HAND-HELD SPECTROMETRY IN ESTIMATING NUMBERS OF THRIPS (*FULMEKIOLA SERRATA*) IN SUGARCANE

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Abstract

Sugarcane thrips, *Fulmekiola serrata* Kobus (Thysanoptera: Thripidae) is a recent pest incursion in South African sugar industry first detected in 2004, which is now present throughout the industry. South African Sugarcane Research Institute (SASRI) applies direct methods for thrips monitoring such as inspecting and examining sugarcane leaves in the field. Since insect pests infestations are unpredictable in space and time, such direct methods are subjective to bias and could not be accurate. The direct methods of thrips monitoring are expensive and labor intensive. Remote sensing can provide consistent, timely, unbiased and cost effective strategies for monitoring sugarcane thrips over growing season. The aims of the present study were (i) to test the validity during autumn period of partial least squares (PLS) models developed in a preceding preliminary study for quantifying sugarcane thrips numbers during summer season; and (ii) to explore the development of other PLS models that could better predict thrips population during autumn. Leaf reflectance in sugarcane variety N19 of 4-5 month old was recorded under controlled (indoor) conditions using a hand-held FieldSpec® 3 spectroradiometer (ASD) to estimate numbers of thrips (nymphs, adults and nymphs + adults). Root mean square error of prediction (RMSEP) was used to achieve the first aim of this study. For the second objective, the spectral data were first transformed to the first-order derivative reflectance. Random forest was then used as variable selection algorithm to reduce the dimensionality of the spectroscopic data. PLS regression analysis was carried out to investigate any possible relationship between thrips numbers and the most important spectral features that ranked by random forest. The validity of the PLS models developed by Abdel-Rahman et al. (In press) for detecting thrips abundance in summer showed RMSEP of 5.58 nymphs, 2.85 adults and 1.59 nymphs + adults with the autumn dataset. For the second objective, the study showed

high correlations for estimating numbers of adults (R^2 = 0.82, RMSEP = 0.5) and nymphs + adults combined (R^2 = 0.86, RMSEP = 0.68).

It was concluded that sugarcane thrips infestation can be estimated with leaf level spectroscopic data and the models of the prediction vary according to the season at which the infestation takes place (summer or autumn).