Lantana rust - *Prospodium tuberculatum*

Site selection

1. Lantana plants must be the common pink-flowering variety.

2. Plants should be non-wilting and actively growing.

3. If possible, the leaves should be regularly wet from dew, fog or rainfall. The rust spores need a wet leaf surface for a minimum of 8 hours (usually 8-12 hours) to germinate.

4. Where possible releases should be conducted in the evening.

5. Treated plants can be bagged to increase the chance of germination of spores. However, this procedure is time consuming due to the number of bags required to achieve adequate infection and that the bags should be removed the morning after inoculation before the sun begins to heat the bag contents. Follow up rain is still essential to achieve establishment.

6. Sites should be protected from drying out, preferably in gullies, under canopy, shaded from eastern sun, so that moisture present is retained longer. Extreme temperatures such as experienced with the western sun are also undesirable for rust survival. However, if inoculation takes place in the late afternoon on the western edge of a lantana stand this side will retain moisture longer than the eastern edge as the sun rises and may result in successful rust inoculation.

7. Sites should be as safe as possible from frost, fire, flood and human interference such as spraying and slashing.

8. The site location should be tagged with marker tape and recorded by GPS as well as a street address with a reference to a well-known position, e.g. a bridge, creek or road junction. This is important for future reference when someone unfamiliar with the area may be required to inspect the site.

9. If possible the release site should be part of, or close to, a large infestation of lantana to allow for spread and development of a rust epidemic. However, this is not vital as it is important to get the rust established first.

10. Regular records of site condition and rust progress are desirable (on a two-monthly basis). Keep this in mind when choosing your sites particularly if the area or surrounding roads may be prone to flooding or are further afield.

During dry weather/drought conditions, all of the above apply but with particular attention being paid to points 2 & 3.

Geographic location and site-specific microclimatic conditions need to be considered; e.g. suitable sites may be present in a shaded south-facing gully. Plant health and leaf-wetness are the primary considerations.

Follow-up rain is vital for the continuation of the rust in a given area following initial germination.

Transport and Storage

The dry powdery spores are sent in small screw-top plastic vials. If possible releases should be made within 1-2 days of receipt and vials should be stored in the refrigerator (not freezer) until required. However, if releases cannot be conducted immediately, vials should be stored in the freezer where they will last up to 2 weeks.

Vials should be kept cool (*ca.* 4^{o} C if possible) while travelling to the release site. An esky and cold pack is ideal. **Vials should not be left in a car in the sun.**

Rust spores are living organisms and their viability decreases with time.

Release Procedure

It doesn't matter whether rust is put out in the morning or afternoon. One vial of talc/rust mix or 1L rust suspension per bush, covering a small (1 metre^2) area should be aimed for. This will assist in being able to find rust pustules on leaves during the monitoring stage as less area needs to be searched. Should the lantana site consist of plants with long canes rather than compact foliage disperse the rust over a slightly bigger area e.g. approx. 2 metre^2. Vials should not be split over several sites. This reduces the chance of a critical mass of rust being released to enhance establishment and makes finding pustules extremely difficult.

Two methods of inoculation can be used:

1. The standard 'salt shaker' technique is to release dry spores which have been pre-mixed with talc powder at the rate of 1 part spores to 50 parts talc. This mixture is sprinkled lightly on the undersides of the leaves on actively growing plants. Take care not to break the branches while twisting the plants during application. Branches should be tagged so searching for spores is easier. If using an electric or hand generated blower, the device should be held low to the ground to spray dust up under the leaves of the lantana bush. A fine white sprinkling should be obvious to the eye.

2. Another technique which is occasionally used is to mix the spores with water (rainwater or distilled) at the rate of 1 vial of spores to 1 litre of water. This mixture must be thoroughly and constantly shaken to maintain a suspension of spores and sprayed onto the undersides of the leaves with a trigger sprayer or similar device. Water-based applications should only be used when it is raining or when leaf wetness is certain in the next few hours after application.

In most cases, as follow-up rainfall is unreliable, and to take into consideration variable climatic and environmental conditions, rust should be repeatedly released over time and space to improve the chances of establishment.

Once off releases of any biocontrol agent have less chance of establishing than releasing a biocontrol agent several times over a long period.

Commonly Asked Questions

- **Is the rust likely to affect other plants?**

It is extremely unlikely that the rust will affect anything but lantana. Before this rust was released, it went through a stringent process to test the likelihood of it going onto other species. It was selected in its country of origin and thoroughly tested in quarantine on plant species related to lantana, plants of economic importance and Australian native plants. It has been shown to be specific to lantana and has received approval for release into the Australian environment.

- **Will lantana be eradicated by the rust?**

No. In the long term, lantana could be reduced to a level where it is no longer a problem, or suppressed so that it can be effectively controlled by other techniques. The biological control agents need the weed as a food source, so where the weed is dense, they breed and become numerous. When the weed declines, agent numbers also decrease. In this way, the agents will eventually reach a natural balance with the weed. The weed can't be eradicated.

- **What success has there been around Australia?**

The rust is widespread from near Gympie in south-east Queensland to Port Macquarie in central NSW. It is also present on the Atherton Tableland. Rust on lantana in sub-coastal areas in south east Queensland may be seen during periods of prolonged wet weather. Many other release sites have not yet been checked.

- **When should I put out the rust?**

Rust for lantana relies on moisture to commence the growth cycle. Ideal conditions would be light rain sustained over a few days, with likely follow-up rain. However, there will be situations when dew, mist or spray will provide sufficient moisture for the growth cycle to commence. Morning or afternoon releases are fine.

- **How long will the rust keep?**

The rust begins to lose viability with time. Below are some suggested rules of thumb

Room temperature	3-4 days
Freezer temperature	1 month
Liquid Nitrogen	1 year

- **Does is matter if the rust is posted to me at room temperature and then frozen?**

No. But the rust will have begun to lose viability, making the chances of establishment slimmer. Therefore, rust when posted should ideally be put out within 1-2 days of it being received.

- **How often should I put it out?**

This will depend on demand from various agencies for the rust. As a suggestion, a single site could be re-inoculated every few months.

- **Can I make the rust work better if I bag plants or water spray the rust onto leaves.**

Bagging or spraying plants may help with initial establishment. The difficulty in trying to manipulate conditions for the rust, is that sooner or later true environmental conditions will determine the ability of the rust to survive.

- **Will the rust survive through winter or drought?**

If spores have developed through their life cycle, then it is possible that spores will survive for a season and reproduce in the next wet season. However, a complete life cycle must occur for this to happen. The rust pustules will need to survive on the stems of the lantana plant or on remaining leaves.

- **How much rust do I put onto a plant? How wide a space should I use?**

A whole vial should be used for a single release site. Ideally the rust should only be spread over about 1 metre^2. By spreading it too far, identifying rust pustules on leaves spread over a wide area will be difficult. If using the 'salt shaker' method, the rust/talc mix should be visible on the leaf underside. Do not overdose the leaf for too much rust may cause premature leaf drop. A light sprinkle per leaf is all that is required.

- **Where on the plant should I apply the rust?**

It is important to apply the rust to the underside of the leaves. If using the 'salt-shaker' method, then the green branches of the lantana plant should be twisted to show the underside of the leaves and the rust sprinkled onto them. A fine white sprinkling should be obvious to the eye. Take care not to break the branches, as the branch may later die.

- **How will the rust arrive in the mail?**

The rust spores will arrive in a packet pre-mixed with talc in a sealed vial. The contact details we currently have for you will be used. If these alter, please advise us as soon as possible to prevent the rust being sent to a wrong address.

- **What do I look for to see if the rust has established?**

The rust pustules are usually obvious from both sides of the leaf. The actual pustules grow on the underside of the leaf and will be slightly raised brown dots. The topside of the leaf may show some yellowing in the immediate circumference of the rust pustule. Often the rust pustules may only be seen by close inspection of the underside of the leaf. The use of a hand lens may assist this process. When pustules are very small and low in numbers, their presence can only be confirmed using a microscope.

- **What tools are available for me to identify rust pustules?**

A picture of rust pustules is shown below. Alternatively a few leaves can be collected and sent to Michael Day at Alan Fletcher Research Station (see below for details) for inspection under a microscope. This method has helped identify rust pustules that have been difficult to identify by eye.

Bottom Top

For further information on lantana biological control please contact:

Royce Holtkamp
Strategy Leader Invasive Species
Industry & Investment NSW
Tamworth Agricultural Institute
4 Marsden Park Rd, Calala, NSW 2340

Ph: 02 6763 1234 or 0428 400743
Email: royce.holtkamp@industry.nsw.gov.au

Bernadette Hanley
Industry & Investment NSW
Grafton Agricultural Research Station
PMB 2
GRAFTON NSW 2460

Ph: 02 6640 1600
Email: bernadette.hanley@industry.nsw.gov.au

Mike Day
Senior Entomologist
Biosecurity Queensland
Alan Fletcher Research Station
PO Box 36, Sherwood, Qld 4075

Ph: 07 3375 0725
Email: Michael.Day@deedi.qld.gov.au

Prospodium tuberculatum release information form

1. Date released:
2. State:
3. Region:
4. Nearest town or suburb:
5. Releaser's name:
6. Releaser's contact number:
7. Site Manager's details (if different to releaser):
8. Release site details (e.g. park/reserve/creek, street address etc):
9. GPS coordinates of site (lat/long [degree/minute/second format preferred], precision of coordinates and map datum if possible):
10. Altitude:
11. Biotype of host plant:
12. Condition of host plant:
13. Number of vials:
14. Method of release:
15. Notes or site description or relevant information such as weather conditions during release (e.g. wind, temperature, rain):

Please return this form to:

Post to:
Royce Holtkamp
Strategy Leader Invasive Species
Industry & Investment NSW
Tamworth Agricultural Institute
4 Marsden Park Rd, Calala, NSW 2340

Ph: 02 6763 1234 or 0428 400743
Fax: 02 6763 1222

Email: royce.holtkamp@industry.nsw.gov.au