BULKING UP, FIELD DISTRIBUTION AND ESTABLISHMENT OF RUBBER VINE RUST, *MARAVALIA CRYPTOSTEGIAE* IN FAR NORTH QUEENSLAND

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Summary The rust fungus *Maravalia cryptostegiae* (Cummins) Ono is being released in Queensland for the classical biological control of the critical weed rubber vine *Cryptostegia grandiflora* R.Br. Novel techniques of production and field distribution of inoculum were devised to meet the needs of a large scale operation. The rust has readily established and has spread throughout the far northern range of the weed. Severe repeated defoliation significantly reduced flowering and increased grass growth adjacent to rubber vine plants. Resultant higher fuel loads should optimize the effects of fire used in the integrated control of rubber vine.

INTRODUCTION

Rubber vine *Cryptostegia grandiflora* R.Br., a native of Madagascar, was introduced as an ornamental in the late nineteenth century and has become a major weed causing severe environmental and economic damage (Chippendale 1991, Tomley 1996). The largest areas of rubber vine in Queensland are situated in the remote rangelands of the Gulf country and Cape York Peninsula, comprising an area of about 140 000 km^2.

Rubber vine rust *Maravalia cryptostegiae* (Cummins) Ono, a Madagascan fungus which parasitizes the leaves and sometimes the young stems of its host was recently introduced for the biological control of rubber vine (Evans and Tomley 1996). As the optimum requirements for infection require wet season conditions, successful establishment demanded the availability of sufficient quantities of viable inoculum, a portable but effective method of applying spores to the leaves in the field and a means of access to remote sites when roads were impassable.

Twenty sites which were inoculated in February and March 1995 were the primary foci for a rubber vine rust epiphytotic in the Peninsula and Gulf country of far North Queensland.

MATERIALS AND METHODS

Inoculum was bulked up by *in vivo* culture of the rust on 150–200 mm high rubber vine seedlings grown in 75 mm plastic pots. Two to three seedlings were grown in each pot in a sandy potting mixture. Wire nursery baskets lined with 0.4 mm black polyethylene sheet to form a trough were used to hold batches of 48 pots. The plants were watered by filling the plastic trough to avoid wetting the leaves as chlorine based compounds in the tap water residue were found to be injurious to the spores. Nutricote® granules were applied to the soil surface as required. When spore yield became too low, seedlings were cut back, allowed to regrow and were recycled every six weeks.

Foliage was inoculated by spraying with a spore suspension of approximately 1.5×10^6 spores per mL in distilled water; wetting agent was not needed provided the suspension was sprayed onto the under surface of leaves using an air brush supplied with compressed air at 100–150 kPa from a compressor or BOC® industrial air bottle.

Inoculated seedlings were then held for 12–18 hours at 22°C in a plastic covered chamber in which leaf wetness was maintained by a Salton® ultrasonic room humidifier to initiate spore germination and infection. The seedlings were then moved to the greenhouse bench where they were maintained at a temperature of 30°–35° C/20°–24°C day/night pustules developed 7–8 days after inoculation.

A back-up culture of the rust was also maintained on plants kept outside the greenhouse during the rainy period from December to February. Heavy infection was naturally maintained on these plants which were included in the harvest.

Spores were harvested from the plants using a scaled up cyclone type spore collector based on the design of Cherry and Peet (1966). This device was fabricated from PVC tubing with a swirl chamber of 50 mm diameter and an inlet tube diameter of 15 mm to which was fitted a 3 m flexible tube. A replaceable nylon gauze screen on the end through which the spores were drawn kept out large particles of extraneous matter. The spores were collected in a glass jar 80 mm in diameter by 160 mm long. Suction was provided by a 7.2 volt Makita® mini vacuum cleaner powered by a 6 volt battery charger or a domestic type vacuum cleaner with a restrictor fitted to the inlet to reduce airflow. Spores were harvested from individual potted plants by holding the infected foliage over a black plastic sheet to catch dislodged spores and leaves. After this was accomplished, spores were removed from detached leaves and from the plastic sheet. Collected spores were dried over silica gel or concentrated sulphuric acid

in a desiccator jar for 24 hours then sealed in plastic screw-top vials and stored at 4°C prior to field release.

Field release sites were accessed by light aircraft, 4WD vehicle and foot. Spores were transported in a chilled polystyrene drink cooler. Two litres of rain water based spore suspension containing approximately 1.5×10^6 spores per mL was prepared just prior to application. Spore suspension was applied to the foliage of about 0.5 ha rubber vine with a 35 cc 1.25 kW petrol powered Marino knapsack misting machine producing an airflow of 8.5 m^3 min^{-1} at a nozzle velocity of 97.5 m sec^{-1} at 6000 rpm. Four sites were inoculated by spraying the spore suspension onto the leaves with a hand operated sprayer.

Twenty sites were treated in three separate trips during February and March 1995. During subsequent inspections a Trimble Scoutmaster® GPS was used to determine the site location and distance the rust had spread.

RESULTS

The bulking up techniques described provided a reliable supply of inoculum with an typical daily production of 4 g of spores. Harvesting of spores with the large cyclone spore collector was seven times faster than a previously used smaller version. By-pass of spores into the vacuum cleaner was also minimal. Viability of inoculum did not significantly decline provided that the spores were used within 7–10 days of harvest.

In the field, application with the misting machine allowed the placement of spore suspension on leaves of rubber vine towers up to 20 m above ground level facilitating early dispersal of the rust. The hand sprayer provided equally high levels of infection but over a smaller area closer to the ground. Infection was achieved at all release sites.

Inspections in May 1995 showed that dispersal of the rust varied spatially depending on cumulative time of leaf wetness at each site. The distance that the rust had spread by wind at individual sites in this time ranged from 100 m to 10 km.

At Inkerman station a satellite infestation of the rust was found on a small group of seedlings approximately 500 mm tall and about 2 m^2 in an area 8 km away from the nearest release site. This was attributed to spores being carried by animals. A similar situation has been observed on Rutland Plains station where an isolated outbreak of rust was found 21 km from the release point.

Intensity of infection was highest in the vicinity of the release points and tapered off with increasing distance. Leaf age did not appear to have an affect on infection levels. Leaves which were heavily attacked and appeared to be totally covered with spores had 47 pustules per square centimetre. At some sites in drier area, infection was heavier on the western sides of bushes away from the morning sun. Defoliation was observed at several sites where heavy rust infection had been sustained over several weeks.

By May 1996 surveys and anecdotal reports from cooperators indicated that most of the rubber vine in the Gulf and Peninsula country was infected by rubber vine rust. At some locations severe and continued defoliation during the growing season was reported. There was a paucity of flowers on heavily infected vines, dieback of stems and seedlings and increased grass growth adjacent to infected rubber vine. The results observed to date suggest that rubber vine rust could significantly reduce the fecundity and vigour of its host.

In the extensive rangelands of far north Queensland fire is one of the main tools used to control rubber vine. Increased fuel loads due to better grass growth close to rubber vine should benefit this management practice.

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