Modeling the correlation between late blight sporulation and climate variables to guide fungicide applications in Cundinamarca, Colombia

Luengas, E.[1], Abril, A.[1], Castro, J.C.[1], Gonzalez, L.N.[1], Navarro, C.[2], Giraldo, D.[2], Ramirez, J.[2], Andrade-Piedra, J.L.[3], Kromann, P.[3], Forbes, G. [4], Guhl, A.[5], y Restrepo, S.[1]

[1] Universidad de los Andes, Department of Biological Sciences, Bogotá, Colombia. E-mail: srestrep@uniandes.edu.co

[2] International Center for Tropical Agriculture (CIAT) Cali, Colombia

[3] International Potato Center (CIP), Quito, Ecuador

[4] International Potato Center (CIP), Lima, Perú

[5] Universidad de los Andes, Department of History.

Introduction

Colombia is the third largest potato producer in South America, but yield losses occur due to diseases and pests. The oomycete *Phytophthora infestans* is the causal agent of late blight, an important disease in potato crops worldwide. Potato production relies on frequent fungicide spraying, increasing production costs and eventually leading to crop abandonment. To better guide fungicide spraying in the field, the influence of weather on pathogen characteristics should be understood (1).

Objectives

In this study we try to i) investigate the correlation under field conditions of the weather variables and dispersal potential (number of sporangia) of the pathogen and with different cultivars varying in their resistance/susceptibility (if a correlation was significant, then we addressed how cultivar resistance and local variability of weather variables affect the correlation); ii) calibrate the GeoSimcast model including commercial crop data and iii) compare the current, observed fungicide application scheme with those predicted by the GeoSimcast model at different RHs.

Materials and Methodos

To achieve this understanding, we sampled the pathogen in twelve commercial potato fields in the province of Cundinamarca, Colombia. Disease samples were collected to estimate the number of sporangia. Fields were planted with different potato cultivars of varying resistance/susceptibility to the disease, and chemical management was performed according to standard agricultural practices. Using the climatic data, we also evaluated the potential non-linear effects of climatic variables and used this analysis to perform a forecast simulation (3). We also used the GeoSimcast model to estimate the number of fungicide applications required to control late blight in this region (2).

Results

Differences between cultivars were observed in the sporangia curves in the initial amount of sporangia (IAS) and the trend of the curve, also were correlates with the resistance of the cultivar. The relationship between climate conditions and sporangia production were depended on the relative humidity and minimum temperature on the day of collection and the day before. The number of applications suggested by the GeoSimcast model runs for 60% and 90% relative humidity and resistant cultivars was very different from the observed number of applications, suggesting that growers always assume optimal conditions for the disease and spray fungicides accordingly.

Conclusions

This is the first study in Colombia to follow the weather variables in commercial and large potato crop fields. We understood the climate correlation with dispersal potential of the late blight pathogen in an important seed-producing area and we calibrated the GeoSimcast model for field conditions in El Rosal, Subachoque & Facatativa, Cundinamarca.

References

[1] Fry, W. 2008. *Phytophthora infestans*: the plant (and R gene) destroyer. Mol Plant Path 9(3):385-402

[2] Giraldo, D., Juarez, H., Pérez, W., Trebejo, I., Yzarra, W., and Forbes, G. 2010. Severity of the potato late blight (*Phytophthora infestans*) in agricultural areas of Peru associated with climate change. Rev Peruana Geo-Atmos 67:56-67

[3] Hutchinson, M. ANUSPLIN version 4.3 User Guide 2004. Centre for Resource and Environmental Studies, The Australian National University, Canberra.