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Short Comminucation

Development of weather based forewarning model for mustard aphid, *Lipaphis erysimi* (Kalt.) in Tarai region of Uttarakhand

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Rapeseed-mustard is a major oilseed crop grown in India next to soybean in terms of production and ranked first in terms of oil yield among all oilseed crops. It is grown on an area of about 6.4 m ha with a production of 8.02 Mt and productivity is 1262 kg ha^{-1}. It has an oil content ranging from 35 to 45 %. Even after the availability of good production technology mustard crop is unable to give potential yield in the country. This is because *Brassica* crops suffer heavy loss in yield due to various biotic and abiotic factors. Among the biotic constraints, insect-pests are one of the most important biotic factors in reducing the crop yield. About 50 insect species have been found infesting rapeseed-mustard in India (Sharma and Singh, 2010). Out of many insect pests, mustard aphid (*Lipaphis erysimi*) is considered important which causes considerable yield losses. Reliable and timely forecasts are of vital importance for appropriate and up to date planning especially for the management of insect-pests associated with the concerned crop. Weather plays crucial role in crop growth as well as development of insect –pests (Saxena *et al.* 2012; Vashisth *et al.* 2011). Therefore, model based on weather parameters and population dynamics can provide reliable forecast of insect pests attack so that suitable plant protection measures could be taken timely to protect the crops. Keeping this in view, present study was undertaken to develop and validate weather based forewarning model for the Tarai region of Uttarakhand, India.

The sixteen years (1998-99 to 2014-15) data of weather parameters and population of *L. erysimi* infesting on rapeseed -mustard crop of Pantnagar was used to study the relationship between population of the aphid and weather parameters and to develop forecasting model for *L. erysimi*. The regression equation was developed by taking aphid population as dependent variable (Y) and weather parameters including maximum temperature (Tmax), minimum temperature (Tmin), morning relative humidity (RH1), evening humidity (RH2), sunshine hours (SSH), rainfall (RF) and wind speed (WS) as independent variables.

Regression equation for one week before weather parameters from the observation on aphid population resulted into higher R^2(0.71). It indicated that the aphid is influenced by weather parameters to the tune of 71% variability.

$Y=31.58 + 2.08T_{max} - 2.76T_{min} - 0.87RH1 + 0.65RH2 - 0.03RF - 1.50SSH + 2.13WS$ $R^2=0.71^{**}$

This equation was used to predict the aphid population for year 2015-16 and 2016-17 (Table 1). The perusal of the data indicated the close proximity of observed value with predicted one indicating the credibility of the model.

Table 1: Validation of forecasting model for *L. erysimi* (Kalt.) at Pantnagar

Year	Observed	Predicted	Residuals
2015-16	14.03	14.09	-0.062
2016-17	12.31	9.49	2.817
		RMSE=4.52	

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