PINE T PRO BALL®

Mating disruption product against the pine processionary moth (*Thaumetopoea pityocampa*) in pine trees

Innovative technology

Innovative format

Biocontrol solution

Composition: (Z)-13-Hexadecen-11-yn-1-yl acetate (40 g/kg)

Formulation: CS (capsules suspension)

Operation mode: pheromone passive diffusion medium

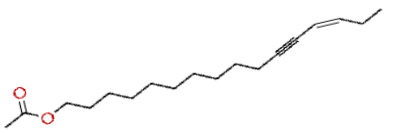
PRODUCT FOR PROFESSIONALS: USE BIOCIDAL PRODUCTS CAREFULLY.
READ THE LABEL AND THE INFORMATION CONCERNING THE PRODUCT BEFORE USE.

PINE T PRO BALL®

Pine T Pro Ball® is a new biocontrol product developed by M2i's R&D teams for professional users. It has been temporally approved as a pheromonal mating disruption solution to manage the **pine processionary moth (PPM)**.

The pine processionary moth (*Thaumetopoea pityocampa*)

Host plants: Pine trees and resinous wood (preference for Austrian pine)
Pest stage: Caterpillar
Targeted stage: Moth
Life cycle: 1 generation/year
Sex pheromone: (Z)-13-Hexadecen-11-yn-1-yl acetate



Caterpillar's stage of *T. pityocampa*

Adult's stage of *T. pityocampa*

Damage on pine needles

Product description

Pine T Pro Ball® comes in pheromone balls packaged in aluminum pouches, each ball containing 4.46 % of microencapsulated pheromone (40 g/kg).

Once the balls applied in the canopy using compressed air gun, the water contained in the formulation evaporates, leaving a thin waxy layer. Microcapsules start to diffuse passively the pheromone in the crop environment.

Pheromone balls of **Pine T Pro Ball®**

Passive release by the upper canopy

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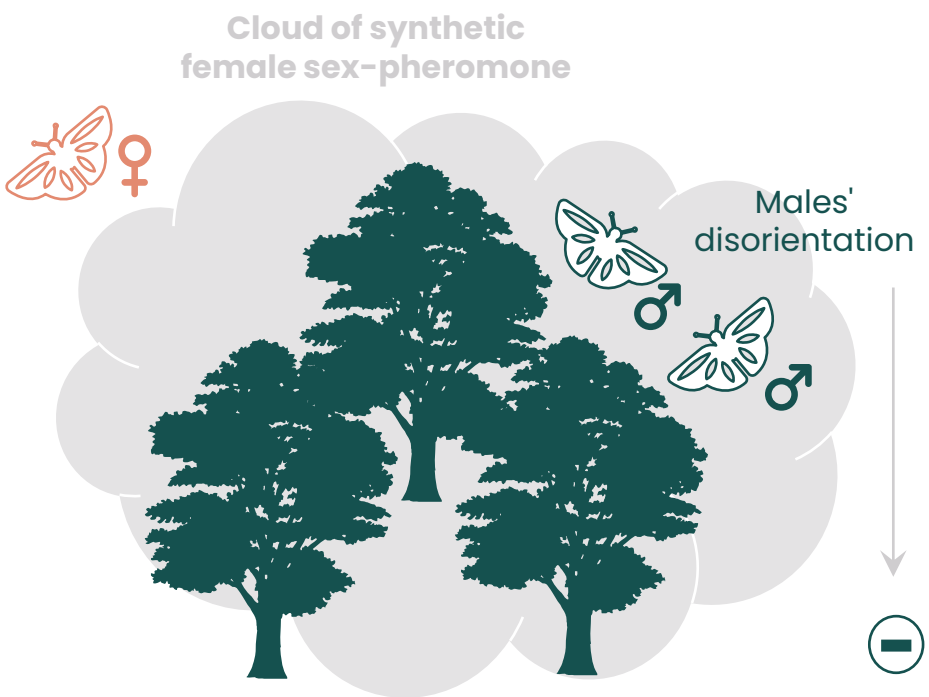
What is mating disruption?



Mating disruption aims at disrupting chemical communication between organisms and at interrupting normal mating behavior by dispensing a synthetic sex pheromone, thereby confusing males and limiting their ability to locate calling females. Consequently, chances of reproduction are limited as well as the proliferation of the pest. Mating disruption is a method based on the restoration of the crop's natural balance. The goal being to curb the pest without eradicating it and without disturbing the local biodiversity.

Product application for Pine T Pro Ball ®

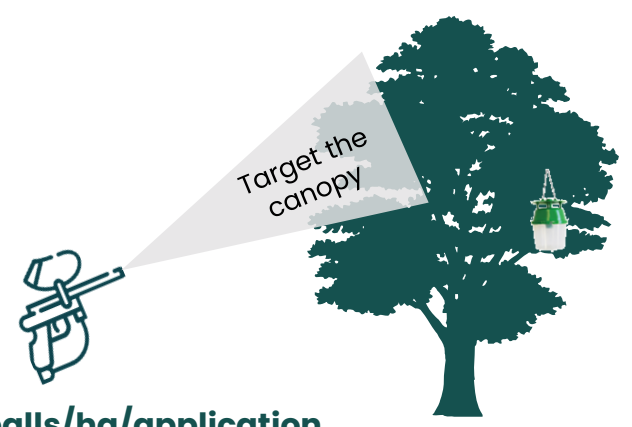
Pine T Pro Ball® application is performed by shooting the pheromone balls in the canopy of the tree (i.e. do not target the trunk) corresponding to the moth mating area. Balls should be applied using a compressed air gun (e.g. paintball gun). Balls will explode when touching needles and branches allowing a passive release of the pheromone by the canopy once the product is dry.

One application per season is sufficient and the product diffuses effectively over the entire flight period. It should be performed before the emergence of the moths (i.e. before the beginning of the flight). The application is authorized for a maximum dose of :

(1) 40 g of active ingredient/ha corresponding to approximatively **400 balls/ha** in the case of forests.

(2) 1 ball per meter high for each tree in the case of urban areas*.

Resistance to leaching
withstands several events of 25 mm of rain



Max. 400 balls/ha/application
1 application/season

Re-entry period: 6 hours

Caution. **Pine T Pro Ball®** can take 24 h to dry depending on the weather conditions. In term of resistance of leaching, it withstands several events of 25 mm of rain. **Do not apply the product if rains of more than 25 mm are forecasted before the product has time to dry**.

Compressed air gun specification: **Pine T Pro Ball®** can be applied using a standard 0.68 caliber gun (i.e. balls measure 17.5 mm). The power of the gun must be between 6 and 12 Joules. The barrel length does not matter in such application.

** See the application protocol for more details.*

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Protocol application for Pine T Pro Ball®

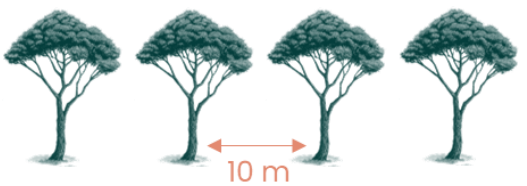
Pine T Pro Ball® application must be adapted to the characteristics of the area to be treated (single tree, alignment, grove, forest, etc.) and its level of infestation. In most cases, caterpillars prefer areas with the best exposure to the sun, such as South/South-West faces of the trees, tallest pines or forests edges. The balls can be shot in the pines canopy or other supports present nearby if necessary.

Mating disruption must be associated with moth monitoring. Traps should be placed inside the plot to control the efficacy of the treatment, and outside the plot (non-disrupted area) to monitor the moth flight.

Below are presented some general examples of protocols for urban and forest areas.

(1) Protocol for the treatment of pine trees in urban areas

Single tree



Alignment of pine trees

Grove
(5 to 10 trees)

- ✓ **1 ball per meter high**

  The number of balls corresponding to the tree's height must be distributed in the whole canopy.

  Shoot a minimum of 10 balls / tree if the height allows it.

- ✓ **Example**

12 meters high = **12 balls in the whole canopy**

- ✓ **10-15 balls / tree**

  If the height of the tree allows it, within the limit of **1 ball per meter high**.

  *Depending on tree size and pest pressure**

- ✓ **Example**

  Low pest pressure / Tree with small height: **10 balls**

  High pest pressure / Tree with great height: **15 balls**

Pest pressure indicator
Low: ≤ 10 nests / tree
High: > 10 nests / tree

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(2) Protocol for the treatment of forests (plots from 1 ha area)

Different cases can be encountered for the treatment of forests, depending on the management of the latter, the pest pressure in the plot and the planting density.

This protocol require the identification of 2 key parameters:

- The **pest pressure in the plot**, declined in 2 general cases: homogeneous or heterogeneous.
- The **planting density of pine trees**, also declined in 2 cases: high/homogeneous or low/heterogeneous. Below are presented different examples of planting densities that can be encountered in forests.

Examples of areas with high/homogeneous planting density (in general plantation forests)

Examples of areas with low/heterogeneous planting density

(A) Homogeneous pest pressure

The two first cases concern forest areas with homogeneous infestation of the pine processionary moth (PPM): **pest pressure can be observed all over the plot**.

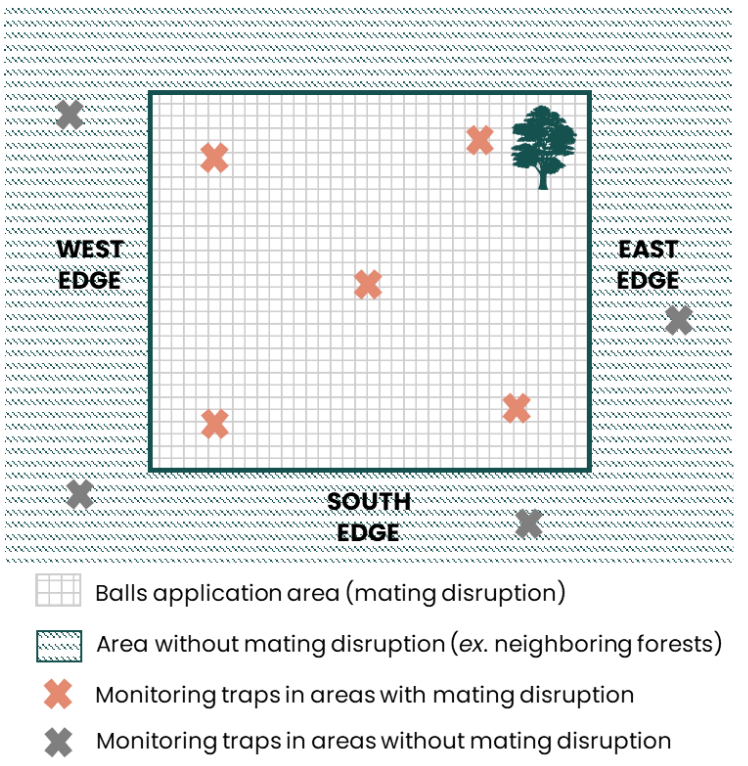
1st case*: Plots with high/homogeneous planting density
(less than 10 meters between the trees)

In such case, balls must be applied **homogeneously on the whole area** – *see diagram beside*. The number of balls to apply must be calculated on the base of **400 balls/ha**, depending on the plot size.

To facilitate the application in such area, it is possible to divide it in a **matrix of squares** (eg. 10 m x 10 m) with a precise number of balls to apply per square.

Balls can be shot on **all kinds of supports present in the plot** (pine trees, but also deciduous trees in mixed wood forest or other supports with a similar height) to obtain a continuous pheromone cloud.

A reinforcement can be planned (1 more ball/square) on sensitive edges: for example, highly infested edges, in contact with prevailing winds or other infested areas, etc.



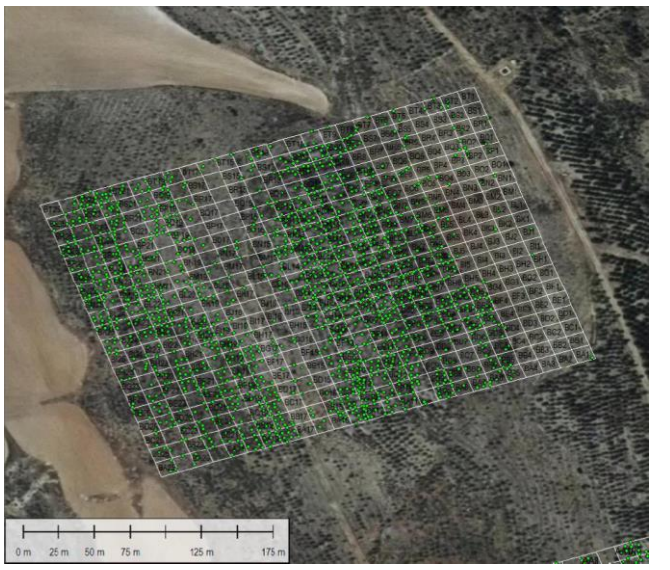
2nd case*: Plots with low/heterogeneous planting density
(more than 10 meters between the trees)

In such case, trees are dispersed so **the protocol of treatment will depend on wood species** present in the plot:

- If there are **only pine trees**, the number of balls to apply must be calculated on the base of **400 balls/ha**, depending on the plot size. The repartition of the balls can be similar to the one stated in case 1, by using a matrix – *see picture beside*.

  Balls must be **distributed on pine trees** (but also in other supports present in the plot with a similar height if necessary).

  A reinforcement can be planned (1 more ball/square) on sensitive edges (eg. highly infested, in contact with prevailing winds or other infested areas, etc.).



Example of matrix that can be modelized for the application of balls

- If there are **pine trees mixed to other species** (such as deciduous trees), they become too dispersed from each other so it is better to perform the treatment with a **protocol adapted to isolated pine trees or groves** (*see protocols for urban areas in section 1*).

* **Note**

These protocols (1st and 2nd cases) can also be applied to pine plantations located in urban areas that present similar characteristics.

These plantations are constituted of more than 10 pine trees and their area is less than 1 hectare.

In such configuration, the pest pressure (homogeneous or heterogeneous) doesn't influence the application protocol. There is also no need of reinforcement because the number of balls applied is sufficient for these small areas.

Examples of urban areas where the Pine T Pro Ball® forest protocol can be applied

(B) HETEROGENEOUS PEST PRESSURE

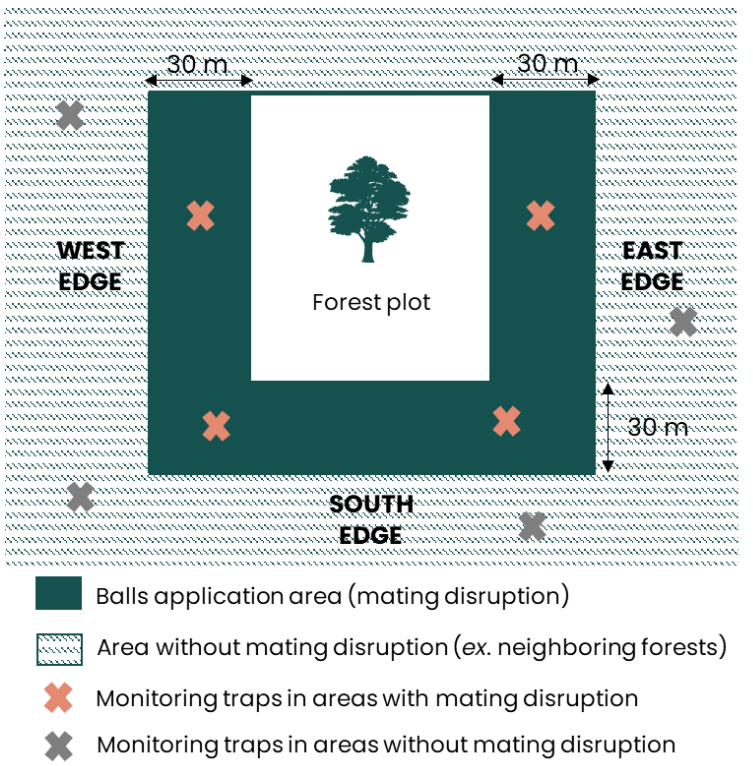
The 2 following cases concern forest areas with heterogeneous infestation of the PPM: **pest pressure is mainly observed in located areas of the plot** (edges, clearings but also other well exposed areas to sunlight).

1st case: Plots with high/homogeneous tree density
(Less than 10 meters between the trees)

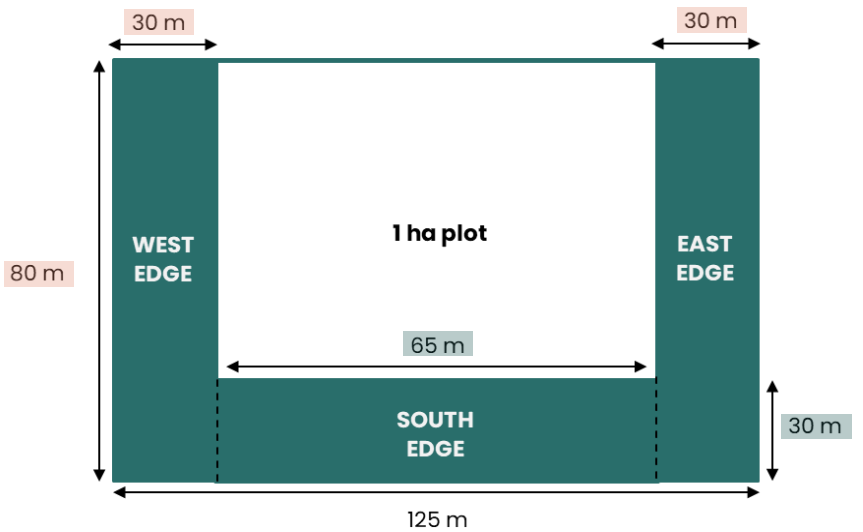
The balls must be applied in the infested areas of the plot (presence of nests), such as edges or clearings, on a 30-meters width around these areas – *see diagram beside*.

The number of balls to apply must be calculated on the base of **400 balls/ha**, depending on the size of the infested area (previously estimated).

Balls must be shot on all kinds of support present in the area to treat (pine trees, but also deciduous trees in mixed wood forest or other supports with a similar height) to obtain a continuous pheromone cloud.



Example of application: 1 ha plot with a pest infestation present on 3 edges (East, South and West).



The plot measures 125 m long and 80 m large.

Calculation of the infested area (edges with a 30-meters width):
(80 m x 30 m) x 2 + **(65 m x 30 m)** = **6 750 m²**

For this area, **270 balls** must be applied (on the base of 400 balls/ha) in the infested edges.

This calculation must be adapted to the area to treat, depending on the dimensions of the plot.

2nd case: Plots with low/heterogeneous tree density
(More than 10 meters between the trees)

In that case, the heterogeneity of the plantation (either pine trees only or mixed forest) doesn't allow to consider the entire area to treat (itself limited to forest edges or clearings).

Trees should be too dispersed from each other, so it is better to perform the treatment with a protocol adapted to isolated pine trees or groves (see protocol for urban areas in section 1).

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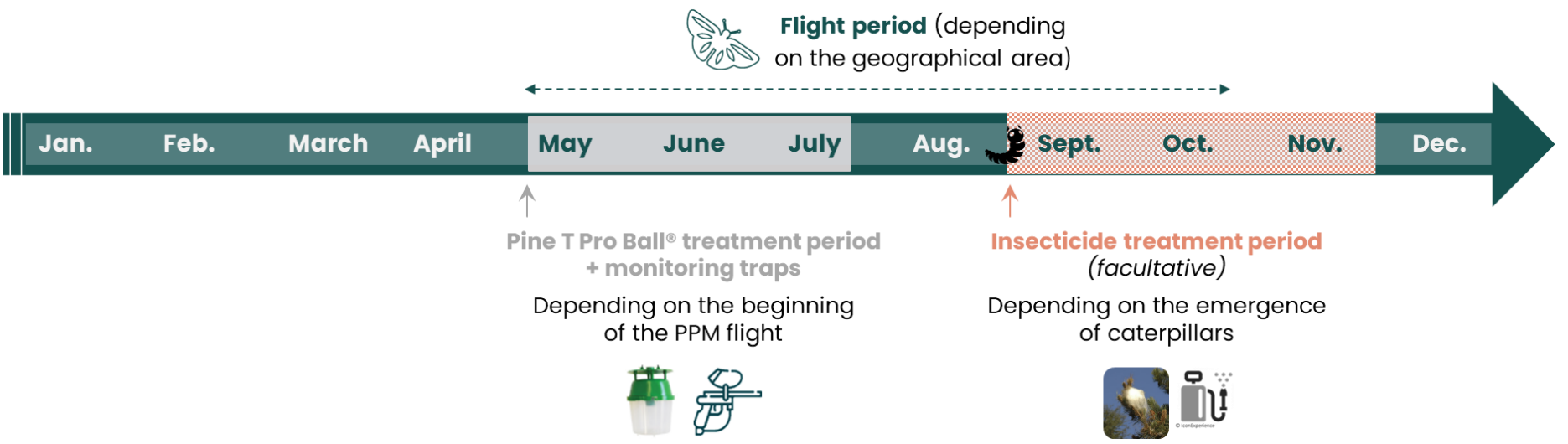
Sequence of actions for Pine T Pro Ball®

For an optimal efficacy of the product, a sequence of key actions must be achieved as explained on the following diagram.

First, mating disruption must be associated with **moth monitoring**. At the same time as the mating disruption application (between May and July, depending on the geographical area), traps should be placed inside the plot to control the efficacy of the treatment, and outside the plot (non-disrupted area) to monitor the moth flight.

The application must be performed before the beginning of the PPM flight (don't hesitate to follow monitoring trap reports, local bulletin or your regional technician). One application of **Pine T Pro Ball®** allows for a diffusion of the active ingredient for approximately 3 to 4 months. The treatment doesn't necessitate renewal as it covers the whole flight period of the pest.

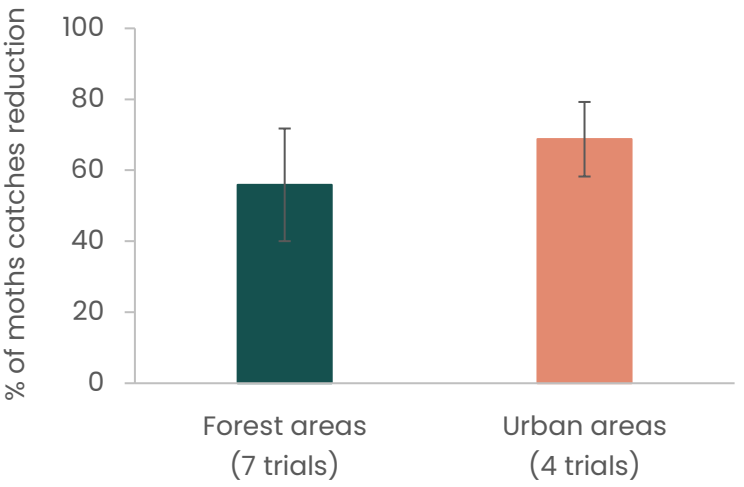
The use of **Pine T Pro Ball®** can be associated with other pest-fighting methods against caterpillars (e.g. insecticides, traps during procession periods, etc.).



Pine T Pro Ball®: field trials efficacy results

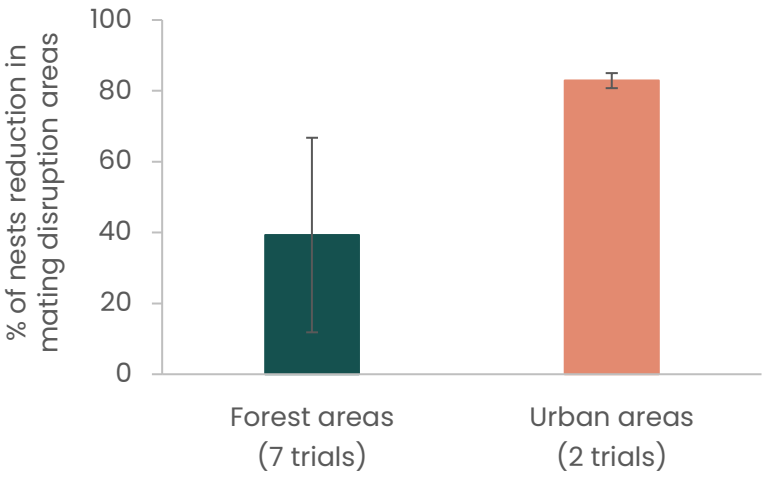
Pine T Pro Ball® has already been used in urban and forest areas. The treatment is able to manage the whole flight of the PPM. Below are presented some efficacy results.

Percentage of moths catches reduction in the mating disruption area*
11 trials in France and Spain (from 2019 to 2020).



*Against a non-treated area ; after 1 year of treatment with **Pine T Pro Ball®**

Percentage of nests number reduction in the mating disruption area**
9 trials in France and Spain (from 2019 to 2020)

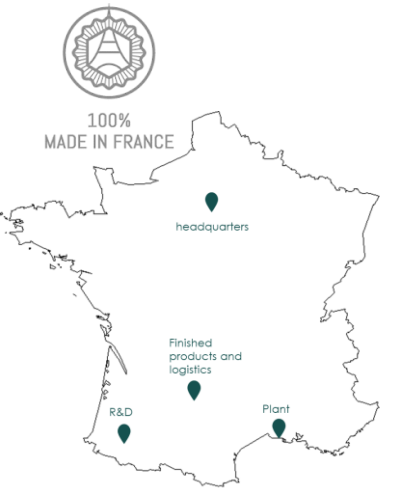


% of nests reduction in the MD area between the beginning and the end of the trial ; after 1 year of treatment with **Pine T Pro Ball®

PINE T PRO BALL®

A « made in France » product, mastered from A to Z by M2i

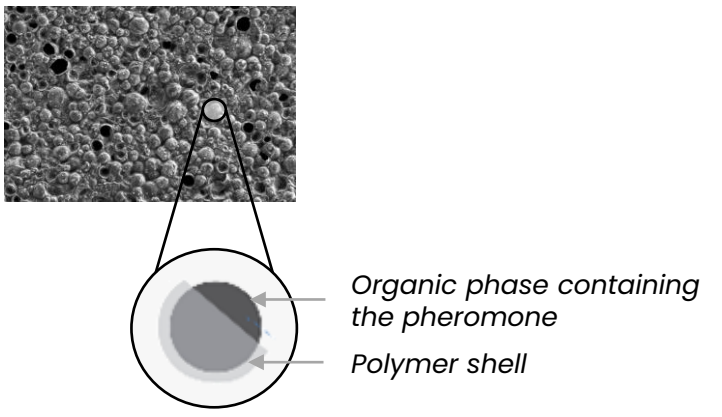
The M2i Group brings together various know-hows, based in different sites in France:



- Lacq: Active substance manufacturing (high active content, higher pheromone purity, friendly impurity profile), innovation center and formulation production facility (patented microencapsulation process).
- Parnac: Packaging and shipping of finished products. Expertise and technical development team (high degree of entomology and agronomy expertise).
- Saint-Cloud: Headquarters and sales teams.

A unique formulation process

The technology of microencapsulation patented by M2i [WO2016131883A1] is based on the dispersion of an organic mixture (natural wax, natural oil and active substance) in an aqueous phase (water and polymer).
At the end of this process, the organic phase containing the active substance (here a pheromone) is trapped in polymer microcapsules.



Microencapsulation assets

- Stability and regular diffusion of the pheromone, leading to the efficacy of the formulation and the stability of the active substance over time.
- Controlled release of the active ingredients during the whole pest cycle.

Practical and easy to use

- Storage at a temperature < 30 °C.
- Long shelf-life product (2 years).
- Fast, easy and playfull to apply
- Odorless.
- No direct contact with the product.
- Compatible with other pest management products (PPP, natural enemies, etc).

Environmentally friendly

- Solvent-free.
- No resistance.
- No impact on natural enemies and pollinators.

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Storage conditions

Pine T Pro Ball® must be stored inside its original sealed aluminium pouch, away from light and heat, in a dry and well-ventilated place. It must also be protected from the frost.

The product can be stored for up to 2 years at room temperature (< 30°C) if the pouch has not been opened (see the date of production written on the packaging).

Do not re-use empty pouches. Empty pouches and unused products in their original packaging must be collected, stored and disposed of by a hazardous waste treatment program. For more information, contact your partner distributor or the local waste treatment program.

Precaution for use

Consult the safety data sheet (SDS) and the label for more details.

General informations

- The applicator must be previously trained to the use of the air compressed gun.
- Wash hands after handling and using the product or any intervention in a treated plot.
- Do not eat, drink, use your phone or smoke while using the product.
- Using well-maintained and adapted equipment. Collective protection measures take precedence over personal protective measures.
- The use of dedicated personal protective equipment (PPE) should be associated with strict hygiene and safety measures (e.g. hand washing, PPE removal procedures, etc.).
- Cleaning and storage measures of reusable PPE and work overalls must be handled according to the label.

Precautions to be taken:

- Before the application: Neighbours should be informed in advance to avoid surprise or concern. A security perimeter of 10 meters around the treated area must be established.
- During the application: Perforated balls should not be used. The application must be performed with the back to the houses. The barrel of the paintball gun must face downwards between each tree. The safety mode of the paintball gun should be on when you are not applying the product. When two persons are applying the product together, they must coordinate in order to avoid potential injuries. Do not shoot balls towards people, animals, etc.
- After the application: Do not forget to use the safety mode. Clean the paintball gun after use. Ensure that no balls or fragments are on the ground.

IN CASE OF AN EMERGENCY: dial **112** or contact the local **poison control center**

Legal notices*

Pine T Pro Ball® – **Provisional registration number**: **FR-2022-0018** (France)

Active ingredients: (Z)-13-hexadecen-11-yn-1-yl acetate [40 g ai/kg] – **Formulation**: capsules suspension – **Crop** : pine tree – **Dose**: 400 balls/ha (forest areas) or 1 ball per meter high of the tree (urban areas).

Caution: **H410**: Very toxic to aquatic life with long lasting effects. **P273**: Avoid release into the environment. **P391**: Collect spillage. **P501**: Dispose of contents/container to hazardous or special waste collection point, in accordance with local, regional, national and/or international regulation.

See label for more details.

Holder of the Marketing Authorization: M2i Biocontrol, 112 Bureau de la Colline 92213 Saint Cloud – RCS Nanterre 801069428 – contact@m2i-group.com – Website: www.m2i-lifesciences.com – Phone: 05 32 09 68 85. Certiphyto registration number: 9200007 - Distribution of plant protection products to professional users.

PRODUCTS FOR PROFESSIONALS: USE BIOCIDAL PRODUCTS CAREFULLY.
Before use, read the label and the information concerning the product.

** To be adapted with local regulation.*