Epidemiology and Forecasting for the Management of Rapeseed-Mustard Diseases

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Abstract

Knowledge of epidemiology and forecasting provides the basic information to develop efficient and workable plant disease control methods. The various weather variables such as temperature (T), relative humidity (RH), rainfall, wind velocity and direction, leaf wetness duration and solar radiation influence different parameters of infection process and disease development. Interaction between these weather variables (independent variables) and disease development (dependent variables) pave the way for the development of the prediction models. The average productivity of rapeseed-mustard, an important oil seed crop in India, is quite low due to infection by several diseases, such as Alternaria blight (Alternaria brassicae) white rust (Albugo candida), downy mildew (Hyaloperonospora parasitica), powdery mildew (Erysiphe cruciferarum) and white stem rot (Sclerotinia sclerotiorum). These diseases are being managed through chemical fungicides, but the efficiency of control measures depends upon the interaction between pathogen and host, which is influenced by environmental factors. Prediction models developed for the management of important diseases of rapeseed-mustard are discussed here. Development of Alternaria blight is favoured by Tmax of 20-25 C, Tmin of 15 C, RHmor > 90% and RHve < 50%. For white rust Tave of >15 C and RH >65% with intermittent rains proved most effective for disease development. Similarly, for downy mildew, a T range of 15-20 C with high RH was considered optimal for its progress. Leaf wetness duration of 4-6 h at 20 C and 6-8 h at 15 C is essential to initiate the downy mildew infection. Stag-head due to mixed infection of downy mildew and white rust is favoured by a T 20 C with high RH. A reduced period of sunshine (2-6 h/d) with rainfall up to 161 mm during flowering favours the stag-head formation. Powdery mildew development is favoured by T range of 16-28 C, mean RH <60% and dry weather especially during February- March. The white stem rot or Sclerotinia rot disease progression is favoured by high RH (>80 %), Tmax up to 25 C and Tmin of 5-12 C. Often prediction models developed at one location may not fit at other locations. It indicates that data needs to be generated for a longer period and the model be tested at multilocations. For greater efficiency, the disease-forecasting models must be developed by taking into account the crop variety, the prevalence of a particular pathotype and the microclimatic factors.

Key words: Alternaria blight, white rust, downy mildew, rapeseed-mustard, powdery mildew, Sclerotinia rot, prediction models

Citation: Mehta Naresh. 2014. Epidemiology and forecasting for the management of rapeseed-mustard diseases. J Mycol Pl Pathol 44 (2): 131-147.