# PATS-C

## Frequently Asked Questions

***What is PATS-C?***

PATS-C is a fixed camera system that automatically tracks airborne pest insects that are active at night (nocturnal). This data is collected daily and published to a dashboard for users, like growers and advisors. PATS-C provides high frequency information about pest presence and population development, and other behavioural characteristics of tracked pests that are useful for optimising your IPM program. With PATS-C we have demonstrated to detect pests up to 1 generation earlier. Up to 6 weeks are gained to effectively control pests.

***Which insects can PATS-C track?***

The focus is currently on moth pests (*Lepidoptera*). The system monitors the following pests: Tomato looper (*Chrysodeixis chalcites*), European pepper moth (*Duponchelia fovealis*), Banana moth (*Opogona sacchari*), Tomato leafminer (*Tuta absoluta*), Snout moth (*Sufetula diminutalis*), Diamondback moth (*Plutella xylostella*), Cotton Bollworm (*Helicoverpa armigera*), False codling moth (*Haumatotibia Leucotreta*) and *Lyprauta*. This list is constantly updated as the library of pests is growing. Please do inquire if you suffer from other moth pests, it is likely that we can help you out quickly and add this pest to our database.

***Can PATS-C see white fly, thrips or aphids?***

No, PATS-C is not designed to see insects smaller than 4 mm (wingspan). For high frequency and consistent monitoring of these and similar size pests and beneficials we advise the Trap-Eye™ solution. Trap-Eye™ can automatically distinguish and count insects on sticky traps. This solution has been developed by Biobest and PATS together and will be on the market from mid-2023 onwards.

***What do I need to do to make PATS-C work in my greenhouse?***

The PATS-C system is placed on existing infrastructure such as a greenhouse pole and requires one power socket (230/240 V). When you receive the PATS-C system, which consists of the white camera box and black LED-module, you can go ahead and install both modules following the provided installation manual. After installation, plugging it in is enough. The system will start running and automatically connects to 4G right after, just like your smartphone! As soon as twilight sets in, data of passing insects is collected.

***How many PATS-C systems should I install?***

We advise growers to place 1 PATS-C system per 1 hectare, for a complete and accurate signalling and tracking of pests. When greenhouses exist of multiple compartments, we advise at least one system per compartment. In those cases, we can provide tailored advice.

***I have several smaller greenhouses (<1 ha.), how will PATS-C be useful to me?***

We typically advise one system per hectare, or one system per smaller compartment or greenhouse. Depending on the situation and severity of the pest over the last few seasons, PATS-C can still be valuable to your IPM program. PATS-C enables you to detect pests early on and continuously track population development. This is hard to do manually and frequently with conventional traps. The same benefits for either small or big greenhouses apply.

***I have a 4 ha greenhouse, why should I install 4 systems if I can also have a sample with 1 system?***

PATS-C provides a sample of the situation. We know that with one system a hectare you have a solid reference point to act timely and targeted on pest development. When areas get bigger, we see that activity within the greenhouse can differentiate due to several factors. For example, 1) different crop species that are grown and attract pests compared to other species, 2) higher pressures near one of the walls due to the position of the sun, 3) the position of the greenhouse to nature/green areas or 4) the position of the greenhouse to other growers nearby that can be a source of the pest. Having one system per hectare gives a more detailed view and reduces unwanted noise, but you can always opt to start with 1 or 2 systems to gain experience with the PATS-C method.

***What do I need to install PATS-C?***

The only two things you will need is a cordless drill, a ladder or pipe-rail vehicle that can be elevated and possibly an extension cable. All other materials required for the installation are provided by PATS and can be installed following our installation manual.

***How high should I install the system?***

We advise placing the camera box (white module) about 1,5 metres above the top of the crop, and the LED (black module) about 10 – 20 centimetres above the top of the crop. Hence, the space between the camera box and the LED is approximately 1,3 metres. Orientation should be on the crops, not on walls, roller screens, doors or other moving objects like fans and sticky traps.

***Should I adjust the height of the system with the growth of the crop?***

No, we advise placing the system at a height such that the camera box will be about 1,5 metres above the final height of the top of the crop, and the LED module about 10 – 20 cm above the final height of the top of the crop. This position remains the same during the whole season.

***Where should I install the PATS-C systems?***

Your Biobest advisor will advise you on the best place to hang the PATS-C system. In general, the following is taken into account:

- Location where grower often experiences first damage/pressure
- In the plant variety that is the most susceptible for the pest
- Near the south wall of the greenhouse
- Near the concrete path/corridor, near a wall/door
- Possibilities with power socket

***What power voltage do I need?***

The PATS-C system needs one power socket of 230/240 V (50/60 Hz). For other voltage requirements we provide a suitable adaptor. This socket should not be on a time switch and should be dedicated to the PATS-C system. It is important for data acquisition, data processing and regular automatic updates that the PATS-C system is always powered.

***Will PATS-C's electricity plug be compatible with my country's electricity socket?***

Yes, in the package delivered, we will provide the right electricity plug that is compatible with your power socket. If we are in doubt about your country's standard, we will coordinate this together with you as the user.

***How much time does it take to install PATS-C?***

The installation of PATS-C typically takes 30 minutes.

***Do I need a SIM-card and subscription to make PATS-C work?***

No, the system comes with a dongle and 4G SIM suitable for the region your business is located. This is all prepared by us such that a plug & play system is provided to you. The monthly 4G subscription is part of the monthly service fee invoiced to you.

***I have WiFi in my greenhouse, can we also use that?***

Yes, but it's not required. PATS-C will work via 4G. In some cases, using WiFi is preferred, for example when the 4G connection is not stable enough in your location.

***What is the range of PATS-C?***

PATS-C can see an area of approximately 100 m². This sounds little, but we have demonstrated in a multitude of crops and for several pests, that this sample – 100 m² per hectare - is very effective. In past years we have learned that moths -and most airborne insects - are very active flyers that will move around a lot during activity hours. PATS-C pick-ups a sample of these flights. The goal is not to map all individual pest insects, but to provide two main answers which are crucial for IPM: (1)

1. Is the pest present in my greenhouse or crop: measuring first flight activity
2. How is the pest developing over time: measuring continued flight activity

Additionally, this gives insight into pest behaviour (e.g., hours of activity) and provides possibility for predicting pest development and -stages to time applications of crop protection solutions.

***How deep into the crop can PATS-C detect activity?***

PATS-C observes the open space above the top of the crops where airborne insects pass. Our set-up does not look into the crop itself.

***Will PATS-C give correct information on Tuta absoluta population development as adults fly near the ground?***

Yes, we have observed and demonstrated that *Tuta absoluta* population development can sufficiently be tracked by PATS-C. With physical observations in the greenhouse in combination with PATS-C, we concluded that *Tuta absoluta* flies both low (near the ground) and high (above the wires) in tomato. This provides enough information in the sample to track population development. Furthermore, we have demonstrated - together with Research Centre Hoogstraten - that PATS-C is able to detect adult *Tuta absoluta* activity 5 weeks earlier than when this pest is scouted for with physical checks for adults in the traps and lures, as well as for eggs and larvae on the crop. The article can be read **here**.

***How often is the data collected and presented?***

The PATS-C system is always running. It will only start to log data during twilight and night-time. Right after sunrise the system starts processing the data and videos of that night, after which the results are published to the www.pats-c.com dashboard. This typically takes 2 hours. Data is mostly available before noon.

***Can PATS-C replace pheromone traps?***

Fast and consistent detection of pest insects is the key to an effective IPM program. PATS-C can detect flying pests (moths) one generation earlier than traditional scouting methods as delta traps with pheromone lures. In addition, pest population development can easily be tracked from day to day. These insights help to respond faster and more adequately to pest pressure development. For a complete monitoring toolset of the total pest situation in your greenhouse, a combination of PATS-C, traps and crop monitoring can be used.

***What kind of maintenance does the PATS-C system require?***

After the camera box and LED module are installed, the PATS-C system requires little to no maintenance. Updates, such as additional insects or new features to the dashboard, are automatically installed through the 4G internet connection. When cleaning the greenhouse at the end of a crop cycle, we advise to remove the camera and LED modules from the greenhouse or to protect it adequately. With the arrival of a new season's crop, the PATS-C can be installed and started up again.

***How does PATS-C identify the moths?***

The PATS-C identifies the different moth species based on several of their characteristics: size, flight pattern, flight speed, moment of peak activity and location.

***Is the PATS-C weatherproof? (Can it handle humidity, water, ...)***

PATS-C can sustain all greenhouse conditions. It can deal with top-down watering and other spraying activities. However, we explicitly advise removing the camera and LED module from the greenhouse when it is cleaned at the end of a crop cycle. With the arrival of a new season's crop, the PATS-C can be installed and started up again. PATS-C can - in mutual agreement - be installed outside the greenhouse, in an outdoor environment. However, we do require you to place it under an adequate shelter against heavy rains, storms, etcetera. It is also important to keep in mind that in outdoor environments, there will be a lot more 'noise' from non-target insect species, as opposed to a more controlled greenhouse environment

***What is the longevity of the PATS-C system?***

The PATS-C system is intended for long-term deployment. It is provided in a service model, which means you always work with a functioning system. When an issue with the hardware occurs, PATS will take care of it. This can often be resolved remotely, but in some cases, we will send you a completely new system or module, which can be swapped for the failing system or module. The old system can then be returned by PATS and parts can be recycled.

***Does PATS-C work for every moth species or does it need to be developed for each new species?***

Today PATS-C can identify 9 different insect species and is mainly focused on moth pests today. However, other pests and beneficials are being added to the insect library. Ask your Biobest advisor about the complete list, as it is updated regularly. The PATS-C camera registers all nocturnal insects, so don't hesitate to ask about a pest that is not yet in our scope. Every new insect that we can identify will be automatically added to your system through updates over the air, making sure that you gain more and more value from already installed hardware.

***What is the accuracy of the PATS-C system?***

The best way to describe the accuracy is by comparing it with the monitoring of traps with pheromones or UV-light. We have demonstrated that PATS-C is able to see various moth pests (e.g., *Tuta absoluta, Chrysodeixis chalcites, Duponchelia fovealis)* up to one generation earlier by looking at adult flight activity. As with other monitoring methods, PATS-C is not showing the exact number of individual insects in the greenhouse. With PATS-C we take a sample of your greenhouse and want to provide two important insights for your IPM program: 1) is the pest (still) present, and 2) is the population developing upward or downward (trends). Additionally, PATS-C has some other benefits:

- Monitoring of pests is fully automated, which means no physical monitoring of traps
- Frequent (daily) and consistent monitoring data to take decisions quickly
- Insights in behaviour, for example the hours a specific species is active to optimise your IPM interventions

***Can we expect detection of stinkbugs (Nezara) with PATS-C in the future?***

Whether or not an insect can be monitored by the PATS-C systems depends on several factors like flight activity and mobility. For our system to work well, an individual of a certain pest needs to fly regularly. It is important that the activity in the airspace above the crop represents the presence of the insect in the greenhouse, as we don't want to underestimate the pest situation in the crop. We are looking into the detection of *Nezara* and other bugs, but these trials are still ongoing.

***Do I need to pay extra for additional insects being added to the system?***

No, every new insect species that can be detected and identified or any other new pest monitoring functions will be automatically added to the system through updates over the air, making sure that you gain more and more value from already installed hardware over time.

***Is there any added value or experiences in chrysanthemum already?***

In chrysanthemum we are well able to monitor moth pests like the Tomato looper (*Chrysodeixis chalcites*). PATS-C is ready to help you with this. Note that you as a user grow with the system, and get more pests, functionalities and benefits over time. Contact your Biobest advisor for more information!

***When I have multiple PATS-C systems in a greenhouse, won't the same moth be detected multiple times?***

PATS-C translates every flight from a moth species into a count in the dashboard. Although the system can distinguish between species, it can't tell apart individual moths of the same species. The goal is not to map all individual pest insects, but to provide two main answers which are crucial for IPM:

1. Is the pest present in my greenhouse or crop: measuring first flight activity
2. How is the pest developing over time: measuring continued flight activity

For this the presence, the increase or decrease in flight activity of a specific species gives a very good indication of pest development. Additionally, this gives insight into pest behaviour (e.g., hours of activity) and provides possibility for predicting pest development and -stages to time applications of crop protection solutions.

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Other questions or suggestions?

In case of other questions or suggestions about PATS-C feel free to contact PATS support via support@pats-drones.com or +31 6 389 122 69, or contact your Biobest advisor.