

Sporulation of *Phytophthora infestans* (Mont.) de Bary on the surface of diseased potatoes and tuber to tuber spread of infection during handling

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Summary

Laboratory experiments and observations in commercial stores showed that viable sporangia of *Phytophthora infestans* can be produced on infected potato tubers of different cultivars. Infection was also found to spread from diseased to healthy tubers during handling.

Introduction

Late blight caused by *Phytophthora infestans* (Mont.) de Bary is the most important disease affecting potatoes (*Solanum tuberosum* L.) in Northern Europe. Early experiments indicated that the pathogen may overwinter saprophytically in the soil (De Bruyn, 1926). However, experiments in the United States (Peterson, 1947) and England (Hirst, 1955) concluded that there was no saprophytic overwintering or sporangial germination in the soil and that all potato infections could be traced to diseased shoots arising from infected tubers. Although sporulation has been observed on tubers at digging (McKay, 1955), there has been no report of sporulation in commercial stores or any report of disease spread from tuber to tuber after harvest. During 1988, some stocks of cv. Cara had low levels of tuber blight infection at harvest but were later found to have high disease incidence following soil extraction, storage and grading. This paper reports our observations and investigations into the spread of late blight in store.

Materials and methods

In December 1988, tubers of cvs Cara, Clauster and Romano stored in 1-tonne pallet boxes were examined for tubers affected with late blight. Tubers of cv. Cara were examined in October 1989. Sporulation of *P. infestans* was confirmed by microscopic examination and spore viability by incubating spore suspensions for up to 3 h at 10 °C and observing the presence of zoospores.

Two isolates of *P. infestans* were obtained from diseased seed tubers cv. Cara and maintained in pure culture on rye meal agar. Inoculum for experiments was produced by growing cultures on 7.5 mm tuber slices of cv. Cara placed on moist filter paper in petri-dishes at 18–20 °C with 12 h daylength and 150 lux light intensity.

Spore suspensions were prepared from 7-day-old tuber cultures by brushing the

Table 1. Incidence of infected tubers cv. Cara after mixing with blight infected tubers.

Isolate	% infection of 20 tubers following incubation for: No. of days incubated		
	10	21	35
C	100	100	100
H	40	60	100

sporangia into distilled water and standardising the suspension at 5000 sporangia/ml. Zoospore formation was induced by incubating the suspension for 3 h at 10 °C prior to inoculation. Tubers were inoculated by immersing them for 1 min in the suspension, placed on moist peat in plastic boxes and incubated for up to 35 days in the dark at 20 °C.

Two inoculated tubers showing *P. infestans* sporulating on their surface were placed in a dry plastic container with dry healthy tubers cv. Cara. The container was inverted 10 times to simulate in-store handling and then the two inoculated tubers were removed and the remaining tubers incubated as previously described.

Results and discussion

Within five days of inoculation in spore suspension, *P. infestans* was observed to be sporulating on the surface of 'Kerr's Pink' and 'Cara' tubers and the viability of the sporangia was confirmed. Also in 1988 some infected tubers of the three cultivars held in commercial stores had sporulating mycelium of *P. infestans*. Zoospores were not released from suspensions prepared from these infected tubers. However, in 1989, tubers were examined soon after harvest and sporangia were found to be viable.

All healthy tubers mixed with infected tubers bearing sporangiophores developed symptoms of tuber blight following 35 days incubation (Table 1). This indicates that healthy tubers can become contaminated with sporangia of *P. infestans* through contact with diseased tubers and that blight symptoms subsequently develop under favourable environmental conditions. In October 1989, the temperature within the pallet boxes was 9–12 °C and relative humidity 95 %, conditions that are likely to favour the development of blight symptoms in surface-contaminated tubers.

This is the first report that *P. infestans* can produce viable sporangia on the surface of diseased tubers and that infection can spread from diseased to healthy tubers. Whether this resulted from recent changes in the host, pathogen or the environment is not known. However, should post-harvest spread of infection become a regular feature in the epidemiology of late blight, it will be necessary to develop handling procedures that decrease or eliminate it.

References

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