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Functional Analyses of the TERMINAL EAR 1-Like RNA Binding Proteins of *Arabidopsis thaliana*

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Abstract

In the Shoot Apical Meristem (SAM) the position at which leaf primordia arise on the periphery, and their subsequent differentiation, have been shown to be (at least in part) to be directed by genetic programs of development. A candidate gene associated with this regulation is *TERMINAL EAR 1 (TE 1)* a maize gene identified by the irregular phyllotaxy of its mutant lines. Unlike most other genes associated with meristem function, *TE 1* is a novel RNA binding gene of the RRM type. It has been shown to have orthologues in a variety of plants including *Arabidopsis thaliana* as well as unicellular eukaryotes including MEI2, a gene whose product is associated with the regulation of meiosis in *Schizosaccharomyces pombe*.

In order to more fully understand *TE1*'s role, a functional characterisation of two of the so-called Mei2-like genes was undertaken in the model plant *A. thaliana*. These genes are called Terminal Ear-Like 1 and 2 (*TEL1* and *TEL2*). Constitutive overexpression of the cDNA of *TEL2* using the Cauliflower Mosaic Virus 35S promoter (CaMV35S) revealed a phenotype involving an apparently prolonged vegetative phase. However this was only observed in a limited number of lines of the total screened, and the next generation did not reiterate this phenotype. These difficulties were overcome using the LhGpOP construct system for ectopic misexpression in specific domains as well as inducible ubiquitous expression. Ectopic expression of either *TEL* cDNA is shown to lead to a pleiotropic spectrum of phenotypes, which in general, were associated with reduced determinant development outside the apical meristems and as well as a delayed overall developmental progression. This provided some evidence that the normal function of *TEL* genes within the apical meristems is the repression of differentiation associated with the regulation of plant growth and architecture.

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Abbreviations

2-ME	2-mercaptoethanol
Amp	Ampicillin, followed by concentration in $\mu\text{g/ml}$
CLSM	Confocal Laser Scanning Microscope
CZ	Central Zone
DEPC	Diethylpyrocarbonate
DEX	Dexamethasone, followed by concentration in μM
DIG	Dioxygenin
DMPC	Dimethylpyrocarbonate
DMSO	Dimethylsulphoxide
dNTPs	deoxyribonucleotide triphosphates
DTT	dithiothreitol
GUS	β -Glucouronidase
Kan	Kanamycin, followed by concentration in $\mu\text{g/ml}$
Hyg	Hygromycin, followed by concentration in $\mu\text{g/ml}$
IPTG	Isopropyl-beta-D-thiogalactopyranoside
mg	milligram
μg	microgram
μM	micromolar
ng	nanogram
NaOAc	Sodium Acetate
PCR	Polymerase Chain Reaction
QC	Quiescent Centre
PZ	Peripheral zone
RAM	Root Apical meristem
rpm	Revolutions per minute
RRM	RNA Recognition Motif
RT-PCR	Reverse Transcriptase polymerase chain reaction
RZ	Rib zone
§	Section
SDS	Sodium Dodecyl Sulfate
SDS-PAGE	SDS Polyacrylamide gel electrophoresis
SAM	Shoot Apical Meristem

Spec	Spectinomycin, followed by concentration in $\mu\text{g/ml}$
SSC	sodium chloride and sodium citrate
TEL	Terminal Ear Like
Tm	Timentin, followed by concentration in $\mu\text{g/ml}$
Tris	Tris(hydroxymethyl)aminomethane
DAG	Days after germination
xg	multiples of gravitational force
X-Glc	5-Bromo-4-Chloro-3-Indolyl-B-D-Glucuronic Acid
X-Gal	5-bromo-4-chloro-3-indolyl- β -D-galactopyranoside
ZD	Zone of Differentiation (Root)
ZE	Zone of Elongation (Root)