Atahualpa’s Revenge: The Spread of Quinoa Downy Mildew

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The Andean crop quinoa, Chenopodium quinoa, has gained popularity in recent years due to its nutritious seed and desirable agricultural traits, such as its tolerance to drought and high saline soils. Prized by the Inca, quinoa is now highly desirable to health conscious consumers in North America and Europe. Quinoa also has interesting applications to plant pathology, including being a “universal” virus host as well as its production of antimicrobial compounds. Quinoa is affected by quinoa downy mildew, caused by Peronospora variabilis (formerly P. farinosa f. sp. chenopodii) which attacks quinoa throughout its native range. Quinoa downy mildew is capable of severely reducing yield and is the most devastating disease of this crop. Quinoa downy mildew has been reported in Denmark, Canada and India, despite the diverse growing conditions found in these countries. Most recently, quinoa downy mildew was reported in the United States when it was discovered in two Pennsylvania quinoa trials in 2011. Disease was first limited to 5-10 plants in areas within the plantings, but the cool, rainy conditions present during the 2011 field season quickly led to an epidemic of quinoa downy mildew in Pennsylvania. Koch’s postulates were verified with the pathogen and its identity confirmed with molecular and morphological techniques. P. variabilis is seedborne, with oospores present under the pericarp, but it is also capable of infecting other Chenopodium species including Chenopodium album. However, downy mildew was not observed on any nearby Chenopodium species while conditions were conducive to the disease on quinoa.