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China-blight — A Web Based DSS on Potato Late Blight Management in China

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SUMMARY

Potato late blight is the most devastating disease of potato in China. Due to the shortage of resistance of cultivars in most cases, chemical control is still the main method in use today to manage the disease. In order to improve the control efficiency, a web based DSS (Decision support system) on potato late blight management in China --- "China-blight" (www.china-blight.net) was developed. This system is composed of the three sub-systems of "Real-time distribution of potato late blight in China", "Infection risk of late blight pathogen based on measured as well as forecasted weather data" and "A farm based simple DSS for the chemical control on potato late blight". Besides, knowledge information as well as services such as "Control methods on late blight", "Resistances of cultivars", "Fungicides database", "Other pests on potatoes", "Questions & experiences exchange" and "Electronic record for field practices of users" also included. The three main function of "China-blight" were described and the work need to be done in the near future was also discussed here.

KEY WORDS

Potato late blight, *Phytophthora infestans*, Monitoring and warning system, Decision support system (DSS)

INTRODUCTION

At present, China has become the top potato production country in the world. Potato, the fourth important food crop in China, is planted mainly in 22 provinces, municipalities and autonomous regions. Potato late blight has become the major limitation to potato production worldwide. In China, it causes 10～40% yield loss in common years or even worse in special years (Song and Xie, 1997). Due to the shortage of resistance of cultivars in most cases, chemical control is still the main method in use today to manage the disease. In order to improve the control efficiency, a web based DSS (Decision support system) on potato late blight management in China --- "China-blight" (www.china-blight.net) was developed in 2008. This system is composed of the three sub-systems of "Real-time distribution of potato late blight in China", "Infection risk of late blight pathogen based on measured as well as forecasted weather data" and "A farm based simple DSS for the chemical control on potato late blight". Besides, knowledge information as well as services such as "Control methods on late blight", "Resistances of cultivars", "Fungicides database", "Other pests on potatoes", "Questions & experiences exchange" and "Electronic record for field practices of users"

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also included. The three sub-systems of "China-blight" were described and the main work in the near future of its use was also discussed below.

THE MAIN FUNCTION OF "CHINA-BLIGHT"

Potato late blight monitoring

One of the main functions of "China-blight" is monitoring attacks of potato late blight in China during the current growing season. The data and working flow showed in Fig. 1, when end users (farmers or local advisors, etc.) find late blight attacks in their fields or areas, they can report to "China-blight" via internet (www.china-blight.net) or send SMS to a noted mobile phone number (in case of the end uses have no internet access) and the person in charge of the system running will report to "China-blight". As while as the system receive these "late blight attacks reports", it can put the red dots on to the nation and regional map according to the location of the attacks (see red dots in A and B in Fig. 1). At the same time the detailed information about these attacks will be put into the "list of late blight attacks". All the leaflets in Fig. 1 can be updated automatically in real time.

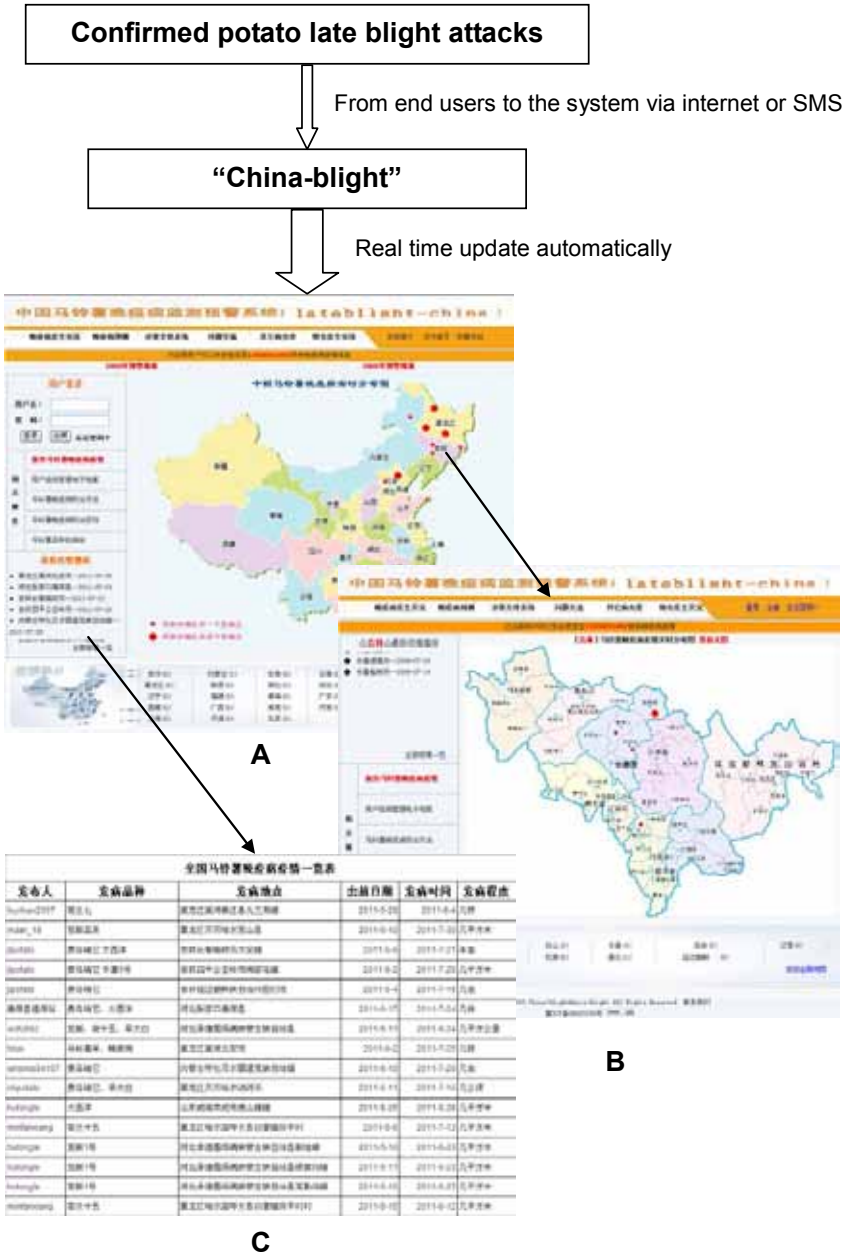

Figure 1. Data and working flow of potato late blight monitoring in “China-blight”. A and B, real time distribution of late blight (red dots on the maps, small dot means only one attack of late blight in the county and big one means more than one attacks in the county) in national and regional scale. C, list of the detailed information of late blight attacks.

Weather data based infection risk assessment of P. infestans on potatoes

"Weather data based infection risk of potato late blight" is another main function of "China-blight". From 2008 to 2010, there is no possibility to get measured hourly weather data so only "Infection risk of potato late blight for the coming 2 days" (Fig. 2) was published and updated daily during the main growing season, the infection risk assessment based on the weather forecast of National Meteorological Center of CMA (www.weather.gov.cn). In 2011 measured hourly weather data (Temperature, Relative humidity and Precipitation) for some selected locations can be obtained from National Meteorological Center of CMA (www.weather.gov.cn), so weather data based infection risk (Fig. 3) was also published and updated every morning from mid of May to the end of August 2011, the model in use was MISP model (Cao *et al*. 1996).

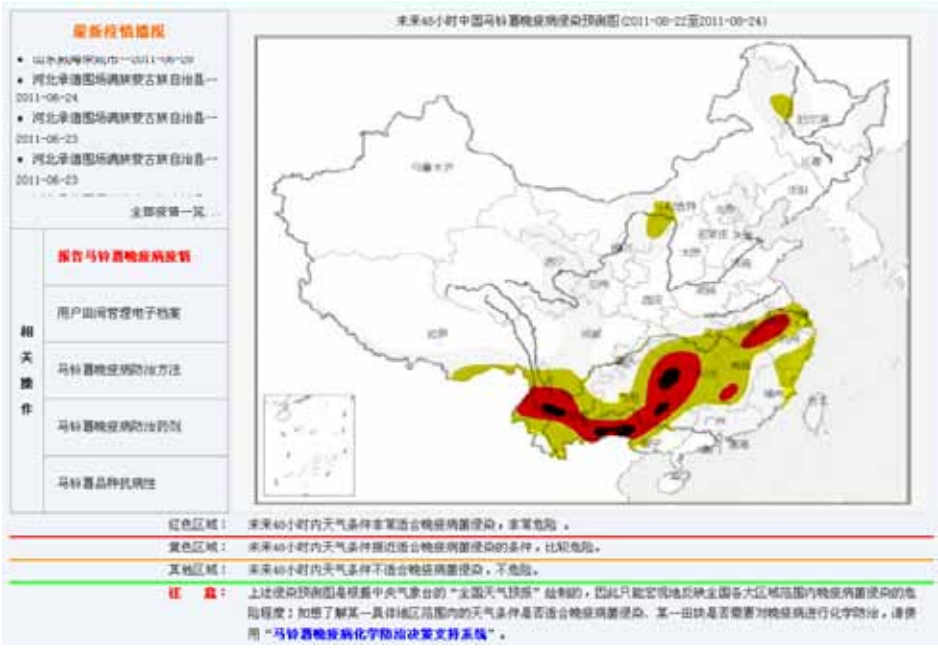

Figure 2. The China-blight leaflet "Infection risk of potato late blight for the coming two days in the national level" on Aug. 22 2011. Red color means "highly risk", yellow color means "risk" and, no color means "no risk". This map drown by hand based on the weather forecast of National Meteorological Center of CMA (www.weather.gov.cn) and updated daily during mid of May to end of August annually.

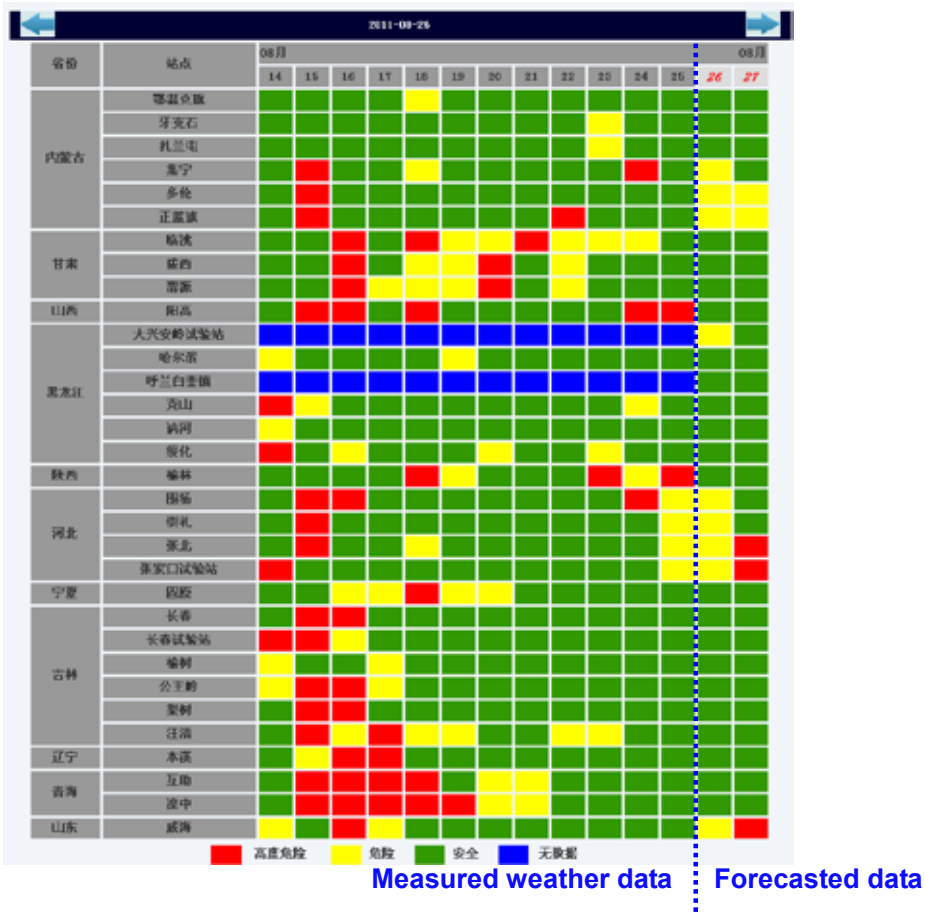

Figure 3. The China-blight leaflet "Weather data based infection risk of potato late blight" for the selected locations on Aug. 26 2011. Red color means "highly risk", yellow color means "risk", green color means "no risk" and, blue color means short of weather data input. Hourly weather data (Temperature, Relative humidity and Precipitation) came from National Meteorological Center of CMA (www.weather.gov.cn) or onset weather data loggers located in the experimental stations of the potato industry of China. Data updated daily during mid of May to end of August annually.

A farm based simple DSS for fungicide spray against potato late blight

The third main function of "China-blight" is "A farm based simple DSS for fungicide spray against potato late blight". As shown in Fig. 4, it is a questionnaire based simple DSS in order to assist farmers to decide when to spray fungicide against potato late blight during growing season. After a farmer answered the question 1 to 5 a suggestion will be given by the system about whether a spray is necessary or not, when to spray and which kind of fungicide should be use in terms of mode of action (Fig. 5).

Figure 4. The China-blight leaflet "A farm base simple DSS for fungicide spray against potato late blight". It is a questionnaire based simple DSS. 1, growth stage of your crop, 2, resistant level of your cultivar, 3, the late blight situation in your own and neighboring fields, 4, precipitation in the coming days and, 5, the time of your last spray against late blight.

Figure 5. The China-blight suggestion leaflet of the "farm base simple DSS for fungicide spray against potato late blight". The suggestion in this case (words in red color) means "The infection risk of late blight is very high in the coming days, we suggest you spray fungicide with protective and curative activity as soon as possible (please pay attention to change the fungicide from your former sprays in case of fungicide resistance of *P. infestans*).

DISCUSSION

Since China is a big country and different regions have different meteorological characteristics, in different areas the occurrence and epidemics of potato late blight are also quite different. So the way for "China-blight" is still long and full of challenges. The planned work of "China-blight" in the near future include 1), validate of different late blight control strategies in different regions in China, 2), setup and test different DSS for chemical spray against late blight in different regions, and 3), cooperate with more farms and local advisors in the main potato producing areas.

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