Laboratory Detection of Plastics in Seedcotton with Ion Mobility Spectrometry

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The US cotton industry wants to increase its market share and value throughout the world by supplying pure cotton. Removing contamination requires developing a means to detect plastics in seedcotton. This study was conducted to determine if ion mobility spectrometry (IMS) could be used to find small amounts of plastic in a matrix of heated seedcotton. Commercial IMS analyzers equipped with membrane inlets sampled air displaced from heated flasks containing seedcotton and five common plastic contaminants: bale twine, new and weathered polypropylene tarp, polyethylene film, and plastic film shopping bags. In the first of two sets of experiments the temperature was varied from 85 to 115 °C to determine its influence on vapor emissions; in the second, air samples were taken from seedcotton containing various amounts of each plastic. Vapors from plastics associated with cotton contamination were detected with IMS in negative polarity; different plastics were distinctive. Vapor molecules and product ions from plastics and seedcotton both increased with temperature. Seedcotton vapors spectra coincided with plastics vapors spectra but had different slope characteristics at specific drift times. Digital signal processing may be used to detect plastic contamination, triggering an alarm or control action. Spectra from new and old polypropylene tarp were nearly identical suggesting detection will be possible after weathering. IMS detection of plastics vapors in seedcotton works in the laboratory. The next step is developing IMS systems for commercial cotton gins.

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