植物生态学报
Chinese Journal of Plant Ecology
ISSN 1005-264X
CN 11-3397/Q
邮发代号：82-5

首页 | 期刊介绍 | 编 委 会 | 投稿指南 | 期刊订阅 | 广告合作 | 下载中心 | 联系我们 | 常见问题 | English

植物生态学报 » 2011, Vol. 35 » Issue (7) :779-788 DOI: 10.3724/SP.J.1258.2011.00779

研究论文 最新目录 | 下期目录 | 过刊浏览 | 高级检索 << Previous Articles | Next Articles >>

微域环境因子对落基山圆柏插穗生根的影响

孟 鹏[1,2], 李玉灵[1*], 尤国春[2], 张 硕[2]

[1]河北农业大学林学院, 河北保定 071000
[2]辽宁省固沙造林研究所, 辽宁阜新 123000

MENG Peng[1,2], LI Yu-Ling[1*], YOU Guo-Chun[2], and ZHANG Shuo[2]

[1]*Forestry College of Agricultural University of Hebei, Baoding, Hebei 071000, China;*
[2]*Liaoning Sand-Fixation and Afforestation Research Institute,Fuxin, Liaoning 123000, China*

- 摘要
- 参考文献
- 相关文章

Download: PDF (612KB) HTML (1KB) Export: BibTeX or EndNote (RIS) Supporting Info

Service
- 把本文推荐给朋友
- 加入我的书架
- 加入引用管理器
- Email Alert
- RSS

作者相关文章
- 孟鹏
- 李玉灵
- 尤国春
- 张硕

摘要 以8年生落基山圆柏(*Juniperus scopulorum*)的嫩枝为试验材料, 采用不同扦插密度和基质等处理措施, 研究了微域环境因子对插穗生根的影响。结果表明, 两种不同扦插密度的生根部位、愈伤率、生根率、炼存率、生根效果指数(root effect index, *REI*)、离散度指数(rooting dispersion index, *RDI*)和分形特征均存在显著差异。综合分析生根率、炼存率、*REI*和*RDI*等发现, 密插处理的效果好于稀插, 稀插处理的插穗生根能力较差, 生根性状离散度较大。密插处理的插穗的根系平均分形维数是稀插处理的1.24倍, 两者差异极显著($p < 0.01$)。不同扦插密度下插穗的生根部位和生根机制不同: 插穗在密插处理下形成诱生根, 在稀插处理下形成原基根。不同的扦插密度造成了落基山圆柏微域环境的显著差异, 但同一密度下不同基质种类对微域环境因子的调控作用有限。密插处理下插穗的微域环境相对湿度较高(最高可达83.5%), 温度较低, 光合有效辐射较小。这些环境因子的差异导致密插处理下插穗的净光合速率(P_n)较高, 蒸腾速率(T_r)较低。在0–60天内, 密插和稀插处理的插穗的P_n均呈上升趋势, 并且二者相差的幅度随着试验时间的延长而迅速增大; 在60天以后, 二者均呈下降趋势, 相差幅度基本保持不变。密插处理下的Tr值在0–30天内基本保持不变, 而此时稀插处理下的T_r迅速增加。在30–60天内密插处理下的T_r快速增加, 60天时达到最大值, 但仍低于稀插处理。这些结果表明, 外部微域环境因子对插穗生根的影响是通过影响其内在生理指标来实现的, 插穗营养状况的差异是造成生根机制不同的主要原因。

关键词： 密插 分形特征 落基山圆柏 生根效果 生根机制 稀插

Abstract： *Aims* Microenvironmental factors such as relative humidity, temperature and light intensity have significant effects on rooting. Our objective was to study the impact of microenvironmental factors on rooting of cuttings of *Juniperus scopulorum* (Rocky Mountain juniper), a native of western North America.
Methods We used the softwood of eight-year-old *J. scopulorum* in a split plot experiment with five plots in river sand and peat substrates and two subplots in each plot with different cutting densities of 400 cuttings•m^{-2} (thin) and 1 666 cuttings•m^{-2} (dense). Data were analyzed using SPSS software.
Important findings The rooting site, rate of callus-formation, rooting percentage, survival rate after training, root effect index (*REI*), rooting dispersion index (*RDI*) and fractal feature of *J. scopulorum* cuttings in the two densities were significantly different. Analysis of rooting percentage, survival rate after training, *REI* and *RDI* indicated that the integrated effect in dense cuttings was better than thin cuttings. The rooting ability of thin density cuttings was worse, but degree of rooting dispersion was higher. The average rooting fractal dimension of dense cuttings was significantly 1.24 times higher than of thin cuttings, and dense cuttings had changed rooting position and mechanism. Cuttings often produced induced roots in dense cuttings and primordial roots in thin cuttings. Different cutting densities resulted in significant different microenvironments of cuttings, whereas the regulating effect of different media in same density on microenvironment was limited. The microenvironmental humidity of dense cuttings was higher (up to 83.5%), while temperature and photosynthetically active radiation (*PAR*) were lower, leading to higher net photosynthetic rate (P_n) and lower transpiration rate (T_r). Within 60 days after insertion, P_n of cuttings in both dense and thin cuttings were rising, and the difference between them increased quickly with time. After 60 days, both were declining, and the difference between them remained relatively constant. Transpiration rate of dense cuttings remained relatively unchanged from 0 to 30 days, while T_r in thin cuttings displayed a rapid increase during the same periods. Transpiration rate of dense cuttings rose sharply in 30–60 days and peaked on the 60th day, but it was still

lower than in thin cuttings. These results implied that the effect of microenvironmental factors on rooting of *J. scopulorum* cuttings was achieved by influencing physiological indexes and that disparity of nutriment status in the two cutting densities was a major cause of differences in the rooting mechanism.

Keywords: dense cutting, fractal feature, *Juniperus scopulorum*, rooting effect, rooting mechanism, thin cutting

收稿日期: 2011-03-11; **出版日期**: 2011-06-30

基金资助:

林业公益性行业科研专项;国家科技攻关课题;中央财政林业科技推广示范资金

通讯作者 李玉灵 Email: liyuling0425@yahoo.com.cn

引用本文:

孟鹏, 李玉灵, 尤国春, 张硕. 微域环境因子对落基山圆柏插穗生根的影响. 植物生态学报, 2011,35(7): 779-788.

MENG Peng, LI Yu-Ling, YOU Guo-Chun, ZHANG Shuo. Effects of microenvironmental factors on rooting of *Juniperus scopulorum* cuttings. Chinese Journal of Plant Ecology, 2011,35(7): 779-788.

链接本文:

http://www.plant-ecology.com/CN/10.3724/SP.J.1258.2011.00779 或 http://www.plant-ecology.com/CN/Y2011/V35/I7/779

[1]

[2] Anthony V. Lebude, Barry Goldfarb, Frank A. Blazich, Farrell C. Wise, John Frampton.2004.Mist, substrate water potential and cutting water potential influence rooting of stem cuttings of loblolly pine.Tree Physiology,24:823-831.

[3] B.J.Phillion, J.DeWitt, W.R.Bunting (1983). Propagation of juvenile scots pine cuttings under a 24-hour photoperiod. Tree Planters′ Notes, 39-42.

[4] Baadsmand S., A.S. Andersen (1984).Transport and accumulation of indole-3-acetic acid in pea cutting under two levels of irradiance.Physiol.Plant., 61, 107-113.

[5] Bruce E. Haissig.1984.Carbohydrate accumulation and partitioning in Pinus banksiana seedlings and seedling cuttings.Physiologia Plantarum,61:13-19.

[6] Cheng GY(程广有), Tang XJ(唐晓杰), Shen XH(沈熙环).2003.Variance of Rooting Ability of Cuttings from Natural Population of Taxus cuspidata and Cutting Technique.Journal of Northeast Forestry University(东北林业大学学报,31:23-25.

[7] Dela E. Boeijink and J.T.M.Van Broekhuizen.1973.Rooting of cuttings of Pinus sylvestris under mist.New Zealand Journal of Forestry Science,4:127-132.

[8] Eliasson L., L. Brunes (1980). Light effects on root formation in aspen and willow cuttings. Physiol. Plant, 43, 13-18.

[9] Erin G. Wilkerson, Richard S.Gates.2005.Transpiration capacity in Poinsettia cuttings at different rooting stages and the development of a cutting coefficient for scheduling mist.J.AMER. SOC.HORT.SCI,130:295-301.

[10] Gay A.P., K. Loach (1977). Leaf conductance changes on leafy cuttings of Cornus and Rhododendron during propagation.J.Hort.Sci.,52:509-516.

[11] Geert-jan De Klerk, Wim van Der Krieken, Joke C.De Jong (1999). Review the formation of adventitious roots: new concepts, new possibilities.In Vitro Cell. Dev. Biol.—Plant, 35, 189-199.

[12] Gong CM(龚春梅), Ning PB(宁蓬勃), Wang GX(王根轩), Liang ZS(梁宗锁).2009.A review of adaptable variations and evolution of photosynthetic carbon assimilating pathway in C3 and C4 plants.Chinese Journal of Plant Ecology(植物生态学报,33:206-221.

[13] Grange R.I., K. Loach (1983).Environmental factors affecting water loss from leafy cuttings in different propagation systems. J. Hortic. Sci., 58, 1-7.

[14] Greenwood M. S., Marino T. M., Meier R. D., Shahan K. W..1980.The role of mist and chemical treatments in rooting loblolly and shortleaf pine cuttings.Forest Science,26:651-655.

[15] Hartmann Hudson T., Kester Dale E., Davies Fred T. Jr., Geneve Robert L. (1983). Plant propagation principles and practices. Prentice-Hall, Englewood Cliffs, N.J., USA, 302-303.

[16] Ivo Müller, Bernhard Schmid, Jacob Weiner..2000.The effect of nutrient availability on biomass allocation patterns in 27 species of herbaceous plants.Perspectives in Plant Ecology, Evolution and Systematics,3:115-127.

[17] Ji KS(季孔庶), Wang ZR(王章荣), Chen TH(陈天华), Wang MX(王明庥).1998.A study on rooting ability variation of masson pine (Pinus massoniana lamb.)cuttings. Journal of Nanjing Forestry University(南京林业大学学报,22:66-70.

[18] Jill R. Barbour, Jo?o P. F. Carvaiho.2009.Response of rocky mountain Juniper(Juniperus scopulorum) seeds to seed conditioning and germination treatments.Seed Technology,31:43-54.

[19] Liao CZ(廖成章)，Yu XH(余翔华).2001.Application of fractal theory on studies of the root structure of plant.Acta Agriculturae Universitis Jiangxiensis (江西农业大学学报,23:192-196.

[20] Marta J.Laskowski, Mary E. Williams, H. Chad Nusbaum and Ian M. Sussex (1995). Formation of lateral root meristems is a two-stage process. Development, 121:3303-3310.

[21] McMahon T A, Kronauer R E.1976.Tree structures:deducing the principle of mechanical design.J Theor Biol,59:443-466.

[22] Meng P(孟鹏), Zhang XL(张学利), Li YL(李玉灵), Song XD(宋晓东), You GC(尤国春).2008.Rooting characteristics of Pinus densiflora var.zhangwuensis cuttings in various culture media. Journal of Desert Research(中国沙漠,28:504-508.

[23] Monika Brinker.1526..Leonel van Zyl, Wenbin Liu, Deborah Craig, Ronald R. Sederoff,David H. Clapham, Sara von Arnold (2004). Microarray analyses of gene expression during adventitious root development in Pinus contorta. Plant Physiology,135:-.

[24] Niu S(牛山), Han QF(韩清芳), Jia ZK(贾志宽).2007.Effects of different treatments on rooting capacity of Medicago sativa.Acta Agriculturae Boreali-Occidentalis Sinica(西北农业学报,16:149-152.

[25] Obeso J R (2002).The costs of reproduction in plants. New Phytologist, 155, 321-348.

[26] R.I. Grange, K. Loach.1985.The effect of light on the rooting of leafy cuttings.Scientia Horticulturae,27:105-111.

[27] Sun JS(孙敬爽), Zheng HJ(郑红娟), Jia DX(贾杜霞), Sun CZ(孙长忠), Wen L(文磊).2008.Effects of different substrates,growth regulators,grades of cuttings and metabolism regulator on cutting propagation of Juniperus squamata ‘Blue Star’.Journal of Beijing Forestry University(北京林业大学学报,30:67-73.

[28] Sven E. Svenson, Fred T. Davies, Sharon A. Duray.1995.Gas exchange, water relations, and dry weight partitioning during root initiation and development of poinsettia cuttings.J.AMER.SOC.HORT.SCI,120:454-459.

[29] Svenson S.E., F. T. Davis Jr.(1989). Photosynthesis and growth during root initiation and root development in poinsettia cuttings. Int. Plant Prop. Soc. Proc., 39:385-389.

[30] Wang XP(王小平), Meng D(孟迪) (2005).The structure study on callus of cuttings branch of Taxus cuspidate. Journal of Tonghua Teachers College(通化师范学院学报), 26（6）：74-75. (in Chinese with English abstract)

[31] Yang XL(杨小林), Zhang XM(张希明), Li YL(李义玲), Xie TT(解婷婷), Wang WH(王伟华).2009.Root fractal characteristics at the hinterland of Taklimakan Desert.Arid Land Geography(干旱区地理,32:249-254.

[32] Zhu XY(朱湘渝), Wang RL(王瑞玲), Huang DS(黄东森) (1991).Research on the rooting properties of the new clones of Populus euramericana. Scientia Silvae Sinicae(林业科学), 27（2）：163-167. (in Chinese with English abstract)

没有找到本文相关文献

Copyright 2010 by 植物生态学报