A new member of the LIR family from perennial ryegrass is cold-responsive, and promotes vegetative growth in Arabidopsis.

A cold-regulated gene Lolium perenne LIR1 (LpLIR1) was isolated from perennial ryegrass using a subtractive approach. The gene has strong homology to the Light Induced Rice1 (LIR1) gene and is regulated at the transcriptional level by cold, and by a diurnal rhythm. Expression of LpLIR1 in perennial ryegrass was upregulated by vernalization but did not follow a standard vernalization-responsive expression pattern. LpLIR1 expression was restricted to vegetative tissues and absent in apices during floral induction and in flowers. LpLIR1 mRNA levels displayed diurnal fluctuations, which peaked before dusk and declined during the night. Heterologous expression of LpLIR1 in Arabidopsis led to a significant increase in leaf formation under short days (SD) conditions but only when plants had received a preceding vernalization treatment. Furthermore, dissection of plant development under SD revealed a minor but significant delay of flowering in the transgenic lines compared to wildtype plants. (c) 2006 Elsevier Ireland Ltd. All rights reserved.