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Selection of intact garlic cloves for in-field sowing based on NIR spectroscopy attribution of grade of infection

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Fusarium proliferatum is a world-wide occurring saprophytic fungi, also known to be a causal agent of several diseases for a broad range of economically important plants, included garlic, leading to a loss of up to 50%. Preventive detection of the earlier-stage infection before seeding is of great interest for farmers, because it could avoid serious losses of yield during harvesting and storage (Waśkiewicz et al, 2012). The first step of this research, presented in Milan in 2016, had the objective to apply the NIR spectroscopy to rapidly determine fungal concentration, avoiding laborious and time-consuming procedures of traditional assays (Tamburini et al, 2016). Afterwards, to satisfy the needs of garlic producers and to provide a real-time method, the attempt to overcome the fungal concentration and directly select the *grade of infection* on in intact garlic cloves (ecotype Aglio di Voghiera DOP Belriguardo) without removing the typical external white/light brown sheath, has been done. In this case, the NIR spectra (800-2500 nm) were collected by means of a NIRFLex N-500 (Büchi, Switzerland) on 250 intact cloves flattened on the glass surface by using a XL-sample holder of 2.5 cm of diameter, suitable for small samples or samples of particular shape (as garlic cloves). Thereafter, cloves were deprived of the sheath to permit the *ex-post* visual analysis. Cloves were classified in grade of infection scale from 1 (healthy) to 5 (very highly infected) based on observations of symptoms and PLS calibration model built (R^2=0.8250; SEC=0.54) on SNV-pretreated spectra. In-lab validation on 60 intact unknown cloves has shown that 75% of all samples were correctly classified. Other 300 intact new cloves been classified, but in this case, cloves were then sowed versus other 300 cloves visually selected, showing an improve of about 15% of correct assignation of the NIR-selected with respect to the current human eye selection.

Keywords: garlic, garlic cloves, grade of infection, *Fusarium*, NIRS

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