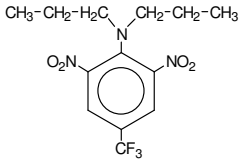
LABEL-FREE IMMUNOSENSOR FOR HERBICIDE TRIFLURALIN DETECTION

using OPTICAL WAVEGUIDE LIGHTMODE SPECTROSCOPY (OWLS) detection

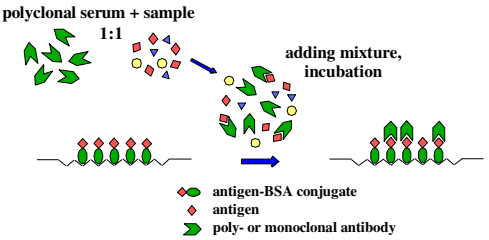
Abstract

Acting as a potent microtubule inhibitor, the dinitroaniline herbicide trifluralin has been used in agricultural applications as a selective, pre-emergence herbicide in various plant cultures including grain, crops, vegetables, fruits and nuts. In recent years, the compound is a subject to increasing toxicological and environmental concerns. OWLS offered a highly sensitive label-free method to develop immobilized antigen-BSA conjugate based competitive immunosensor.



Application of OWLS sensors

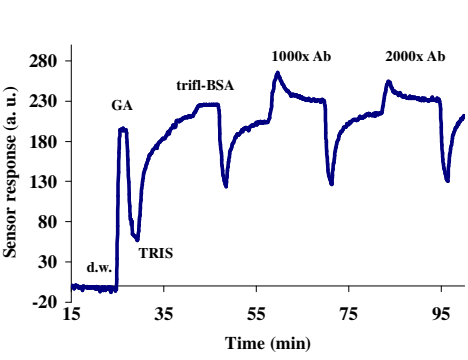
as competitive immunosensor for the detection of trifluralin



Surface Chemistry of OWLS sensors

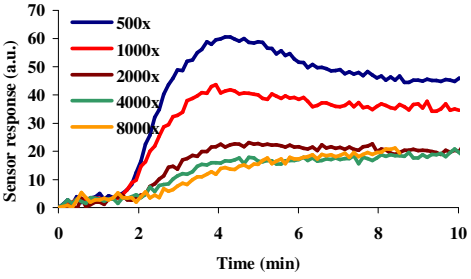
- Amino functionalisation of waveguide surface by (γ-aminopropyl)triethoxysilane
- Immobilisation of trifluralin-BSA conjugate on the OWLS sensor surface.

Sensitization of the sensor surface with trifluralin-BSA conjugate



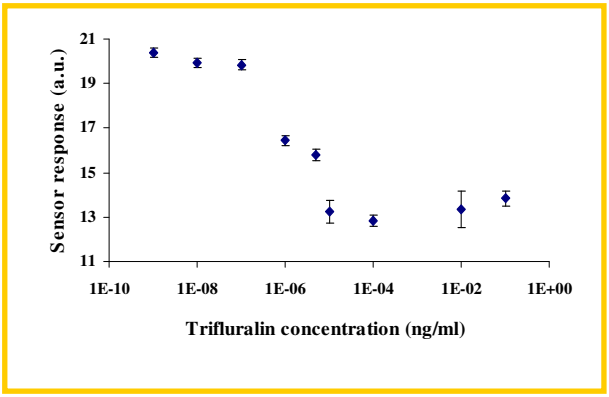
Optimization of antiserum dilution

Sensor response for different polyclonal serum dilutions was investigated.



Standard inhibition curve

of the immobilized antigen conjugate based competitive trifluralin immunosensor



Cross-reactivity

of dinitroaniline herbicides, haptens and various synthetic intermediates in the competitive OWLS immunosensors:

Compound	CR (%) (OWLS sensor)
Trifluralin	100
Ethalfluralin	6,9
Benfluralin	3,4
Isopropalin	0,26
2,6-Dinitro-4-trifluoromethylaniline	0,09
Pendimethalin	>0,01
2,6-Dinitro-4-trifluoromethyl-1-chlorobenzene	>>0,01
2,6-Dinitroaniline	>>0,01
Aniline	>>0,01

Conclusion

A competitive or binding inhibition (immobilized antigen-based) OWLS immunosensor was developed and optimized for the detection of trifluralin. The OWLS sensor was optimized for major method parameters, such as sensitizing antigen concentration (10 μgml^{-1}) and antiserum dilution (1:2000) and offered a standard curve for trifluralin in the analyte concentration range of 2 x 10^{-7} to 3 x 10^{-5} $ngml^{-1}$ in water.

References

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2. Székács A., Trummer N., Adányi N., Váradi M., Szendrő I. "Development of a non-labeled immunosensor for the herbicide trifluralin via optical waveguide lightmode spectroscopic detection", Analytica Chimica Acta 487, 2003, 31-42

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