

Scientific Paper:

Sensors 9, 3218-3227, 2009

Methodology and Significance of Microsensor-based Oxygen Mapping in Plant Seeds – an Overview

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Abstract:

Oxygen deficiency is commonplace in seeds, and limits both their development and their germination. It is, therefore, of considerable relevance to crop production. While the underlying physiological basis of seed hypoxia has been known for some time, the lack of any experimental means of measuring the global or localized oxygen concentration within the seed has hampered further progress in this research area. The development of oxygen-sensitive microsensors now offers the capability to determine the localized oxygen status within a seed, and to study its dynamic adjustment both to changes in the ambient environment, and to the seed's developmental stage. This review illustrates the use of oxygen microsensors in seed research, and presents an overview of existing data with an emphasis on crop species. Oxygen maps, both static and dynamic, should serve to increase our basic understanding of seed physiology, as well as to facilitate upcoming breeding and biotechnology-based approaches for crop improvement.

Key-words: Hypoxia, microoptode, oxygen sensing, seed development, seed photosynthesis