



United States Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine



Importation of Litchi (*Litchi chinensis* Sonn.) and Longan (*Dimocarpus longan* Lour.) fruits from Vietnam into the Continental United States

Risk Management Document

August 18, 2011

United States Department of Agriculture
Animal and Plant Health Inspection Service
Agency Contact: claudia.ferguson@aphis.usda.gov

I. Executive Summary:

The National Plant Protection Organization (NPPO) of Vietnam requested market access to export fresh litchi (*Litchi chinensis*) and longan (*Dimocarpus longan*) fruits to the continental United States. These fruits have not been exported from Vietnam to the United States before, so Vietnam provided detailed information on pests associated with this commodity in that country. Vietnam further proposed to treat the fruit with an APHIS approved generic irradiation treatment that would mitigate risks from most insect pests. Based on the pest information received and that the fruit would receive an APHIS approved irradiation treatment, APHIS determined that a pest list identifying all quarantine insect pests in Vietnam would be sufficient information to evaluate pathway risks from insects and that further assessment for the insect pests was not needed. This approach would also meet one of APHIS' objectives behind the development of a generic irradiation treatment for most insect pests.

APHIS's Center for Plant Health Science and Technology (CPHST) developed a pest risk assessment (PRA) for litchi, longan and rambutan, originating from member countries of the ASEAN region comprising: Brunei, Cambodia, Indonesia, Laos, Malaysia, the Philippines, Thailand, and Vietnam (USDA, 2011). CPHST identified the quarantine pests that are likely to follow the pathway for these three commodities from each country. The PRA further analyzes the pathway risks from non-insect pests i.e. the pests that are not targeted by the irradiation treatment, and recommends measures that might be needed to mitigate risks from these non-insect pests. The PRA was based on (1) the information provided by member countries of the region, (2) published scientific literature and (3) pest interception records of the United States Department of Agriculture (Pest ID, 2009).

Analysis of the pest lists for litchis and longans from Vietnam indicated that most pests likely to follow the pathway are insect pests and would be effectively neutralized¹ with the irradiation generic dose of 400 Gy (USDA, 2006). Litchis and longans may also potentially serve as a pathway for a mite *Aceria litchii* and litchis may also serve as a pathway for a fungus, *Phytophthora litchii*. Both *Aceria litchii* and *Phytophthora litchii* are rated to have a **medium** risk potential. Since irradiation is not an approved treatment for these pests, additional measures would be needed to mitigate their pathway risks.

This risk management document outlines the phytosanitary measures that APHIS will require for the importation of litchis and longans from Vietnam and documents the evidence used by APHIS to conclude that these measures will effectively prevent the introduction of quarantine pests into the continental United States.

¹ A pest is considered neutralized when it is killed, rendered sterile or its further development into becoming an adult is stopped.

II. Commodity wise analysis of quarantine pests and mitigation measures required

1. Litchis

A. Introduction

The PRA completed by CPHST identified 16 quarantine pests that could potentially follow the pathway of litchi fruit from Vietnam (USDA, 2011; Table 1). These include 14 insect pests, one mite and one fungus as follows:

Table 1. Quarantine pests likely to follow the pathway of fresh litchi fruit imported from Vietnam into the continental United States.

Arthropods	
Acari: Eriophyidae	<i>Aceria litchii</i> (Keifer)
Diptera: Tephritidae	<i>Bactrocera cucurbitae</i> (Coquillett)
	<i>Bactrocera dorsalis</i> (Hendel)
Hemiptera: Coccidae	<i>Ceroplastes rubens</i> Maskell
	<i>Coccus viridis</i> (Green)
Hemiptera: Pseudococcidae	<i>Dysmicoccus neobrevipes</i> Beardsley
	<i>Nipaecoccus viridis</i> (Newstead)
	<i>Paracoccus interceptus</i> Lit
	<i>Planococcus lilacinus</i> (Cockerell)
	<i>Planococcus litchi</i> Cox
	<i>Planococcus minor</i> (Maskell)
	<i>Pseudococcus cryptus</i> Hempel
Lepidoptera: Gelechiidae	<i>Conopomorpha sinensis</i> Bradley
Lepidoptera: Pyralidae	<i>Conogethes punctiferalis</i> (Guenée)
Lepidoptera: Tortricidae	<i>Cryptophlebia ombrodelta</i> (Lower)
Fungi	
Oomycetes: Pythiales	<i>Phytophthora litchii</i> (C.C. Chen ex W.H. Ko, H.S. Chang, H.J. Su, C.C. Chen & L.S. Leu) Voglmayr, Göker, Riethm. & Oberw

B. Risk Management Measures

APHIS proposes to allow the importation of the fresh litchi fruit from Vietnam into the continental United States (except Florida) under the following conditions:

- (a) The fruit must be commercially produced and be part of a commercial consignment as defined in 7 CFR Section 319.56-2. The fruit must be grown in orchards registered with and monitored by the NPPO of Vietnam to ensure that fruits are produced free of disease caused by *Phytophthora litchii*.

- (b) The cartons containing the fruit must be stamped “Not for importation into or distribution in FL”.
- (c) The fruit must be irradiated with a minimum absorbed dose of 400 Gy and follow the requirements of 7CFR parts 305 and 319.
- (d) Prior to departure from Vietnam:
 - If irradiation is applied outside the United States, each consignment of fruit must be inspected jointly by APHIS and Vietnam inspectors. Using a sampling procedure mutually agreed upon by APHIS and the NPPO, a representative sample of fruit must be drawn from each lot, inspected and found free from the fungus, *Phytophthora litchii*. A Phytosanitary Certificate (PC) issued by the NPPO of Vietnam must accompany each consignment certifying that the fruit received the required irradiation treatment with 400 Gy as the minimum absorbed dose. The PC must also include an AD that the consignment was inspected by the Vietnam inspectors and found free from *Phytophthora litchii*.
 - If irradiation is to be applied upon arrival in the United States, each consignment of fruit must be inspected by Vietnam inspectors. Using a sampling procedure mutually agreed upon by APHIS and the NPPO, a representative sample of fruit must be drawn from each lot, inspected and found free from the fungus, *Phytophthora litchii*. A Phytosanitary Certificate (PC) issued by the NPPO of Vietnam must accompany each consignment with an Additional Declaration (AD) that the consignment was inspected by the Vietnam inspectors and found free from *Phytophthora litchii*.
- (e) Each consignment is subject to inspection at the U.S. ports-of-entry.

C. Evidence for the Effective Removal of Pests of Concern from the Pathway

(i) Insect Pests:

Fourteen of the sixteen pests likely to follow the litchi pathway are insect pests. A minimum absorbed dose of 400 Gy has been determined by APHIS regulations 7CFR305.9 to be adequate to neutralize all insect pests excluding adults and pupae in the order Lepidoptera. Of the fourteen insect pests likely to follow the pathway, three belong to the order Lepidoptera (Table 1). Although the generic irradiation treatment is not approved for Lepidopteran pupae and adults, those life stages are unlikely to be associated with the commodity. Due to their mobility, free-living adults of Lepidoptera are unlikely to be in the pathway of commercially produced litchi fruits. As for the pupal stage, in most of the genera of concern (*Conogethes*, *Conopomorpha*, *Cryptophlebia*), the pupae are either associated with plant parts other than fruit or they occur externally on their host’s plant parts (CABI, 2007; Hwang and Hsieh, 1989; IPM DANIDA, 2003; Nair, 1975; Ooi et al., 2002; Underhill, 1943; van der Berg et al., 2001). Or, if the pupae occur inside the fruit or seed of their host plants, they would be associated with premature fruit drop and/or obvious damage and symptoms (CABI, 2007; Gupta et al., 2005; Singh et al., 2002; Waite and Hwang, 2002), thereby making it likely for the fruit to be culled during standard harvest or post-harvest handling and processing. Also, except for two interceptions of *Conopomorpha* in permit cargo with litchi fruit, inspectors at U.S. ports-of-entry have never intercepted pupae of the other Lepidoptera genera of concern associated with commercial fruit

shipments of any type of fruit (PestID, 2009). This lack of interception is evidence of the low likelihood of any of the Lepidoptera pupae following the pathway of commercial fruit. The irradiation treatment, along with standard postharvest processes, therefore, will likely mitigate the risks from all the insects listed above.

(ii) Mites:

The litchi mite, *Aceria litchii*, is found associated with litchi and longan only (USDA, 2007). The mite is primarily a pest of foliage and flower parts but is also sometime associated with the fruit. In severe cases, flowers may be completely destroyed and setting of fruit is prevented or the set fruit may be damaged cosmetically (Waite, 1999). Mites are external pests on the fruit, and because of the damage it causes on fruits, inspection and culling of the damaged fruit are considered effective in mitigating risk from such pests. Although it is unlikely that commercially produced fruit is a pathway for the mite, because of its small size, shipments should be prohibited into Florida, where litchis are grown, as an added precaution. This is consistent with other import programs where shipments of litchis and/or longans are prohibited into Florida for the same pest. Shipments of litchi and/or longans from China, India, Thailand and Hawaii into the mainland U.S. with inspection for the pest over the past few years show no record of interception.

(iii) Fungi:

Commercial litchi production areas where *Phytophthora litchii* is present and active will require fungicidal field treatments to reduce fruit drop. Having NPPO of Vietnam monitor fields where litchi is produced for export will ensure application of disease control measures. In nature the disease is confined to a single host (litchi), although under laboratory conditions, tomatoes, papayas and loofah (*Luffa cylindrical*) may also be infected (CABI, 2003). Most infected litchi fruit will be culled because trained harvesters, packinghouse personnel, and plant quarantine inspectors can easily detect the distinctive signs of the disease on fruit. Infected, non-symptomatic fruit may go undetected, but the likelihood of introduction via the few fruit that may escape detection is very low. It is highly unlikely that market fruit will be in a situation to introduce the disease because free water is required for the spores to infect a host. Additionally, there is no record of interception of this disease on litchis imported into the U.S. from other countries in regions where this pathogen is present. Therefore no measures are recommended for this pathogen beyond certification for freedom based on inspection (USDA 2007).

As part of the U.S. requirements (7 CFR 305.9) governing the use of irradiation as a phytosanitary treatment, APHIS and the NPPO of Vietnam must jointly develop an operational work plan (OWP). The work plan shall include details of activities including inspection of articles that NPPO must perform before the treatment or departure. Inspection of the fruit and freedom from pests not targeted by irradiation as declared on the PC will ensure that all pests of concern are removed from the pathway.

2. Longan

A. Introduction

The PRA completed by CPHST identified 17 quarantine pests that could follow the pathway of longan fruit from Vietnam (USDA, 2011; Table 2). All but one pest, a mite, are insect pests.

Table 2. Quarantine pests identified as likely to follow the pathway of fresh longan fruit imported from Vietnam into the continental United States

Arthropods	
Acari: Eriophyidae	<i>Aceria litchii</i> (Keifer)
Diptera: Tephritidae	<i>Bactrocera dorsalis</i> (Hendel)
Hemiptera: Coccidae	<i>Ceroplastes rubens</i> Maskell
	<i>Coccus viridis</i> (Green)
	<i>Drepanococcus chiton</i> (Green)
Hemiptera: Pseudococcidae	<i>Dysmicoccus neobrevipes</i> Beardsley
	<i>Exallomochlus hispidus</i> (Morrison)
	<i>Maconellicoccus hirsutus</i> (Green)
	<i>Nipaecoccus viridis</i> (Newstead)
	<i>Paracoccus interceptus</i> Lit
	<i>Planococcus lilacinus</i> (Cockerell)
	<i>Planococcus litchi</i> Cox
	<i>Planococcus minor</i> (Maskell)
	<i>Pseudococcus cryptus</i> Hempel
Lepidoptera: Gelechiidae	<i>Conopomorpha sinensis</i> Bradley
Lepidoptera: Pyralidae	<i>Conogethes punctiferalis</i> (Guenée)
Lepidoptera: Tortricidae	<i>Cryptophlebia ombrodelta</i> (Lower)

B. Risk Management Measures

APHIS proposes to allow the importation of the fresh longan fruit from Vietnam into the continental United States (except Florida) under the following conditions:

- (a) The fruit must be commercially produced and be part of a commercial consignment as defined in 7 CFR Section 319.56-2.
- (b) The cartons containing the fruit must be stamped “Not for importation into or distribution in FL”.
- (c) The fruit must be irradiated with a minimum absorbed dose of 400 Gy and follow the requirements of 7CFR parts 305 and 319.
- (d) Prior to departure from Vietnam:
 - If irradiation is applied outside the United States, each consignment of fruit must be inspected jointly by APHIS and Vietnam inspectors and accompanied by a Phytosanitary

Certificate (PC) issued by the NPPO of Vietnam certifying that the fruit received the required irradiation treatment with 400 Gy as the minimum absorbed dose.

- If irradiation is to be applied upon arrival in the United States, each consignment of fruit must be inspected by Vietnam inspectors and accompanied by a Phytosanitary Certificate (PC) issued by the NPPO of Vietnam.

(e) Each consignment is subject to inspection at the U.S. ports-of-entry.

C. Evidence for the Effective Removal of Pests of Concern from the Pathway

(i) Insect Pests:

Sixteen of the seventeen pests likely to follow the longan pathway are insect pests. A minimum absorbed dose of 400 Gy has been determined by APHIS regulations 7CFR305.9 to be adequate to neutralize all insect pests excluding adults and pupae in the order Lepidoptera. Of the sixteen insect pests likely to follow the pathway, three belong to the order Lepidoptera (Table 2). Although the generic irradiation treatment is not approved for Lepidoptera pupae and adults, those life stages are unlikely to be associated with the commodity here. Due to their mobility, free-living adults of Lepidoptera are unlikely to be in the pathway of commercially produced longan fruits. As for the pupal stage, the pupae in the three genera of concern (*Conogethes*, *Conopomorpha*, and *Cryptophlebia*), are either associated with plant parts other than fruit or they occur externally on their host's plant parts (CABI, 2007; Hwang and Hsieh, 1989; IPM DANIDA, 2003; Nair, 1975; Ooi et al., 2002; Underhill, 1943; van der Berg et al., 2001). Or, if the pupae occur inside the fruit or seed of their host plants, they would be associated with premature fruit drop and/or obvious damage and symptoms (CABI, 2007; Gupta et al., 2005; Singh et al., 2002; Waite and Hwang, 2002), thereby making it likely for the fruit to be culled during standard harvest or post-harvest handling and processing. Except for two interceptions of *Conopomorpha* in permit cargo with litchi fruit, inspectors at U.S. ports-of-entry have never intercepted pupae of the other Lepidoptera genera of concern associated with commercial fruit shipments (of any type of fruit) (PestID, 2009). This lack of interception is evidence of the low likelihood of any of the Lepidoptera pupae following the pathway of commercial fruit. The irradiation treatment, along with standard postharvest processes, therefore, will likely mitigate the risks from all the insects listed above.

(ii) Mites:

As explained under litchis, the litchi mite, *Aceria litchii*, is found associated with litchi and longan only (USDA, 2007). The mite is primarily a pest of foliage and flower parts but is also sometimes associated with the fruit. In severe cases, flowers may be completely destroyed and setting of fruit is prevented or the set fruit may be damaged cosmetically (Waite, 1999). Mites feed externally on the fruit and because of the damage mites causes on fruits, inspection and culling of the damaged fruit are considered effective in mitigating risk from such pests. Although it is unlikely that commercially produced fruit is a pathway for the mite, because of its small size, shipments should be prohibited into Florida, where litchis are grown, as an added precaution. This is consistent with other import programs where shipments of litchis and/or longans are prohibited into Florida for the same pest. Shipments of litchi and/or longans from

China, India, Thailand and Hawaii into the mainland U.S. with inspection for the pest over the past few years show no record of interception.

As part of the U.S. requirements (7CFR305.9) governing the use of irradiation as a phytosanitary treatment, APHIS and the NPPO of Vietnam must jointly develop an operational work plan (OWP). The work plan shall include details of activities including inspection of articles that NPPO must perform before the treatment or departure. Phytosanitary inspection of the fruit will ensure that all pests of concern not targeted by irradiation are removed from the pathway.

III. Conclusion

The phytosanitary requirements described above include treatment of litchi and longan fruit from Vietnam with irradiation using a minimum absorbed dose of 400 Gy and phytosanitary inspections for pests not targeted by the irradiation treatment. The risk management document concludes that based on the evaluation of effectiveness of these measures directed against the pests of concern, APHIS finds that the safeguards of 7 CFR § 319.56 and the additional mitigations described here will result in the effective removal of the pests of concern identified by the PRA for the importation of fresh litchis and longans from Vietnam into the Continental United States.

IV. Authors:

Inder Paul S. Gadh, Ph.D.
Senior Risk Manager – Treatments

V. References:

- CABI. 2003. Crop Protection Compendium. Commonwealth Agricultural Bureau International (CABI), Wallingford, UK.
- CABI. 2007. Crop Protection Compendium. Centre for Agriculture and Biosciences International (formerly Commonwealth Agricultural Bureau International) (CABI), Wallingford, UK.
- Gupta, H. C. L., O. P. Ameta, and V. K. Chechani. 2005. Management of insect pests of horticultural crops. Agrotech Publishing Academy, Udaipur. 224 pp.
- Hwang, J. S., and F. K. Hsieh. 1989. The bionomics of the cocoa pod borer, *Conopomorpha cramerella* (Snellen), in Taiwan. Plant Protection Bulletin Taipei 31(4):387-395.
- IPM DANIDA. 2003. Durian fruit borer. IPM Thailand. Last accessed March 10, 2006, http://www.ipmthailand.org/EN/Pests/Durian_fruit_borer.htm.
- Nair, M. R. G. K. 1975. Insects and mites of crops in India. Indian Council of Agricultural Research New Delhi. 404 pp.
- Ooi, P. A. C., A. Winotai, and J. E. Peña. 2002. Pests of minor tropical fruits. Pages 315-330 in J. E. Peña, J. L. Sharp, and M. Wysoki, (eds.). Tropical fruit pests and pollinators: biology, economic importance, natural enemies and control. CAB International, Wallingford, U.K.

- PestID. 2009. Pest Identification Database (PestID). United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine. <https://moks14.aphis.usda.gov/aqas/login.jsp>. (Archived at PERAL).
- Singh, Y. P., G. K. Singh, and K. Suresh. 2002. Occurrence of *Dichocrocis punctiferalis* Guen. (Lepidoptera: Pyralidae) on mango in Western U.P. *Progressive Horticulture* 34(1):130.
- Underhill, G. W. 1943. Some insect pests of ornamental plants [Abstract]. *Virginia Agric Expt Sta Bull* 349:1-38.
- USDA. 2006. USDA Treatments for Fruits and Vegetables. January 27, 2006 issue of *Federal Register* 71(18): 4451-4464.
- USDA. 2007. Pest lists for fresh *Litchi chinensis* (lychee or litchi), *Dimocarpus longan* (longan), *Mangifera indica* (mango), *Garcinia mangostana* L. (mangosteen), *Nephelium lappaceum* L. (rambutan), and *Ananas comosus* (pineapple) fruit from Thailand, US Department of Agriculture, Animal & Plant Health Inspection Service, Plant Protection & Quarantine, Center for Plant Health Science & Technology, NC .
- USDA. 2011. Importation of Fresh Fruit of Litchi (*Litchi chinensis*), Longan (*Dimocarpus longan*), and Rambutan (*Nephelium lappaceum*) into the Continental United States from ASEAN Countries - A Qualitative, Pathway-initiated Pest Risk Assessment. USDA, APHIS, CPHST, 107 pp.
- van den Berg, M. A., E. A. de Villiers, and P. H. Joubert. 2001. Pests and beneficial arthropods of tropical and non-citrus subtropical crops in South Africa. Institute for Tropical and Subtropical Crops, Nelspruit, South Africa. 525 pp.
- Waite, G. K. 1999. New evidence further incriminates honey bees as vectors of lychee erinose mite *Aceria litchi* (Acari: Eriophidae). *Experimental and Applied Acarology* 23(2): 145-147.
- Waite, G. K., and J. S. Hwang. 2002. Pests of litchi and longan. Pages 331-359 in J. E. Peña, J. L. Sharp, and M. Wysoki, (eds.). *Tropical fruit pests and pollinators: biology, economic importance, natural enemies and control*. CABI Publishing, Wallingford, UK.