

Development of a smartphone-based assay using cholinesterase strips for the on-site determination of organophosphates

A. S. Tsagkaris¹, P. Mraz¹, L. Drabova¹, M. Tomaniova¹, J. Pulkrabova¹ and J. Hajslova^{1*}

¹Department of Food Analysis and Nutrition, Faculty of Food and Biochemical Technology, University of Chemistry and Technology, Prague, Technická 5, 166 28 Prague 6 – Dejvice, Prague, Czech Republic

The use of smartphones as colorimetric detectors is a concept of increasing popularity and great potential in food analysis [1]. Smartphones provide a broad variety of advantages like rapid testing, on-site measurement, low cost, online data management and minimal instrumentation. In the meantime, pesticide residues analysis remains on the spotlight of food science. To determine accurately pesticides like organophosphates (OPs) laborious, sophisticated and time consuming methodologies are needed. For the purpose of rapid screening, alternative strategies can be used based on the principle that OPs inhibit the action of cholinesterases (ChE), namely acetylcholinesterase (AChE) and butyrylcholinesterase (BuChE) [2]. The inhibition is dependent on the concentration of pesticides and can be detected by color change [3, 4]. To this end, we have been developing a cheap and fast colorimetric ChE smartphone based assay for the determination of OPs.

To begin with, Ellman's and indoxyl acetate (IDA) assays were selected after a comprehensive review of the literature. Cotton-based strips with immobilized AChE and BuChE were purchased. Dimensions of the strip, substrates for the enzymatic reaction, concentration of the substrates and chromogenic agents, reaction time between enzyme-inhibitor and color development time were checked and optimized. RGB and HSV color spaces were used as analytical signal for OPs concentration, which was measured using free smartphone applications downloaded from Google Play store. These preliminary data show the prospective of the colorimetric smartphone assay to be used and validated in real food matrices like apple and wheat.

References

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