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ALTERNATE TRELLISING MATERIALS FOR PASSION FRUIT (*PASSIFLORA EDULIS* SIMS) VINES

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ABSTRACT

A study was conducted to evaluate six different types of live and non-live stakes with three different types of wires as trellising materials for passion fruit vines grown in the mid country wet zone during the period 1982 to 1985. Interaction between different types of stakes and wires was significant. *Gliricidia* (*Gliricidia maculata*) which is a live stake, used with plain steel wire gave the highest fruit yield and the highest benefit/cost ratio. Bamboo (*Bambusa vulgaris*) another live stake, used with barbed wire gave similar yields and second highest benefit/cost ratio. Since the initial cost is very high, concrete and 'L' iron supports gave very low benefit/cost ratio. *Gliricidia* stakes with plain steel wire can be recommended as promising trellising materials for passion fruit vines.

KEY WORDS: *Gliricidia maculata*, Live stake, Passion fruit, Trellising materials

INTRODUCTION

Passion fruit of the family Passifloraceae is a fruit crop suitable for both tropical and subtropical areas (Menzel *et al.*, 1989). Sri Lanka had been considered as a passion fruit growing country in the world about 2 decades ago (Abeyasinghe, 1973). In 1988, extent under passion fruit was 1112 ha (Ministry of Agricultural Development and Research, 1988).

The commercial passion fruit production is based on two important varieties, the yellow passion fruit (*Passiflora edulis* f. *flavicarpa*) and the purple passion fruit (*Passiflora edulis* f. *edulis*), the former being more tropical than the latter (Winks *et al.*, 1988).

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Passion fruit, being a vigorous woody perennial vine, must be provided with a long lasting trellise on which it can grow. Such a trellising system is needed to facilitate cultural practices such as weeding, spraying, hand pollination and harvesting of fruits.

Erection of a trellising system claims a major fraction of the cost of production (Anon, 1965). Generally, wooden posts of 8—10 cm in diameter and 2.25—2.50m in length and barbed or plain steel wire (2—3mm diameter) are used for trellising. If the trellising system is not strong enough or not durable, it will collapse due to the weight of the vine, sooner or later. This leads to low yield and high cost of production.

This paper reports the relative performance of some alternate trellising materials for passion fruit vines in mid country wet zone.

MATERIALS AND METHODS

This study was conducted at the Central Agricultural Research Institute, Gannoruwa during the period 1983—1985. Six different types of stake, gliricidia (*Gliricidia maculata*), wal ehala (*Pterocarpus indicus*), yellow bamboo (*Bambusa vulgaris*), teak (*Tectona grandis*) wood, concrete and 'L' iron, and 3 types of wire, barbed wire, plain steel wire (2mm diameter) and nylon cord (5mm diameter) were tested in 2 factor factorial experiment set in a randomized complete block design with 4 replications.

Gliricidia, wal ehala and yellow bamboo were live stakes. The yellow passion fruit vines were planted 2m between rows and 5m between vines within row. The live stakes were 7.0 to 8.0cm in diameter and 2m tall from the ground after installation. The 'L' iron stakes were installed with a concrete base of 45cm depth. The wires ran over the top of the stakes. They were pulled and tied to the pegs fixed next to stakes.

Raising of seedlings, field planting and other cultural practices were done as recommended by the Department of Agriculture (1972).

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Hand pollination was practised every afternoon to ensure good fruit set. Live stakes were lopped once in every 3 months. The branches of the live stakes, below the wire were removed.

Data on fruit yield, durability of stakes, frequency of replacement of stakes, and cost of trellising were recorded.

RESULTS AND DISCUSSION

Analysis of fruit yield revealed that the stakes vs wire interaction is significant implying that there are specific combinations of stakes and wires for fruit production. This interaction follows different patterns in different combinations of stakes and wires. Table 1 compares the mean fresh fruit yields of different treatments. Mean yields of gliricidia and wal ehala with plain steel wire; gliricidia, bamboo, 'L' iron and plain wood stake with barbed wire and wal ehala, bamboo and concrete support with nylon cord, gave statistically similar yields.

Gliricidia: Gliricidia stake with plain steel wire gave the highest mean fruit yield (10.01 kg/vine) and it was statistically similar to the yields given by the same stake with barbed wire; bamboo with barbed wire and nylon cord; wal ehala with plain steel wire and nylon cord; plain wood with barbed wire; concrete with nylon cord, and 'L' iron with barbed wire (Table 1).

Table 1. Mean passion fruit yields (kg/vine)

Type of stake	Type of wire		
	Plain steel	Barbed wire	Nylon cord
Gliricidia	10.01 ^a	7.23 ^{a b}	6.06 ^b
Bamboo	6.30 ^b	9.13 ^a	7.93 ^a
Wal ehala	7.16 ^a	5.88 ^b	7.23 ^{a b}
Plain wood	6.13 ^b	7.42 ^a	5.51 ^b
Concrete	6.75 ^b	6.03 ^b	8.93 ^a
'L' iron	5.23 ^b	8.81 ^a	5.41 ^b

In a column, treatment means having a common letter are not significantly different by DMRT at 5% level.

Gliricidia usually sprouts readily at the upper end causing early and meaningful establishment as a live stake. Therefore, the wire can exist for a long period on gliricidia. Hence, low percentage of replanting has been recorded for gliricidia (Fig. 1). First replacement of gliricidia stake was recorded 15 months after installation. The highest percentage of replacement was about 14% reported 21 months after installation. Aside from that, being a legume, it might have added more nitrogen to the soil through N_2 fixing root nodules. This could have a beneficial effect as nitrogen is a major nutrient required for cultivation of passion fruit (Menzel *et al.*, 1989).

Both plain steel and barbed wires are equally effective with gliricidia stakes (Table 1). Nylon cord tends to sag between the stakes due to the weight of the vine and expansion of the cord as a result of exposure to sun during day time. Also the vines cannot remain in position because the nylon cord is smooth and slippery. Since gliricidia grows vigorously, the steel and barbed wires are kept tightly between the stakes.

Bamboo: Bamboo stake gave higher yields with barbed wire (9.13 kg/vine) and nylon cord (7.93 kg/vine) than with plain steel wire (6.30 kg/vine). Bamboo usually sprouts at the nodes towards the mature end. Therefore, die-back advances from the top towards the base until it meets the sprout, if any. Nylon cord did not have the opportunity to sag because the bamboo stakes were replaced frequently (Fig. 1). The first bamboo stake was replaced 3 months after planting and 97% of the bamboo stakes were replaced 9 months after installation. All of them decayed 3 months later.

Bamboo made a significantly effective trellising with barbed wire and nylon cord. However, frequent replacement of bamboo kept nylon cord more tight between stakes than barbed wire or steel wire as handling of nylon cord is relatively easier. Consequently nylon cord made a good combination with bamboo.

Wal ehala: This stake made a good combination with plain steel wire and nylon cord (Table 1). Wal ehala readily sprouts at the basal half. Therefore, it needs replacing more frequently than gliricidia but

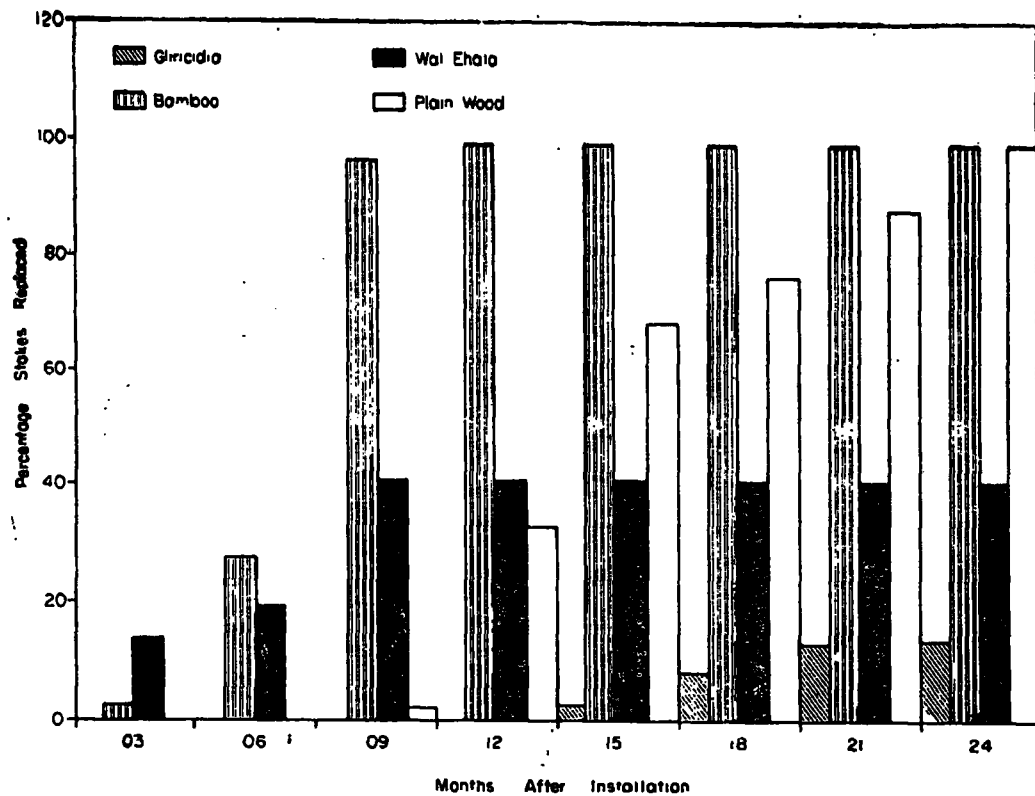


Fig. 1. Percentage stakes replaced versus time

less frequently than bamboo (Fig. 1). Since upper portion decays, the stake would break due to the weight of the vine. The first replacement (about 14%) was recorded 3 months after planting and the highest replanting (41%) was recorded 6 months later. After first 9 months wal ehala grew well, and produced branches. Every replacement during early months has increased the number of established wal ehala stakes in the trial. However wal ehala gave its highest passion fruit yield with both plain steel wire and nylon cord. Steel and nylon cords could easily be tightened. Wal ehala is not a strong stake so that it tends to bend toward a pull, for example, the weight of the vine.

Plain wood: This stake combined with barbed wire yielded 7.42 kg/vine which was the highest recorded for plain wood (Table 1). Plain wood stakes are very strong but easily damaged by termites. The first wood stake was replaced 9 months after installation and all of them were replaced within first 24 months of the experiment (Fig. 1). The stakes were very strong so that they could hold the weight of the vines without losing the tightness of the wire. Also barbed wire can be well fixed on the top of the stake. Steel wire and nylon cord could not maintain the tightness, resulting in lower yields than barbed wire (Table 1).

Concrete: Concrete support, gave high yields when used with nylon cord (8.93 kg/vine) (Table 1). Nylon cord fixed over the concrete supports frequently snapped at the point where it rests on the post. This was mainly due to the swaying of the vines which damaged nylon cord at the point it rests on the post. Unlike live stakes concrete supports were not replaced (Fig. 1).

'L' iron: 'L' iron and barbed wire combination gave markedly higher yield (8.81 kg/vine) (Table 1). 'L' iron is a permanent stake and the barbed wire once it is tightened will not lose the tightness. 'L' iron gave less yields with the plain steel wire and nylon cord.

Nylon cord, barbed and steel wire: Generally, nylon cord, after it is exposed to direct sunlight for few hours, loses its tension, gets extended bending at the middle. Barbed and steel wires have rough surface unlike nylon cord and hence, vines easily spread on them.

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Benefit/cost analysis: Benefit/cost analysis showed that gliricidia and plain steel wire combination gave the highest ratio among all the trellising combinations (Table 2). Bamboo stakes with barbed wire gave the second highest benefit/cost ratio and bamboo with steel wire could just compensate the cost of production. All the other alternate trellising materials tested, yielded a ratio less than 1. The lowest ratio was recorded for 'L' iron and concrete supports because the initial cost of them was extremely high (Table 2).

Table 2. Benefit/cost values for the different types of stakes and wires

Type of stake	Type of wire		
	Plain steel	Barbed wire	Nylon cord
Gliricidia	1.56	0.99	0.62
Bamboo	1.00	1.42	0.99
Wal ehala	0.99	0.63	0.63
Plain wood	0.52	0.65	0.36
Concrete	0.26	0.23	0.20
'L' iron	0.16	0.26	0.09

Assumptions

1. All calculations were based on the prices of inputs and rate of wages as at November 1990.
2. Passion fruit 1 kg = Rs. 10/-.
3. Discounting rate for net income was considered as 12% per annum as suggested by Gittinger (1984).

Most of the farmers might not be able to afford the high cost of trellising. They would definitely prefer durable and readily available, alternate trellising materials that require low maintenance and give higher benefit/cost ratio. If the stake is live, replacement is negligible and also the lopping materials can be used as a mulch.

CONCLUSIONS

There are specific combinations of stakes and wires for trellising passion fruit vines in the mid country wet zone. Gliricidia stakes with plain steel wire gave the highest fruit yield and highest benefit/cost ratio. Bamboo and barbed wire or nylon cord; wal ehala and plain steel wire; and gliricidia with barbed wire also provided suitable trellising materials for passion fruit vines. Bamboo and nylon cord needed frequent replacing.

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