



# A Rapid electrochemical screening of type-B trichothecenes

G. Volpe, F. Ricci, D. Moscone, G. Palleschi

Dipartimento di Scienze e Tecnologie Chimiche, Università di Roma Tor Vergata, Roma, Italy,



## BACKGROUND AND OVERVIEW

Trichothecenes are mycotoxins (mainly produced by *Fusarium* fungi) commonly found in cereals. They are classified into Group A and Group B compounds depending on their structure. The most important Trichothecenes are T-2 and HT-2 within group A, and DON and NIV from group B. Commonly used detection methods include separation techniques coupled to spectroscopic detector such as GC/MS, HPLC/UV, HPLC/MS. An alternative approach to circumvent these drawbacks could be the use of electrochemical methods which are known to be easy to perform, cost-effective and very fast.

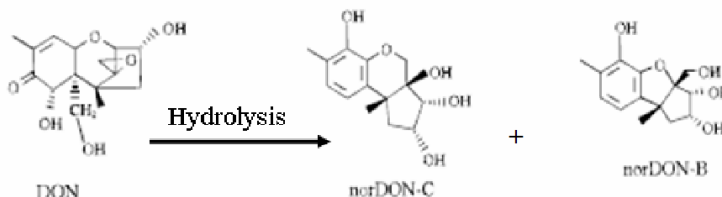


*Fusarium*

## SCHEME OF MEASUREMENT

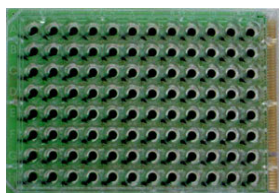
It has been reported that after an hydrolysis step in basic solution (at 80 °C for 1 hour), group B trichothecenes give rise to two electroactive compounds (norDON-C, norDON-B)

### 1. Hydrolysis:

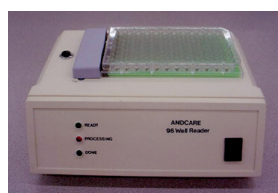


The two electroactive compounds are then measured by using a 96-well screen printed electrodes (SPEs).

### 2. Measurement:



96-well screen-printed microplate



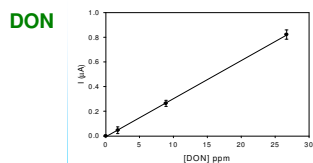
AndCare 9600 sensor reader

**Electrochemical technique:** IPA (Intermittent Pulse Amperometry)  
**Applied potential:** 600 mV vs. Ag/AgCl  
**Measurement frequency:** 20 Hz

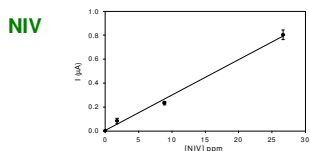
**Total analysis time for 96 wells: 30 seconds**

## RESULTS

### Standard curves for DON and NIV



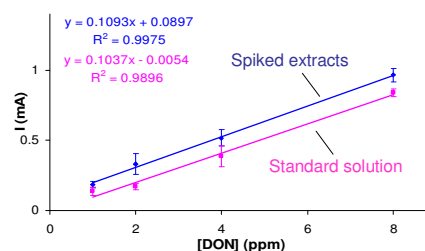
**DON**  
 Detection limit: 1 ppm  
 Linearity range: 1–27 ppm  
 Sensitivity (nA ppm<sup>-1</sup> cm<sup>-2</sup>): 408



**NIV**  
 Detection limit: 1 ppm  
 Linearity range: 1–27 ppm  
 Sensitivity (nA ppm<sup>-1</sup> cm<sup>-2</sup>): 382

- Sample treatment**
- Step 1: 25 g of wheat or maize sample  
↓ 100 ml of ACN/H<sub>2</sub>O 86/14
  - Step 2: Extraction for 3 minutes with a high speed blender  
↓
  - Step 3: Filtration with a Whatman paper n°1  
↓ 8 ml of the filtered extract
  - Step 4: Clean-up with Mycosep column  
↓ 3 ml of the cleaned extract
  - Step 5: Dried under nitrogen flow  
↓
  - Step 6: Resuspended with 0.75 ml of NaOH 0.1 M + KCl 0.1 M  
↓
  - Step 7: Hydrolysis  
↓
  - Step 8: Electrochemical measurement

### Evaluation of matrix effect Blank samples spiked at step 6



### Evaluation of accuracy and reproducibility Blank samples spiked at step 1

Expected value [DON] (μg/ml)	Found value [DON] (μg/ml)	RE%	RSD
1.0	1.1	+ 10	16%
2.0	2.1	+ 5	1%
4.0	3.4	- 15	9%

## CONCLUSIONS

The detection scheme adopted in this work for the rapid electrochemical detection of type-B trichothecenes has shown interesting features in terms of sensitivity, accuracy and simplicity of operation. Detection limits achieved and working concentration range are useful for the adaptation of this method as a screening tool for feed analysis.

