PHOTOACOUSTIC SPECTROSCOPY FOR ESTIMATING NUTRITIONAL INDICES IN LEPIDOPTERAN DEFOLIATORS

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Lymantria dispar L. and *Malacosoma neustrium* (L.) are the most serious defoliators of cork oak in the Mediterranean region. For this reason, information on their feeding behaviour are important in pest management. A non-destructive approach by using photoacoustic spectroscopy (PAS) combined with a partial least squares regression analyses (PLS), has been used to provide a rapid and cost-effective analysis to assess foliage chemistry and to estimate some nutritional indices of these insects. For testing the performance of larvae, cork oak leaves for chemical, spectroscopic analysis and bioassays were collected during the cork oak vegetational season. Leaves were analysed for their water content, polyphenols, tannins, condensed tannins, amid, nitrogen and carbon according to standard chemical protocols. Waldbauer's method was applied to determine the following indices: Relative Growth Rate (RGR), Relative Consumption Rate (RCR), Efficiency of Conversion of Ingested food (ECI), Approximate Digestibility (AD), Efficiency of Conversion of Digested food (ECD).
Chemometrics of PAS/PLS regression analysis produced adequate prediction algorithms for the studied chemico-physical and nutritional parameters. Multivariate analysis of data showed good relationships between the consumption and utilization of food by insects and nitrogen, condensed tannins, polyphenols, water content in foliage. Moreover, the relative based PAS/PLS models enabled the prediction of some chemico-physical constituents of foliage as nitrogen (R^2=0.85), condensed tannins (R^2=0.72), polyphenols (R^2=0.84), water (R^2=0.82) and ECD and ECI indices both for *Lymantria* (R^2=0.82; R^2=0.61, respectively) and *Malacosoma* (R^2=0.71; R^2=0.66, respectively). The proposed approach showed to be very useful for investigating the insects feeding behaviour and for obtaining leaf chemico-physical data and nutritional indices acquiring only the PAS spectra that can be collected quickly and at low cost.

Keywords: cork oak defoliators, nutritional indices, foliage chemistry, photoacoustic spectroscopy, Chemometrics