New Project

CP 74

Exploiting ethylene and wounding signalling to promote adventitious root formation in hard to root ornamental species

(HDC Studentship)

Project Number:	CP 74
Project Title:	Exploiting ethylene and wounding signalling to promote adventitious root formation in hard to root ornamental species (HDC Studentship).
Project Leader:	Dr Russell Sharp
Contractor:	Moulton College
Industry Representative:	Dr Neal Wright, Micropropagation Services Ltd
Start Date:	01/10/2010
End Date:	31/12/2013
Project Cost:	£64,650

Project Summary:

The role of ethylene in the rooting of cuttings has been only minimally studied to date. Direct exposure to ethylene rarely shows promotion of rooting. However, some studies have shown that the soluble ethylene precursor, 1-aminocyclopropane-1-carboxylic acid (ACC) promotes rooting. Historically, ACC has been an expensive compound to synthesise and so has been ignored in favour of traditional auxin based rooting compounds. However, a thorough cost-benefit analysis of the concentrations of ACC actually required to promote rooting, leads us to believe it can be used as an additional or alternative root compound to auxins. This studentship will compare ACC treatment to traditional rooting compounds, plus combinations of both.

The second section of the studentship will investigate the signalling processes involved in the promotion of rooting resulting from basal wounding. Mechanical wounding stimulates ethylene signalling, and is also known to promote rooting, although the hormonal basis for the wound response is unknown. The student will investigate the role of ethylene signalling and mechanical wounding and any interaction in promoting rooting. The main aspect of wounding the student will investigate is the potential for exploiting the recent findings that the presence or absence of light has dramatic effects on the response of plants to wounding. The student will thus determine what is the optimal light intensity to conduct cutting preparation and wounding on nurseries, ACC transport in wounded cuttings and ethylene

emissions as the cuttings develop. At all points of the studentship experiments will be conducted in line with industry propagation standards.

Aims & Objectives:

i) Projects aims

To assess the potential for the manipulation of ethylene and wounding signals to promote adventitious root formation in hard to root ornamental species. The studentship will study all aspects of the signalling processes from natural endogenous transport through to applied work studying the use of exogenous applications of ACC and wounding treatments on nurseries.

ii) Objectives by year

Year 1

- Identify which hard to root species/cultivars show improved rooting of cuttings by application of ACC
- Investigate the relationship between the amount of ACC applied and rooting success to determine the optimal concentration for key species.

Year 2

- Develop a non-destructive method for measuring ethylene emissions from cuttings.
- Study the natural levels of ACC and subsequent ethylene emission in cuttings; from excision to potting up in hard to root and easy to root species.
- Establish if wounding in light/darkness influences rooting success.
- Determine the optimal method and location of cutting wounding.

Year 3

- Assess if basal wounding of the cutting leads to increased transport of ACC in the transpiration stream and subsequent ethylene emission from the foliage.
- Determination of the optimal irradiance intensity in which to wound cuttings.

Benefits to industry

Transfer of the student's findings via the HDC would lead to improved rooting procedures on nurseries and reduced loses in rooting hard-to-root species. This in turn would vastly reduce the labour and material costs involved with taking cuttings that subsequently fail to root. Reduced levels of rooting failure also reduces the quantity of decaying material present in a propagation unit, and could lead to lower incidents of fungal diseases such as cutting 'foot rot'.
An additional benefit could be to provide additional tools to growers when they attempt to root a new cultivar that is proving difficult by conventional means.

Disclaimer

Further information

Email the HDC office (hdc@hdc.ahdb.org.uk), quoting your HDC number, alternatively contact the HDC at the address below:

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