BACTERIAL POD SPOT OF RAPE IN ALBERTA

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Abstract

A bacterial disease of rape (Brassica campestris) affecting the pods conspicuously was found on two farms in southern Alberta in 1973. The causal bacterium, a species of Pseudomonas, was isolated and proved to be pathogenic on certain new varieties, eg. Span and Torch, inoculated with it. It appears to infect most readily through wounds.

Résumé

En 1973, on a trouvé dans deux fermes du sud de l'Alberta une maladie bactérienne du colza (Brassica campestris) qui s'attaque aux siliques. La bactérie responsable, une espèce de Pseudomonas, a été isolée et s'est avérée pathogène à certaines nouvelles variétés, notamment Span et Torch. Les infections semblent se propager trbs facilement par des meurtrissures.

During July 1973 damaged specimens of Span rape (Brassica campestris L.) plants affected with an apparently undescribed bacterial disease were received at the Plant Industry Laboratory, Alberta Department of Agriculture, Edmonton, from the Rockyford district of southern Alberta. They came from two separate farms in the area and were submitted from the office of the district agriculturist at Strathmore.

Extent and nature of the damage

The damage reported affected as much as 20% of one crop and 50% of the other. The pods in particular were directly attacked, many of them failing to develop properly and to produce normal seed. Stem injuries though less conspicuous also occurred and probably contributed appreciably to the total damage. Considerable financial loss as a result of reduced yield and quality of the seed in all probability was incurred by the damage on both farms.

Field symptoms and signs

Pod specimens from affected crops were commonly discolored with scattered dark brown irregularly-shaped spots. These tended to be more angular than circular. In the case of young pods in particular, marked curling, stunting, and other forms of distortion were common symptoms (Fig. 1). Older pods developed spots but remained more normal in shape (Fig. 2). Pale gray exudates were commonly present on the surface of the spots or lesions. These constituted the principal signs of the disease and indicated that it was probably caused by a bacterium. The presence of exudates on the spots would be useful in distinguishing bacterial pod spot lesions from those caused by funqal pathogens such as Alternaria spp. with which they might be confused.

Etiology

The first attempts to isolate a causal organism from the necrotic tissues of the pod spots, using several procedures, yielded a yellow bacterium mainly but it failed to produce infection of wounded green rape pods inoculated with it. Hence it was concluded that it was a saprophyte associated with the lesions.

since bacterial exudates were commonly present on the pod spots, suspensions of the bacteria in them were made in sterile water ana these were smeared on sterile potato sucrose agar in petri plates. A variety of bacterial colonies developed, among which were numerous grayish white shiny ones. From single colonies of these, cultures were obtained which were used to inoculate green span rape pod by pricking them with a sterile needle coated with bacteria from a young culture. In the case of detached pods these were placed following inoculation on sterile water agar in petri plates which were kept at room temperature on a laboratory bench for 2 to 3 weeks. As a rule each pod under test was inoculated at two points near the ends, and a sterile needle wound was made in the centre to serve as a check (Fig. 3). A few pods attached to their mother plants were also inoculated using similar methods except

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Figures 1 and 2. Pods of Span rape affected with bacterial pod spot, collected from two fields at Rockyford, Alberta. 1) Deformed pods: note dried exudate on lesions of central pod. 2) Pods from a second field show less deformity than those in Figure 1. possibly as a result of later infection.

for those of the incubation period. These pods were sprayed after inoculation with sterile water and covered with plastic bags moistened inside to assure high humidity around the pods. The plants bearing the inoculated pods were then placed in a growth chamber at 21 - 23 C.

The pathogenicity of the above-mentioned grayish white bacterium for green rape pods was established by following through Koch's rules of proof. A day or so after inoculation slightly sunken water-soaked areas a few millimeters in diameter began to appear aound the points of application of the inoculum. These gradually darkened as the affected cells became necrotic. The spots developed slowly requiring around 2 weeks to become a dark brown color in the case of Span rape. The spots tended to be limited in lateral development by the nerves of the pods and to be more elongated and angular than circular in shape.

From preliminary examinations to date of certain cultural and other physiological characters of the bacterial pod spot pathogen it would appear that it is a species of Pseudomonas, but further work will be required to determine its exact identity. It is clear, however that it is quite different from the bacterium which causes the

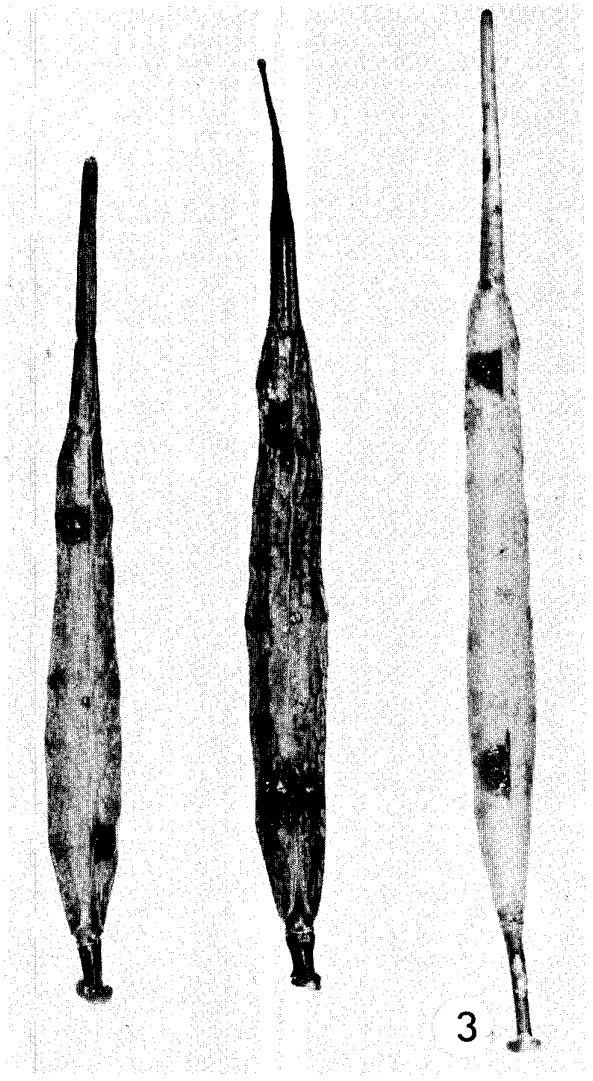

Figure 3. Pods of Torch rape artificially inoculated with the bacterial pod spot bacterium. The dark spots near the pod ends mark the points of inoculation through needle wounds. The wound in the center of each pod was not inoculated.

destructive black rot disease of cruciferous vegetables; this organism, Xanthomonas campestris (Pamm.) Dowson, has been found to attack rape (3) but, judged by seed inoculation tests made by Bain (1), much less severely than cruciferous vegetables.

Predisposition of the host

Studies made so far have indicated that the bacterium under study is primarily a wound parasite. This has been repeatedly confirmed by inoculation of wounded and unwounded parts of immature rape pods. Infection occurred almost exclusively in wounded areas. Uninoculated wounds serving as checks remained free from infection (Fig. 3). so far the chief method of artificial wounding used has been by needle pricking but abrasion with sandpaper has also been successful. In the field it is probable that wounding, permitting entry and estaolishment of the pathogen in the host, may be accomplished in a variety of ways. The action of wind and wind-blown soil may well be important as it has recently been shown to be for bacterial diseases of alfalfa and beans by Claflin et al. (2) and for bacterial spot of tomatoes by Vakili (4). Environmental factors such as moisture, temperature, and light may also be criticial as predisposing factors along with wounding of the host and at the same time as direct determinants of the activity of the pathogen.

Varietial reactions

The reactions of different varieties of rape to the bacterium causing bacterial pod spot may differ but this has yet to be determined. It is possible that some of the newer varieties are more susceptible than older ones and that their appearance in western Canada has given the bacterial pod spot organism a chance to express itself. So far our observations on this disease have been made mainly on the Polish varieties Span and Torch, both of which differ in chemical composition from some of the older varieties notably in having a lower erucic acid content. Tests of the reactions of other varieties are presently under way.

Transmission

As yet methods of transmission of the bacterial pod spot pathogen have received little attention. The role of seed in transmission from season to season may well be important. Very poor seed from pods severely affected with bacterial pod spot have been germinated and it is suspected that seedlings from it may provide primary inoculum. Also diseased rape pods and other infected residues deposited on the soil in all probability will harbour the pathogen over winter. Moreover, the possibility of inoculum being produced by other cultivated and wild host plants should also not be overlooked. Secondary spread from such sources may then occur through the action of wind, insects, or other agents.

Acknowledgments

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