FAO SUB-REGIONAL OFFICE FOR THE PACIFIC ISLANDS

REPORT ON THE APPLICATION FOR MARKET ACCESS OF POLYNESIAN PLUM (Spondias dulcis) FROM FIJI, VANUATU, SAMOA, COOK ISLANDS AND TONGA TO NEW ZEALAND

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Final Report on the Application for Market Access of Polynesian Plum (*Spondias dulcis*) from Fiji, Vanuatu, Samoa, Cook Islands and Tonga to New Zealand

(*Spondias dulcis*)

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Acknowledgements

This report is an output of requests from governments of Fiji, Vanuatu, Samoa, Cook Islands and Tonga for FAO Technical Assistance to provide support to the five Pacific Island Countries to collect and provide relevant information which will form the basis to enable New Zealand Ministry of Agriculture an Fisheries (NZMAF) Biosecurity to carry out Risk Analysis Assessment for the Market Access of Polynesian Plum (*Spondias dulcis*) and Island Cabbage (*Abelmoschus manihot*) to New Zealand.

This is a major task, as indicated in the Terms of Reference and tight work programs so as to meet as many Officials and cover wide areas in all the five countries including New Zealand, and it would not have happened without the excellent assistance extended to me throughout my consultations. The information and data presented in this report were collected during these consultations.

Therefore, I am pleased to acknowledge the technical assistance by FAO and in particular Dr. Vili Fuavao, the FAO Sub Regional Representative of SAPA, Dr. Matairangi Purea and Staff for this consultancy, and all support on the logistics of travel and work program appointments to the five Pacific Island countries, and including New Zealand.

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I was overwhelmed with the excellent support and helpfulness from the Heads of Agriculture, Senior Staff and Officials, Produce Exporters and Traders, and Growers of Fiji, Vanuatu, Samoa, Cook Islands and Tonga. I had wonderful support in organizing my visits and appointment from the FAO Contact Points in all the five countries. It was a very good feeling to have positive support from the locals, thus giving a good indication of their wishes and desires to open up new market access in New Zealand.

The Secretariat of the Pacific Community is a major provider of Pests and Diseases Database for the Pacific Islands and was the main source for me. Ms Luisa Korodrau and Dr. Lex Thomson were very helpful indeed in accessing information on Vi.

I had very good support from Mr. Chris Cocker, the Trade Commissioner for the Pacific Islands Trade and Investment Commission in Auckland, with provision of transportation and in particular his staff Mr. Joe Fuavao, who made my appointments and market visits possible, I would not have covered much without his help.

Executive Summary

The Polynesian plum is indigenous to tropical Asia but an ancient introduction to Melanesia, Polynesia and as far as the Marquesas and to the Caroline Islands in Micronesia. The tree is found growing very well in the more tropical islands of Fiji, Vanuatu, and Samoa as well as in the cooler climates of the Cook Islands and Tonga. It is cultivated for its edible fruits and also for its use in native medicine. It is not referred to specifically by varieties but rather as broad categories according to type of tree, fruit shape, fruit sizes and fruit flavor such as Small fruits; Large fruits; Oval fruits; Oblong fruits; Sour/sweet fruits and Dwarf varieties.

The actual cultivated acreages in the five requesting countries are not known as it is not cultivated commercially but rather as backyard trees in their residential homes or at their farmlands or as one of the forest plants. The tree is propagated mainly from seeds though rooted stem cuttings is also used. It takes up to 5 years or more to start bearing fruits, and continue fruiting up to 40 years or more. It is grown organically with no spray programs at all and no chemical fertilizers either. Polynesian plum is found to be thriving well in the low/medium climates of these five countries. Polynesian plums generally start flowering as early as July and continue right through to December. Fruit maturity may begin from November through to July, depending on the time of flowering and climatic conditions. It is noted that the flowering season and maturing season starts earlier in Samoa, Cook Islands and Tonga and much later in Fiji, and Vanuatu**.**

There are very good fresh market potentials for this fruit in New Zealand, especially through existing Pacific Market Outlets and also through the weekend flea markets such as in Otara, and Mangere. There were very positive responses from the Island Importers in New Zealand due to its off season nature, meaning it matures during the time when there are no fruits such as breadfruits, avocado, mangoes etc., thus enabling the HTFA facilities to operate all year round, and for Pacific Islanders in New Zealand to buy and eat one of their favorite fruits.

It is significant to note that the *Spondias dulcis* is not a fruit fly host in Fiji, Samoa, Cook Islands and Tonga. However, it is a host for the *Bactrocera trelineola* fruit fly in Vanuatu, a specie that is not in the other four countries. As for the other pests, at present there are no spray programs in all five requesting countries. There are two options for the five countries:

i. Declare as fruit fly Non-Host Status of Polynesian Plum for Fiji, Samoa, Cook Islands and Tonga and export at only immature to green mature fruits.

ii. Fruit Fly Treatment Using High Temperature Forced Air (HTFA).

All the five requesting countries have High Temperature Forced Air (HTFA) Treatment Facilities and their Quarantine Authorities are well aware and very familiar with the procedures, and approved Pathways for their respective approved commodities to New Zealand.

Without any spray programs, the use of HTFA treatment appears to be a very good option as the fruits are assured to be free of any fruit flies or any other pests. Though some HTFA plants are not operational, these could be fixed, tested and re-certified. Pathways could be developed for the Polynesian plum in the same manner as that used in Tonga for mango, avocado and breadfruit. Those crops are grown as backyard or farmland fruit trees without the use of fertilizers and pesticide sprays. A Sample Export Pathway for Polynesian Plum is shown in Figure 9 of the report.

Part 1: Information on Crop

1. Crop

Scientific Name	: Spondias dulcis Parkinson, Jour
Synonym	: Spondias cytherea Sonnerat.
Family	: Anacardiaceae
Common Name	: Polynesian Plum, Golden Apple/Otaheite
Fiji	: Wi, Aura
Vanuatu	: Naus
Samoa	: Vi
Cook Islands	: Vi Kavakava
Tonga	: Vi

2. Distribution and Ecology

The Polynesian plum is indigenous to tropical Asia but an ancient introduction to Melanesia, Polynesia and as far as the Marquesas and to the Caroline Islands in Micronesia. The tree is found growing very well in the more tropical islands of Fiji, Vanuatu, and Samoa, as well as in the cooler climates of the Cook Islands and Tonga. It is cultivated for its edible fruits and also for its use in native medicine.

3. Variety

Though the Polynesian Plum is an ancient fruit tree of the Pacific, it is not referred to specifically by varieties, but rather as broad categories according to type of tree, fruit shape, fruit sizes and fruit flavor. These categories include: Small fruit varieties; Large fruit varieties; Oval fruits; Oblong fruits; Sour/sweet varieties and Dwarf varieties. Some of the common ones are shown in the pictures below:

Figure 1: Oval fruits

Figure 2: Oblong fruits

Figure 3: Dwarf variety with small fruits

It was found that the variety was not an issue but rather referred to all fruits as Wi or Vi and marketed as such irrespective of variety, shape or taste.

4. Botanical Description

Generally, it is a medium sized to large branching tree, smooth, grey-barked deciduous tree up to 15 meters or more in height. Leaves alternate, pinnately, compound. Flowers are in paniculate clusters, numerous, small, and white. Fruits are oval to oblong, with green to yellow skin and light green pulp. The seeds are large and fibrous. However, there are now dwarf varieties developed in Tahiti, Hawaii and other countries and now being introduced, as noted in the Cook Islands. This dwarf variety may have very good potential for commercial cultivation in the future. The tree is deciduous; meaning that it sheds all its leaves annually during the cooler months and mature trees usually begin to flower and fruiting with the new flush of leaves.

Figure 4: Mature Fruiting Trees

Figure 5: Deciduous during cool winter months

Figure 6: New flush with young fruits

5. Producing Area

The tree is found growing extremely well as a backyard garden tree as well as a forest plant and in great abundance in Vanuatu, Fiji and Samoa and lesser extend in the cooler countries of Tonga and Cook Islands. It is not grown in the small coral islands or atolls.

6. Production

The actual cultivated acreages in the five requesting countries are not known as it is not cultivated commercially but rather as backyard trees in their residential homes or at their farmlands or as one of the forest plants.

The tree is propagated mainly from seeds though rooted stem cuttings is also used. It takes up to 5 years or more to start bearing fruits, and continue fruiting up to 40 years or more. The plant is allowed to grow to a large tree but may be pruned back severely, especially in town properties and backyard gardens. Re-growths were commonly seen on this study.

For commercial cropping, pruning will be an important aspect to enable pesticide treatments and ease of harvesting. The use of dwarf varieties is worth consideration particularly if they truly fruit all year round, as I was told in the Cook Islands.

Polynesian plum is grown organically in all the five requesting countries. It is grown organically in all the five countries with no spray programs at all and no chemical fertilizers either.

Polynesian plums generally start flowering as early as July and continue right through to December. Fruit maturity may begin from November through to July, depending on the time of flowering and climatic conditions. It is noted that the flowering season and maturing season starts earlier in Samoa, Tonga and Cook Islands and much later in Fiji, and Vanuatu. This is noted also on the quantities of fruits being sold on the local markets. There were still lots of fruits on the trees and at the markets in Fiji and Vanuatu as compared to Samoa, Tonga and Cook Islands.

7. Temperature and Rainfall

There are many variations in the climatic conditions between the five countries due to the land and ocean mass. However, they all enjoy a tropical maritime climate without great extreme of heat or cold. All five countries experience the same distinct wet season from November to April and dry season from May to October. They are all exposed and vulnerable to the cyclonic periods during the wet season from November to April and similarly to prolong dry spells and prolong wet conditions associated with La Nina and El Nino phenomenon. The high countries of Fiji, Vanuatu and Samoa experience flash flooding during the wet season. Also the five countries are within the 'Ring of Fire' in the Pacific Ocean and thus experience earthquakes and tsunami threats/warnings.

The Polynesian plum is found to be thriving well in the low/medium climates of these five countries.

The table below shows the distribution of Average Temperatures, Rainfall and Relative Humidity for the five countries.

Table 1: Distribution of average temperatures, rainfall and relative humidity for five countries

Country	Average Temperature	Average Rainfall	Average Relative Humidity
Fiji	18 - 32° C	1500 – 6000 mm	65 – 90%
Vanuatu	21 – 27° C	1500 – 4000 mm	75 – 80%
Samoa	19 - 32.2° C	2000 - 5000 mm	70 – 91%
Cook Islands	21 – 28° C	2000 mm	84 %
Tonga	18 – 30° C	1673 – 2453 mm	80.6%

8. Harvesting

The Polynesian plum is a tree and it grows bigger and taller with age. The usual techniques of harvesting are by:

- **i.** Young men/boys climb the trees and shake the fruits down or use a long pole up on the tree to pick the fruit.
- **ii.** Use a long pole from the ground to pluck the fruits.
- **iii.** Throw sticks to bring down the fruits, usually for very tall trees.
- **iv.** Allow the fruits to ripen on the tree and collected for eating when fallen to the ground.

The above methods may result in bruised and cracked fruits. However, these fruits are not wasted as they are eaten up fresh on the spot.

For export it will be absolutely necessary to pick the fruits carefully to avoid any fruit damages as fruit quality and shelf life will be adversely affected by any post harvest treatments required. The use of netting to catch the fruits would be very useful.

A very important aspect to this is to prune back the tall trees to lower levels and maintain the re-growths within easy reach, thus facilitate good harvest techniques. Use of dwarf varieties has good potentials.

9. Marketing

9.1 Local Market

Fruits are transported to the local markets in coconut baskets or in bags. They are displayed on tables and sold singly depending on size or in small heaps/lots of 6-12 fruits and sold at $1-$3.00. Fruits are sold in this manner in Vanuatu, Fiji and Tonga. None were seen in Samoa and Cook Islands, probably due to end of season.

Figure 7: Large oblong fruits sold in heaps or as single fruit

Figure 8: Large oval fruits sold in heaps or as single fruit

9.2. Export Market

At present, only Fiji exports fresh Polynesian plum to Canada under normal phytosanitary requirements as Canada is not threatened due to its climate regimes. Tonga does send to New Zealand small quantities of dried barks and leaves of the Polynesian plum for Tongan medicine.

There are very good fresh market potentials for this fruit in New Zealand, especially through existing Pacific Market Outlets and also through the weekend flea markets such as in Otara and Mangere. There were very positive responses from Importers of produce from the Islands and with hopes that clearances come soon and not to wait for years.

It is important to note that market access of this commodity to New Zealand was very much supported by Island Exporters, High Temperature Forced Air (HTFA) Operators and growers in the five requesting countries and also the Island Importers in New Zealand, This is due to its off season nature, meaning it matures during the time when there are no fruits such as breadfruits, avocado, mangoes etc., thus enabling the HTFA facilities to operate all year round, and for Pacific Islanders in New Zealand to buy and eat one their favorite fruits.

All the five countries have existing NZ MAF Biosecurity Commodity Pathways with selected and approved crops and they all have HTFA Treatment Facilities. Upon approval, similar Pathways (System's Approach) could be developed for the Polynesian Plum.

10. Uses of Polynesian Plum

The fruit is a favorite among the local population of the five requesting countries. They are grown as one of the backyard fruit trees. It is available when the other fruits such as mangoes, avocado, orange, breadfruits etc, are not in season.

The fruits are eaten by the family, shared with neighbors and relatives or sold at the local markets.

The leathery fruit skins of very green to mature fruits are peeled and flesh eaten fresh green or ripen.

The fruit is also crated, mixed with crated coconut in water and sugar to make 'otai vi", a delicious island drink.

Mature fruits are also used for making local vi jam. Immature to mature fruits are used for making pickles and chutneys.

Other parts of the tree are used for native medicine. In Tonga infusion of the bark is use for treating stomachache, diarrhea and teething problems of children. Infusion of leaves used for treating pink eye. Big trunks also used for making canoes.

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Part 2 Pest and Diseases

2A Summary Tables

2A.1. Fruit fly List for Specific Countries, Hosts, Identified Commodities, Host Lists and References

It was very important to look at the fruit fly status of the five countries and to see if *Spondias dulcis* is a host.

It is significant to note that the *Spondias dulcis* is not a fruit fly host in Fiji, Samoa, Cook Islands and Tonga. However, it is a host for the *Bactrocera trelineola* fruitfly in Vanuatu, specie that is not in the other four countries.

Listed below are the fruit fly species, hosts of economic importance and references for the 5 countries.

2A.1.1 Fruit fly Species and Hosts – Fiji Islands

2A.1.1.1 Pacific Fruit Fly (*Bactrocera xanthodes* (Broun))

It is known to attack at least 40 host plant species in 30 genera and 22 families. Published host plant records from surveys in Fiji, Tonga, Samoa and Cook Islands include:

Plant families	Plant species	Common names	Cook Is	Tonga	Fiji	Samoa
ANACARDIACEAE	*Mangifera indica*	Mango	-	X	-	-
ANNONACEAE	*Annona muricata*	Soursop	-	-	-	X
APOCYNACEAE	*Cerbera manghas*	-	-	X	-	-
APOCYNACEAE	*Ochrosia oppositifolia*	-	-	X	X	-
CARICACEAE	*Carica papaya*	Papaya	X	X	X	X
COMBRETACEAE	*Terminalia catappa*	Tropical almond	-	-	-	X
EUPHORBIACEAE	*Excoecaria agallocha*	-	-	X	-	-
LAURACEAE	*Persea americana*	Avocado	-	X	-	X
LECYTHIDACEAE	*Barringtonia edulis*	-	-	-	X	-
MORACEAE	*Artocarpus altilis*	Breadfruit	X	X	X	X
MORACEAE	*Artocarpus heterophyllus*	Jackfruit	X	-	X	X
PASSIFLORACEAE	*Passiflora edulis*	Passionfruit	-	X	-	-
PASSIFLORACEAE	*Passiflora ligularis*	Passionfruit	-	X	-	-
PASSIFLORACEAE	*Passiflora quadrangularis*	Giant granadilla	-	X	X	X
RUTACEAE	*Citrus maxima*	Pomelo	-	-	X	-
RUTACEAE	*Citrus reticulata*	Mandarin	-	X	-	-
SAPOTACEAE	*Burckella richii*	-	-	X	-	-
SAPOTACEAE	*Pouteria cainito*	Abiu	-	-	-	X
SOLANACEAE	*Capsicum annuum*	Bell pepper	-	X	-	-

Table 2: Pacific fruit fly host plants - Fiji

Sources of published host data:

1. Drew, R.A.I. 1989. The Tropical Fruit Flies (Diptera: Tephritidae: Dacinae) of the Australasian and Oceanian regions. Memoirs of the Queensland Museum. 26: 1-521.

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2A.1.1.2 *Bactrocera kirki* (Froggatt)

Its known host range includes 49 host species in 32 genera and 22 families. The following list covers published host plants from surveys in Tonga, Samoa and French Polynesia:

Plant families	Plant species	Common names	Tonga	Samoa	French Polynesia
ANACARDIACEAE	*Mangifera indica*	Mango	X	X	X
ANACARDIACEAE	*Spondias cytherea*	Golden apple	-	-	X
ANACARDIACEAE	*Spondias mombin*	Hog-plum	-	-	X
ANNONACEAE	*Annona muricata*	Soursop	X	-	X
ANNONACEAE	*Annona reticulata*	Bullock's heart	-	-	X
APOCYNACEAE	*Ochrosia oppositifolia*	-	X	-	-
CAESALPINACEAE	*Inocarpus fagifer*	Tahiti chestnut	X	X	X
CARICACEAE	*Carica papaya*	Papaya (ripe)	-	-	X
COMBRETACEAE	*Terminalia catappa*	Tropical almond	X	X	X
COMBRETACEAE	*Terminalia littoralis*	-	X	-	-
CUCURBITACEAE	*Cucurbita pepo*	Pumpkin	-	-	X
GUTTIFERAE	*Calophyllum inophyllum*	Indian laurel	X	X	-
LAURACEAE	*Persea americana*	Avocado	X	X	X
MYRTACEAE	*Eugenia brasiliensis*	-	-	X	-
MYRTACEAE	*Eugenia uniflora*	Surinam cherry	X	-	-
MYRTACEAE	*Psidium cattleianum*	Strawberry guava	-	-	X
MYRTACEAE	*Psidium guajava*	Guava	X	X	X
MYRTACEAE	*Syzygium corynocarpum*	-	X	-	-
MYRTACEAE	*Syzygium deleatum*	-	X	-	-
MYRTACEAE	*Syzygium jambos*	Rose-apple	X	X	X
MYRTACEAE	*Syzygium malaccense*	Mountain apple	X	X	X
MYRTACEAE	*Syzygium neurocalyx*	-	X	-	-
MYRTACEAE	*Syzygium richii*	-	X	-	-
OXALIDACEAE	*Averrhoa carambola*	Carambola	X	-	X
PASSIFLORACEAE	*Passiflora edulis*	Passionfruit	X	X	-
PASSIFLORACEAE	*Passiflora quadrangularis*	Giant granadilla	-	-	X
ROSACEAE	*Eryobotria japonica*	Loquat	-	-	X
RUBIACEAE	*Morinda citrifolia*	Noni	-	X	-
RUTACEAE	*Citrus maxima*	Pomelo	-	-	X
RUTACEAE	*Citrus reticulata*	Mandarin	X	-	X
RUTACEAE	*Citrus sinensis*	Orange	X	-	X
SAPINDACEAE	*Pometia pinnata*	Pacific lychee	-	X	X
SAPOTACEAE	*Pouteria cainito*	-	-	X	-
SOLANACEAE	*Capsicum annuum*	Bell pepper	X	-	-
SOLANACEAE	*Solanum melongena*	Eggplant	-	-	X
TILIACEAE	*Elaeocarpus tonganus*	-	-	X	-

Table 3: Bactrocera kirki (Froggatt) host plants - Fiji

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3. Leweniqila, L., Heimoana, V., Purea, M., Munro, E., Allwood, A.J., Ralulu, L. and E. Tora Vueti. 1997. Seasonal abundances of *Bactrocera facialis* (Coquillett), *B. passiflorae* (Froggatt), *B. xanthodes* ((Broun) and *B. melanotus* (Coquillett) in Orchard and Forest Habitats. pp. 121-124 in: Allwood, A.J. and R.A.I. Drew. Management of Fruit Flies in the Pacific. ACIAR Proceedings No 76. 267p.

4. Leblanc, L. and R. Putoa. 2000. Fruit Flies in French Polynesia and Pitcairn Islands. SPCPest Advisory Leaflet No 29. 4pp.

5. Litsinger, J.A, Fakalata, O.K., Faluku, T.L., Crooker, P.S. and N. von Keyserlingk. 1991. A Study of Fruit Fly Species (Tephritidae) Occuring in the Kingdom of Tonga. pp. 177-190 in: Vijaysegaran, S., and A.G. Ibrahim (Eds). First Symposium on Fruit Flies in the Tropics. Kuala Lumpur, 1988. Malaysian Agricultural Research and Development Institute. Kuala Lumpur.

6. Tunupopo Laiti, F., Enosa, B., Peters, A. and E. Tora Vueti. 2002. Fruit flies in Samoa. SPC Pest Advisory Leaflet No 32. 4pp. Download the leaflet in English (327 Kb pdf document). Tupou, S., Heimoana, V., Foliaki, S. and E. Tora Vueti. 2001. Fruit Flies in Tonga. SPC Pest Advisory Leaflet No 41. 4pp.

2A.1.1.3 *Bactrocera passiflorae* (Froggatt)

A polyphagous pest species recorded from at least 55 host plant species in 42 genera and 29 families. Published host records from Fiji are:

Plant families	Plant species	Common names	Fiji
ANACARDIACEAE	*Anacardium occidentale*	Cashew	X
ANACARDIACEAE	*Dracontomelon sylvestre*	-	X
ANACARDIACEAE	*Mangifera indica*	Mango	X
APOCYNACEAE	*Cerbera manghas*	-	X
APOCYNACEAE	*Ochrosia oppositifolia*	-	X
CAESALPINACEAE	*Inocarpus fagifer*	Tahiti chestnut	X
CHRYSOBALANACEAE	*Chrysobalanus icaco*	-	X
COMBRETACEAE	*Terminalia catappa*	Tropical almond	X
COMBRETACEAE	*Terminalia litoralis*	-	X
LAURACEAE	*Persea americana*	Avocado	X
LECYTHIDACEAE	*Barringtonia edulis*	-	X
LONGIANACEAE	*Neuburgia corynocarpa*	-	X
MYRTACEAE	*Psidium cattleianum*	Strawberry guava	X
MYRTACEAE	*Psidium guajava*	Guava	X
MYRTACEAE	*Syzygium jambos*	Rose apple	X
MYRTACEAE	*Syzygium malaccense*	Mountain apple	X
PASSIFLORACEAE	*Passiflora quadrangularis*	Giant granadilla	X
RUBIACEAE	*Coffea liberica*	Coffee	X
RUTACEAE	*Citrus aurantium*	Sour orange	X
RUTACEAE	*Citrus maxima*	Pomelo	X
RUTACEAE	*Citrus reticulata*	Mandarin	X
RUTACEAE	*Citrus sinensis*	Orange	X
RUTACEAE	*Citrus x paradisi*	Grapefruit	X
RUTACEAE	*Fortunella japonica*	Kumquat	X
SANTALACEAE	*Santalum yasi*	Sandalwood	X
SAPINDACEAE	*Pometia pinnata*	Pacific lychee	X
SAPOTACEAE	*Chrysophyllum cainito*	Star apple	X
SIMAROUBACEAE	*Amaroria soulameides*	-	X

Table 4: Bactrocera passiflorae (Froggatt) host plants - Fiji

Sources of published host data:

1. Drew, R.A.I. 1989. The Tropical Fruit Flies (Diptera: Tephritidae: Dacinae) of the Australasian and Oceanian regions. Memoirs of the Queensland Museum. 26: 1-521.

2. Simmonds, H.W. 1936. Fruit Fly Investigations. 1935. Department of Agriculture, Fiji. Bulletin No. 19. 18pp.

3. Tora Vueti, E. 2000. Fruit Flies in Fiji Islands. SPC Pest Advisory Leaflet No 28. 4pp.

4. Tora Vueti, E., Ralulu, L., Walker, G.P., Allwood, A.J., Leweniqila, L. and A. Balawakula. 1997. Host availability - Its impact on Seasonal Abundance of Fruit Flies. pp. 105-110 in: Allwood, A.J. and R.A.I. Drew. Management of Fruit Flies in the Pacific. ACIAR Proceedings No 76. 267p.

2A.1.1.4 *Bactrocera distincta* (Malloch)

Distribution: Fiji Islands, Tonga, Samoa, American Samoa, Futuna.

It infests 10 host species, in 9 genera and 5 families, but mostly in the family Sapotaceae. There are several more records that need to be confirmed. Published host records in Fiji include:

Plant families	Plant species	Common names	TONGA	FIJI	SAMOA
MYRTACEAE	*Eugenia brasiliensis*	-	-	-	X
SAPOTACEAE	*Burkella richii*	Kau'uta (Tongan name)	X	-	-
SAPOTACEAE	*Chrysophyllum cainito*	Star apple	X	X	X
SAPOTACEAE	*Manilkara zapota*	Sapodilla	X	X	X
SAPOTACEAE	*Planchonella costata*	Kalaka (Tongan name)	X	-	-
SAPOTACEAE	*Planchonella membranacea*	Kau tahi (Tongan name)	X	X	-

Table 5: Bactrocera distincta (Malloch) host plants - Fiji

Sources of published host data

1. Drew, R.A.I. 1989. The Tropical Fruit Flies (Diptera: Tephritidae: Dacinae) of the Australasian and Oceanian egions. Memoirs f the Queensland Museum. 26: 1-521.

2. Litsinger, J.A, Fakalata, O.K., Faluku, T.L., Crooker, P.S. and N. von Keyserlingk. 1991. A Study of Fruit Fly Species (Tephritidae) Occuring in the Kingdom of Tonga. pp. 177-190 in: Vijaysegaran, S., and A.G. Ibrahim (Eds). First Symposium on Fruit Flies in the Tropics. Kuala Lumpur, 1988. Malaysian Agricultural Research and Development Institute. Kuala Lumpur.

3. Tora Vueti, E. 2000. Fruit Flies in Fiji Islands. SPC Pest Advisory Leaflet No 28. 4pp.

4. Tora Vueti, E., Allwood, A.J., Leweniqila, L., Ralulu, L., Balawakula, A., Malau, A., Sales, F. and K. Peleti. 1997. Fruit Fly Fauna in Fiji, Tuvalu, Wallis and Futuna, Tokelau and Nauru. pp. 60-63 in: Allwood, A.J. and R.A.I. Drew. Management of Fruit Flies in the Pacific. ACIAR Proceedings No 76.67p.

5. Tunupopo Laiti, F., Enosa, B., Peters, A. and E. Tora Vueti. 2002. Fruit flies in Samoa. SPC Pest Advisory Leaflet No 32. 4pp. Download the leaflet in English (327 Kb pdf document).

6. Tupou, S., Heimoana, V., Foliaki, S. and E. Tora Vueti. 2001. Fruit Flies in Tonga. SPC Pest Advisory Leaflet No 41. 4pp.

2A.1.2 Fruitfly Species and Hosts – Vanuatu

2A.1.2.1 *Bactrocera trilineola* Drew

Surveys by the Fruit Fly Project have identified 31 host plant species in 26 genera and 18 families. Published host records are compiled on the following table:

Plant families	Plant species	Common names	Vanuatu
ANACARDIACEAE	*Anacardium occidentale*	Cashew	X
ANACARDIACEAE	*Mangifera indica*	Mango	X
ANNONACEAE	*Annona muricata*	Soursop	X
CARICACEAE	*Carica papaya*	Papaya	X
CAESALPINACEAE	*Inocarpus fagifer*	Tahiti chestnut	X
COMBRETACEAE	*Terminalia catappa*	Tropical almond	X
LAURACEAE	*Persea americana*	Avocado	X
MORACEAE	*Artocarpus altilis*	Breadfruit	X
MUSACEAE	*Musa x paradisiaca*	Plantain	X
MYRTACEAE	*Eugenia uniflora*	Surinam cherry	X
MYRTACEAE	*Psidium guajava*	Guava	X
MYRTACEAE	*Syzygium elusiifolium*	-	X
MYRTACEAE	*Syzygium jambos*	Rose-apple	X
MYRTACEAE	*Syzygium malaccense*	Mountain apple	X
OXALIDACEAE	*Averrhoa carambola*	Carambola	X
RUTACEAE	*Citrus limon*	Lemon (smooth)	X
RUTACEAE	*Citrus maxima*	Pomelo	X
RUTACEAE	*Citrus sinensis*	Orange	X
RUTACEAE	*Fortunella japonica*	Kumquat	X
SAPINDACEAE	*Pometia pinnata*	Pacific lychee	X

Table 6: Bactrocera trilineola Drew host plants - Vanuatu

Sources of published host data

1. Allwood, A.J. 2000. Fruit Flies in Vanuatu. SPC Pest Advisory Leaflet No 27. 4pp.

2. Allwood, A.J., Tumukon, T., Tau, D. and A. Kassim. 1997. Fruit Fly Fauna in Vanuatu. pp. 77-80 in: Allwood, A.J. and R.A.I. Drew. Management of Fruit Flies in the Pacific. ACIAR Proceedings No 76. 267p.

2A.1.2.2 Breadfruit fly (*Bactrocera umbrosa* (Fabricius))

Host range restricted to *Artocarpus* spp. (Moraceae): breadfruit (*A. altilis*), jackfruit (*A. heterophyllus*), chempedak (*A. integer*) (record from Asia). Host records from other families in Asia to be verified.

Sources of published host data

1 Drew, R.A.I. 1989.The tropical fruit flies (Diptera: Tephritidae: Dacinae) of the Australasian and Oceanian regions. Memoirs of the Queensland Museum. Volume 26. 521 pp. (Description and illustration).

2 Hong, T.K., Serit, M. 1988. Movements and population density comparisons of native male adult *Dacus dorsalis* and *Dacus umbrosus* (Diptera: Tephritidae) among three ecosystems. Journal of plant protection in the tropics. 5: 17-21. (Ecology).

3 Vagalo, M., Hollingsworth, R., Tsatsia, F. 1997. Fruit fly fauna in Solomon Islands. pp. 81-86 in: Allwood, A.J., and Drew, R.A I., Management of fruit flies in the Pacific. ACIAR Proceedings No 76. 267pp. (Host list, seasonal abundance).

4 Tan, H.K. 1984. Description of a new attractant trap and the effect of placement height on catches of two *Dacus* species (Diptera: Tephritidae). Journal of Plant Protection in the Tropics. 1: 117-120. (Trapping).

5 Tan, H.K. 1985. Estimation of native populations of male *Dacus* spp. by Jolly's stochastic method using a new designed attractant trap in a village ecosystem. Journal of Plant Protection in the Tropics. 2: 87-95. (Trapping).

6 Tan, H.K., and Lee, S.L. 1982. Species diversity and abundance of *Dacus* (Diptera: Tephritidae) in five ecosystems of Penang, West Malaysia. Bulletin of Entomological Research. 72: 709-716.

2A.1.3 Fruit fly Species and Hosts – Samoa

2A.1.3.1 Pacific Fruit Fly (*Bactrocera xanthodes* (Broun))

It is known to attack at least 40 host plant species in 30 genera and 22 families. Published host plant records from surveys in Fiji, Tonga, Samoa and Cook Islands include:

Plant families	Plant species	Common names	Cook Is	Tonga	Fiji	Samoa
ANACARDIACEAE	*Mangifera indica*	Mango	-	X	-	-
ANNONACEAE	*Annona muricata*	Soursop	-	-	-	X
APOCYNACEAE	*Cerbera manghas*	-	-	X	-	-
APOCYNACEAE	*Ochrosia oppositifolia*	-	-	X	X	-
CARICACEAE	*Carica papaya*	Papaya	X	X	X	X
COMBRETACEAE	*Terminalia catappa*	Tropical almond	-	-	-	X
EUPHORBIACEAE	*Excoecaria agallocha*	-	-	X	-	-
LAURACEAE	*Persea americana*	Avocado	-	X	-	X
LECYTHIDACEAE	*Barringtonia edulis*	-	-	-	X	-
MORACEAE	*Artocarpus altilis*	Breadfruit	X	X	X	X
MORACEAE	*Artocarpus heterophyllus*	Jackfruit	X	-	X	X
PASSIFLORACEAE	*Passiflora edulis*	Passionfruit	-	X	-	-
PASSIFLORACEAE	*Passiflora ligularis*	Passionfruit	-	X	-	-
PASSIFLORACEAE	*Passiflora quadrangularis*	Giant granadilla	-	X	X	X
RUTACEAE	*Citrus maxima*	Pomelo	-	-	X	-
RUTACEAE	*Citrus reticulata*	Mandarin	-	X	-	-
SAPOTACEAE	*Burckella richii*	-	-	X	-	-
SAPOTACEAE	*Pouteria cainito*	Abiu	-	-	-	X
SOLANACEAE	*Capsicum annuum*	Bell pepper	-	X	-	-
SOLANACEAE	*Lycopersicon esculentum*	Tomato	-	X	-	-

Table 7: Pacific Fruit Fly host plants - Samoa

Sources of published host data

1 Drew, R.A.I. 1989. The Tropical Fruit Flies (Diptera: Tephritidae: Dacinae) of the Australasian and Oceanian regions. Memoirs of the Queensland Museum. 26: 1-521.

2 Heimoana, V., Tunupopo, F., Toleafoa, E. and C. Fakanaiki. 1997. The Fruit Fly Fauna of Tonga, Western Samoa, American Samoa and Niue. pp. 57-59 in: Allwood, A.J. and R.A.I. Drew. Management of Fruit Flies in the Pacific. ACIAR Proceedings No 76. 267p.

3 Kassim, A. 1994. Fruit Flies and Their Control in Cook Islands (1st Ed.). SPC Pest Advisory Leaflet. 8pp.

4 Kassim, A. 2001. Fruit Fly in Cook Islands (Revised Edition). SPC Pest Advisory Leaflet No. 35.

5 Litsinger, J.A, Fakalata, O.K., Faluku, T.L., Crooker, P.S. and N. von Keyserlingk. 1991. A Study of Fruit Fly Species (Tephritidae) Occuring in the Kingdom of Tonga. pp. 177-190 in: Vijaysegaran, S., and A.G. Ibrahim (Eds). First Symposium on Fruit Flies in the Tropics. Kuala Lumpur, 1988. Malaysian Agricultural Research and Development Institute. Kuala Lumpur.

6 Simmonds, H.W. 1936. Fruit Fly Investigations. 1935. Department of Agriculture, Fiji. Bulletin No. 19. 18pp.

7 Tora Vueti, E. 2000. Fruit Flies in Fiji Islands. SPC Pest Advisory Leaflet No 28. 4pp.

8 Tora Vueti, E., Ralulu, L., Walker, G.P., Allwood, A.J., Leweniqila, L. and A. Balawakula. 1997. Host availability - Its impact on Seasonal Abundance of Fruit Flies. pp. 105-110 in: Allwood, A.J. and R.A.I. Drew. Management of Fruit Flies in the Pacific. ACIAR Proceedings No 76. 267p.

9 Tunupopo Laiti, F., Enosa, B., Peters, A. and E. Tora Vueti. 2002. Fruit flies in Samoa. SPC Pest Advisory Leaflet No 32. 4pp. Download the leaflet in English (327 Kb pdf document).

10 Tupou, S., Heimoana, V., Foliaki, S. and E. Tora Vueti. 2001. Fruit Flies in Tonga. SPC Pest Advisory Leaflet No 41. 4pp.

2A.1.3.2 *Bactrocera kirki* (Froggatt)

Its known host range includes 49 host species in 32 genera and 22 families. The following list covers published host plants from surveys in Tonga, Samoa and French Polynesia:

Plant families	Plant species	Common names	Tonga	Samoa	French Polynesia
ANACARDIACEAE	*Mangifera indica*	Mango	X	X	X
ANACARDIACEAE	*Spondias cytherea*	Golden apple	-	-	X
ANACARDIACEAE	*Spondias mombin*	Hog-plum	-	-	X
ANNONACEAE	*Annona muricata*	Soursop	X	-	X
ANNONACEAE	*Annona reticulata*	Bullock's heart	-	-	X
APOCYNACEAE	*Ochrosia oppositifolia*	-	X	-	-
CAESALPINACEAE	*Inocarpus fagifer*	Tahiti chestnut	X	X	X
CARICACEAE	*Carica papaya*	Papaya (ripe)	-	-	X
COMBRETACEAE	*Terminalia catappa*	Tropical almond	X	X	X
COMBRETACEAE	*Terminalia littoralis*	-	X	-	-
CUCURBITACEAE	*Cucurbita pepo*	Pumpkin	-	-	X
GUTTIFERAE	*Calophyllum inophyllum*	Indian laurel	X	X	-
LAURACEAE	*Persea americana*	Avocado	X	X	X
MYRTACEAE	*Eugenia brasiliensis*	-	-	X	-
MYRTACEAE	*Eugenia uniflora*	Surinam cherry	X	-	-
MYRTACEAE	*Psidium cattleianum*	Strawberry guava	-	-	X
MYRTACEAE	*Psidium guajava*	Guava	X	X	X
MYRTACEAE	*Syzygium corynocarpum*	-	X	-	-
MYRTACEAE	*Syzygium deleatum*	-	X	-	-
MYRTACEAE	*Syzygium jambos*	Rose-apple	X	X	X
MYRTACEAE	*Syzygium malaccense*	Mountain apple	X	X	X
MYRTACEAE	*Syzygium neurocalyx*	-	X	-	-
MYRTACEAE	*Syzygium richii*	-	X	-	-
OXALIDACEAE	*Averrhoa carambola*	Carambola	X	-	X
PASSIFLORACEAE	*Passiflora edulis*	Passionfruit	X	X	-
PASSIFLORACEAE	*Passiflora quadrangularis*	Giant granadilla	-	-	X
ROSACEAE	*Eryobotria japonica*	Loquat	-	-	X
RUBIACEAE	*Morinda citrifolia*	Noni	-	X	-
RUTACEAE	*Citrus maxima*	Pomelo	-	-	X
RUTACEAE	*Citrus reticulata*	Mandarin	X	-	X
RUTACEAE	*Citrus sinensis*	Orange	X	-	X
SAPINDACEAE	*Pometia pinnata*	Pacific lychee	-	X	X
SAPOTACEAE	*Pouteria cainito*	-	-	X	-
SOLANACEAE	*Capsicum annuum*	Bell pepper	X	-	-
SOLANACEAE	*Solanum melongena*	Eggplant	-	-	X
TILIACEAE	*Elaeocarpus tonganus*	-	-	X	-

Table 8: Bactrocera kirki (Froggatt) host plants - Samoa

Sources of published host data

1 Hammes., C., H. Chant. 1989. Manuel de défense des cultures en Polynésie Française. Institut Français de Recherche Scientifique pour le Dévelppement en Coopération. Service de L'économie Rurale de Polynésie Français. Entomologie Agricole.

2 Heimoana, V., Tunupopo, F., Toleafoa, E. and C. Fakanaiki. 1997. The Fruit Fly Fauna of Tonga, Western Samoa, American Samoa and Niue. pp. 57-59 in: Allwood, A.J. and R.A.I. Drew. Management of Fruit Flies in the Pacific. ACIAR Proceedings No 76. 267p.

3 Leweniqila, L., Heimoana, V., Purea, M., Munro, E., Allwood, A.J., Ralulu, L. and E. Tora Vueti. 1997. Seasonal abundances of *Bactrocera facialis* (Coquillett), *B. passiflorae* (Froggatt), *B. xanthodes* ((Broun) and *B. melanotus* (Coquillett) in Orchard and Forest Habitats. pp. 121-124 in: Allwood, A.J. and R.A.I. Drew. Management of Fruit Flies in the Pacific. ACIAR Proceedings No 76. 267p.

4 Leblanc, L. and R. Putoa. 2000. Fruit Flies in French Polynesia and Pitcairn Islands. SPCPest Advisory Leaflet No 29. 4pp.

5 Litsinger, J.A, Fakalata, O.K., Faluku, T.L., Crooker, P.S. and N. von Keyserlingk. 1991. A Study of Fruit Fly Species (Tephritidae) Occuring in the Kingdom of Tonga. pp. 177-190 in: Vijaysegaran, S., and A.G. Ibrahim (Eds). First Symposium on Fruit Flies in the Tropics. Kuala Lumpur, 1988. Malaysian Agricultural Research and Development Institute. Kuala Lumpur.

6 Tunupopo Laiti, F., Enosa, B., Peters, A. and E. Tora Vueti. 2002. Fruit flies in Samoa. SPC Pest Advisory Leaflet No 32. 4pp. Download the leaflet in English (327 Kb pdf document).

7 Tupou, S., Heimoana, V., Foliaki, S. and E. Tora Vueti. 2001. Fruit Flies in Tonga. SPC Pest Advisory Leaflet No 41. 4pp.

2A.1.3.3 *Bactrocera distincta* (Malloch)

It infests 10 host species, in 9 genera and 5 families, but mostly in the family Sapotaceae. There are several more records that need to be confirmed. Published host records in Fiji, Tonga and Samoa are:

Plant families	Plant species	Common names	TONGA	FIJI	SAMOA
MYRTACEAE	*Eugenia brasiliensis*	-	-	-	X
SAPOTACEAE	*Burkella richii*	Kau'uta (Tongan name)	X	-	-
SAPOTACEAE	*Chrysophyllum cainito*	Star apple	X	X	X
SAPOTACEAE	*Manilkara zapota*	Sapodilla	X	X	X
SAPOTACEAE	*Planchonella costata*	Kalaka (Tongan name)	X	-	-
SAPOTACEAE	*Planchonella membranacea*	Kau tahi (Tongan name)	X	X	-

Table 9: Bactrocera distincta (Malloch) host plants - Samoa

Sources of published host data

1 Drew, R.A.I. 1989. The Tropical Fruit Flies (Diptera: Tephritidae: Dacinae) of the Australasian and Oceanian regions. Memoirs of the Queensland Museum. 26: 1-521.

2 Litsinger, J.A, Fakalata, O.K., Faluku, T.L., Crooker, P.S. and N. von Keyserlingk. 1991. A Study of Fruit Fly Species (Tephritidae) Occuring in the Kingdom of Tonga. pp. 177-190 in: Vijaysegaran, S., and A.G. Ibrahim (Eds). First Symposium on Fruit Flies in the Tropics. Kuala Lumpur, 1988. Malaysian Agricultural Research and Development Institute. Kuala Lumpur.

3 Tora Vueti, E. 2000. Fruit Flies in Fiji Islands. SPC Pest Advisory Leaflet No 28. 4pp.

4 Tora Vueti, E., Allwood, A.J., Leweniqila, L., Ralulu, L., Balawakula, A., Malau, A., Sales, F. and K. Peleti. 1997. Fruit Fly Fauna in Fiji, Tuvalu, Wallis and Futuna, Tokelau and Nauru. pp. 60-63 in: Allwood, A.J. and R.A.I. Drew. Management of Fruit Flies in the Pacific. ACIAR Proceedings No 76. 267p.

5 Tunupopo Laiti, F., Enosa, B., Peters, A. and E. Tora Vueti. 2002. Fruit flies in Samoa. SPC Pest Advisory Leaflet No 32. 4pp. Download the leaflet in English (327 Kb pdf document).

6 Tupou, S., Heimoana, V., Foliaki, S. and E. Tora Vueti. 2001. Fruit Flies in Tonga. SPC Pest Advisory Leaflet No 41. 4pp.

2A.1.4 Fruitfly Species and Hosts – Cook Islands

2A.1.4.1 Pacific Fruit Fly (*Bactrocera xanthodes* (Broun))

It is known to attack at least 40 host plant species in 30 genera and 22 families. Published host plant records from surveys in Fiji, Tonga, Samoa and Cook Islands include:

Plant families	Plant species	Common names	Cook Is	Tonga	Fiji	Samoa
ANACARDIACEAE	*Mangifera indica*	Mango	-	X	-	-
ANNONACEAE	*Annona muricata*	Soursop	-	-	-	X
APOCYNACEAE	*Cerbera manghas*	-	-	X	-	-
APOCYNACEAE	*Ochrosia oppositifolia*	-	-	X	X	-
CARICACEAE	*Carica papaya*	Papaya	X	X	X	X
COMBRETACEAE	*Terminalia catappa*	Tropical almond	-	-	-	X
EUPHORBIACEAE	*Excoecaria agallocha*	-	-	X	-	-
LAURACEAE	*Persea americana*	Avocado	-	X	-	X
LECYTHIDACEAE	*Barringtonia edulis*	-	-	-	X	-
MORACEAE	*Artocarpus altilis*	Breadfruit	X	X	X	X
MORACEAE	*Artocarpus heterophyllus*	Jackfruit	X	-	X	X
PASSIFLORACEAE	*Passiflora edulis*	Passionfruit	-	X	-	-
PASSIFLORACEAE	*Passiflora ligularis*	Passionfruit	-	X	-	-
PASSIFLORACEAE	*Passiflora quadrangularis*	Giant granadilla	-	X	X	X
RUTACEAE	*Citrus maxima*	Pomelo	-	-	X	-
RUTACEAE	*Citrus reticulata*	Mandarin	-	X	-	-
SAPOTACEAE	*Burckella richii*	-	-	X	-	-
SAPOTACEAE	*Pouteria cainito*	Abiu	-	-	-	X
SOLANACEAE	*Capsicum annuum*	Bell pepper	-	X	-	-
SOLANACEAE	*Lycopersicon esculentum*	Tomato	-	X	-	-

Table 10: Pacific Fruit Fly host plants - Cook Islands

Sources of published host data

1 Drew, R.A.I. 1989. The Tropical Fruit Flies (Diptera: Tephritidae: Dacinae) of the Australasian and Oceanian regions. Memoirs of the Queensland Museum. 26: 1-521
.

2 Heimoana, V., Tunupopo, F., Toleafoa, E. and C. Fakanaiki. 1997. The Fruit Fly Fauna of Tonga, Western Samoa, American Samoa and Niue. pp. 57-59 in: Allwood, A.J. and R.A.I. Drew. Management of Fruit Flies in the Pacific. ACIAR Proceedings No 76. 267p.

3 Kassim, A. 1994. Fruit Flies and Their Control in Cook Islands (1st Ed.). SPC Pest Advisory Leaflet. 8pp.

4 Kassim, A. 2001. Fruit Fly in Cook Islands (Revised Edition). SPC Pest Advisory Leaflet No. 35.

5 Litsinger, J.A, Fakalata, O.K., Faluku, T.L., Crooker, P.S. and N. von Keyserlingk. 1991. A Study of Fruit Fly Species (Tephritidae) Occuring in the Kingdom of Tonga. pp. 177-190 in: Vijaysegaran, S., and A.G. Ibrahim (Eds). First Symposium on Fruit Flies in the Tropics. Kuala Lumpur, 1988. Malaysian Agricultural Research and Development Institute. Kuala Lumpur.

6 Simmonds, H.W. 1936. Fruit Fly Investigations. 1935. Department of Agriculture, Fiji. Bulletin No. 19. 18pp.

7 Tora Vueti, E. 2000. Fruit Flies in Fiji Islands. SPC Pest Advisory Leaflet No 28. 4pp.

8 Tora Vueti, E., Ralulu, L., Walker, G.P., Allwood, A.J., Leweniqila, L. and A. Balawakula. 1997. Host availability - Its impact on Seasonal Abundance of Fruit Flies. pp. 105-110 in: Allwood, A.J. and R.A.I. Drew. Management of Fruit Flies in the Pacific. ACIAR Proceedings No 76. 267p.

9 Tunupopo Laiti, F., Enosa, B., Peters, A. and E. Tora Vueti. 2002. Fruit flies in Samoa. SPC Pest Advisory Leaflet No 32. 4pp. Download the leaflet in English (327 Kb pdf document).

10 Tupou, S., Heimoana, V., Foliaki, S. and E. Tora Vueti. 2001. Fruit Flies in Tonga. SPC Pest Advisory Leaflet No 41. 4pp.

2A.1.4.2 *Bactrocera melanotus* (Coquillett)

It attacks 38 species of hosts, in 28 genera and 20 families. Published records are:

Plant families	Plant species	Common names	Cook Is
ANACARDIACEAE	*Mangifera indica*	Mango	X
CARICACEAE	*Carica papaya*	Papaya	X
CAESALPINACEAE	*Inocarpus fagifer*	Tahiti chestnut	X
COMBRETACEAE	*Terminalia catappa*	Tropical almond	X
GUTTIFERAE	*Calophyllum inophyllum*	Indian laurel	X
LAURACEAE	*Persea americana*	Avocado	X
MORACEAE	*Artocarpus altilis*	Breadfruit	X
MYRTACEAE	*Eugenia uniflora*	Surinam cherry	X
MYRTACEAE	*Psidium guajava*	Guava	X
MYRTACEAE	*Syzygium cumini*	Pistarch	X
MYRTACEAE	*Syzygium jambos*	Rose-apple	X
MYRTACEAE	*Syzygium malaccense*	Mountain apple	X
OXALIDACEAE	*Averrhoa carambola*	Star fruit	X
RUBIACEAE	*Guettarda speciosa*	-	X
RUBIACEAE	*Morinda citrifolia*	Noni	X
RUTACEAE	*Citrus maxima*	Pomelo	X
RUTACEAE	*Citrus reticulata*	Mandarin	X
RUTACEAE	*Citrus sinensis*	Orange	X
RUTACEAE	*Citrus x paradisi*	Grapefruit	X
SOLANACEAE	*Lycopersicon esculentum*	Tomato	X

Table 11: Bactrocera melanotus host plants – Cook Islands

Sources of published host data

1 Drew, R.A.I. 1989. The Tropical Fruit Flies (Diptera: Tephritidae: Dacinae) of the Australasian and Oceanian regions. Memoirs of the Queensland Museum. 26: 1-521.

2 Kassim, A. 1994. Fruit Flies and Their Control in Cook Islands (1st Ed.). SPC Pest Advisory Leaflet. 8pp.

3 Kassim, A. 2001. Fruit Fly in Cook Islands (Revised Edition). SPC Pest Advisory Leaflet No. 35.

2A.1.4.3 Queensland fruit fly (*Bactrocera tryoni* (Froggatt))

A polyphagous species recorded from more than 113 host plant species in Australia. Published records from New Caledonia and French Polynesia, where it was bred from 61 species, in 40 genera and 26 families, are:

Plant families	Plant species	Common names	New Caledonia	French Polynesia
ANACARDIACEAE	*Anacardium occidentale*	Cashew	X	X
ANACARDIACEAE	*Mangifera indica*	Mango	X	X
ANACARDIACEAE	*Spondias cytherea*	Golden apple	X	X
ANACARDIACEAE	*Spondias mombin*	Hog plum	-	X
ANNONACEAE	*Annona muricata*	Soursop	-	X
ANNONACEAE	*Annona reticulata*	Bullock's heart	X	X
ANNONACEAE				

Table 12: Queensland fruit fly host plants –Cook Islands

2A.1.5 Fruit fly Species and Hosts – Tonga

2A.1.5.1 *Bactrocera facialis* (Coquillett)

A polyphagous pest that attacks 72 host species in 54 genera and 33 families. The following list includes published records from surveys in Tonga:

HOSTS OF *BACTROCERA FACIALIS*			**TONGA**
ANACARDIACEAE	*Anacardium occidentale*	Cashew	X
ANACARDIACEAE	*Mangifera indica*	Mango	X
ANNONACEAE	*Annona muricata*	Soursop	X
APOCYNACEAE	*Cerbera manghas*	Toto (Tongan name)	X
APOCYNACEAE	*Ochrosia oppositifolia*	Fao (Tongan name)	X
CAESALPINACEAE	*Inocarpus fagifer*	Tahiti chestnut	X
CARICACEAE	*Carica papaya*	Papaya	X
COMBRETACEAE	*Terminalia catappa*	Tropical almond	X
COMBRETACEAE	*Terminalia littoralis*	Telie'a manu (Tongan)	X
GUTTIFERAE	*Calophyllum inophyllum*	Indian laurel	X
LAURACEAE	*Persea americana*	Avocado	X
MELIACEAE	*Vavaea amicorum*	Ahi vao (Tongan name)	X
MORACEAE	*Artocarpus altilis*	Breadfruit	X
MYRTACEAE	*Eugenia uniflora*	Surinam cherry	X
MYRTACEAE	*Psidium guajava*	Guava	X
MYRTACEAE	*Syzygium corynocarpum*	-	X
MYRTACEAE	*Syzygium jambos*	Rose apple	X
MYRTACEAE	*Syzygium malaccense*	Mountain apple	X
MYRTACEAE	*Syzygium neurocalyx*	-	X
MYRTACEAE	*Syzygium richii*	-	X
PASSIFLORACEAE	*Passiflora foetida*	Wild passionfruit	X
PASSIFLORACEAE	*Passiflora ligularis*	Passionfruit	X
PASSIFLORACEAE	*Passiflora quadrangularis*	Giant granadilla	X
ROSACEAE	*Prunus persica*	Peach	X
RUBIACEAE	*Gardenia tahitensis*	-	X
RUBIACEAE	*Guettarda speciosa*	Puopua (Tongan name)	X
RUTACEAE	*Citrus aurantium*	Sour orange	X
RUTACEAE	*Citrus limon*	Lemon	X
RUTACEAE	*Citrus maxima*	Pomelo	X
RUTACEAE	*Citrus x paradisi*	Grapefruit	X
RUTACEAE	*Citrus reticulata*	Mandarin	X
RUTACEAE	*Citrus sinensis*	Orange	X
RUTACEAE	*Micromelum minutum*	Takafalu (Tongan name)	X
SANTALACEAE	*Santalum yasi*	Sandalwood	X
SAPINDACEAE	*Pometia pinnata*	Pacific lychee	X
SAPOTACEAE	*Chrysophyllum cainito*	Star apple	X
SAPOTACEAE	*Manilkara zapota*	Sapodilla	X
SOLANACEAE	*Capsicum annuum*	Capsicum	X
SOLANACEAE	*Capsicum frutescens*	Chilli (long var.)	X
SOLANACEAE	*Lycopersicon esculentum*	Tomato	X
THYMELAEACEAE	*Phaleria disperma*	Huni (Tongan name)	X

Table 13: Bactrocera facialis (Coquillett) host plants- Tonga

Sources of published host data

1. Heimoana, V., Tunupopo, F., Toleafoa, E. and C. Fakanaiki. 1997. The Fruit Fly Fauna of Tonga, Western Samoa, American Samoa and Niue. pp. 57-59 in: Allwood, A.J. and R.A.I. Drew. Management of Fruit Flies in the Pacific. ACIAR Proceedings No 76. 267p.

2. Leweniqila, L., Heimoana, V., Purea, M., Munro, E., Allwood, A.J., Ralulu, L. and E. Tora Vueti. 1997. Seasonal abundances of *Bactrocera facialis* (Coquillett), *B. passiflorae* (Froggatt), *B. xanthodes* ((Broun) and *B. melanotus* (Coquillett) in Orchard and Forest Habitats. pp. 121-124 in: Allwood, A.J. and R.A.I. Drew. Management of Fruit Flies in the Pacific. ACIAR Proceedings No 76.267p.

3. Litsinger, J.A, Fakalata, O.K., Faluku, T.L., Crooker, P.S. and N. von Keyserlingk. 1991. A Study of Fruit Fly Species (Tephritidae) Occuring in the Kingdom of Tonga. pp. 177-190 in: Vijaysegaran, S., and A.G. Ibrahim (Eds). First Symposium on Fruit Flies in the Tropics. Kuala Lumpur, 1988. Malaysian Agricultural Research and Development Institute. Kuala Lumpur.

4. Ana, V., Foliaki, S. and E. Tora Vueti. 2001. Fruit Flies in Tonga. SPC Pest Advisory Leaflet No 41. 4pp.

2A.1.5.2 Pacific fruit fly (*Bactrocera xanthodes* (Broun))

It is known to attack at least 40 host plant species in 30 genera and 22 families. Published host plant records from surveys in Fiji, Tonga, Samoa and Cook Islands include:

Plant families	Plant species	Common names	Cook Is	Tonga	Fiji	Samoa
ANACARDIACEAE	*Mangifera indica*	Mango	-	X	-	-
ANNONACEAE	*Annona muricata*	Soursop	-	-	-	X
APOCYNACEAE	*Cerbera manghas*	-	-	X	-	-
APOCYNACEAE	*Ochrosia oppositifolia*	-	-	X	X	-
CARICACEAE	*Carica papaya*	Papaya	X	X	X	X
COMBRETACEAE	*Terminalia catappa*	Tropical almond	-	-	-	X
EUPHORBIACEAE	*Excoecaria agallocha*	-	-	X	-	-
LAURACEAE	*Persea americana*	Avocado	-	X	-	X
LECYTHIDACEAE	*Barringtonia edulis*	-	-	-	X	-
MORACEAE	*Artocarpus altilis*	Breadfruit	X	X	X	X
MORACEAE	*Artocarpus heterophyllus*	Jackfruit	X	-	X	X
PASSIFLORACEAE	*Passiflora edulis*	Passionfruit	-	X	-	-
PASSIFLORACEAE	*Passiflora ligularis*	Passionfruit	-	X	-	-
PASSIFLORACEAE	*Passiflora quadrangularis*	Giant granadilla	-	X	X	X
RUTACEAE	*Citrus maxima*	Pomelo	-	-	X	-
RUTACEAE	*Citrus reticulata*	Mandarin	-	X	-	-
SAPOTACEAE	*Burckella richii*	-	-	X	-	-
SAPOTACEAE	*Pouteria cainito*	Abiu	-	-	-	X
SOLANACEAE	*Capsicum annuum*	Bell pepper	-	X	-	-
SOLANACEAE	*Lycopersicon esculentum*	Tomato	-	X	-	-

Table 14: Pacific fruit fly host plants – Tonga

Sources of published host data

1. Drew, R.A.I. 1989. The Tropical Fruit Flies (Diptera: Tephritidae: Dacinae) of the Australasian and Oceanian regions. Memoirs of the Queensland Museum. 26: 1-521.

2. Heimoana, V., Tunupopo, F., Toleafoa, E. and C. Fakanaiki. 1997. The Fruit Fly Fauna of Tonga, Western Samoa, American Samoa and Niue. pp. 57-59 in: Allwood, A.J. and R.A.I. Drew. Management of Fruit Flies in the Pacific. ACIAR Proceedings No 76. 267p.

3. Kassim, A. 1994. Fruit Flies and Their Control in Cook Islands (1st Ed.). SPC Pest Advisory Leaflet. 8pp.

4. Kassim, A. 2001. Fruit Fly in Cook Islands (Revised Edition). SPC Pest Advisory Leaflet No. 35.

5. Litsinger, J.A, Fakalata, O.K., Faluku, T.L., Crooker, P.S. and N. von Keyserlingk. 1991. A Study of Fruit Fly Species (Tephritidae) Occuring in the Kingdom of Tonga. pp. 177-190 in: Vijaysegaran, S., and A.G. Ibrahim (Eds). First Symposium on Fruit Flies in the Tropics. Kuala Lumpur, 1988. Malaysian Agricultural Research and Development Institute. Kuala Lumpur.

6. Simmonds, H.W. 1936. Fruit Fly Investigations. 1935. Department of Agriculture, Fiji. Bulletin No. 19. 18pp.

7. Tora Vueti, E. 2000. Fruit Flies in Fiji Islands. SPC Pest Advisory Leaflet No 28. 4pp.

8. Tora Vueti, E., Ralulu, L., Walker, G.P., Allwood, A.J., Leweniqila, L. and A. Balawakula. 1997. Host availability - Its impact on Seasonal Abundance of Fruit Flies. pp. 105-110 in: Allwood, A.J. and R.A.I. Drew. Management of Fruit Flies in the Pacific. ACIAR Proceedings No 76. 267p.

9. Tunupopo Laiti, F., Enosa, B., Peters, A. and E. Tora Vueti. 2002. Fruit flies in Samoa. SPC Pest Advisory Leaflet No 32. 4pp. Download the leaflet in English (327 Kb pdf document).

10. Tupou, S., Heimoana, V., Foliaki, S. and E. Tora Vueti. 2001. Fruit Flies in Tonga. SPC Pest Advisory Leaflet No 41. 4pp.

2A.1.5.3 *Bactrocera kirki* (Froggatt)

Its known host range includes 49 host species in 32 genera and 22 families. The following list covers published host plants from surveys in Tonga, Samoa and French Polynesia:

Plant families	Plant species	Common names	Tonga	Samoa	French Polynesia
ANACARDIACEAE	*Mangifera indica*	Mango	X	X	X
ANACARDIACEAE	*Spondias cytherea*	Golden apple	-	-	X
ANACARDIACEAE	*Spondias mombin*	Hog-plum	-	-	X
ANNONACEAE	*Annona muricata*	Soursop	X	-	X
ANNONACEAE	*Annona reticulata*	Bullock's heart	-	-	X
APOCYNACEAE	*Ochrosia oppositifolia*	-	X	-	-
CAESALPINACEAE	*Inocarpus fagifer*	Tahiti chestnut	X	X	X
CARICACEAE	*Carica papaya*	Papaya (ripe)	-	-	X
COMBRETACEAE	*Terminalia catappa*	Tropical almond	X	X	X
COMBRETACEAE	*Terminalia littoralis*	-	X	-	-
CUCURBITACEAE	*Cucurbita pepo*	Pumpkin	-	-	X
GUTTIFERAE	*Calophyllum inophyllum*	Indian laurel	X	X	-
LAURACEAE	*Persea americana*	Avocado	X	X	X
MYRTACEAE	*Eugenia brasiliensis*	-	-	X	-
MYRTACEAE	*Eugenia uniflora*	Surinam cherry	X	-	-
MYRTACEAE	*Psidium cattleianum*	Strawberry guava	-	-	X
MYRTACEAE	*Psidium guajava*	Guava	X	X	X
MYRTACEAE	*Syzygium corynocarpum*	-	X	-	-
MYRTACEAE	*Syzygium deleatum*	-	X	-	-
MYRTACEAE	*Syzygium jambos*	Rose-apple	X	X	X
MYRTACEAE	*Syzygium malaccense*	Mountain apple	X	X	X
MYRTACEAE	*Syzygium neurocalyx*	-	X	-	-
MYRTACEAE	*Syzygium richii*	-	X	-	-
OXALIDACEAE	*Averrhoa carambola*	Carambola	X	-	X
PASSIFLORACEAE	*Passiflora edulis*	Passionfruit	X	X	-
PASSIFLORACEAE	*Passiflora quadrangularis*	Giant granadilla	-	-	X
ROSACEAE	*Eryobotria japonica*	Loquat	-	-	X
RUBIACEAE	*Morinda citrifolia*	Noni	-	X	-
RUTACEAE	*Citrus maxima*	Pomelo	-	-	X
RUTACEAE	*Citrus reticulata*	Mandarin	X	-	X
RUTACEAE	*Citrus sinensis*	Orange	X	-	X
SAPINDACEAE	*Pometia pinnata*	Pacific lychee	-	X	X
SAPOTACEAE	*Pouteria cainito*	-	-	X	-
SOLANACEAE	*Capsicum annuum*	Bell pepper	X	-	-
SOLANACEAE	*Solanum melongena*	Eggplant	-	-	X
TILIACEAE	*Elaeocarpus tonganus*	-	-	X	-

Table 15: Bactrocera kirki (Froggatt) host plants - Tonga

Sources of published host data

1. Hammes., C., H. Chant. 1989. Manuel de défense des cultures en Polynésie Française. Institut Français de Recherche Scientifique pour le Dévelppement en Coopération. Service de L'économie Rurale de Polynésie Français. Entomologie Agricole.

2. Heimoana, V., Tunupopo, F., Toleafoa, E. and C. Fakanaiki. 1997. The Fruit Fly Fauna of Tonga, Western Samoa, American Samoa and Niue. pp. 57-59 in: Allwood, A.J. and R.A.I. Drew. Management of Fruit Flies in the Pacific. ACIAR Proceedings No 76. 267p.

3. Leweniqila, L., Heimoana, V., Purea, M., Munro, E., Allwood, A.J., Ralulu, L. and E. Tora Vueti. 1997. Seasonal abundances of *Bactrocera facialis* (Coquillett), *B. passiflorae* (Froggatt), *B. xanthodes* ((Broun) and *B. melanotus* (Coquillett) in Orchard and Forest Habitats. pp. 121-124 in: Allwood, A.J. and R.A.I. Drew. Management of Fruit Flies in the Pacific. ACIAR Proceedings No 76. 267p.

4. Leblanc, L. and R. Putoa. 2000. Fruit Flies in French Polynesia and Pitcairn Islands. SPCPest Advisory Leaflet No 29. 4pp.

5. Litsinger, J.A, Fakalata, O.K., Faluku, T.L., Crooker, P.S. and N. von Keyserlingk. 1991. A Study of Fruit Fly Species (Tephritidae) Occuring in the Kingdom of Tonga. pp. 177-190 in: Vijaysegaran, S., and A.G. Ibrahim (Eds). First Symposium on Fruit Flies in the Tropics. Kuala Lumpur, 1988. Malaysian Agricultural Research and Development Institute. Kuala Lumpur.

6. Tunupopo Laiti, F., Enosa, B., Peters, A. and E. Tora Vueti. 2002. Fruit flies in Samoa. SPC Pest Advisory Leaflet No 32. 4pp. Download the leaflet in English (327 Kb pdf document)

7. Tupou, S., Heimoana, V., Foliaki, S. and E. Tora Vueti. 2001. Fruit Flies in Tonga. SPC Pest Advisory Leaflet No 41. 4pp.

2A.1.5.4 Bactrocera distincta *(Malloch)*

It infests 10 host species, in 9 genera and 5 families, but mostly in the family Sapotaceae. There are several more records that need to be confirmed. Published host records in Fiji, Tonga and Samoa are:

Plant families	Plant species	Common names	TONGA	FIJI	SAMOA
MYRTACEAE	*Eugenia brasiliensis*	-	-	-	X
SAPOTACEAE	*Burkella richii*	Kau'uta (Tongan name)	X	-	-
SAPOTACEAE	*Chrysophyllum cainito*	Star apple	X	X	X
SAPOTACEAE	*Manilkara zapota*	Sapodilla	X	X	X
SAPOTACEAE	*Planchonella costata*	Kalaka (Tongan name)	X	-	-
SAPOTACEAE	*Planchonella membranacea*	Kau tahi (Tongan name)	X	X	-

Table 16: Bactrocera distincta (Malloch) host plants - Tonga

Sources of published host data

1. Drew, R.A.I. 1989. The Tropical Fruit Flies (Diptera: Tephritidae: Dacinae) of the Australasian and Oceanian regions. Memoirs of the Queensland Museum. 26: 1-521.

2. Litsinger, J.A, Fakalata, O.K., Faluku, T.L., Crooker, P.S. and N. von Keyserlingk. 1991. A Study of Fruit Fly Species (Tephritidae) Occuring in the Kingdom of Tonga. pp. 177-190 in: Vijaysegaran, S., and A.G. Ibrahim (Eds). First Symposium on Fruit Flies in the Tropics. Kuala Lumpur, 1988. Malaysian Agricultural Research and Development Institute. Kuala Lumpur.

3. Tora Vueti, E. 2000. Fruit Flies in Fiji Islands. SPC Pest Advisory Leaflet No 28. 4pp.

4. Tora Vueti, E., Allwood, A.J., Leweniqila, L., Ralulu, L., Balawakula, A., Malau, A., Sales, F. and K. Peleti. 1997. Fruit Fly Fauna in Fiji, Tuvalu, Wallis and Futuna, Tokelau and Nauru. pp. 60-63 in: Allwood, A.J. and R.A.I. Drew. Management of Fruit Flies in the Pacific. ACIAR Proceedings No 76. 267p.

5. Tunupopo Laiti, F., Enosa, B., Peters, A. and E. Tora Vueti. 2002. Fruit flies in Samoa. SPC Pest Advisory Leaflet No 32. 4pp. Download the leaflet in English (327 Kb pdf document).

6. Tupou, S., Heimoana, V., Foliaki, S. and E. Tora Vueti. 2001. Fruit Flies in Tonga. SPC Pest Advisory Leaflet No 41. 4pp.

2A.1.5.5 *Bactrocera passiflorae* (Froggatt)

A polyphagous pest species recorded from at least 55 host plant species in 42 genera and 29 families. Published host records from Fiji are:

Plant families	Plant species	Common names	Fiji
ANACARDIACEAE	*Anacardium occidentale*	Cashew	X
ANACARDIACEAE	*Dracontomelon sylvestre*	-	X
ANACARDIACEAE	*Mangifera indica*	Mango	X
APOCYNACEAE	*Cerbera manghas*	-	X
APOCYNACEAE	*Ochrosia oppositifolia*	-	X
CAESALPINACEAE	*Inocarpus fagifer*	Tahiti chestnut	X
CHRYSOBALANACEAE	*Chrysobalanus icaco*	-	X
COMBRETACEAE	*Terminalia catappa*	Tropical almond	X
COMBRETACEAE	*Terminalia litoralis*	-	X
LAURACEAE	*Persea americana*	Avocado	X
LECYTHIDACEAE	*Barringtonia edulis*	-	X
LONGIANACEAE	*Neuburgia corynocarpa*	-	X
MYRTACEAE	*Psidium cattleianum*	Strawberry guava	X
MYRTACEAE	*Psidium guajava*	Guava	X
MYRTACEAE	*Syzygium jambos*	Rose apple	X
MYRTACEAE	*Syzygium malaccense*	Mountain apple	X
PASSIFLORACEAE	*Passiflora quadrangularis*	Giant granadilla	X
RUBIACEAE	*Coffea liberica*	Coffee	X
RUTACEAE	*Citrus aurantium*	Sour orange	X
RUTACEAE	*Citrus maxima*	Pomelo	X
RUTACEAE	*Citrus reticulata*	Mandarin	X
RUTACEAE	*Citrus sinensis*	Orange	X
RUTACEAE	*Citrus x paradisi*	Grapefruit	X
RUTACEAE	*Fortunella japonica*	Kumquat	X
SANTALACEAE	*Santalum yasi*	Sandalwood	X
SAPINDACEAE	*Pometia pinnata*	Pacific lychee	X
SAPOTACEAE	*Chrysophyllum cainito*	Star apple	X
SIMAROUBACEAE	*Amaroria soulameides*	-	X

Table 17: Bactrocera passiflorae (Froggatt) - Tonga

Sources of published host data

1. Drew, R.A.I. 1989. The Tropical Fruit Flies (Diptera: Tephritidae: Dacinae) of the Australasian and Oceanian regions. Memoirs of the Queensland Museum. 26: 1-521.

2. Simmonds, H.W. 1936. Fruit Fly Investigations. 1935. Department of Agriculture, Fiji. Bulletin No. 19. 18pp.

3. Tora Vueti, E. 2000. Fruit Flies in Fiji Islands. SPC Pest Advisory Leaflet No 28. 4pp.

4. Tora Vueti, E., Ralulu, L., Walker, G.P., Allwood, A.J., Leweniqila, L. and A. Balawakula. 1997. Host availability - Its impact on Seasonal Abundance of Fruit Flies. pp. 105-110 in: Allwood, A.J. and R.A.I. Drew. Management of Fruit Flies in the Pacific. ACIAR Proceedings No 76. 267p.

2A.2 General Plant Pest List for Specific Countries, Identified Commodities and References-SPC Database

2A.2.1. Pest List for a selected Host - Fiji Islands

Host/ Common/ Names	*	Pest/ Order / Common Names	Literature Reference
Spondias dulcis / golden apple	n	Aphelenchoides sp. / Tylenchida	CABI CPC 2001
	n	Aphelenchoides sp. / Tylenchida	Orton Williams K.J., 1980
	a	Chrysomphalus dictyospermi / Hemiptera / Spanish red scale	Williams & Watson, 1988
	n	Criconemella onoensis / Tylenchina	Orton Williams K.J., 1980
	n	Ditylenchus sp. / Tylenchina	Orton Williams K.J., 1980
	n	Helicotylenchus dihystera / Tylenchina	Orton Williams K.J., 1980
	n	Helicotylenchus microcephalus / Tylenchina	Orton Williams K.J., 1980
	a	Hemiberlesia palmae / Hemiptera	Williams & Watson, 1988
	n	Hemicriconemoides cocophillus / Tylenchida	Orton Williams K.J., 1980
	n	Hoplolaimus seinhorsti / Tylenchina / lance nematode	Orton Williams K.J., 1980
	n	Meloidogyne sp. / Tylenchina / root knot nematodes	Orton Williams K.J., 1980
	n	Pratylenchus zeae / Tylenchina / root-lesion nematode of maize	Orton Williams K.J., 1980
	n	Rotylenchulus reniformis / Tylenchina / reniform nematode	Orton Williams K.J., 1980
	a	Selenaspidus articulatus / Hemiptera / West Indian red scale	Williams & Watson, 1988
There are **14** pest records for Spondias dulcis /golden apple			

2A.2.2 Pest List for a selected Host - Vanuatu

Host/ Common Names	*	Pest/ Order / Common Names	Literature Reference
Spondias dulcis / golden apple	f	Glomerella cingulata / Incertae sedis / anthracnose	Wright J., 2003
	f	Phellinus noxius / Hymenochaetales / brown cocoa root rot	Ivory & Daruhi, 1993.
There are **2** pest records for Spondias dulcis / golden apple			

2A.2.3 Pest List for a selected Host – Samoa

Host/ Common Names	*	Pest/ Order / Common Names	Literature Reference
Spondias dulcis / golden apple	f	Pseudocercospora mombin / Mycosphaerellales	Dingley et al., 1981
There is **1** pest record for Spondias dulcis / golden apple			

2A.2.4 Pest List for a selected Host - Cook Islands

Host/ Common Names	*	Pest/ Order / Common Names	Literature Reference
Spondias dulcis / golden apple			
There are **0** pest records for Spondias dulcis / golden apple			

2A.2.5 Pest List for a selected Host - Tonga

Host/ Common Names	*	Pest/ Order / Common Names	Literature Reference
Spondias dulcis / golden apple	n	Achlysiella williamsi / Tylenchida	Orton Williams K.J., 1980
	n	Helicotylenchus dihystera / Tylenchina	Orton Williams K.J., 1980
	n	Helicotylenchus microcephalus / Tylenchina	Orton Williams K.J., 1980
There are **3** pest records for Spondias dulcis / golden apple			

KEY

*** Pest Group: a =** arthropods**; b =** bacteria**; f =** fungi**; g =** gastropods**; n/a =** n/a**; n =** nematodes**; n/k =** not known**; ve =** vertebrates**; v =** viruses**; w =** weeds**;**

2A.3. Additional Plant Pest List - UNDP/FAO-SPEC Survey, 1982

Spondias cytherea Sonn. (Anacardiaceae) – VI, WI (Also known as Golden Apple; Otaheite Apple)

Local Names:	Fiji	:	vi
	Niue	:	vi
	W. Samoa	:	vi
Commodity of concern:	This is a green fruit, yellow when ripe, up to 10 cm in diameter, with a large stone seed.		
Virology findings:	No record of viruses in Survey area.		
Nematode findings:	Nematodes would not likely be a problem when considering the clean healthy fruit.		

Source: "Plant Quarantine Guidelines for Movement of Selected Commodities in the Pacific, UNDP/FAO-SPEC Survey of Agricultural Pests & Diseases in the South Pacific" by Oliver O. Stout, 1982

QUARANTINE ACTION RECOMMENDATIONS	**INSECT PESTS OF CONERN IN PACIFIC AREA**	**Cook Islands**	**Fiji**	**Kiribati**	**Niue**	**Tonga**	**Tuvalu**	**Western Samoa**
	Order: Homoptera							
If found, treat using *SP-1*	**Diaspididae:** *Aspidiotus destructor* Sign. – Transparent scale On leaves and stems; possible on fruit.	—	x	—	—	—	—	—
Not likely on fruit. If found, treat using *SP-1*	**Geometridae:** *Gymnoscelis* sp.indet. – Pug moth Eat leaves and flowers.	x	—	—	—	—	—	—
Not on fruit. No action necessary.	**Gracilariidae:** *Caloptilia iselaea* (Meyrik) – Gracilariid moth	x	—	—	—	—	—	—
Same as above.	Mine leaves.							
Not of quarantine significant	Family Gracilariidae sp. Indet. – Grailariid moth Leaf miner.	—	—	—	x	—	—	—
	*Pseuoercospora mombin (*Petrak & Cif.) Deighton – Leaf spot	—	—	—	—	—	—	x

VI FRUIT - SUMMARY OF QUARANTINE RECOMMENDATIONS

There appears to be no serious plant pests or diseases on this commodity in this Survey Area that requires restrictive quarantine action. Careful inspection should be carried out. Treatment or other quarantine action should proceed without delay if warranted by inspection findings.

2B Detail Information of Pest and Diseases

2B.1 Microsoft Excel Worksheet of Vi Pest Lists 09

The key Worksheet for this Section is attached in a separate document as Attachment 1. It is a Microsoft Excel Worksheet called “Vi Pest List 09”. This worksheet was provided by Dr. Fakava, of NZ MAF Bio-security to use instead of Annex 2 of my Terms of Reference.

2B.2 Pest Control, Treatments and Export Pathways

As explained earlier in the report, the Polynesian plum in all the five requesting countries is not cultivated commercially but rather as backyard trees in their residential homes or at their farmlands or as one of the forest plants. These are grown organically, without the use of fertilizers and pesticides. The trees are too big for any available economic form of spray programs.

There are two options for the five countries:

i. Declare as fruit fly Non-Host Status of Polynesian Plum for Fiji, Samoa, Cook Islands and Tonga and export at only immature to green mature fruit.

ii Fruit Fly Treatment Using High Temperature Forced Air (HTFA).

It is noted that all the five requesting countries have High Temperature Forced Air (HTFA) Treatment Facilities and that their Quarantine Authorities are well aware and very familiar with the procedures and approved Pathways for their respective approved commodities to New Zealand.

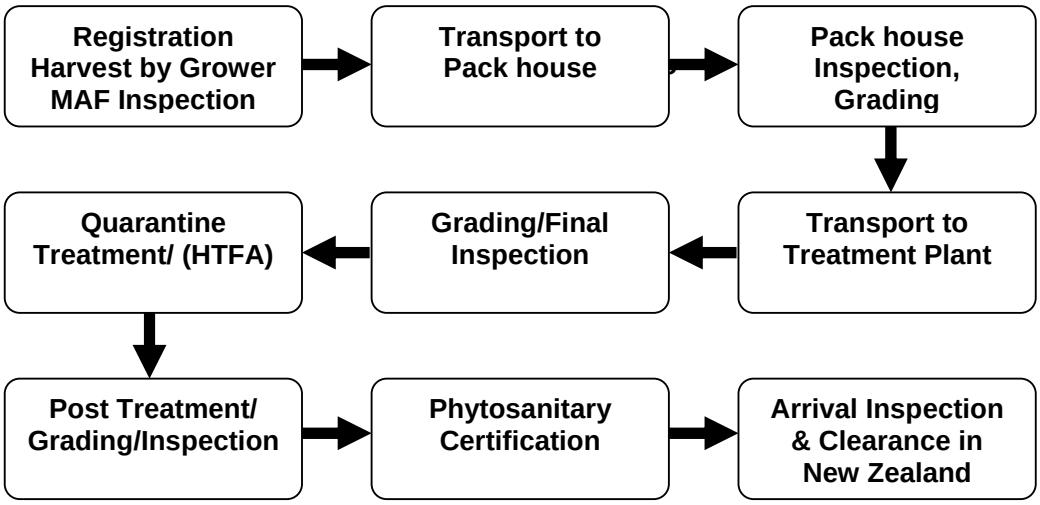
Considering the implications of fruit flies and the absence of pesticide spray programs, the use of HTFA treatment appears to be a very good option. So far, only Samoa has conducted one trial on HTFA treatment of the Polynesian plum and the results are promising and there is a need for each country to carry out similar tests.

Through the use of the HTFA treatment, the produce is assured to be free of any fruit flies or any other pests on the fruits. However, it was noted that some HTFA plants are not operational but these could be fixed, tested and re-certified. Similar Pathways such as those fruits like mangoes, breadfruit, avocadoes etc. could be developed for the Polynesian plum.

In the case of Tonga, fruits such as mango, avocado and breadfruit are approved for HTFA treatment for export to New Zealand. These crops are grown as backyard or farmland fruit trees without the use of fertilizers and pesticide sprays. Polynesian plum is cultivated in the same manner in all the requesting countries therefore, it is strongly recommended to use a similar Pathway as those approved for Tonga.

A suggested Export Pathway for the Polynesian Plum is shown in Figure 9.

Figure 9: Suggested Export Pathway for Polynesian Plum



C Conclusion

In conclusion, there is very good market potential for Polynesian plum in New Zealand for Pacific Islanders and having the Market Access will open up new trading opportunities on this commodity for Fiji, Vanuatu, Samoa, Cook Islands and Tonga.

D Attachments

Attachment 1: Microsoft Excel Worksheet of Vi Pest List 09.

This key Worksheet to this report is attached as Attachment 1. It is a separate Microsoft Excel file called *"Vi Pest List 09.xls"*

Attachment 2: Consultancy Terms of Reference

The Terms of Reference for this Consultancy is attached as Attachment 2. It is a separate Microsoft Word Document called *"Consultancy Terms of Reference.doc"*

Attachment 3: Consultancy Travel Itinerary & Work Program

The Consultancy Travel Itinerary & Work Program is attached as Attachment 3. It is a separate Microsoft Word Document called *"Consultancy Travel Itinerary & Work Program.doc"*

Attachment 4: Officials Consulted by Country

The list of Officials Consulted while undertaking this consultancy is attached as Attachment 4. It is a separate Microsoft Word Document called *"Officials Consulted by Country.doc"*