EPIDEMIOLOGY AND CONTROL OF PINK ROT OF POTATOES

Authors

E. O'Sullivan and L.J. Dowley
Crops Research Centre,
Oak Park, Carlow

ISBN 1 901138 73 9

September 1998

The Science of Farming and Food

EUROPEAN UNION
European Agricultural Guidance and Guarantee Fund

Teagasc, 19 Sandymount Avenue, Dublin 4

CONTENTS

SUMMARY **1**

INTRODUCTION **1**

METHODS **1**

RESULTS AND DISCUSSION **2**

CONCLUSIONS **4**

REFERENCES **5**

SUMMARY

Rotting of tubers was reported in early potato crops in Co. Wexford in 1995. *Geotrichum candidum*, which causes a condition known as rubbery rot, was isolated from a sample of affected tubers. In further investigations in 1996 both *G. candidum* and *Phytophthora erythroseptica*, the cause of pink rot, were isolated from diseased tubers. In pathogenicity tests *P. erythroseptica* re-infected tubers while *G. candidum* did not. It was concluded that the disease was pink rot. In 1997 foliar applications of the systemic fungicide metalaxyl were evaluated for its control. The level of control obtained was insufficient to overcome the problem which pink rot can cause in early potatoes.

INTRODUCTION

There were widespread reports of soft rotting of potato tubers in first and second early crops in Co. Wexford in 1995. An investigation of some crops in late July showed that the problem was not soft rot but a condition similar to pink rot caused by *Phytophthora erythroseptica*. This disease was first described in Ireland by Pethybridge (1913) and was subsequently reported in several other countries (Stamps, 1978). The affected tubers, while soft and spongy, remained intact. The exposed surfaces of cut tubers turned pink and subsequently black. In a preliminary study *Geotrichum candidum* (syn. *Oospora lactis*) was isolated from infected tubers. This has been infrequently reported to cause a condition known as rubbery rot with symptoms broadly similar to those of pink rot (Humphreys-Jones, 1969). However, in subsequent pathogenicity tests an isolate of *G. candidum* did not re-infect tubers. The objectives of this study were

1) to identify the cause of the problem and
2) to investigate control measures.

METHODS

Early crops on six farms where the disease had been severe in 1995 were inspected in July 1996. Samples of affected tubers were collected from these farms. Pieces of infected tissue from randomly selected tubers were cultured on growth media selective for *G. candidum* and *P. erythroseptica*. The growth rates of isolates of both species were assessed at different temperatures in order to determine their optimum growth temperatures. Growth rates were estimated by measuring the diameters of three replicate cultures, originating from centrally

inoculated discs of five isolates of each organism, on potato dextrose agar (PDA) at 15, 20, 23, 26, 31, 33 and 37^0C. Six isolates of *P. erythroseptica* and six of *G. candidum* were tested for pathogenicity on tubers of cvs. Home Guard and British Queen. Pieces of tissue were removed from the heel ends of tubers with a cork borer and plugs of PDA cultures of one or other organism were inserted. The tubers were incubated in a humid environment for 7 days at 20 or 26^0C and examined for symptoms.

In 1997, after the problem had been identified as pink rot, the systemic fungicide metalaxyl was evaluated for control. Trials were laid down in four commercial potato crops in Co. Wexford, one of Home Guard and three of British Queen. The four trials were on farms, and two of them in fields, where pink rot was reported to have occurred in 1995. The trials were laid down as randomised blocks with fourfold replication. Each plot consisted of six drills each 10 m long. Metalaxyl was applied as the commercially available product Ridomil MZ 72 at 2.5 kg (0.2 kg metalaxyl) per ha per application. There were five different treatments and an untreated control. The treatments consisted of one, two, three and four applications of metalaxyl and one application of double rate (0.4 kg metalaxyl per ha). The first sprays were applied when plant height averaged 8-10 cm (24 April to 8 May) and subsequent sprays were applied at intervals of approximately 14 days. The double rate was applied at the same time as the second application in each trial.

RESULTS AND DISCUSSION

The problem was first investigated in 1995. In preliminary studies *G. candidum* was readily isolated from a sample of affected tubers and it was presumed that the disease was rubbery rot. However, the failure of an isolate of *G. candidum* to re-infect tubers cast doubt on this presumption.

In 1996 the disease did not appear to be as severe or as widespread as reported in 1995. On two of the six farms investigated no symptoms were found in either samples of harvested tubers or growing crops. On four other farms symptoms were found in discarded tubers in grading sheds or in tuber samples dug from crops. In the most severely affected crop (Home Guard) an estimated 5% of tubers showed symptoms. On two other farms, in crops of British Queen and Home Guard, the levels of infection of tubers were estimated at less than 1%. A few discarded tubers in grading sheds in these two farms, as well as in another farm where the disease was not detected in a growing crop, also showed symptoms.

Both *P. erythroseptica* and *G. candidum* were isolated from infected tubers. Both species were also isolated from a sample of the maincrop cv. Kerr's Pink received from a farm in Co. Cork in October 1996. *P. erythroseptica* was isolated more frequently from freshly harvested tubers but after storage this species was difficult to isolate, even on a selective medium, and *G. candidum* was isolated readily.

Isolates of *P. erythroseptica* grew at temperatures 15 to 31^0C but not at 33^0C. Growth was optimum at 26^0C. Isolates of *G. candidum* grew at temperatures 15 to 33^0C but not at 37^0C. Growth was optimum at 31^0C.

All six isolates of *P. erythroseptica* tested were pathogenic on Home Guard and British Queen at both 20 and 26^0C. All tubers of both cultivars inoculated became infected. Disease symptoms were similar to those occurring in the field. None of the six isolates of *G. candidum* infected tubers of either cultivar at either temperature. As a result of these pathogenicity tests it was concluded that the problem was pink rot caused by *P. erythroseptica*, with non- parasitic strains of *G. candidum* as secondary invaders.

It appears that the problem was more widespread and severe in 1995 than in 1996 or 1997. In the majority of crops investigated in 1996 and 1997 the disease appeared to be either absent or present at a low level and the local Teagasc adviser received few reports of problems. However, as shown by growth rate studies, *P. erythroseptica* favours relatively high temperatures. The summer weather in 1995 was much warmer than in 1996 or 1997 and that probably explains the high incidence of the disease in that year.

In 1997 all four control trial crops were scheduled for harvesting without burning-off. Prior to harvesting, 25 randomly selected plants were dug from the four middle drills of each unsprayed control plot and the tubers examined for symptoms of pink rot. The crop of Home Guard was sampled on 19 June and the crops of British Queen on 4, 15, and 22 July. There were no symptoms of pink rot in tubers sampled from any of the trials. The crop of Home Guard was not harvested on schedule and was burned off one week later. Pink rot subsequently developed in this crop and all treatments were sampled on 23 July. At this stage symptoms were found in tubers from 15% of plants in the unsprayed treatment with from 1 to 4 affected tubers per plant. Pink rot occurred in tubers from 5%, 6%, 4%, 8% and 9% of plants from treatments receiving one, two, three, four and double applications of metalaxyl respectively with from 1 to 3 affected tubers per plant. However these reductions in the proportions of plants with infected tubers were not statistically significant.

In another area of the same crop the disease was more severe than it was in the area where the trial was carried out. An assessment of 40 plants selected at random showed pink rot in tubers from 60% of plants with from 1 to 7 (average 2.5) affected tubers per plant.

Various formulations of metalaxyl, used as foliar and soil applications, have been assessed for the control of pink rot and have caused some reductions in the incidence of the disease (C. Nuninger, Novartis; private communication). The only formulation registered for use in Ireland is Ridomil MZ 72. Treatment with this product caused some reduction in the incidence of pink rot but the effects were not statistically significant. Tubers affected by pink rot are difficult to detect at harvest. Many early potato producers use grader harvesters from which the tubers are packed into paper sacks in the field and marketed immediately. Affected tubers subsequently leak in sacks and even a few per sack can result in entire consignments of produce being rejected. The degree of control achieved with metalaxyl at the rates applied in these trials appears insufficient to overcome the problems which pink rot creates for early potato producers, particularly if the disease is severe.

Pink rot occurred in only one of the trials in 1997 and only after the trial had been burned off. The late development of the disease may have been due to the changed physiology of the crop resulting from burning-off or to changed environmental conditions. If the disease develops or only becomes severe with senescence there might not be a problem if early potato crops in risk areas were harvested while still green.

CONCLUSIONS

- The problem affecting early potato crops in Co. Wexford is pink rot caused by *P. erythroseptica.*

- The proportions of tubers affected are generally low but difficult to detect and subsequently leak in sacks resulting in rejection of consignments of produce.

- Foliar application of metalaxyl does not give adequate control of the disease.

REFERENCES

Humphreys-Jones, D.R. 1969. Rubbery rot (Oospora lactis (Fres.) Sacc) of potatoes. *Plant Pathology* **18:** 186 - 187

Pethybridge, G.H. 1913. On the rotting of potato tubers by a new species of *Phytophthora* having a method of sexual reproduction hitherto undescribed. *Scientific Proceedings of the Royal Dublin Society*, **13:** 529 - 565

Stamps, D.J. 1978. *Phytophthora erythroseptica. CMI descriptions of pathogenic fungi and bacteria.* Commonwealth Mycological Bureau. 3pp