



US005837876A

United States Patent [19]
Conkling et al.

[11] **Patent Number:** **5,837,876**
[45] **Date of Patent:** **Nov. 17, 1998**

- [54] **ROOT CORTEX SPECIFIC GENE PROMOTER**
- [75] Inventors: **Mark A. Conkling**, Fuquay-Varina; **Nandini Mendu**, Durham; **Wen Song**, Raleigh, all of N.C.
- [73] Assignee: **North Carolina State University**, Raleigh, N.C.
- [21] Appl. No.: **508,786**
- [22] Filed: **Jul. 28, 1995**
- [51] **Int. Cl.⁶** **C12N 15/29**; C12N 15/82; C12N 15/32; A01H 5/00
- [52] **U.S. Cl.** **800/205**; 800/DIG. 43; 435/172.3; 435/240.4; 435/240.47; 435/252.3; 435/320.1; 435/252.2; 536/23.71; 536/24.1; 536/23.6
- [58] **Field of Search** 536/24.1, 23.6, 536/23.71; 435/240.4, 252.3, 320.1, 172.3, 252.2; 800/205, DIG. 43

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,943,647	7/1990	Houck et al.	800/205
4,943,674	7/1990	Houck et al.	800/205
4,962,028	10/1990	Bedbrook et al.	435/172.3
5,097,025	3/1992	Benfey et al.	536/27
5,177,308	1/1993	Barton et al.	800/205
5,229,292	7/1993	Stock et al.	435/252.34
5,283,184	2/1994	Jorgensen et al.	435/172.3

FOREIGN PATENT DOCUMENTS

WO 91/13992 9/1991 WIPO C12N 15/82

OTHER PUBLICATIONS

F. Fuller et al.; Soybean nodulin genes: Analysis of cDNA clones reveals several major tissue-specific sequences in nitrogen-fixing root nodules, *Proc. Natl. Acad. Sci. USA* 80:2594-2598 (1983).

L. M. Evans et al.; Distribution of root in mRNA species in other vegetative organs of pea (*Pisum sativum* L.), *Mol. Gen. Genet.* 214:153-157 (1988).

D. Bogusz et al.; Functioning haemoglobin genes in non-nodulating plants, *Letters to Nature* 331:178-180 (1988).

J.C. Sanford; The Biolistic Process, *Trends in Biotechnology* 6:299-302 (1988).

D. R. Lerner et al.; Cloning and Characterization of Root-Specific Barley Lectin, *Plant Physiol.* 91:124-129 (1989).

Y. T. Yamamoto; A tobacco root-specific gene; characterization and regulation of its transcription, Ph.D. Thesis submitted to the Graduate Faculty of North Carolina State University, Genetics Dept. (1989).

Y. T. Yamamoto; A tobacco root-specific gene; characterization and regulation of its expression, *J. Cell Biochem.* 13(D) (Suppl) (1989).

M. A. Conkling et al.; Isolation of Transcriptionally Regulated Root-Specific Genes from Tobacco, *Plant Physiol.* 93:1203-1211 (1989).

Y. T. Yamamoto et al.; Root-specific genes from tobacco and *Arabidopsis homologous* to an evolutionary conserved gene family of membrane channel proteins, *Nucleic Acids Research* 18:7449 (1990).

Y. T. Yamamoto et al.; Characterization of cis-Acting Sequences Regulating Root-Specific Gene Expression in Tobacco, *The Plant Cell* 3:371-382 (1991).

F.C. Hsu et al., Phloem Mobility of Xenobiotics VI. a phloem-mobile pro-nematocide based on oxamyl exhibiting root-specific activation in transgenic tobacco, *Pestic. Sci.* 44, 9-19 (1995).

B. Keller et al.; Specific expression of novel cell wall hydroxyproline-rich glycoprotein gene in lateral root initiation, *Genes & Dev.* 3:1639-1646 (1989).

Conkling et al. *Plant Physiol.* vol. 93 pp. 1203-1211 (1990) Isolation of Transcriptionally Regulated . . .

Primary Examiner—David T. Fox
Assistant Examiner—Thomas Haas
Attorney, Agent, or Firm—Bell, Seltzer, Park & Gibson

[57] **ABSTRACT**

An isolated DNA molecule which comprises a DNA promoter sequence which directs root cortex specific transcription of a downstream heterologous DNA segment in a plant cell. A DNA construct which comprises an expression cassette comprising, in the 5' to 3' direction, a promoter of the present invention and a heterologous DNA segment positioned downstream from the promoter and operatively associated therewith. Transformed plants, such as tobacco plants, comprise transformed plant cells containing a heterologous DNA construct comprising an expression cassette as described above.

22 Claims, 5 Drawing Sheets