

**RN_{ASE} AND DN_{ASE} ACTIVITY AND ISOFORM PATTERNS DURING ADVENTITIOUS
ROOT FORMATION IN CUTTINGS OF *EBENUS CRETICAL*.**

**Thomas Syros^{1,2}, Traianos Yupsanis^{2*}, Ioannis Karsisiotis², Antoanela Patras^{2,3},
and Athanasios Economou^{1,4}**

¹School of Agriculture, Aristotle University, 54124 Thessaloniki, Greece, *E-mail: yupsanis@chem.auth.gr

²School of Chemistry, Aristotle University, 54124 Thessaloniki, Greece

³School of Horticulture, Ion Ionescu de la Brad University, 700490 Iasi, Romania

⁴Institute of Agrobiotechnology, CERTH, 570 01 Themi-Thessaloniki, Greece

REFERENCES

- Abou Auda M. M., Symeonidis L., Hatzistavrou E., Yupsanis T. (2002). Nucleolytic activities and appearance of a new DNase in relation to nickel and manganese accumulation in *Alyssum murale*. *Journal of Plant Physiology*, 159: 1087-1095.
- Auffray C., Rougeon F. (1980). Purification of mouse immunoglobulin heavy-chain messenger RNAs from total myeloma tumor RNA. *European Journal of Biochemistry*, 107: 303-314.
- Bearden J. C. (1978). Quantitation of submicrogram quantities of protein by an improved protein-dye binding assay. *Biochimica and Biophysica Acta*, 533: 525-529.
- Berthon J. Y., Maldiney R., Sotta B., Gaspar T., Boyer N. (1989). Endogenous levels of plant hormones during the course of adventitious rooting in cuttings of *Sequoiadendron giganteum* (Lindl.) *in vitro*. *Biochemie and Physiologia Pflanzen*, 184: 405-412.
- Bhattacharya N. C. (1988). Enzyme activities during adventitious rooting. *In*: Davis T. D., Haissig B. E., Sankhla N. (Eds.). *Adventitious root formations in cuttings*. Dioscorides Press, Portland, Oregon, 2: 88-101.
- Bhattacharya S., Bhattacharya N. C., Nanda K. K. (1976). Effect of exogenous application of nucleic acids and auxin on the rooting of hypocotyls cuttings of *Impatiens balsamina*. Evidence for the uptake of information molecules. *Experientia*, 32: 1301-1303.
- Brown H. B., Ho T. D. (1987). Biochemical properties and hormonal regulation of barley nuclease. *European Journal of Biochemistry*, 168: 357-364.
- Chang S.-C., Gallie D. R. (1997). RNase activity decreases following a heat shock in wheat leaves and correlates with its posttranscriptional modification. *Plant Physiology*, 113: 1253-1263.
- Duhrssen E., Lanzendorfer M., Neumann K. H. (1984). Comparative investigation on DNA organization of some varieties of *Daucus carota* L. *Zeitschrift für Pflanzenphysiologie*, 113: 223-229.
- Gaspar T., Kevers C., Hausman J. F., Berthon J. Y., Ripetti V. (1992). Practical use of peroxidase activity as a predictive marker of rooting performance of micropropagated shoots. *Agronomie*, 12: 757-765.
- Graf G., Larkins B. A. (1995). Activity of single-stranded DNA endonucleases in mung bean is associated with cell division. *Plant Molecular Biology*, 29: 703-710.
- Green P. J. (1994). The ribonucleases of higher plants. *Annual Revue of Plant Physiology Plant Molecular Biology*, 45: 421-445.
- Haissig B. E. (1982). Activity of some glycolytic and pentose-phosphate pathway enzymes during the development of adventitious roots. *Physiologia Plantarum*, 55: 261-272.
- Hatzilazarou S. P., Syros T. D., Yupsanis T. A., Bosabalidis A. M., Economou A. S. (2006). Peroxidases, lignin and anatomy during *in vitro* and *ex vitro* rooting of gardenia (*Gardenia jasminoides* Ellis) microshoots. *Journal of Plant Physiology*, 163: 827-836.
- Hausman J. F. (1993). Changes in peroxidase activity, auxin level and ethylene production during root formation by poplar shoots raised *in vitro*. *Plant Growth Regulation*, 13: 263-268.
- Jarvis B. C., Shannon P. R. M., Yasmin S. (1983). Influence of IBA and Cordycepin on rooting and RNA synthesis in stem cuttings of *Phaseolus aureus* Roxb. *Plant Cell Physiology*, 24: 139-146.
- Kefalas P. S., Yupsanis T. (1995). Properties and specificity of a calcium dependent endonuclease from germinated

- lentil (*Lens culinaris*). Journal of Plant Physiology, 146: 1-9.
- Kevers C., Hausman J. F., Faivre-Rampant O., Evers D., Gaspar T. (1997). Hormonal control of adventitious rooting: Progress and Questions. Journal of Applied Botany/Angewandte Botanik, 71: 71-79.
- Laemmli U. K. (1970). Cleavage of structural proteins during the assembly of heads of the bacteriophage T₄. Nature, 227: 681-685.
- LeBrasseur N. D., MacIntosh G. C., Perez-Amador M. A., Saitoh M., Green P. J. (2002). Local and systemic wound-induction of RNase and nuclease activities in *Arabidopsis*: RNS1 as a marker for a JA-independent systemic signalling pathway. Plant Journal, 29: 393-403.
- Ludwig-Muller J. (2000). Indole-3-butyric acid in plant growth and development. Plant Growth Regulation, 32: 219-230.
- Matousek J., Tupy J. (1987). Developmental changes in nuclease and other phosphohydrolase activities in anthers of *Nicotiana tabacum* L. Journal of Plant Physiology, 129: 351-362.
- Metaxas D., Syros T., Yupsanis T., Economou A. S. (2004). Peroxidases during adventitious rooting in cuttings of *Arbutus unedo* and *Taxus baccata* as affected by plant genotype and growth regulator treatment. Plant Growth Regulation, 44: 257-266.
- Nanda K. K., Bhattacharya N. C. (1973). Electrophoretic separation of ribonucleic acids on polyacrylamide gels in relation to rooting of etiolated stem segments of *Populus nigra*. Biochemie und Physiologie der Pflanzen, 164: 632-635.
- Oppenoorth J. M. (1979). Influence of cycloheximide and actinomycin D on initiation and early development of adventitious roots. Physiologia Plantarum, 47: 134-138.
- Rout G. R., Samantaray S., Das P. (1999). Root induction in microshoots of *Simarouba glauca* L. *in vitro*: Peroxidase as a marker for rooting. Silvae Genetica, 48: 14-17.
- Rout G. R., Samantaray S., Das P. (2000). *In vitro* rooting of *Psoralea corylifolia* Linn: Peroxidase activity as a marker. Plant Growth Regulation, 305: 215-219.
- Saxena C., Samantaray S., Rout G. R., Das P. (2000). Effect of auxins on *in vitro* rooting of *Plumbago zeylanica*: Peroxidase activity as a marker for root induction. Biologia Plantarum, 43: 121-124.
- Sugiyama M., Ito J., Aoyagi S., Fukuda H. (2000). Endonucleases. Plant Molecular Biology, 44: 387-397.
- Syros T., Yupsanis T., Economou A. (2001). Factors affecting the determination of peroxidase activity of *Ebenus cretica* cuttings. A preliminary survey. Propagation of Ornamental Plants, 1: 50-53.
- Syros T., Yupsanis T., Economou A. (2003). Fractionation and electrophoretic patterns of storage proteins of *Ebenus cretica*. A preliminary survey as a tool in taxonomy. Biologia Plantarum, 46: 435-443.
- Syros T., Yupsanis T., Zafriadis H., Economou A. S. (2004). Activity and isoforms of peroxidases, lignin and anatomy, during adventitious rooting in cuttings of *Ebenus cretica* L. Journal of Plant Physiology, 161: 69-77.
- Syros T. D., Yupsanis T. A., Economou A. S. (2005). Expression of peroxidases during seedling growth in *Ebenus cretica* L. as affected by light and temperature treatments. Plant Growth Regulation, 46: 143-151.
- Syros T., Kofidis G., Bosabalidis A. M., Economou A. S. (2006a). Leaf structural dynamics associated with adaptation of two *Ebenus cretica* ecotypes. Biologia Plantarum, 50: 245-250.
- Syros T. D., Economou A. S., Bosabalidis A. M., Yupsanis T. A. (2006b). *Ebenus cretica* L., a potential new floricultural crop. Anatomical, physiological and biochemical approaches. In: da Silva J. T. (Ed.). Floriculture, Ornamental and Plant Biotechnology, Global Science Book, UK: 4: 662-668.
- Thelen M. P., Northcote D. H. (1989). Identification and purification of a nuclease from *Zinnia elegans* L. A potential molecular marker for xylogenesis. Planta, 179: 181-195.
- Upadhyaya A., Davis T. D., Sankhla N. (1986). Some biochemical changes associated with paclobutrazol-induced adventitious root formation on bean hypocotyl cuttings. Annals of Botany, 57: 309-315.
- Yupsanis T., Georgatsos J. G. (1983). Chromatin-associated nucleases of germinating barley. International Journal of Biochemistry, 7: 959-963.
- Yupsanis T., Kefalas P. S., Eleftheriou P., Kotinis K. (2001). RNase and DNase activities in the alfalfa and lentil grown in iso-osmotic solutions of NaCl and mannitol. Journal of Plant Physiology, 158: 921-927.
- Yupsanis T., Pantazaki A. (1988). Specificity of chromatin-associated barley nucleases towards a synthetic deoxynucleotide. Journal of Experimental Botany, 207: 1469-1473.
- Yupsanis T., Symeonidis L. (2001). A *Thinopyrum ponticum* and *Triticum aestivum* hybrid. Electrophoretic patterns of their endogenous phosphorylation, Diphosphonucleoside kinases, DNases and RNases. Theoretical and Applied Genetics, 102: 782-786.
- Yupsanis T., Symeonidis L., Kalemi T., Moustaka H., Yupsani A. (2004). Purification, properties and specificity of an endonuclease from *Agropyron elongatum* seedlings. Plant Physiology and Biochemistry, 42: 767-776.