inverted "U" Trellis

Posts can be of hardwood, metal or concrete and should be spaced 2 to 3 metres apart in the row. Some farmers use wood which will root and grow, such as hog plum or gliricidia. It is also possible to use a combination of different types of posts, e.g. teak posts (hardwood) alternating with hog plum.

Where hardwood posts are used, they should be at least 250 cm long and 10-15 cm thick, while those used for end posts should be at least 300 cm long and 20 cm in diameter. Lower portions should be treated to prevent rotting, either by dipping or painting with a preservative such as creosote or by charring.

If using a T or arbour type trellis, leave at least 2 metres between the ends of the cross pieces to allow a tractor to pass between the trellises. The trellis should be at least 2 metres high. Lower trellises allow the vine to touch the ground too early and this reduces yields.

Some farmers use existing trees as trellises. These can be extended by running wires from tree to tree or running a cable from tree to tree and running wires on top. This method saves a substantial part of the cost of trellising. However, it creates problems later on as pruning and spraying become more difficult and less effective. It also kills the supporting trees after a few years as the passion fruit vines form a dense cover over the trees.

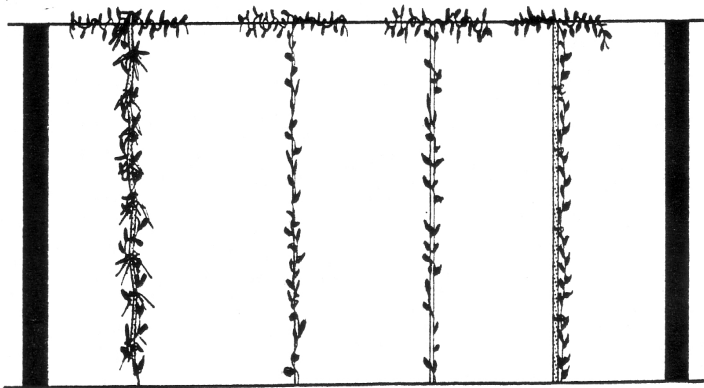
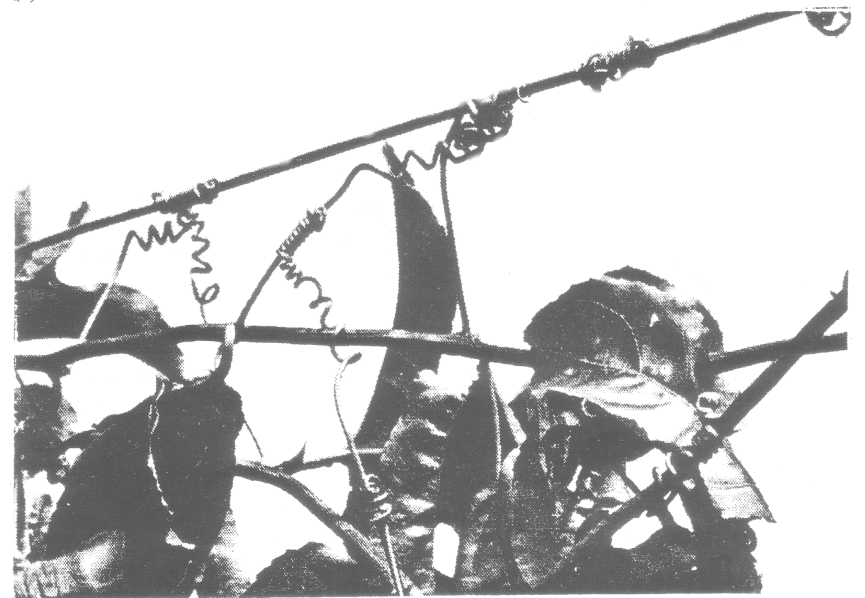


Fig. 5 Methods of training young vines



**PLATE 2: Vines should be wrapped around the wire (a)
Rather than cling to the wire by the tendrils only (b).**



PLATE 1: A young vine trained up to the wire along a string.

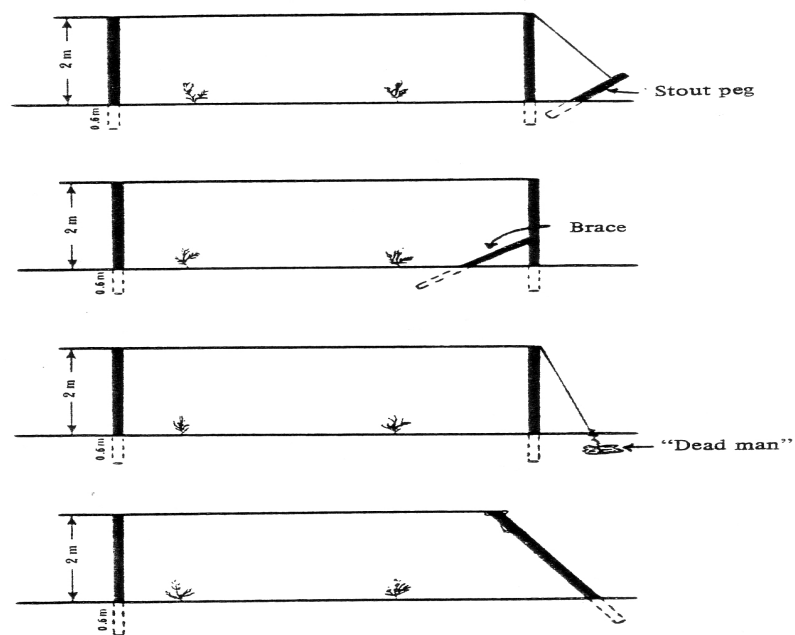


Fig. 4 Diagrams showing different methods of anchoring the wire at the ends of the rows.

Training and Pruning

The young vine will grow quickly with a minimum of branching if supported in an upright position by means of a pole, string or wire. It should be wound around or tied to the pole or string at 25 cm intervals. (Fig. 5). If tied, the ties must be removed after the vine has become established on the horizontal wires. The end portion of bamboo, when inverted and hung from the trellis wire provides good support and removes the need for frequent tying.

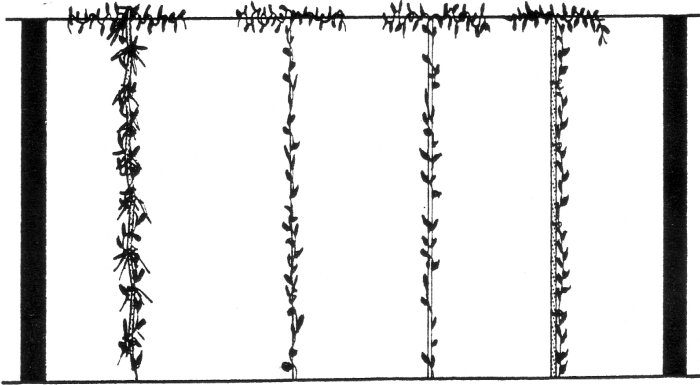


Fig. 5 Methods of training young vines

Allow two to six upright shoots or leaders to grow to the overhead wires. These should be single, straight vines and all side shoots should be removed as they arise. After these leaders meet the overhead or trellis wires they are wrapped around them as they grow, until leaders from adjacent vines meet. Then the terminal buds are pinched off. This promotes the development of lateral shoots which hang down from trellis and bear the crop. (**Fig. 6**).

When the laterals touch the ground, they should be pruned 15 cm above ground level. Flowers and fruits are borne only on new growth, so after a lateral has borne its fruits, it should be removed 15 to 20 cm away from the leader. This will promote new laterals to appear and set a new crop. It also allows better penetration of crop protection sprays. (**Fig. 7**).

All the tendrils along the leaders should be removed to prevent them from ringing other nearby leaders (**Plate 3**).

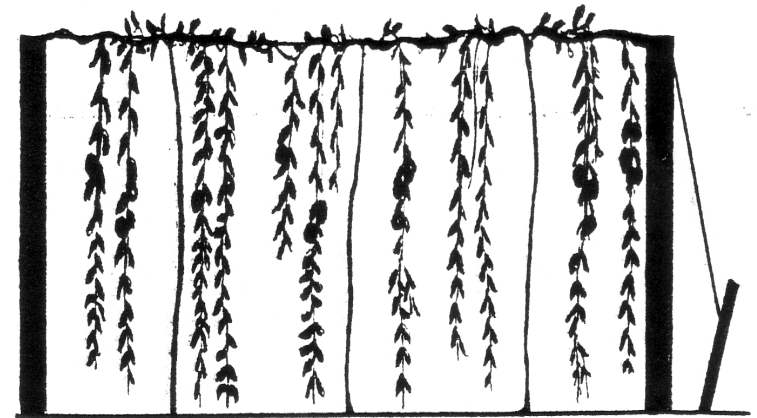


Fig. 6 Mature vines with fruit

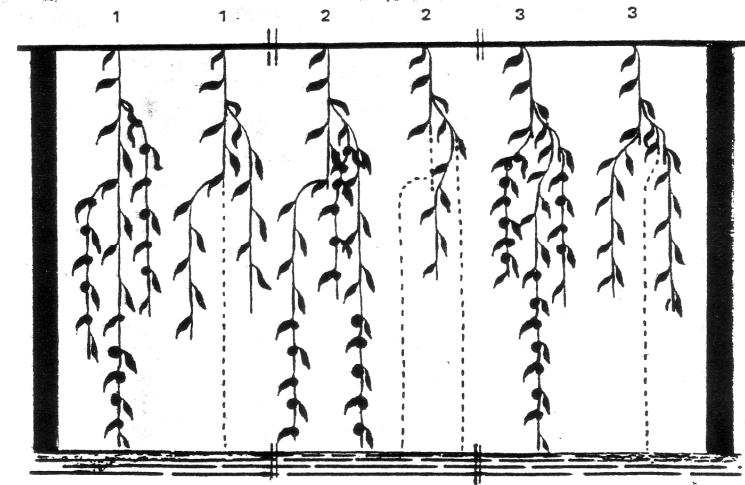


Fig. 7 Diagram showing pruning in three consecutive stages of growth.