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ATNOGC1 PROTEIN BIOELECTRODE FOR THE DETERMINATION OF STRESS SIGNALLING MOLECULES NITRIC OXIDE (NO), CARBON MONOXIDE (CO) AND CALCIUM ION (CA2+)

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Abiotic and biotic stresses affect plant growth and development, which lead to major crop losses. This research aims at developing stress tolerant crops through the determination of signalling molecules such as nitric oxide (NO), carbon monoxide (CO) and calcium ion (Ca^{2+}), which bind and activate plant proteins such as *At*NOGC1 that induce stress tolerance in plants. AtNOGC1 is a novel plant protein with a guanylyl cyclase (GC) activity in vitro and is characterized by the heme NO and oxygen (O_2) binding domain (H-NOX), which sense NO and O2. *At*NOGC1 was expressed and purified as a ~ 67.7 kDa protein and was used to develop an electrochemical enzyme based-biosensor by immobilising the protein onto the glassy carbon electrode (GCE) surface. Electrochemistry technique such as cyclic voltammetry (CV) was used to determine the binding affinity of *At*NOGC1 protein to stress signalling molecules. The mono-oxygenation catalytic cycle of *At*NOGC1 binding towards NO took place in a reduction reaction and both the Fe^{3+} and the Fe^{2+} state of the heme binds to CO. The dynamic linear range of the Ca2+ was determined to be from 1 nM to 3 nM. This study demonstrated that *At*NOGC1 protein plays an important role as an electron transporter in redox reactions and that it binds to NO, CO and Ca^{2+}. *At*NOGC1 protein bioelectrode is reproducible and can be used to determine the binding of many biological molecules in a short, reliable period of time. This research aims to pave a way towards the development of stress tolerant crops to improve food security, for the population to have an access to reliable, sufficient, affordable and nutritious food.

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