Homology of the isa promoter from barley (Hordeum vulgare) and other cereals

John C. Russell  
Southern Cross University

Agnelo Furtado  
Southern Cross University

Robert J. Henry  
Southern Cross University

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Russell John C., Furtado, Agnelo., Henry, Robert J.

Address: Molecular Plant Breeding Cooperative Research Centre, Centre for Plant Conservation Genetics, Southern Cross University, P.O. Box 157, Lismore NSW, 2480

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Summary

Controlling the spatial, developmental and temporal expression of transgenes in plants is critical to the successful utilisation of transgenes. In the typical process of plant development, regulation of gene expression is the primary biological process underpinning the function and survival of the plant and is controlled at the transcriptional and post-transcriptional level. Transcriptional control of regulation is the outcome from interactions between DNA binding proteins and the promoter region. Genes are simplistically made up of two parts, the coding region which determines the protein produced, and the promoter region which determines where, when and to what extent a gene is expressed. Using genetic engineering and the right promoter, the activation or suppression of transgene expression can be achieved. Thus the search is on for promoters which express in specific anatomical areas of a plant and at specific stages of plant development.

The bifunctional alpha amylase and subtilisin inhibitor (ISA) is a endogenous gene synthesised in barley grain and is an important component of the grain composing up to 0.5% of the total seed protein (Mundie, Mundy, and Vas, 1985; Jarret et al., 1997), in addition wheat (Triticum aestivum) and rice (Oryza sativa) are also known to produce a similar protein. Although the physiological function of this protein is not clear, it is known that it selectively inhibits the high pl group of alpha-amylases (Mundy, Heigaard, and Svendsen, 1984), in addition to the bacterial serine protease subtilisin (Mundy, Heigaard, and Svendsen, 1984).

The bifunctional alpha amylase and subtilisin inhibitor gene (las) has been studied in barley, with specific interest in its high activity promoter and its ability to control gene expression in specific areas in the barley grain with an aim to identifying its suitability for expressing transgenes in barley grain. Studies have shown that the las promoter directs reporter gene expression in the pericarp but not in the aleurone tissue of developing barley seeds (Furtado, 2003). The aim of this study is to report on the las homologues in wheat and rice and discern any relationships between the las promoters in barley, wheat and rice which may indicate their suitability for expressing transgenes.

References

FURTADO, A. 2003. Studies on promoter regions of the bifunctional alpha-amylase and subtilisin inhibitor gene (las) and the pathogenase related gene (prb-1) from barley. PhD, The University of Queensland, Brisbane.

