

Unraveling the Spectrum of Diseases Affecting Lima Bean in New York

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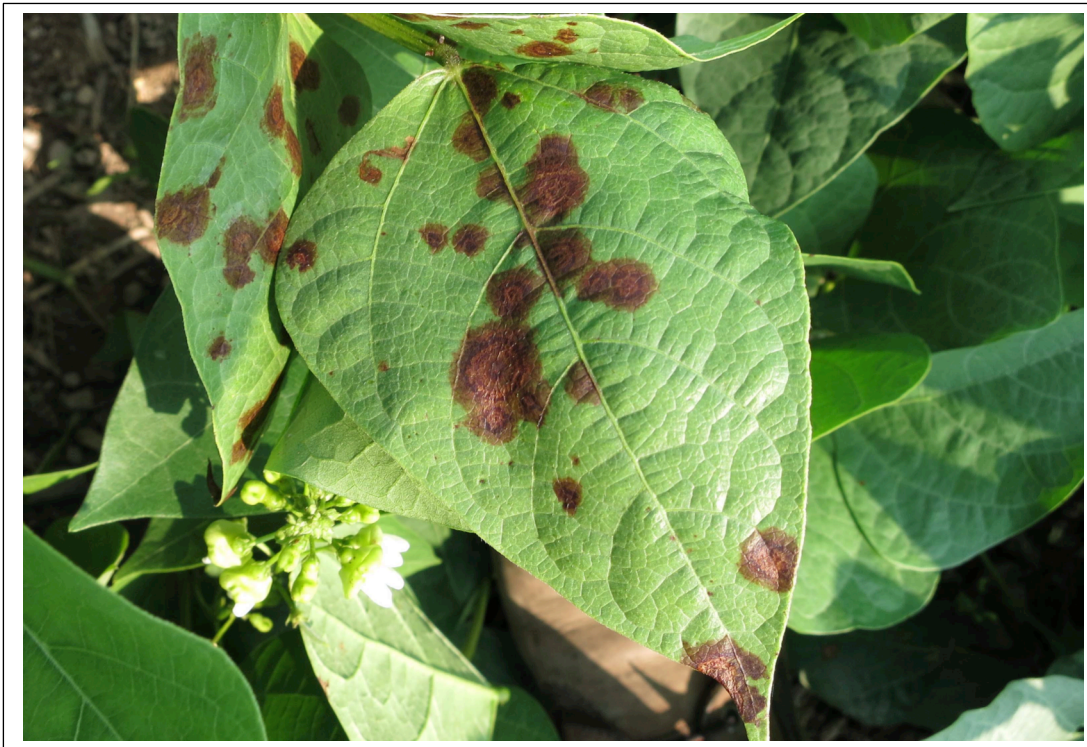
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Background

Lima beans (*Phaseolus lunatus*) are grown for processing in Western New York and production area is expanding rapidly. In 2013 and 2014, an uncharacterized disease was observed on leaves, and sometimes on the stems and pods. Symptoms on leaves were necrotic, circular lesions with irregular margins (2 to 19 mm in diameter). These lesions were usually discrete, but sometimes coalesced to form larger necrotic blotches (Fig. 1). Older lesions developed a tan-colored center in which fungi were directly observed. The objective of this study was to quantify the association between disease symptoms and organisms which may be responsible for the disease, and test their pathogenicity.

Fig. 1. Symptoms of foliar disease collected from lima bean fields in Western New York in 2014.



Methods

Isolations. Isolations were conducted from lesions on leaves collected from 3 fields in 2013, and 10 fields in 2014. Representative mycelia that grew from the samples were identified by standard protocols and characteristics for these genera of fungi.

Pathogenicity testing. The pathogenicity of two commonly isolated fungi was quantified using both detached leaf and whole plant assays (Table 1). In detached leaf experiments, five leaves were harvested from 3-week-old lima bean plants (vars. ‘Cypress’, ‘Kingston’, and ‘Maestro’). Spore suspensions were applied to the leaves with a small spray bottle. Sterile distilled water was applied to other leaves as noninoculated controls. Leaves were incubated at room temperature for 6 days under ambient light. Disease symptoms after this time were described and severity estimated.

In whole plant assays, 3-week-old lima bean plants of the same variety were maintained in the greenhouse. Spore suspensions were applied to each plant. Plants of each variety which received only sterile distilled water were also included as noninoculated controls. Plants were covered with plastic bags for 10 days to maintain high humidity in greenhouse at 20°C. Disease symptoms were described and disease incidence and severity were counted.

Isolations were then conducted from 10 lesions across all varieties, and the isolation frequency quantified. Both the detached leaf and whole plant assays were repeated.

Results

Boeremia exigua var. *exigua* was the only fungus isolated from diseased leaf samples in 2013. In isolations conducted in 2014, a fungus most similar to *Peyronellaea americana*, and *Alternaria alternaria* were isolated at highest frequency (Table 1).

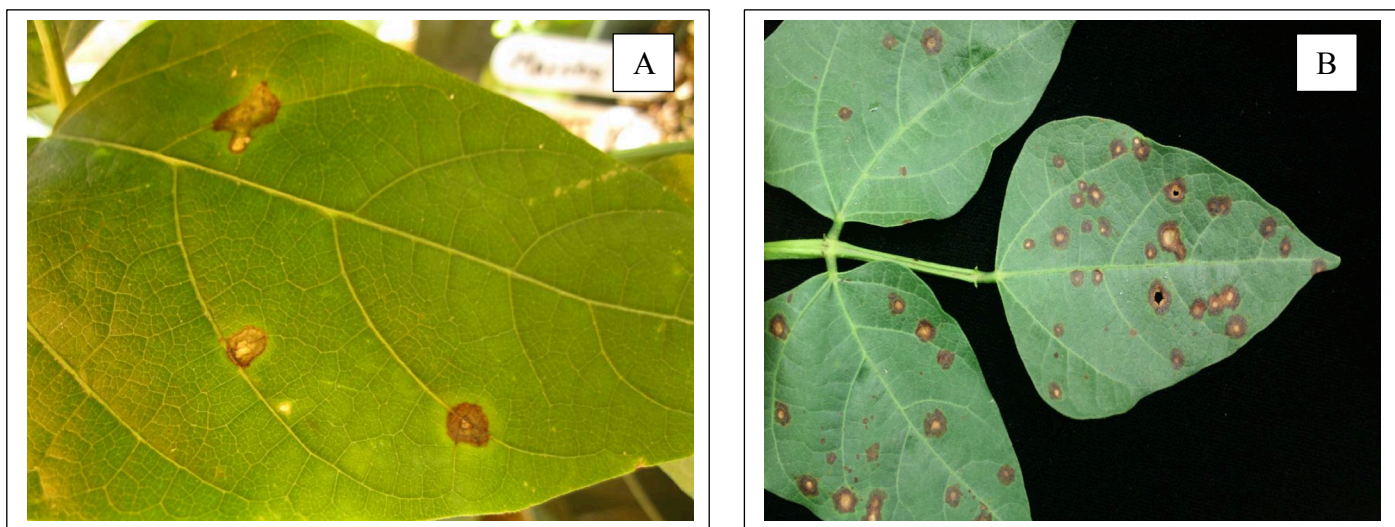
Table 1. Isolation frequency (%) of fungi associated with necrotic lesions on leaves from lima bean fields in Western New York in 2013 and 2014.

| Isolate | Year | Isolation Frequency (%) | Pathogenicity |
|---|------|-------------------------|--------------------------|
| <i>Boeremia exigua</i> var. <i>exigua</i> | 2013 | Not available | YES |
| <i>Peyronellaea americana</i> -like | 2014 | 29 | YES |
| <i>Alternaria alternata</i> | 2014 | 55 | In progress ^a |
| <i>Phoma medicaginis</i> | 2014 | 3 | In progress |
| <i>Epicoccum nigrum</i> | 2014 | 3 | Not tested ^b |
| <i>Phoma sorghina</i> | 2014 | 3 | In progress |
| Unidentified fungi | 2014 | 6 | - |

^aPathogenicity tests to varieties, ‘Cypress’, ‘Kingston’, and ‘Maestro’ are underway. ^bThis fungus is most likely a secondary organism.

Pathogenicity testing. *Boeremia exigua* var. *exigua* and *Pe. americana*-inoculated leaves developed disease symptoms similar to those observed in the field (Table 1; Figs. 2 and 3). The inoculated fungi was reisolated from these disease symptoms in all cases. No disease was observed on the noninoculated control plants.

Fig. 2. Disease symptoms on lima bean var. ‘Cypress’ caused by infection with *Boeremia exigua* var. *exigua* (A) and *Peyronellaea americana* (B).



Significance

Boeremia exigua var. *exigua* and the *Pe. americana*-like isolate have been confirmed as fungal pathogens of lima bean in New York. The *Pe. americana*-like isolate is likely to be a new strain of this species. The similarity in symptoms observed following artificial inoculation may make distinguishing between the diseases caused by either pathogen in the field problematic.

Further Work

Ongoing studies are assessing the pathogenicity of the additional species isolated from lima bean leaves (*A. alternata*, *P. medicaginis*, and *P. sorghina*). Further work is planned to quantify the effect of these pathogens on yield and conduct a comprehensive cost/benefit analysis of the use of fungicides for disease management.

Acknowledgments

We gratefully acknowledge funding from the New York State Vegetable Research Association and Council and a Graduate Student Extension Assistantship provided by The New York Agricultural Experiment Station, Cornell University, Geneva for the second author.