

Protection of Vegetables Against
Typhoons by Passionfruit
Quickfence

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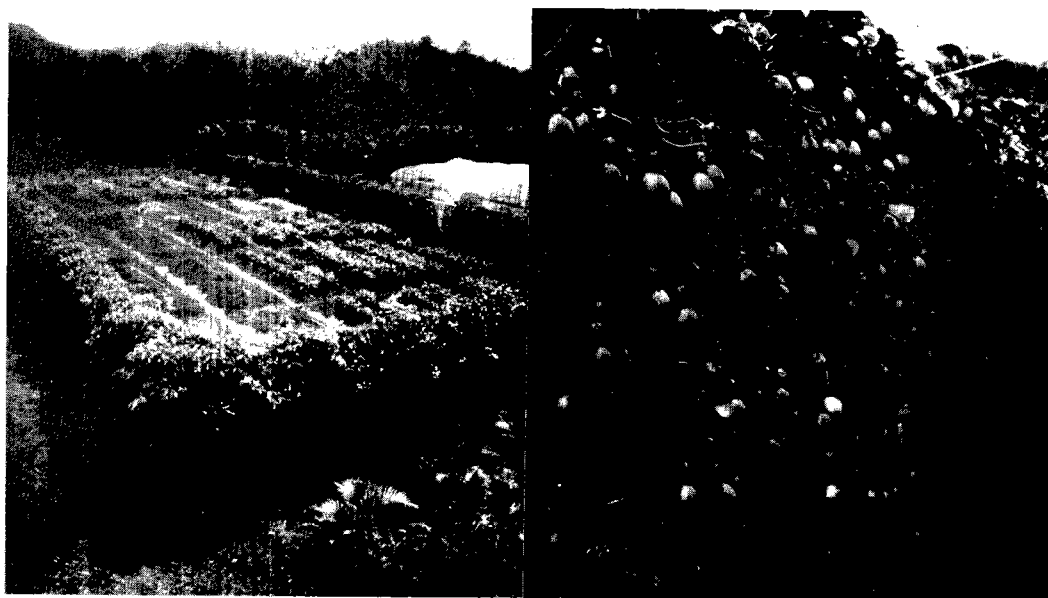


Fig. 1. Quickfence of Passionfruit

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Abstract

The typhoon-windbreaking effect of a passionfruit quickfence trained on scaffold pipes was investigated on the Ogasawara Islands. Typhoon damage to winged bean was much less severe in fields surrounded by this fence than in exposed fields, and the summer income of passionfruit grown on the fence more than paid for the cost of materials and labor required for fence construction. A quickfence of passionfruit plants appears therefore to be an effective and economical way to reduce typhoon damage to crops.

Introduction

The Ogasawara Islands are located at 27 degrees North in the subtropics where typhoon damage frequently disturbs the cultivation of ordinary commercial vegetables from summer to autumn. According to 1971-1982 records, an annual average of 0.8 typhoon passed within 100 km and 2.3 passed within 300 km of Chichijima (Bonin), the main island. Ozawa (1989) reported that row cover provided valuable protection for crawling melon. However, as row cover is not suitable for upright crops, more effective measures are required to prevent typhoon damage.

Traditionally, sugarcane has been cultivated between fields to shelter them from wind, but with the introduction of monoculture and increasing use of farm machinery, compounded by the drop in sugarcane's market value, these wind shelter belts have fallen into disuse. The winter cultivation of pumpkins, a major crop that avoided the typhoon season, has also declined with the increase in imports from Mexico and New Zealand since 1981. These trends have increased the physical and economic risk of typhoon damage to vegetables which cultivated on the Ogasawara Islands.

Shelter nets, another form of protection, are ineffective against typhoon winds, and broken nets sometimes damage the plants by rubbing.

To discover a more effective means of protection, the wind-shelter effect of a passionfruit quickfence was studied and the ancillary income from the passionfruit harvest was measured against costs.

Materials and Methods

Rooted cuttings of passionfruit cultivar Tai-Non No.1, developed at the Feng-Shang Tropical Horticultural Experimental Branch of the Taiwan Agricultural Experimental Station in the Republic of China, were planted around a 6-are field on August 1986. Scaffold pipes (46 mm in diameter) were erected above the passionfruit plants as shown in Fig.2. Branches were supported in an upright position by the pipe ; lateral and ground-trailing branches were removed. Fertilizer was applied only to the field crops, except when the passionfruit plants were transplanted. Passionfruit plants had grown to a sufficient size to provide protection by Spring 1987.

Winged bean cultivar Urizun, developed at the Okinawa Branch of the Japan Tropical Agriculture Research Center, was sown in rows 2 m, 0.75 m apart between hills on February 14, 1987. The young plants were trained on straight stakes as shown in Fig. 3.

Two different kinds of protection were combined in four treatments to determine which strategy would be most effective against typhoon wind: half the fields were left unsheltered by passionfruit fences, and in half of each type of field (sheltered and exposed), stakes were set loosely to allow stakes to fall upon typhoon attack. The combinations were: ① wind shelter

plus fall-down stakes, ② wind shelter, ③ exposure plus fall-down stakes, ④ exposure. Fields of types ① and ② were adjacent to fields of types ③ and ④. Each block contained 12 plants.

Typhoon 8715 attacked the Ogasawara Islands on September 15, 1987, with a maximum recorded wind speed of 40.7 m/sec. The degree of damage to winged bean pods was calculated using Equation (1) according to the classification in Fig. 4.

$$\text{Degree of damage (\%)} = \frac{\sum_{g=0}^5 g \cdot n}{4N} \times 100 \quad (1)$$

where N is the total number of pods, g is the grade of damage, and n is the number of pods having undergone a given grade of damage.

Construction costs were estimated from Economic Research Association construction cost estimates and standard laborer's wages on Ogasawara Island. Yields in the exposed field ④ were not taken into consideration, because plant ages were not the same age as in other fields.

Results and Discussion

The cost of quickfence construction was estimated to be about ¥2,000 per meter, of which ¥1,099 per meter was the cost of materials and ¥945 per meter that of labor (Table 1). The harvest of marketable passionfruit from mid-June to July was 60 fruits or about 4.5 kg per meter.

The degree of pod damage was greatest just after the typhoon passed; plants recovered gradually afterwards, and no damage was observed 9 days after the typhoon in any field. The degree of damage was in the descending order: exposure > wind shelter > exposure plus fall-down stakes > wind shelter plus fall-down stakes (Fig. 5). Post-typhoon marketable yields decreased gradually in all treatments, however increased since middle of October, especially in treatment with wind shelter plus fall-down (Fig. 6).

Because passionfruit leaves were damaged only on the windward side, the quickfence should be generally effective unless it comes under direct attack by a very severe typhoon.

The study demonstrated that a passionfruit quickfence offers not only valuable protection against typhoon winds, but high yields and own tolerance against wind damage as well. Its use is expected to benefit public health in other ways as well, since passionfruit is rich in Vitamin A (Kikutani *et al.* 1988), of which the summer intake by Ogasawara Island residents is poor (Ozawa *et al.*, 1987).

Acknowledgment

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パッションフルーツの生垣を利用した 野菜の防風対策

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小笠原諸島は北緯27度に位置し、台風の常襲地帯である。従来、サトウキビを利用して圃場を仕切り被害を軽減していたが、経済性の上から必ずしも十分とはいえず、さらに有効な対策が望まれていた。そこで、足場パイプを利用して、圃場周囲にパッションフルーツの生垣を作り（Fig. 2）、シカクマメに対する台風被害の軽減効果とパッションフルーツの収量性を検討した。

パッションフルーツ‘台風1号（中華民国台湾省農業試験場鳳山熱帯園芸試験分所）’の挿し木苗を1986年8月に圃場周囲に定植し、翌1987年2月14日にシカクマメ‘ウリズン（熱帯農業研究センター沖縄支所）’を圃場内に播種した（Fig. 3）。1987年9月15日に台風8715号が来襲し、最大瞬間風速40.7 m/sを記録した。この台風に際し、生垣の有無と株たおしの有無を組合せて、①生垣＋株たおし、②生垣、③株たおし、④無処理の4処理を設けシカクマメの被害に及ぼす影響を調査した。処理③、④は、パッションフルーツの生垣に隣接した圃場に設置し、株たおしはシカクマメを誘引した直立支柱ごと、ほぼ一昼夜に渡って実施した。

パッションフルーツの生垣の建設に要する直接工事費は、材工ともで約2,000円/mであった。一方、6月中旬から7月にかけて、生垣1mあたり60果、約4.5kgが収穫でき、この収入は生垣の建設費を大きく上回った（Table 1）。①生垣＋株たおしでは、台風によるシカクマメの若葉の被害が著しく減少し、台風後の収量の回復も早かった（Fig. 5, Fig. 6）。

以上のことから、パッションフルーツの生垣は高い防風機能を有するほか、パッションフルーツそのものの生産性が高く、さらに、生垣としての耐風性も高いことから、著しく有効な防風手段といえた。

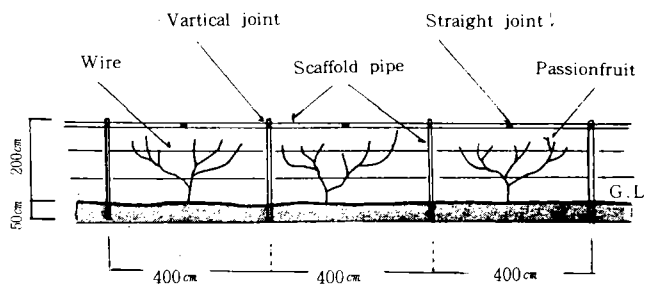


Fig. 2. Structure of quickfence

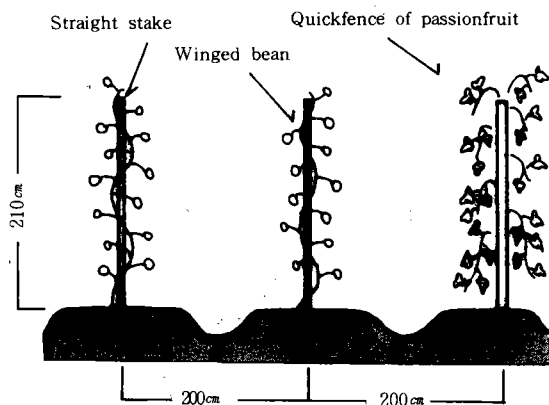


Fig. 3. Illustration of experimental farm

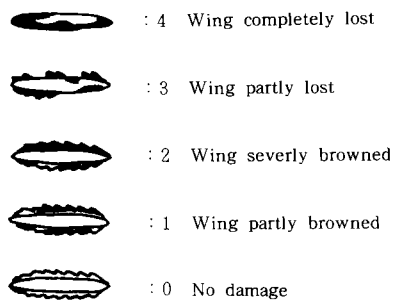


Fig. 4. Grades of pod damage

Table 1 Cost of constructing one meter of quickfence

Materials	Norm	Amount	Unit	Unit price	price
— (Yen) —					
Scaffold pipe	∅46.8	1.625	m	500	813
Straight joint	∅46.8	0.25		180	45
Vartical joint	∅46.8	0.25		230	58
Sundry materials *				180	183
Labor	Normal	0.075	men	12,600	945
Total cost					2,044

* 20% of main materials

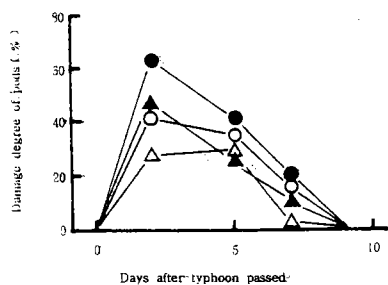


Fig. 5. Effect of each type of protection on pod damage to winged bean

- △ Quickfence plus fall down
- Quickfence
- ▲ Fall down
- Exposed

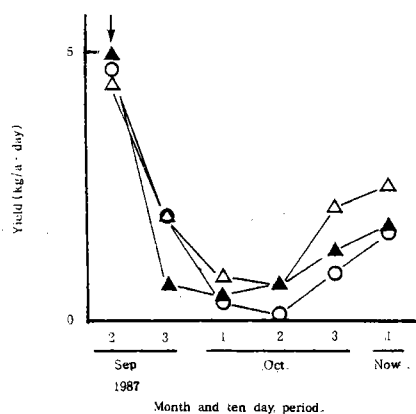


Fig. 6. Effect of each type of protection on winged bean yields

- △ Quickfence plus fall down
 - Quickfence
 - ▲ Fall down
 - Exposed
- Arrow : typhoon attack