

EPPO Datasheet: *Neoleucinodes elegantalis*

Last updated: 2020-05-29

IDENTITY

Preferred name: *Neoleucinodes elegantalis*

Authority: (Guenée)

Taxonomic position: Animalia: Arthropoda: Hexapoda: Insecta:
Lepidoptera: Crambidae

Other scientific names: *Leucinodes elegantalis* Guenée

Common names: cocona fruit borer, eggplant moth, small tomato borer, tomato fruit borer

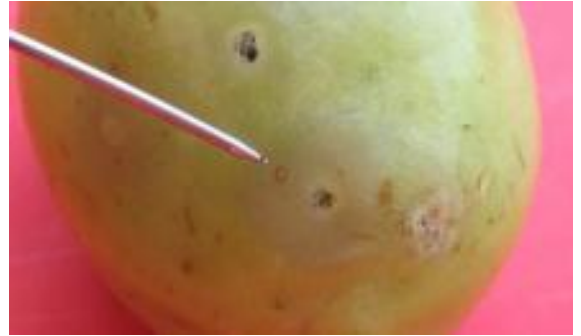
[view more common names online...](#)

EPPO Categorization: A1 list

[view more categorizations online...](#)

EU Categorization: A1 Quarantine pest (Annex II A)

EPPO Code: NEOLEL



[more photos...](#)

Notes on taxonomy and nomenclature

Neoleucinodes elegantalis (Guenée) was initially described as *Leucinodes elegantalis* Guenée and recorded as a South American species attacking tomato in the states of Paraná and Minas Gerais in Brazil. Capps (1948) regarded *L. elegantalis* sufficiently different from other *Leucinodes* species known from the Old World, and created the genus *Neoleucinodes* in which he assigned this New World species as *Neoleucinodes elegantalis*. Recent studies have shown genetic divergence between populations of *N. elegantalis* from different areas and different hosts (Maia *et al.*, 2016; Diaz-Montilla *et al.*, 2013; Noboa, 2017a - see also under *Hosts*).

HOSTS

N. elegantalis is an oligophagous pest that attacks only fruits of plants belonging to the family Solanaceae. Its host list includes major crops, such as tomato (*Solanum lycopersicum*), eggplant (*S. melongena*) and pepper (*Capsicum annuum*), as well as some tropical plants cultivated for fruit, especially *S. quitoense* (naranjilla), *S. betaceum* (tree tomato), *S. sessiliflorum* (cocona), *S. pseudolulo* (lulo del Pacifico), *S. aethiopicum* (gilo) and *S. sisymbriifolium* (litchi tomato). Other hosts in the list below are wild solanaceous plants, mostly belonging to the *Leptostemonum* subgenus.

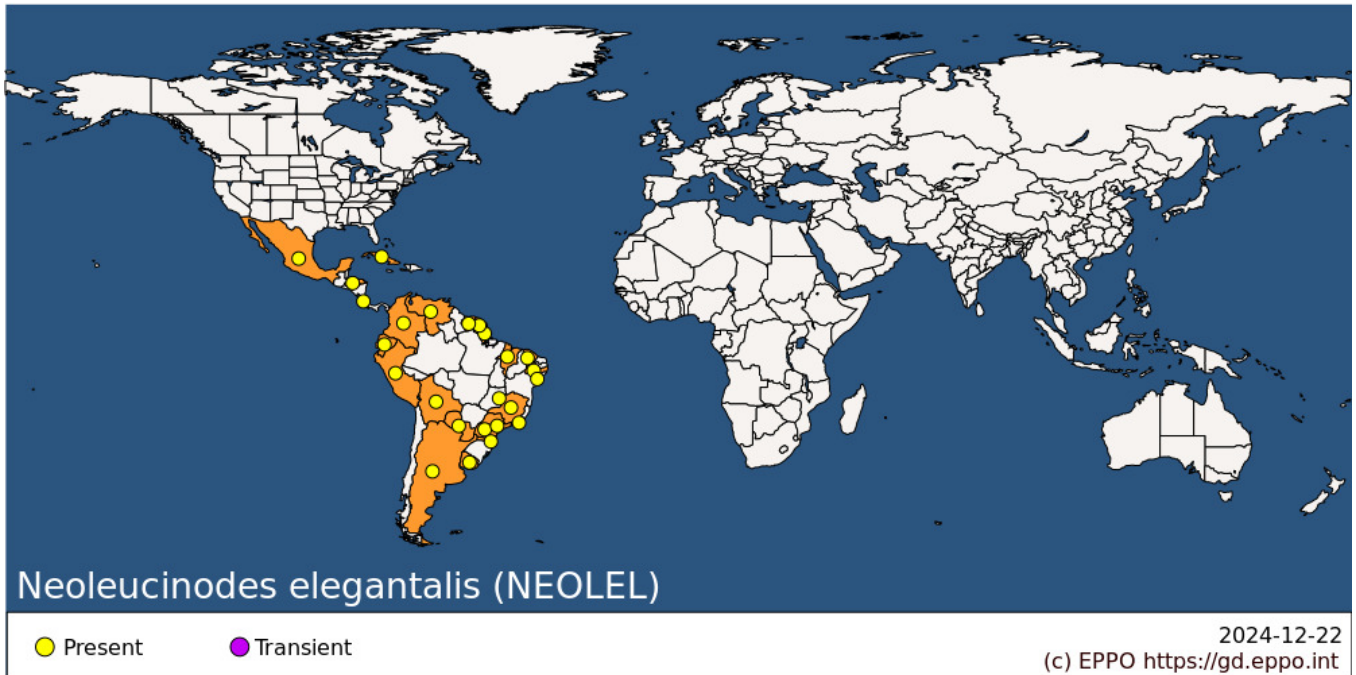
It is noteworthy that in Colombia there are areas where the insect was not found on some host crop plants planted at certain altitudes. In Ecuador, the insect causes damage to *S. quitoense* and *S. betaceum* in some areas, but in the same areas it has not been observed on *S. lycopersicum* and *C. annuum* (Paredes *et al.*, 2010; Noboa *et al.*, 2017). Recent studies on the diversity of populations of *N. elegantalis* in Colombia showed the presence of biotypes or host races separated by the Andes mountain range, with some level of morphological, biological and genetic differences, and in some cases a decrease of reproductive compatibility between races (Diaz-Montilla *et al.* 2013, 2017a&b, 2018).

Host list: *Capsicum annuum*, *Solanum acerifolium*, *Solanum aethiopicum*, *Solanum arboreum*, *Solanum atropurpureum*, *Solanum betaceum*, *Solanum crinitum*, *Solanum hirtum*, *Solanum lycocarpum*, *Solanum lycopersicum*, *Solanum melongena*, *Solanum pseudolulo*, *Solanum quitoense*, *Solanum sessiliflorum*, *Solanum sisymbriifolium*, *Solanum torvum*, *Solanum umbellatum*

GEOGRAPHICAL DISTRIBUTION

N. elegantalis is reported only from the Neotropics. In addition to the distribution records below, it has been reported in several countries of South America, Central America and the Caribbean, where its current presence is nevertheless in doubt. This is the case for old records (Capps, 1948) that are not supported by more recent publications (Grenada,

Guatemala, Guyana, Jamaica, Nicaragua, Panama, Trinidad and Tobago), as well as for Nicaragua, El Salvador and Puerto Rico.



North America: Mexico

Central America and Caribbean: Costa Rica, Cuba, Honduras

South America: Argentina, Bolivia, Brazil (Amapa, Ceara, Distrito Federal, Maranhao, Minas Gerais, Parana, Pernambuco, Rio de Janeiro, Santa Catarina, Sao Paulo, Sergipe), Colombia, Ecuador, French Guiana, Paraguay, Peru, Suriname, Uruguay, Venezuela

BIOLOGY

Eggs are oviposited singly or in groups of 2-3 eggs (Blackmer *et al.*, 2001; Eiras and Blackmer, 2003). The oviposition sites differ depending on the host plant. On tomato, eggs are oviposited under or on the calyx, or at the surface of the fruit (Salas *et al.*, 1991; Marcano, 1991a, Blackmer *et al.*, 2001; Rodrigues Filho *et al.*, 2003; Jaramillo *et al.*, 2007). A large proportion of eggs are laid on small fruits of 1-3 cm diameter (Blackmer *et al.*, 2001; Carneiro *et al.*, 1998; Eiras and Blackmer, 2003; Rodrigues Filho *et al.*, 2003). Eggs may also be oviposited on floral stalks and flower buds and, when the pest is present at high densities, on leaves (Carneiro *et al.*, 1998). On eggplant, eggs are mostly laid on the calyx or directly on the fruit and below the sepals (Espinoza, 2008; Serrano *et al.*, 1992). There is a great variation in the number of eggs per female, but the average number appear to be around 30-50 (Fernandez and Salas, 1985, Marcano, 1991a&b; de Moraes & Foerster, 2014).

Larvae of *N. elegantalis* pass through 4 larval instars at 20°C and 25°C and five larval instars at 15°C and 30°C (Marcano *et al.*, 1991b). Neonate larvae enter the fruit within a short time after hatching (approximately one to a few hours) (Eiras and Blackmer, 2003; Diaz-Montilla, pers. comm.). Larvae develop only inside fruit. Usually, there are only a few larvae per fruit. Depending on fruit size, fruit of tomato can for example host 1 to 34 larvae (Serrano *et al.*, 1992).

Mature larvae exit the fruit and develop into pupae, which are protected by a delicate sticky cocoon (Carneiro *et al.*, 1998). The pupation site varies according to the morphology of the host plant and the material that the larvae encounters when exiting the fruit. In tomato, pupae are formed on enfolded leaves on the plant, and can still develop after the leaves fall onto the ground. In *S. quitoense*, pupae are formed on leaves and dry flower buds in the aerial part of the plant, but also between the fruits of a cluster or in plant debris accumulated in the axils of the plants. In sweet pepper, pupae may be formed on plastic mulch on the ground at the base of the plant (Capps, 1948; Salas *et al.*, 1991; Marcano 1991a; EDA, 2007; Asaquibay *et al.*, 2009; Salas *et al.*, 1991, Serrano *et al.*, 1992; Viáfara *et al.*, 1999).

Adults are nocturnal, including mating and oviposition activities. During the day, they remain motionless hidden under the leaves of weeds or crop hosts (Marcano *et al.*, 1991a). Females attract mates by emitting a sex pheromone. They mate within 48 to 72 h after emergence, and oviposition typically occurs shortly after mating (Marcano *et al.*, 1991a, de Moraes & Foerster, 2014).

It is important to note, especially in relation to control, that life stages of *N. elegantalis* are not easily accessible: eggs may be under the calyx on some hosts; neonate larvae are at the surface of fruits for a very short time before entering the fruit for their entire life; pupae are enclosed in a cocoon attached to leaves or in debris, and adults are nocturnal.

At temperatures around 20-25°C, the life cycle lasts 30-60 days, and it was found to last 115 days on tomato at 14.7°C (Marcano *et al.*, 1991a&b; Serrano *et al.* 1992; de Moraes & Foerster, 2014). *N. elegantalis* has several generations per year, but no precise data is available in the literature. In some areas, the pest is present throughout the year in the crops and generations overlap (Barbosa *et al.*, 2010). There is no evidence that *N. elegantalis* has a diapause. Models based on climatic data showed that, in Colombia, there may be 2 to 11 generations per year depending on locations (EPPO, 2014), and in Brazil 5 to 10 generations per year (De Moraes & Foerster, 2015).

Development is favoured by a relative humidity above 65% and a maximum temperature of 25°C (Marcano (1991 a&b)). Regarding temperature thresholds, Marcano *et al.* (1991 a&b, with respectively tomato and eggplant as food) did not obtain oviposition at 14.7°C, no hatching at 30.2°C, and no development to the adult stage at 34.5°C. In similar trials, de Moraes & Foerster (2015) obtained similar results, with however some oviposition occurred at 15°C, and *N. elegantalis* from different regions of Brazil completed their life cycle and reproduced between 15°C and 27°C (de Moraes & Foerster, 2015). On the basis of a linear regression with existing data, EPPO (2014) estimated that development of *N. elegantalis* stops at 10.5°C, while de Moraes & Foerster (2015) estimated that the lower temperature threshold for immature stages of *N. elegantalis* is 8.8°C.

DETECTION AND IDENTIFICATION

Symptoms

Larvae entry and exit holes are present on fruit. The entry hole is very small and heals over time, leaving a scar consisting of a depressed area with a necrotic spot of about 0.5 mm, which is almost imperceptible (Espinoza, 2008). Exit holes are larger. There may be excrement on the fruit (especially on fruit of *S. quitoense* and *S. betaceum*). Fruit may have a slight abnormal coloration, and may fall (EPPO, 2014).

Morphology

Eggs

Flat, slightly textured, oval, measuring 0.5 mm long and 0.3 mm wide. Just-oviposited eggs are white, turning light yellow and becoming brown prior to hatching.

Larva

Mature larvae measure 15 and 20 mm in length. Body colour from white to pink with a brown head. Body pinacula without sclerotization and pigmentation. The colour of the pinacula is similar to that of the body; they are present as a slightly raised blister particularly on the meso- and meta-thorax. Prothoracic shield pale yellow with light-brown markings.

Pupa

Obtect. Colour varying from light to dark brown, measuring 12–15 mm, with a cremaster. Dorsum of the abdominal segments smooth. The 2nd and 3rd abdominal segment with a protruding cover above each spiracle.

Adult

The adult is a moth with white wings, somewhat hyaline with dark brown or black scaly areas. Dorsally the abdomen has a striking white band covering the entire 1st abdominal segment and part of the 2nd and 3rd segments, the rest of the segments covered by a mixture of dark- brown and black scales. The abdomen in ventral view, with the entire 1st abdominal segment and a large portion of the 2nd and 3rd segment white in colour, the other segments paler than the dorsum. Laterally, the abdomen has small tufts of scales of the same colour, often difficult to see in descaled specimens. There is a sexual dimorphism. In the females, the third labial palp is longer than in the males. The male wingspan is 15–33 mm and the female wingspan 15–30 mm.

Detection and inspection methods

The pest is difficult to detect visually. Symptoms of infestation are not readily observed at early stages of infestation. Eggs are very small, larvae are inside the fruit, entry holes are very small and may be hidden under the calyx, pupae are hidden, and adults are nocturnal. Nevertheless, detection of eggs can be used to determine the timing of plant protection products applications (see *Control*) (Serrano *et al.*, 1992; Benvenega *et al.*, 2010; da Silva *et al.*, 2019). Damage is more likely to be first observed at harvest of the first fruit (Carneiro *et al.*, 1998).

Trapping is available and relies on a sex pheromone. A synthetic pheromone blend has been available commercially since 2001 in Venezuela (Silva, 2008) and has been used in several countries (Jaffe *et al.*, 2007). However, it does not work on all populations and host races (K. Jaffe, pers. comm.). More recently, a study demonstrated differences between populations and host races in their response to pheromones (Diaz-Montilla *et al.*, 2017a).

Positive identification of *N. elegantalis* is required to confirm the presence of the pest. *N. elegantalis* is morphologically very similar to several other species of Crambidae that occur in Central and South America. Keys are available in Diaz & Solis (2007).

PATHWAYS FOR MOVEMENT

International movement of *N. elegantalis* could occur on infested host fruit and plants for planting bearing fruit, as well as on infested fruit packaging. Host fruit is known to be a pathway for the introduction of the pest into Suriname, and there have been numerous interceptions of *N. elegantalis* on fruit imported into the USA and the Netherlands. A key factor for the successful entry of *N. elegantalis* into a country would be that packing and handling facilities for imported fruit are situated close to production areas. Regarding plants for planting, only plants with fruit may be a pathway, which may be the case for plants for ornamental purposes. Finally, fruit or plants for planting carried in travellers' luggage are a potential pathway, although successful entry is less likely than for commercial consignments (EPPO, 2014).

PEST SIGNIFICANCE

Economic impact

N. elegantalis has had a negative economic impact on Solanaceae production in Latin America. It causes fruit losses either directly or through secondary infection by other organisms, and also has negative impacts on export markets.

Fruit losses on tomato crops were reported to reach 60 % in Colombia, 77% in Brazil and 41 % in Venezuela during the rainy season (Perez Rosero, 2010, citing others). In Argentina, losses on glasshouse tomatoes reached 12 % (Puch and Mollinedo, 2009).

In tomatoes, eggplants and sweet pepper destined for the fresh market, almost any insect making an entry or exit hole on the fruit will result in fruit loss through secondary bacterial or fungal infection, cosmetic damage, or insect contamination. *N. elegantalis* has been a major problem for export of Solanaceae fruit from infested countries (Diaz-Montilla *et al.*, 2018). In Honduras losses of 1% were recorded on eggplant (Diaz & Brochero, 2012), but were associated with significant impact on export. For processing tomatoes, the primary losses are due to fruit shipments that are rejected because of larval contamination: the presence of any recognizable insect larvae or portion of a larva in consumer products is unacceptable to most consumers (Espinoza, 2008).

Control

The management of *N. elegantalis* has relied on the application of insecticides, and integrated measures combining chemical control based on the results of monitoring, biological control and cultural practices have been developed (Silva, 2008; SENESA Honduras, 2012). The timing of insecticide applications needs to be adapted to the life stage targeted (eggs, young larvae or adults), as each life stage is accessible only during a limited time (Espinoza, 2008, da Silva *et al.*, 2018). Pheromone traps or visual inspection for eggs can be used for monitoring, depending on the life stage targeted (EPPO, 2014; da Silva *et al.*, 2019). Several life stages may be present at the same time because of overlapping generations, which also hamper control as different active substances need to be used against different life stages.

Egg parasitoids of the genus *Trichogramma* have been widely studied as a biological control agent of *N. elegantalis*. The following species of *Trichogramma* have been reported in the literature as potential biological control agents to control *N. elegantalis*: *T. exiguum*, *T. pretiosum* and *T. minutum* (Berti and Marcano 1995, Cross 1996, Viáfara *et al.*, 1999, Blackmer *et al.*, 2001; Leiderman & Sauer, 1953; Parra & Zucchi, 2004. Silva, 2008, de Oliveira *et al.*, 2017).

Mating disruption using sex pheromones has been investigated as a promising control technique (De França *et al.*, 2013 & 2017). However, pheromones should be adapted to the different populations/biotypes as Diaz-Montilla *et al.* (2017a) showed that different populations and host races may respond differently to pheromones traps.

Finally promising results were obtained recently in the selection of a hybrid of *S. quitoense* with resistance to *N. elegantalis* (Polanco-Puerta *et al.*, 2018).

Phytosanitary risk

N. elegantalis is an EPPO A1 quarantine pest (EPPO, 2019). This species is potentially a serious pest of tomato, eggplant, and sweet pepper, which are widely grown in the EPPO region. It also presents a risk for tropical host fruit which are grown to a limited extent in the EPPO region, such as tree tomato (*S. betaceum*). In the EPPO region, the endangered area is considered to be the Mediterranean Basin and Portugal (EPPO, 2014; da Silva *et al.*, 2017). Establishment outdoors in the rest of the EPPO region is considered unlikely. In northern areas of the EPPO region, only transient field populations are expected, but permanent populations may establish in greenhouses. *N. elegantalis* may cause damage in protected conditions, even if it does not establish permanently. In case of establishment, losses are likely to occur at least until control methods are added to the current integrated management programmes. Human-assisted pathways, especially fruit, may spread the pest over long distances within the EPPO region. Eradication or containment of this species will be difficult and costly, and unlikely to be successful other than in protected conditions (EPPO, 2014).

PHYTOSANITARY MEASURES

EPPO recommended that phytosanitary measures should be taken for fruits and plants for planting of cultivated host species. Fruit should originate from a pest-free area or pest-free place of production in screened glasshouses, in both cases pheromone trapping should be used. Alternatively, a systems approach may be required, combining growing under screenhouses, monitoring, treatment and good agricultural practices, as well as inspection and sorting at packing, and visual inspection of the consignment. New packaging should be used before export, and packaging should be destroyed or safely disposed of after import. In importing countries, it is important that the trade and production flows are separated, and that surveillance systems (including trapping at packing stations) are in place (EPPO, 2014). No treatment schedule for host fruit appears to be available to date. In experiments, 100 and 200 Gy (gamma irradiation) were lethal doses against eggs and larvae of *N. elegantalis* (Costa *et al.*, 2009). For plants for planting, similar options of pest-free area or pest-free place of production were recommended, as well as importing plants that have never borne fruit (e.g. seedlings). Plants and containers should be free from plant debris. Finally, raising awareness and inspection of luggage would mitigate the risk of entry with travellers (EPPO, 2014).

REFERENCES

- Asaquibay IC, Gallegos GP, Arroyo M; Williams R & Alwang J (2009) Comportamiento y alternativas de control del gusano del fruto de la naranjilla (*Neoleucinodes elegantalis*). Boletín Divulgativo. Instituto Nacional Autonomo de Investigaciones Agropecuarias, Quito (Ecuador). Estacion Experimental Santa Catalina. Dept. de Proteccion Vegetal.
- Barbosa FS, Menezes E, Arruda LN, Brito D, Carmo MGF & Pereira MB (2010) Preferência de oviposição de broca-pequena-do-fruto em oito variedades de tomate rasteiro. *Horticultura Brasileira* **28**, 634-640.
- Benvenga SR; De Bortoli SA, Gravena S & Barbosa JC (2010). Monitoramento da broca-pequena-do-fruto para tomada de decisão de controle em tomateiro estaqueado. *Horticultura Brasileira* **28**, 435-440.
- Berti J & Marcano R (1995) Preferencia de *Trichogramma pretiosum* (Riley) (Hymenoptera: Trichogrammatidae) por huevos de diferentes hospederos. *Boletín de Entomología Venezolana* **10**, 1-5.
- Blackmer JL, Eiras AE & De Souza CLM (2001) Oviposition preference of *Neoleucinodes elegantalis* (Guenée) (Lepidoptera: Crambidae) and rates of parasitism by *Trichogramma pretiosum* Riley (Hymenoptera: Trichogrammatidae) on *Lycopersicon esculentum* in São José de Ubá, RJ, Brazil. *Neotropical Entomology* **30**, 89-95.
- Capps HW (1948) Status of the Pyraustid moths of genus *Leucinodes* in the New World, with descriptions of new genera and species. *Smithsonian Institution Press, Proceedings* **98**, 69-83.
- Carneiro J, Pedrosa Haji FN & dos Santos FA (1998) Bioecologia e controle da broca pequena do tomateiro *Neoleucinodes elegantalis*. Circular Técnica 26. Embrapa, Meio Norte, Brazil.
- Costa HSF, Fanaro GB, Araújo MMJO, Santillo AG, de Faria JTVA & Villavicencio ALCH (2009) Gamma irradiation as a quarantine treatment for *Neoleucinodes elegantalis* in tomato fruit. International Nuclear Atlantic Conference - INAC. Rio de Janeiro, RJ, Brazil, September 27 to October 2, 2009 Associação Brasileira De Energia Nuclear – Aben. 5p.
- Cross MV (1996) Evaluación del parasitismo de *Trichogramma pretiosum* Riley sobre el perforador del fruto del tomate *Neoleucinodes elegantalis* Guenée (Lepidoptera: Pyralidae) en el Valle. Tesis Ingeniero Agrónomo. Facultad de Ciencias Agrícolas, Universidad de Nariño. Pasto. 106 p.
- Da Silva EM, Crespo ALB, Farias ES, Bacci L, Queiroz RB & Picanço MC (2019) Conventional sampling plan for scouting *Neoleucinodes elegantalis* (Lepidoptera: Crambidae) eggs on tomato fruits. *Journal of Economic Entomology* **112**, 2433-2440 (abstract).
- Da Silva RS, Arcanjo LP, Soares JRS, Ferreira DO, Serrão JE, Martins JC, Costa ÁH & Picanço MC (2018) Insecticide toxicity to the borer *Neoleucinodes elegantalis* (Guenée) (Lepidoptera: Crambidae): developmental and egg-laying effects. *Neotropical Entomology* **47**, 318-325.
- Da Silva RS, Kumar L, Shabani F, Picanço MC (2017) Potential risk levels of invasive *Neoleucinodes elegantalis* (small tomato borer) in areas optimal for open field *Solanum lycopersicum* (tomato) cultivation in the present and under predicted climate change. *Pest management science* **73**, 616-627.
- De França SM, Oliveira Breda M, Badji CA & De Oliveira JV (2013) Chapter 6. The use of behavioral manipulation techniques on synthetic insecticides optimization. In: Trdan S (ed) *Insecticides - Development of safer and more effective technologies*. Intechopen Limited, London (GB).
- De Franca SM, Oliveira JV, Badji CA, Guedes CA, Duarte BLR, Oliveira CM & Breda MO (2017) Management of *Neoleucinodes elegantalis* (Lepidoptera: Crambidae) in tomatoes using mating disruption and attract and kill. *Journal of Agricultural Science and Technology* **19**, 133-144.
- De Moraes CP & Foerster LA (2014) Development and reproduction of *Neoleucinodes elegantalis* (Lepidoptera: Crambidae) on tomato (*Solanum lycopersicum*) cultivars. *Revista Colombiana de Entomología* **40**, 40-43.
- De Moraes CP & Foerster LA (2015) Thermal requirements, fertility, and number of generations of *Neoleucinodes elegantalis*

(Guenée) (Lepidoptera: Crambidae). *Neotropical Entomology* **44**, 38-344.

De Oliveira CM, De Oliveira JV, Rafael D, Barbosa S, Breda MO, De França SM, Duarte BLR (2017) Biological parameters and thermal requirements of *Trichogramma pretiosum* for the management of the tomato fruit borer (Lepidoptera: Crambidae) in tomatoes. *Crop Protection* **99**, 39-44.

Díaz AE & Brochero HLM (2012) Parasitoides asociados al perforador del fruto de las solanáceas *Neoleucinodes elegantalis* (Lepidoptera: Crambidae) en Colombia". *Revista Colombiana de Entomología* **38**, 50-57.

Díaz AE & Solís AM (2007) A new species and species distribution records of *Neoleucinodes* (Lepidoptera: Crambidae: Spilomelinae) from Colombia, feeding on *Solanum* sp. *Proceedings of the Entomological Society of Washington* **109**, 897-908.

Díaz-Montilla AE, Baena-Bejarano N, Montoya-Lerma J & Saldamando-Benjumea CI (2018) Reproductive incompatibility and fitness components in *Neoleucinodes elegantalis* races (Lepidoptera, Crambidae) from three Solanaceae hosts. *Caldasia* **40**, 199-215.

Díaz-Montilla AE, Gallego-Sánchez G, Suárez-Barón H, Cano-Calle D, Arango-Isaza RE, Viera W, Saldamando-Benjumea CI (2017b) *Neoleucinodes elegantalis* (Guenée) Population structure and isolation by distance in Central and South America revealed with cytochrome oxidase I (CO1) Gene. *Southwestern Entomologist*, **42**, 753-768.

Díaz-Montilla AE, Suarez-Baron H, Gallego-Sanchez G, Viera-Arroyo WF & Saldamando-Benjumea CI (2017a) Variation in the capture of *Neoleucinodes elegantalis* Guenee (Lepidoptera: Crambidae) males using commercial sex pheromones on three solanaceous hosts. *Corpoica Ciencia y Tecnología Agropecuaria* **18**, 583-597.

Díaz-Montilla AE, Suárez-Baron HG, Gallego-Sánchez G, Saldamando-Benjumea CI & Tohme J (2013) Geographic differentiation of Colombian *Neoleucinodes elegantalis* (Lepidoptera: Crambidae) haplotypes: evidence for Solanaceae host plant association and Holdridge life zones for genetic differentiation. *Annals of the Entomological Society of America* **106**, 586-597.

EDA (2007) Identificación, daño y control del barrenador en el fruto del tomate/berenjena. (*Neoleucinodes elegantalis*: Pyralidae - Lepidóptera). Boletín Técnico de Producción. Entrenamiento y Desarrollo de Agricultores. Cortes, Honduras.

Eiras AE & Blackmer JL (2003) Eclosion time and larval behavior of the tomato fruit borer, *Neoleucinodes elegantalis* (Guenée) (Lepidoptera: Crambidae). *Scientia Agricola (Piracicaba, Brazil)* **60**, 195-197.

EPPO (2014) Pest risk analysis for *Neoleucinodes elegantalis*. EPPO Platform on PRAs. <https://pra.eppo.int/pra/1078c88d-bf07-486f-841c-7faa74b93c58>

Espinoza (2008) Barrenador del fruto de la berenjena, *Neoleucinodes elegantalis*. Hoja Técnica No. 2, Enero, 2008. FHIA, Cortés, Honduras.

Fernandez S & Salas A (1985) Estudio sobre la biología del perforador del fruto del tomate *Neoleucinodes elegantalis* (Lepidoptera:Pyralidae). *Agronomía Tropical* **35**, 77-81.

Jaffe K, Miras B & Cabrera A (2007) Mate selection in the moth *Neoleucinodes elegantalis*: evidence for a supernormal chemical stimulus in sexual attraction. *Animal behaviour* **73**, 727-734.

Jaramillo J, Rodríguez VP, Guzmán M, Zapata M & Rengifo T (2007) Manual Técnico: Buenas Prácticas Agrícolas en la Producción de Tomate Bajo Condiciones Protegidas. Gobernación de Antioquia, MANA, CORPOICA, Centro de Investigación 'La Selva'. FAO.

Leiderman L & Sauer HFG (1953) A broca pequena do fruto do tomateiro *Neoleucinodes elegantalis* (Guenée, 1854). *Biológico* **19**, 182-186.

Maia AVP, Almeida C, Santoro KR, Melo JLA, Oliveira JV, Guedes RNC & Badji CA (2016). High-level phylogeographic structuring of *Neoleucinodes elegantalis* Guenée (Lepidoptera, Crambidae) in Brazil: an important

tomato pest. *Revista Brasileira de Entomologia* **60**, 206-210.

Marcano RV (1991a) Estudio de la biología y algunos aspectos del comportamiento del perforador del fruto del tomate *Neoleucinodes elegantalis* (Lepidoptera: Pyralidae) en tomate. *Agronomía Tropical* **41**, 257-263.

Marcano RV (1991b). Ciclo biológico del perforador del fruto del tomate *Neoleucinodes elegantalis* (Guenée) (Lepidoptera: Pyralidae), usando berenjena (*Solanum melongena*) como alimento. *Boletín de entomología venezolana* **6**, 135-141.

Noboa M, Viera W, Díaz A, Vásquez W, Ron L (2017) Genitalic differentiations in *Neoleucinodes elegantalis* (Guenée) (Lepidoptera: Crambidae) associated with Solanaceae crops in Ecuador. *Insects* **8**, 91, 11 pp.

Paredes J, Peralta EL & Gómez P (2010) Gusano perforador de los frutos de naranjilla (*Solanum quitoense* Lam): Identificación y biología. *Revista Tecnológica ESPOL-RTE* **23**, 27-32.

Parra JRP & Zucchi RA (2004) *Trichogramma* in Brazil: feasibility of use after twenty years of research. *Neotropical Entomology* **33**, 271-281.

Pérez Rosero M (2010) Mejoramiento genético en *Solanum lycopersicum* para la resistencia al pasador del fruto *Neoleucinodes elegantalis* Guenée (Lepidoptera: Crambidae). Universidad Nacional de Colombia. Facultad de Ciencias Agropecuarias, Palmira, Colombia. Thesis.

Polanco-Puerta MF, Gómez-Posada S & Padilla-Osorio JC (2018) Evaluación de la resistencia de un híbrido F1 de *Solanum quitoense* Lam. a *Neoleucinodes elegantalis* (Guenée) y *Meloidogyne incognita*. *Ciencia & Tecnología Agropecuaria* **19**, 351-356.

Puch LI & Mollinedo VA (2009) Evaluación del daño provocado por la ‘polilla del tomate’ (*Tuta absoluta* Meyrick) y el ‘perforador del fruto del tomate’ (*Neoleucinodes elegantalis* Guenée). XXXII Congreso Argentino de Horticultura. libro de resúmenes. Salta, Argentina. *Horticultura Argentina* **28**, 82.

Rodrigues Filho IL, Marchior LC & da Silva LV. 2003. Análise da oviposição de *Neoleucinodes elegantalis* (Gene, 1854) (Lepidoptera: Crambidae) para subsidiar estratégia de manejo. *Agronomía* **37**, 23-26.

Salas J, Álvarez C, Parra A (1991) Contribución al conocimiento de la ecología del perforador del fruto del tomate *Neoleucinodes elegantalis* (Guenée) (Lepidoptera: Pyraustidae). *Agronomía Tropical* **41**, 275-283.

SENASA Honduras (2012) Plan de Accion. Manejo integrado del perforador del fruto del tomate (*Neoleucinodes elegantalis*: Pyralidae). Servicio Nacional de Sanidad Agropecuaria de Honduras.

Serrano A, Muñoz E, Pulido J & De la Cruz J (1992) Biología, hábitos y enemigos naturales del *Neoleucinodes elegantalis* (Guenée). *Revista Colombiana de Entomología* **18**, 32-37.

Silva I (2008) Control biológico y etológico del perforador del fruto del tomate. *Revista Digital INIA HOY* N° 2, mayo-agosto 2008.

Viáfara HF, García F & Diaz AE (1999) Parasitismo natural de *Neoleucinodes elegantalis* (Guenée) (Lepidoptera: Pyralidae) en algunas zonas productoras de Solanáceas del Cauca y Valle del Cauca Colombia. *Revista Colombiana de Entomología* **25**, 151-159.

ACKNOWLEDGEMENTS

The first version of this datasheet was prepared by A. Diaz-Montilla, Corporación Colombiana de Investigación Agropecuaria, Corpoica C.I La Selva (CO). It was based on the work of the Expert Working Group on *N. elegantalis* (A Diaz-Montilla, CO; A Macleod, Fera, GB; R Potting, Plant Protection Service, NL; E Ucciero, Plant Protection Service, IT; M Suffert, EPPO and F Grousset, EPPO). This revision was prepared in 2020 by the EPPO Secretariat, with recent literature.

How to cite this datasheet?

EPPO (2024) *Neoleucinodes elegantalis*. EPPO datasheets on pests recommended for regulation. Available online. <https://gd.eppo.int>

Datasheet history

This datasheet was first published in the EPPO Bulletin in 2015 and is now maintained in an electronic format in the EPPO Global Database. The sections on 'Identity', 'Hosts', and 'Geographical distribution' are automatically updated from the database. For other sections, the date of last revision is indicated on the right.

EPPO (2015) *Neoleucinodes elegantalis*. Datasheets on pests recommended for regulation. *EPPO Bulletin* **45**(1), 9-13. <https://doi.org/10.1111/epp.12189>



Co-funded by the
European Union