USING A DECISION TREE TO PREDICT THE POPULATION DENSITY OF REDHEADED COCKCHAFER (*ADORYPHORUS* COULONI) IN DAIRY FIELDS

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ABSTRACT

The redheaded cockchafer (RHC) (*Adoryphorus couloni*) (Burmeister) is a significant insect pest causing damage to pastures. Ordinal decision trees were developed using environmental variables and current population data to predict the categorical risk of RHC infestation in a dairy field.

Keywords: Decision tree, DEM, topographic tools, insect population modelling

INTRODUCTION

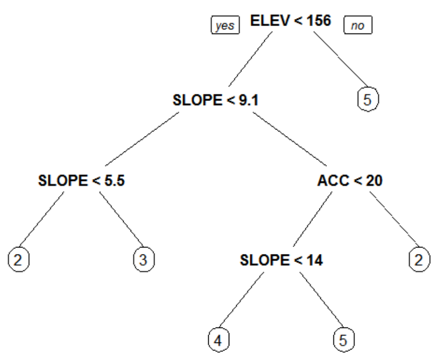
A native soil dwelling insect pest, the redheaded cockchafer (RHC) (*Adoryphorus couloni*) (Burmeister) is an important problem in the higher rainfall regions of south-eastern Australia. The majority of its lifecycle is spent underground feeding on roots and soil organic matter making the RHC difficult to detect and control (Cosby et al. 2012). The ability to predict the density of third instar RHC infestations of zones across fields or farms may provide a way for producers to economically use endophyte pastures or biological controls like nematodes against the pest. Apparent soil electrical conductivity (soil ECa) measured by an EM38, elevation from a differential global positioning system (dGPS) are sensor derived environmental variables all known to have a relationship with third instar RHC counts (Cosby et al. 2012). This approach, however, requires an operator to complete a ground survey of each paddock which can be time consuming and costly. It would be cheaper and more convenient if the environmental data was could be collected remotely via digital elevation models (DEMs) from the internet to create predictive models.

MATERIALS AND METHODS

Three paddocks on dairy farm were sampled for third instar RHC larvae and surveyed using an EM38. To develop a predictive model three ordinal supervised classification trees were produced using a combination of sensor derived environmental variables including elevation, slope and flow accumulation calculated from a DEM, soil ECa and current RHC population data. To assess the reliability of each model the true state accuracy and nearest neighbour accuracy was assessed. Nearest neighbour accuracy took into account the population density category one level above (1- extreme) and below (3 – common) the predicted category (2 –abundant).

RESULTS AND DISCUSSION

The best model based on an accuracy of 42% nearest neighbour accuracy of 82% used only the topographic attributes (elevation, slope and flow accumulation) derived from a DEM as inputs (Fig. 1).



Corresponding Branch

Category 5 (Trace) 0-24 larvae m^{-2}
Category 4 (Few) 25-50 larvae m^{-2}
Category 3 (Common) 75-125 larvae m^{-2}
Category 2 (Abundant) 126-250 larvae m^{-2}
Category 1 (Extreme) >251 larvae m^{-2}

Fig. 1. Supervised classification tree using topographic attributes to predict category of RHC infestation.

CONCLUSION

The decision tree using only topographic attributes derived from a free and easily obtainable DEM was the best model produced to predict the categorical level of third instar RHC infestations. As soil ECa did not improve the accuracy of the model it was not vital to developing the model.

REFERENCES

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