

A NOVEL APPROACH TO STUDY cGMP SIGNALLING IN PLANTS

HUSSAIN J., VANDELLE E., DELLEDONNE M.

Dipartimento Scientifico e Tecnologico, Università degli Studi di Verona, Strada Le Grazie 15,
37134 Verona (Italy)

cyclic GMP, Arabidopsis thaliana, abiotic stress, growth, development

The occurrence of the second messenger 3,5-cyclic guanyl monophosphate (cGMP) has been shown in a number of plant species, including barley, tobacco and *Arabidopsis*. Physiological processes where cGMP signalling has been observed, or has been inferred, to play a role include chloroplast development, α -amylase production in aleurone tissue, NO-dependent expression of defence-related genes and salt/osmotic stress. Until now, cGMP signalling has been studied by pharmacological approach, using membrane permeable analogues of cGMP.

In this work we have developed a novel approach for studying cGMP signalling by expressing mammalian soluble guanylate cyclase in plants. Transgenic *Arabidopsis thaliana* plants have been developed which constitutively express a functional soluble guanylate cyclase (alpha and beta sub-units). The expression of both sub-units of the enzyme was confirmed by Real-time PCR and northern blot. These plants show a considerably higher guanylate cyclase activity and accumulate many folds higher cGMP content as compared to wild type plants. At phenotypic level, transgenic plants are more salt stress sensitive than their wild-type counter parts. Further work will consist in using these plants to study the role of cGMP during physiological processes in plants especially during defence responses.

References:

Nakane, M., Arai, K., Saheki, S., Kuno, T., Buechler, W., & Murad, F. (1990). Molecular cloning and expression of cDNAs coding for soluble guanylate cyclase from rat lung. *The Journal of Biological Chemistry*, 265, 16841–16845.

Maathuis, F.J.M., (2006) cGMP modulates gene transcription and cation transport in *Arabidopsis* roots. *The Plant Journal*, 45, 700–711.