Résumé Communication Congrès – O. PRUVOST, AMIS_PVBMT

IN : 9th International Workshop on Plant Disease Epidemiology - Landerneau, France - 2005/04/ 11-15 - Facing 21st Century Challenges

SPATIAL AND TEMPORAL ANALYSIS OF ONION BACTERIAL BLIGHT IN SEED PRODUCTION FIELDS

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Background and objectives

Bacterial blight of onion (BBO), a biennial plant species, is an emerging disease now present in many onion-producing areas. The causal agent, *Xanthomonas axonopodis* pv. *allii* (*Xaa*), is seedborne (2). Although the importance of seedborne *Xaa* as an initial inoculum source associated with the early stages of epidemics has been reported (3), no study concerning the epidemiology of BBO in seed production fields was conducted. In addition, the process of contamination of onion seeds in diseased fields is not understood and has never been measured. Our objectives were to (i) describe the temporal and spatial dynamics of the disease in experimental onion seed production plots, and (ii) evaluate contamination rates of seeds from these plots.

Materials and methods

Epidemic progress in experimental plots of 121 x 60 onion plants contaminated onion bulbs (random inoculation was performed on 0.27% of the plants) was monitored. This experiment was done in duplicate over two consecutive cropping seasons. Disease incidence (percentage of infected plants per plot) was monitored each two weeks. Temporal analyses were performed by nonlinear regression analysis. Logit, Gompertz, complementary log-log and Probit link function models were tested. Akaike Information Criterion was used to choose the most appropriate model. The beta-binomial parameter (tetha) and the binary form of Taylor's power law were used to assess disease aggregation in quadrats consisting of 2x4, 4x8 and 6x12 plants. Spatial patterns were also examined using semivariance analysis. Bacterial analyses of seeds were performed after harvests using both a semi-selective medium (2) and a *Xaa*-specific nested-PCR (1).

Results and discussion

Disease progress curves differed highly between the two years (incidence ranged from 0.05 to 0.6) probably because of climatic differences between the two studied seasons: winter season and late-summer season. Gompertz and probit link function model were the most appropriate models for describing the temporal increase of incidence. Aggregation of the disease incidence was detectable in all plots tested except for one plot at one date. When aggregation was detected, it tended to be a function of disease incidence at the three quadrat sizes tested, as shown by the binary form of Taylor's power law. The exponential model was a good descriptor of the semivariograms. Spatial dependencies were different between the two years, and ranged from 1.63 m in winter to 3.99 m in late-summer. Seed contamination was associated with high disease incidence (≥0.44).

References

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