Could rice blast occur in Australia ?

V. Lanoiselet[A], E. J. Cother[B], G. J. Ash[A]

[A] Farrer Centre, Charles Sturt University PO Box 588, Wagga Wagga 2678 Australia

[B] NSW Agriculture, Agricultural Institute, Forest Rd, Orange 2800 Australia

Corresponding author: Vincent Lanoiselet (Email: vlanoiselet@csu.edu.au)

Introduction

Rice blast, caused by the fungus *Magnaporthe grisea* (T. T. Herbert) Yaegashi & Udagawa (anamorph *Pyricularia grisea* (Cooke) Sacc.) is generally considered the most important disease of rice worldwide. Infection of rice plants occurs from airborne conidia (Figure 1) and symptoms appear as lesions or spots. Rice blast has never been observed in the Australian rice growing area but *M. grisea* has been reported on weeds in several Australian States including NSW.

Methods

The predictive bio-climatic modelling software CLIMEX (Sutherst and Maywald 1985) was used to assess the suitability of the Australian climate for pathogenicity of *M. grisea*. A rice blast model was then created with the software DYMEX (Maywald *et al.* 1997) to predict the behaviour of the pathogen in the rice growing areas of Australia.

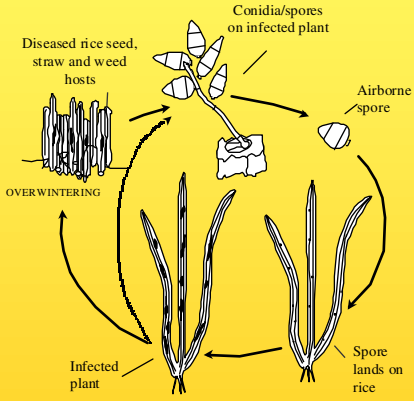


Figure 1: rice blast lifecycle

Results

CLIMEX. 91 locations had a similar climate (match level ≥ 60%) to Deniliquin. The majority of these locations where within the distribution area of *M. grisea* (Figure 2).

DYMEX. Model validation (Colusa): for the majority of the years, the last simulated infection event occurred within 3 months of sowing (Figure 3). However, in 1998, the model predicted rice blast to occur during the entire rice growing season.
Model simulation (Yanco): According to the model, 9 seasons out of 11 were favourable (≥ 1 infection event) for rice blast (Figure 3). For most of the years, rice blast was able to occur for a period ranging between 1 to 3 months. However, in 1991 the conditions were favourable for the disease to continuously occur during the entire rice growing season.

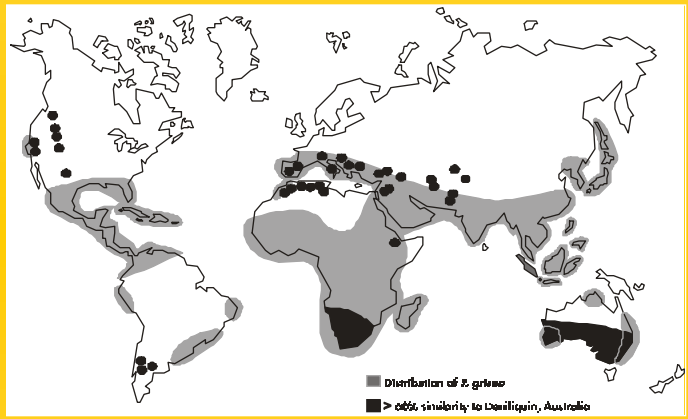


Figure 2: Worldwide locations with a ≥ 60% similar climate to Leeton overlayed with a distribution map of *Magnaporthe grisea*.

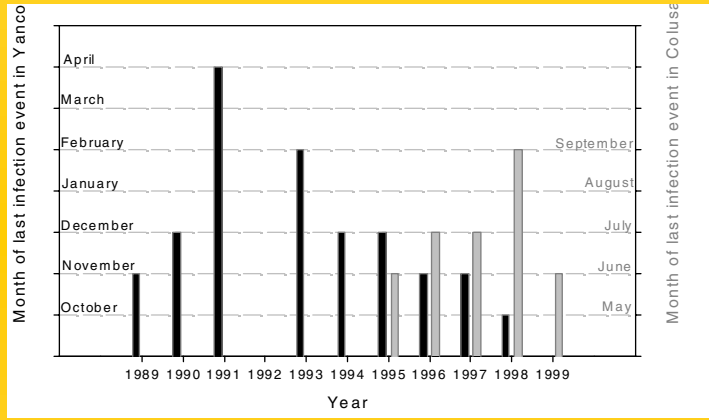


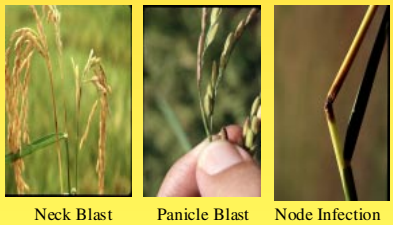
Figure 3: Month of the last infection event of *Magnaporthe grisea* in Colusa, USA (1993-1999) and in Yanco (1988-1998)

CLIMEX The climate of the Australian rice growing area, represented by Deniliquin was compared with the rest of the world. The matching locations were shown on a map (0 = no similarity and 100 = a complete match). These locations were then compared with the world distribution map of *M. grisea*.

DYMEX
Model simulation: Meteorological data from Yanco were used to run the rice blast model during the rice-growing period for each year between 1988 and 1999. The simulation was initiated with 100 disease lesions and the month of the last infection was recorded every year.

Model validation Rice blast was reported in California for the first time in 1996 (Greer *et al.* 1997). Colusa (Sacramento Valley, CA) was chosen to validate the model which was run with the meteorological data from 1993 to 1999. The month of the last infection was recorded every year.

Leaf Blast Collar Blast



Neck Blast Panicle Blast Node Infection

Discussion

The Deniliquin climate projection to the rest of the world revealed that most of the matching locations were within the distribution area of *M. grisea*, including Sacramento, the latest rice growing area where the pathogen was known to occur. The climatic conditions prevailing in the Australian rice growing area can therefore be considered as favourable for *M. grisea*.
The rice blast model was successfully validated as it detected the 1996-99 Californian infection events of *M. grisea* near Colusa (Figure 3). The model also showed that the climatic conditions of Yanco are favourable for rice blast almost every year.

These results indicate the effectiveness of both CLIMEX and DYMEX in predicting potential potential disease outbreaks and reinforce the need to maintain strict quarantine vigilance on this and other pathogens.

References

Greer, C.A., Scardaci, S.C. and Webster, R.K. (1997) – First report of Rice Blast caused by *Magnaporthe grisea* in California. *Plant Disease* **81**:1094.

Maywald, G.F., Sutherst, R.W. and Zalucki, M.P. (1997) – Generic Modelling for Integrated Pest Management. Proceedings of MODSIM 97, International Congress on Modelling and Simulation (Eds A.D. McDonald and M. McAleer), pp. 1115-1116.

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