

FURTHER SPREAD OF BLISTER SMUT OF MAIZE IN PAPUA AND NEW GUINEA

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ABSTRACT

The further spread of Ustilago maydis in Papua and New Guinea, as indicated by confirmed infected cobs in new areas, is recorded. The incidence of the disease in previously infected areas remained low and the possible reasons for this are discussed.

INTRODUCTION

IN a previous report (Shaw 1968) the distribution in Papua and New Guinea of blister smut of maize, caused by *Ustilago maydis*, was given up till October 1967. At that time records had been reported for most of the northern side of the mainland of Australian New Guinea as well as one record for New Britain, at Dagi near Hoskins. No infections had been recorded in the large islands of New Ireland and Bougainville or in Papua.

RECORDS IN NEW AREAS SINCE OCTOBER 1967

Records in new areas in both Papua and New Guinea since October 1967 are given below. The first record in a new area may not, of course, have been the first infection in that area.

NEW GUINEA

New Britain

The second record of *U. maydis* in New Britain occurred in November 1967 at an animal industry station near Rabaul in the north of the island. Some of the seed was said to have come from the Eastern Highlands on the mainland where infections had been recorded for several years. Eleven cobs were infected in a small area; all the diseased maize was burnt after drenching with diesel oil.

In the following year another record was made at a corrective institution 30 miles from Rabaul, and by July infections were reported throughout an area with a 30 mile radius around Rabaul. A more isolated infection was later

recorded in the Upper Wide Bay area, apparently derived from seed supplied from an infected garden near Rabaul.

No further records, however, have been reported for the Dagi area near Hoskins, the site of the first outbreak in New Britain, where diseased crops were also destroyed.

Bougainville, Solomon Islands

In January 1968 the first outbreak on Bougainville was reported. Two cobs were found infected at Kunua on the north-west coast. In November 1968 infected cobs (number unspecified) were reported at two villages in the Siwai area in the south of the island and in September 1969 one infected cob was reported from a village garden near Kieta.

New Ireland

In September 1968 the disease was recorded for the first time on this large island in a garden at a corrective institution at Namatanai, but to date no other infections have been reported.

Menyamya area, mainland New Guinea

In February, 1968 six plants were found infected in two gardens in the Menyamya area. It is probable that this area was infected previously, as diseased cobs had been reported in October 1967 near Kaintiba in Papua only 20 miles distant from Menyamya and on a direct walking track with that centre.

Western Highlands

As previously reported (Shaw 1968) records of the disease were made in the Western Highlands of the mainland before October 1967. In November 1968 the first records were made in the far west of the Highlands at Laiagam, about 60 miles by direct line north-west from Mount Hagen.

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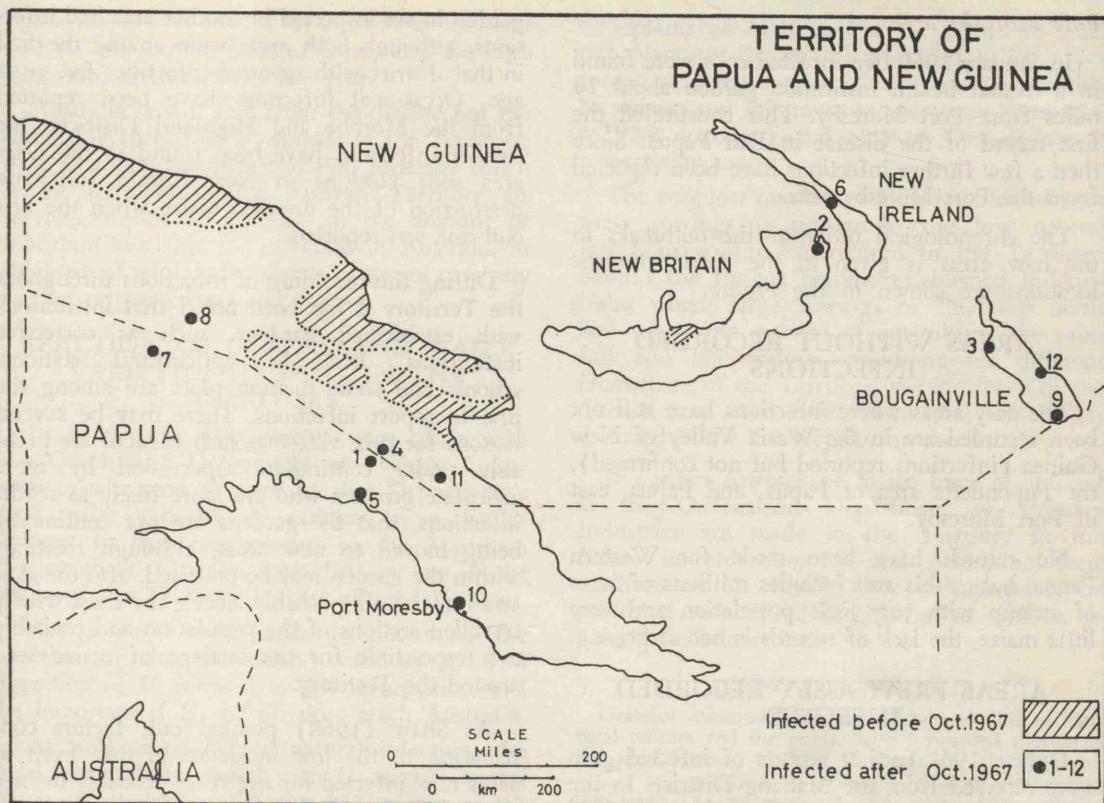


Figure.—Areas infected with *Ustilago maydis* prior to and after October 1967.

Wau area

The first record of infection in the Wau area was in April 1969. Wau is in a valley in the mountains south of Lae, but it has direct road contact with Lae, one of the earliest infected areas, and it had been expected that infected cobs would have been found at Wau earlier than April 1969.

PAPUA

Central Papua

In October 1967 an agricultural officer found some infected cobs at a mission station near Kaintiba, a village in Papua 12 miles from the New Guinea border and 20 miles from the larger population centre of Menyama, 8 miles on the New Guinea side of the border. No other infections were found on this patrol which covered the surrounding areas.

On 1 March 1968 five infected cobs were found at Kaintiba and on 14 March 14 cobs were found infected at Murua near the end of the walking track from Menyama through Kaintiba. Murua is only 5 miles in direct line from the large centre of Kerema on the South Papua coast. The relative positions are shown in the Figure. All infected cobs were burnt. No information could be obtained as to the source of the seed.

Southern Highlands

The first record of the disease in the Southern Highlands was made at Tari in October 1968. Tari is a small centre 80 miles due west of Mount Hagen in New Guinea, and 40 miles south-west from Laiagam, also in New Guinea, where smut was first recorded in November 1968.

Port Moresby area

In January 1969 two infected cobs were found in a mental health institution garden about 14 miles from Port Moresby. This constituted the first record of the disease in East Papua. Since then a few further infections have been reported from the Port Moresby area.

The chronological order of the outbreaks in the new areas is given in the *Table* and the locations are shown in the *Figure*.

AREAS WITHOUT RECORDED INFECTIONS

The only areas where infections have still not been recorded are in the Waria Valley of New Guinea (infections reported but not confirmed), the Popondetta area of Papua, and Papua, east of Port Moresby.

No records have been made for Western Papua, but as this area includes millions of acres of swamp with very little population and very little maize, the lack of records is not surprising.

AREAS PREVIOUSLY RECORDED INFECTED

During 1968 further reports of infected cobs were received from the Madang District. In the Sepik District further records have been received but the incidence has been low. During two surveys carried out by agricultural officers only one garden in 12 inspected in one area and one

garden in six inspected in another area had infections, although both areas were among the first in that district with reported infections five years ago. Occasional infections have been reported from the Morobe and Highland Districts. No further infections have been found in the Dagi area near Hoskins in New Britain following destruction of the diseased maize when the first outbreak was reported.

During the recording of infections throughout the Territory it has been noted that institutions with established gardens, such as corrective institutions, hospitals, agricultural stations, schools and some mission plots are among the first to report infections. There may be several reasons for this, viz., that such gardens are probably under continuous supervision by more articulate growers who are more likely to report infections, that the gardens are not continually being moved to new areas, although rotations within the garden may be practised, also the staff and inmates are probably among the most widely travelled sections of the population and probably are responsible for the carriage of maize seed around the Territory.

As Shaw (1968) pointed out, factors contributing to the low incidence to date even in areas now infected for five years probably include the relatively small numbers of maize plants grown in the village gardens, the system of shifting agriculture used in most areas excepting the established gardens of institutions, the rain-

Table.—Chronological order of outbreaks of smut in new areas.

Date	Map Reference No.	Locality	Region
1967 October	1	Central Papua (Kaintiba)	Papua
November	2	North New Britain	New Guinea
1968 January	3	North-west Bougainville	New Guinea
February	4	Menyamy	New Guinea
March	5	Central Papua (Murua)	Papua
September	6	New Ireland (Namatanai)	New Guinea
October	7	Southern Highlands (Tari)	Papua
November	8	Far Western Highlands (Laiagam)	New Guinea
November	9	South Bougainville	New Guinea
1969 January	10	Port Moresby area	Papua
April	11	Wau	New Guinea
September	12	East coast, Bougainville (Kieta)	New Guinea

fall which is over 20 in. in some areas and over 100 in. per annum in most areas, and the high temperatures throughout the year.

Australia is still free from the disease but the increasing spread of *U. maydis* in the Territory, especially its occurrence near Port Moresby which is the terminal of the Australia-Territory air services, means an increase in the amount of inoculum available for infection in Australia in the form of wind-borne spores or spores passively carried on passengers and freight.

REACTION OF QUEENSLAND MAIZE VARIETIES TO SMUT IN THE TERRITORY

In 1968-1969 arrangements were made with the Queensland Department of Primary Industries to sow seed of some of that Department's best maize varieties, or varieties of particular interest to that Department, in the Markham Valley about 12 miles from Lae, in one of the areas of the Territory longest affected by smut.

The sowings were made to determine the reaction of the Queensland varieties to field infection of *U. maydis*, as this information will be important if *U. maydis* does reach Australia.

As well as relying on natural infection, the seed was heavily dusted with *U. maydis* spores from infected cobs. Of the 837 plants of 32 lines which reached maturity, only two bore cobs that were infected. Another sowing with new seeds was made several months later and, as well as natural infection, the seed was again heavily dusted with spores, and infected cobs from other areas were attached to stakes around the plot from the time the first leaves appeared above ground level. In this planting there were 10 infected cobs on individual plants out of

656 plants of 24 lines. For the period of these two plantings the rainfall averaged 11.35 in per month and the ranges of the average monthly maximum and minimum temperatures were 83.9 to 92.8 degrees F and 69.5 to 73.4 degrees F respectively.

The very low number of infections found with these sowings is similar to the low natural infections so far experienced in the Territory. Should the fungus become established in Australia where large sowings of the crop occur and where the systems of agriculture, the rainfall and temperature conditions are different from those of the Territory, the incidence of the disease may also differ from that which has occurred in the Territory during the last six years.

If further sowings of maize lines of interest to the Queensland Department of Primary Industries are made in the Territory in the future in order to try and determine their reactions to *U. maydis*, they will probably be subjected to artificial inoculation as well as to natural field infection.

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- SHAW, DOROTHY E. (1968). Outbreak of blister smut of maize in New Guinea and its attempted eradication. *Res. Bull. Dep. Agric. Stock Fish., P. Moresby*, Pl. Path. Ser., 2 : 3-19.

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