Box-tree moth

Cydalima perspectalis

The box-tree moth or sometimes referred to as just box moth, *Cydalima perspectalis,* is an invasive moth species, native to Japan, Korea and China, which can cause extensive damage to box trees (*Buxus* spp.). It was first recorded in Europe in 2007 and since then has spread throughout continental Europe, arriving in the UK in 2012 and has now been detected on mature plantings and a nursery in Ireland in 2018 (Fig 1). The spread of the insect across the continent has been greatly aided by international trade in its primary host, *Buxus* spp. The natural dispersal rate of the moth is 7-10 km a year. Larvae of the moth feed almost exclusively on *Buxus* spp. Foliage and occasionally bark is consumed by the caterpillar causing severe aesthetic damage and occasionally death of the plant. There are no native *Buxus* species in Ireland; it is a pest of ornamental plants only.

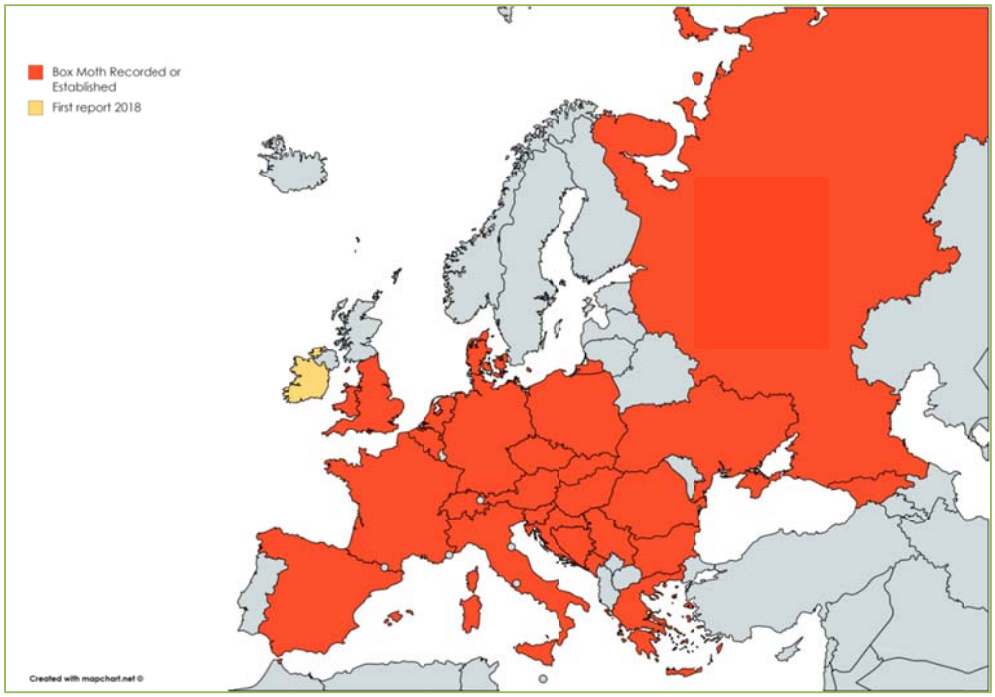

Figure 1. Distribution of Box moth September 2018 based on CABI reports. (https://www.cabi.org/isc/datasheet/118433)

As stated, this insect originates from East Asia and was first discovered in South-western Germany and the Netherlands in 2007. It has since spread to most of Europe except for northern Scandinavian countries. *C. perspectalis* tolerates relatively low temperatures and is very mobile. As the moth is not native to Europe, it has few predators, possibly due to the build-up of toxic alkaloids from their host-plant. So far very few parasites have been found and so it has been readily able to establish limited only by abiotic factors.

Figure 2. Feeding damage to *Buxus* hedge caused by box tree moth larval feeding

Figure 3. Accumulation of Insect frass (waste) observed on a mature planting of *Buxus spp*. in South Dublin, Ireland in 2018.

1. Life cycle

Eggs are laid by moths in patches on the underside of box leaves. Caterpillars feed on foliage and occasionally stems of *Buxus* as the caterpillar develops. The caterpillar has a distinctive green and black body, with a black head capsule. Large amounts of frass (insect waste) are produced (Fig 5 & Fig 3). Experience from continental Europe is that plants can be defoliated very quickly, in as little as a few weeks at the peak of summer (Fig 2). Once mature, caterpillars form a tight protective tent of foliage and silk and pupate. Adults can fly up to 10 km in their life time

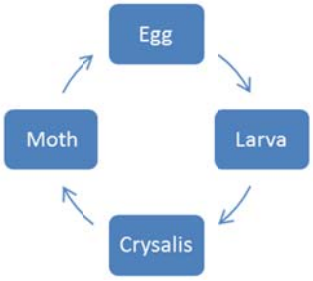

Figure 4. Diagram of the lifecycle of *Cydalima perspectalis*

Young caterpillars overwinter in a cocoon built from webbing, constructed between leaves (Fig 6). The caterpillars enter into diapause (resting phase) in autumn triggered as temperature and day length decrease. Caterpillars begin feeding again in spring. It is estimated, based on climatic modelling that the moth will have between one and two generations per year in Ireland, similar to the predictions for the north of England (Nacambo et al., 2014). Up to 4 generations can develop in warmer climates and in the south of England up to three generations have been observed in 2018.

Figure 5. Mature larva of box tree moth (*C. perspectalis*) feeding on *Buxus* spp. Note the large amounts of insect frass (waste) produced (red circle) and characteristic feeding habit which leave the leaf margin intact (Blue arrow)

Figure 6. Overwintering cocoon of an immature box tree moth larvae (Red arrow)

Figure 7. Webbing, frass and chrysalis of box-tree moth

Figure 8. Chrysalis of box-tree moth (*C. perspectalis*). The chrysalis can often be observed within the webbing created by the larva, which attaches it to the plant

Figure 9. Adult box tree moth (*C. perspectalis*) recovered from a chrysalis collected from a mature *Buxus* planting in Dublin in September 2018

1. Monitoring

Plants on the nursery or established plants in the environment should be monitored during the growing season. Caterpillar damage is easily recognizable. The insects themselves are distinctive with large black eyes and yellow marking along a green body. Few other caterpillars feed on *Buxus* and do not look similar to box moth. Begin checking the boxwood plants in March for emerging caterpillars. As more experience develops of the insect behaviour in Ireland timing for detection may be refined to specific months or weeks.

Pheromone traps can be used to trap male moths; they do not attract the female egg laying moths. The traps can be used indoors and outdoors. They should be in place before the adults take to the wing, possibly late April and monitored regularly. Adults stop flying in Autumn. Pheromone lures used last for between 4 and 12 weeks depending on brand as does area covered. Mass trapping using pheromone traps has been demonstrated to be unsuccessful in interrupting the life cycle of the moth and should only be used as a monitoring aid.

Guidelines for placement

Traps should be placed near *Buxus* plants at a height of between 1.5m to 2 m above ground level. Fill the trap to 5cm with water/ detergent solution. Traps should be suspended by a short chord for safety reason and to prevent solution being poured out on windy days. Pheromone capsules are inserted in the top of the trap. Any spare lures should be stored in a fridge until needed. Replace the water with fresh solution regularly as the scent of putrid mothsor insects will repel others from the trap.

Remove and count moths that are found. Keeping a written record of trap numbers will help determine pest numbers and will be useful for spray programmes.

2. Control options

Control options for box moth should address the appropriate life stage of the insect. Insecticide application should only be made if the pest is present – routine use of insecticides below threshold level is wasteful, harmful to the environment and may contribute to the development of insecticide resistance. Temperature, humidity, precipitation and wind can impact significantly the efficacy of the treatment programme. Never apply treatment products in windy conditions, wet foliage or when rain is forecast in the coming hours.

Treatment should commence once eggs, caterpillar or adult moths have been found. Chemical controls listed are for professional use only and must be applied by registered pesticide users. Recent research in Belgium has found *Bacillus thurengiensis*, Steward and Conserve to be most effective.

3.1 Biological control options

Bacillus thuringiensis e.g. Lepinox Plus **IRAC N/A**

This bacteria, must be consumed by a feeding larva or caterpillar. It will cause the insect to stop feeding due to fatal damage caused to the insects intestinal wall. The bacteria is naturally occurring and is compatible with organic and IPM systems. The bacteria is not stable in UV light and will breakdown in c.10 days in daylight. As the caterpillar must consume it a feeding agent e.g. fructose/glucose should be applied also.

3.2 Conventional Insecticide options

Spinosad e.g. Conserve and Tracer **IRAC 5**

This systemic pesticide is absorbed and dispersed in the plant during the growing season. This is a targeted pesticide and is suitable to use in an IPM programme. It controls the larval stage of the life cycle only. Depending on situation 4-6 applications may be made in one season. 2 applications can be made 5-7 days apart followed by a 10 week interval.

Indoxicarb e.g. Steward **IRAC 22A**

Indoxicarb is selective in control of caterpillars and relatively harmless to beneficial insects. It controls the larval and egg stages of the life cycle only. Uptake is predominantly through feeding with limited contact action. As the caterpillar must consume it, a feeding agent e.g. fructose/glucose should be applied also.

Pyrethrin e.g. Pyrethrum 5 EC **IRAC 3A**

Contact acting pesticide therefore good coverage is essential. It controls the larval stage of the life cycle only. Broad spectrum of insects controlled with a very short persistence as it is broken down by UV light.

Deltamethrin e.g. Decis or Polux **IRAC 3A**

Contact effect, only therefore treat if caterpillars are active. It controls the larval stage of the life cycle only. Good coverage is essential. Broad spectrum of insects controlled with a long persistence.

Lambda-cyhalothrin e.g. Kate Neon, Ninja etc. **IRAC 3A**

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It is critical when selecting Insecticides for control of this pest that insecticides with differing IRAC mode of action codes be selected, as this reduces the risk of resistance developing and also should improve overall efficacy.

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Reference:

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