

A Global Assessment of Late Blight Severity

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The absence of systematic estimates of global late blight severity represents a large gap in the literature on this important disease. The availability of such estimates could enhance the effectiveness of late blight control strategies and improve the allocation of resources for global late blight research. The previously available information was incomplete and highly uncertain.

A potato late blight disease forecaster was linked to a climate database in a Geographic Information System (GIS). The disease forecaster was developed as a tool for late blight management. On the basis of weather data, the forecaster indicates when sprays are needed. The climate database consists of a 10-minute grid with interpolated monthly climate data. First, we estimated where and when potato can be grown. Then we ran the model for a susceptible variety for all 10-minute cells of the global climate database where potato can be grown. The estimated number of sprays needed to control late blight is a good proxy for disease severity. Zones with high severity include the tropical highlands of Latin America, Africa and Asia, Western Europe, the east coast of Canada and the northern USA, southeast Brazil, and central-south China. Major production zones with a low late blight pressure include the Indo-Gangetic plains in India and Bangladesh, where irrigated potato is produced in the cool dry season, and the northwestern USA.

A global database of potato production was used to calculate area-weighted country aggregates. These were compared with estimates of current fungicide use. The

size of the differences indicates whether there is scope for increasing productivity from improved management of late blight. If there is a wide gap, the increased use of fungicides, together with resistance, should be promoted. If the gap is smaller, host resistance and optimization of fungicide use become important. The GIS-linked model was also run for a resistant variety. This allows a rough estimate of potential impact of the introduction of late blight resistance in terms of changes in fungicide use.

Future work includes a more formal validation of our predictions with observed optimal number of sprays. To allow estimates of yield gains, a simulation model could be used that simulates both the epidemic and potato growth. We also need to parameterize the model for new, highly resistant varieties. Future research will also involve different aggregation levels. We will zoom in to the (sub) country level and include details we did not include at the global level such as 1) current levels of deployment of resistance; 2) the shift of growing season to avoid late blight; and 3) the induction of late blight by overhead sprinklers. We intend to use this approach to help select test sites and study other aspects of late blight management, such as the importance of sanitation. The effects of climate change on potato production and potato late blight will also be studied within this framework.

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