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Occurrence and Spread of *Phragmidium violaceum* on Blackberry (*Rubus fruticosus*) in Victoria, Australia

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Abstract

The rust fungus *Phragmidium violaceum* which was being considered for the biological control of European blackberry (*Rubus fruticosus* agg.) in Australia, was recorded as being present in Victoria in February 1984. Several distinct, heavily infested sites were found indicating that the fungus was probably deliberately introduced, thus contravening Australian plant quarantine laws. Spread of the rust has been rapid. Field observations and laboratory inoculations have shown six species of European blackberry to be susceptible while two are resistant. The implications of the results are discussed.

Répartition et Dissémination de *Phragmidium violaceum* sur les Ronces (*Rubus fruticosus*) à Victoria, en Australie

En Europe, on a évalué les possibilités d'utilisation du champignon de la rouille *Phragmidium violaceum* pour la lutte biologique contre les ronces (*Rubus fruticosus* agg.) en Australie. À la fin de février 1984, la présence du champignon a été relevée à Victoria. Plusieurs sites distincts, fortement infestés, ont été repérés, ce qui indique que le champignon a sans doute été introduit intentionnellement, malgré les lois australiennes sur la quarantaine des plantes. On surveille actuellement la dissémination de la rouille et ses effets virulents sur la plante nuisible.

Introduction

The rust fungus *Phragmidium violaceum* (Schultz) Winter (Uredinales) was studied in Europe between 1978 and 1983 to determine its suitability for the biological control of European blackberry (*Rubus fruticosus* L. agg.; Rosaceae) in Australia. The investigations showed that this autoecious and macrocyclic rust is highly damaging to eight species and several hybrids of *R. fruticosus* naturalized in Australia and that it is sufficiently specific to these weeds (Bruzzese and Hasan, unpubl. data). It was therefore concluded that the rust's introduction to Australia would be desirable. Submissions were being prepared to have the weed approved as a candidate weed for biological control (Field and Bruzzese 1985) and to seek approval from the Federal Department of Primary Industry for introduction of the rust. However, the rust was identified as being present in southern Victoria in late February 1984 (Marks *et al.* 1984), before these approvals could be obtained. This article describes and gives the preliminary results of a survey carried out to study the spread of the rust in Victoria.

Methods and Materials

Early Inspections

The day after *P. violaceum* was identified, the site of first discovery in south Gippsland was visited by officers of the Department of Conservation, Forests and Lands. An inspection of the Albert River valley near the township of Hiawatha showed several heavily infected European blackberry brambles along the road in the valley. These brambles were in the early stages of defoliation and were quite distinct from adjoining brambles which were only lightly infected. After the inspection it was concluded that the pathogen had been in this area for a short time (probably 6–8 wks), that it was probably deliberately distributed as all the heavily infected brambles were in accessible situations, and that eradication of the infestations was impossible as although the main infestations were localized, individual pustules were found on blackberry over a distance of about 10 km along the valley.

Two days later, another outbreak of the rust was reported from the Dandenong Ranges east of Melbourne. Upon inspection of the area only one heavily infected bramble was found in the main street of the township of Olinda. Individual pustules and light infestations were found over an area of about 100 km^2

The infections at Olinda and Hiawatha, which are 130 km apart, seemed to be of the same age. The possibility then arose that several other release sites occurred in these or other parts of Victoria.

Survey of Occurrence and Spread

Assuming that the rust was deliberately and therefore illegally introduced, there was a strong possibility that this was done on plant material. It was therefore possible that other less specific plant pathogens or arthropods may have also been introduced. A survey was therefore planned with the following aims: (1) discover other possible release sites of the rust in Victoria; (2) identify undesirable organisms which may have also been introduced; (3) study the spread of the rust; and (4) find which species of blackberry were susceptible to the rust.

Field officers of the Department of Conservation, Forests and Lands were asked to carry out the survey in their districts. A meeting was held in each Senior Land Management Officer's district within 2 wks of the discovery of the rust. All Land Management Officers, District Foresters and National Parks Rangers in charge of public land in the district were invited to attend the meeting. Each officer was issued with a detailed description of *P. violaceum*, a 24 × 20 cm photograph showing different stages of infection on blackberry leaves, detailed instructions on the procedure for the survey, and questionnaires for each site in their districts. Each officer was asked to select five blackberry sites in each Parish of their district which were to be inspected for the presence or absence of rust. If *P. violaceum* was thought to be present, the attack was to be ranked as heavy (brambles defoliated), common (pustules on most leaves) or rare (occasional pustules on a bramble). This information was used to decide if the site was a possible release area, or close to one. A sample of a few leaves representative of the infection were requested with the questionnaire to enable the identification of the pathogen and in most cases, that of the blackberry.

Officers were asked to complete the first inspection by mid-April. Another inspection at the same sites was carried out in June and one is planned for November 1984. These will enable the spread of the rust in Victoria to be studied.

Media Campaign

Soon after the rust was discovered, the media was informed through a press release made by the Minister for Conservation, Forests and Lands. The public was asked to supply any information which may be of importance in establishing how the rust entered Australia and where it was released. Subsequent press releases were made to keep the public informed on the spread of the rust and as a reminder of the interest in how the rust entered Australia.

Results and Discussion

The early inspections and the April survey showed that *P. violaceum* appeared to be released at a number of sites in Victoria (Fig. 1). Release seemed to be concentrated in south Gippsland where 17 possible release sites were found (13 at Hiawatha and one each at LeRoy, Seaview, Mt. Eccles and Bena). Other possible release sites in Victoria were in the Dandenong ranges (two at Olinda), Otway ranges (two at Beech Forest) and Strathbogie ranges (one at Strathbogie). Inspection of these sites has not yet revealed evidence of other introduced pathogens or arthropods.

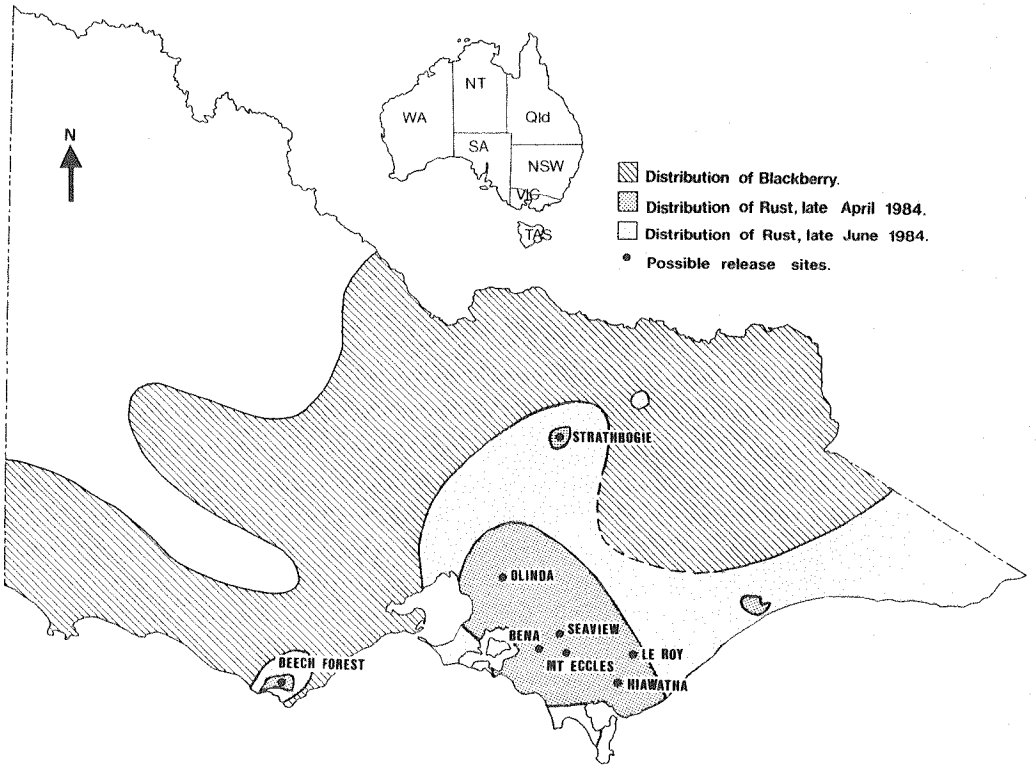

Fig. 1. Spread of *Phragmidium violaceum* (Schultz) Winter on European blackberry in Victoria, February–June 1984.

The April survey showed that the rust spread very rapidly. Questionnaires for 1666 sites throughout Victoria's blackberry range were received and positive identification of the rust was made at 244 sites. It also showed that the south Gippsland and Dandenong ranges infestations had merged but those of the Otway and Strathbogie ranges ramained isolated (Fig. 1). The questionnaires for the June survey indicate that

considerable spread has occurred during the autumn months (Fig. 1). Also, most samples received in June showed that the rust was producing overwintering spores indicating that for this growing season, spread of the rust has ceased.

The leaf samples received show that four species of blackberry have been attacked. These are *Rubus procerus* P.J. Muell., *R. polyanthemus* Lindeb., *R. laciniatus* Willd., and some *R. ulmifolius* Schott hybrids. Laboratory inoculations of the eight European blackberry species naturalized in Victoria has confirmed the observations from field collected specimens. The inoculations have also shown that *R. ulmifolius* and *R. vestitus* Weihe & Nees are susceptible to the rust but that *R. cissburiensis* Barton & Riddels, *R. rosaceus* Weihe & Nees and some *R. ulmifolius* hybrids are highly resistant to this strain(s) of the rust. Further studies are underway which will quantify the effect of the rust on blackberry species. The results will indicate whether there is a need to import other selected strains of *P. violaceum*.

Whilst the media campaign has not yet yielded information on how the rust entered Australia, it was helpful with information on the spread of the rust. Reports were received from as far as northeastern New South Wales where the rust was first recorded in early June. Here it was released by farmers who imported the rust from Victoria (J.E. Cherry, pers. comm., 1984).

Acknowledgments

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