园艺学报 » 2014, Vol. 41 » Issue (1) :17-25 DOI:

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低温放热法研究8 个葡萄砧木和6 个栽培品种芽的抗寒性

高 振，翟 衡，臧兴隆，朱化平，杜远鹏*

山东农业大学园艺科学与工程学院，山东泰安 271018

Using Differential Thermal Analysis to Analyze Grape Buds Cold Hardiness of 8 Rootstocks and 6 Cultivars

GAO Zhen, ZHAI Heng, ZANG Xing-long, ZHU Hua-ping, and DU Yuan-peng*

College of Horticultural Science and Engineering, Shandong Agricultural University, Tai'an, Shandong 271018, China

摘要 采用差热分析系统（Differential Thermal Analysis，DTA）对不同葡萄砧木和栽培品种进行低温放热分析（Low temperature exotherms analysis，LTE），建立各品种芽的温度—伤害度LT－I（Lethal Temperature－Injury）回归直线。回归方程斜率（lethal temperature coefficient，Qlt）代表温度每降低1 ℃芽增加的伤害程度，反应不同品种对降温的敏感性。利用隶属函数度法对LT20 ~ LT80 进行排序，发现赤霞珠芽抗寒性最差，摩尔多瓦次之，威代尔、香赛罗、110R、3309C、140Ru、北醇、1103P 和101-14 Mgt抗寒性强，Frontenac、贝达、5BB 和SO4 抗寒性最强；深休眠后的葡萄芽抗寒性增强，1 月中旬芽的抗寒性明显强于11 月末的芽。

关键词： 葡萄；芽；抗寒性；差异温度分析系统；低温放热；LT&ndash I 回归直线

Abstract： China is cold and little snow in winter as a continental monsoon climate，cold damage to grapes often occurs in northern regions. Freezing injury reduces grape output significantly，and causes an enormous waste of manpower and material resources due to the requirement for re-plantation in severe cases. The annual minimum temperature occurs in January and may reach below－15 ℃ in Shandong Province where belongs to the buried critical areas. Although commercial grape production in Shandong predominantly relies on own-rooted plants，there is an interest in grafting to rootstocks for its higher cold hardiness. Therefore，comparing grape hardiness in same period to filter out the strong cold resistance varieties for production is very important and imminent. We evaluated buds cold hardiness of 8 rootstocks and 6 cultivars in this study，which aims to screen out strong cold hardiness rootstocks and cultivars. A system for Differential Thermal Analysis（DTA）was applied for Low Temperature Exotherms（LTE）analysis of buds of several grape varieties，and the regression line of temperature-injury（LT－I）of buds was established. LTE analysis，which can be used to compare the cold hardiness of different plant varieties，has been undergoing improvement since the 1970s. Initially，the half-lethal temperature（LT50），LT10 or LT90 was applied to analyze initial low-temperature exothermic data，but these values failed to fully reflect the cold hardiness of different varieties. LT－I analysis obtained by LTE method could make an overall evaluation of grapevine cold hardiness，and lethal temperature coefficient（Qlt）is calculated as the slope of the linear portion of the LT－I regression line within 20% to 80% injury，the range of importance to plant survival and production. Qlt represents the rate of injury increase for one-degree decrease of lethal temperature（LT），could reflect the sensitivity of varieties to low temperature. The order of Qlt of buds was Chancellor < 5BB < Frontenac < Beichun < SO4 < Vidal < 101-14Mgt < Beta < 3309C < 140Ru < Moldova < Cabernet Sauvignon < 110R < 1103P；The buds 50% lethal temperature of different cultivars was in the order of Cabernet Sauvignon > Moldova > Vidal > Chancellor > 110R > 1103P > 3309C > 140Ru > Beichun > 101-14 Mgt > Frontenac > Beta > 5BB > SO4. A comprehensive evaluation on LT20 to LT80 of different varieties were analyzed by subordinate function value analysis. The result indicated that the buds of Cabernet Sauvignon had the worst cold hardiness，followed by Moldova，Vidal，Chancellor，110R，3309C，140Ru，Beichun，1103P and 101-14M，while Frontenac，Beta，5BB and SO4 had the best cold hardiness. Buds in deep dormancy had a better cold hardiness，characterized by the buds cold hardiness in January were better than in November.

Keywords： grapevine， bud， cold hardiness， differential thermal analysis， low temperature exotherms analysis，

lethal temperature-injury

基金资助:

国家现代农业产业体系建设专项资金项目（CARS-30）；长江学者和创新团队发展计划项目（IRT1155）

引用本文:

高 振, 翟 衡, 臧兴隆等 .低温放热法研究8 个葡萄砧木和6 个栽培品种芽的抗寒性[J] 园艺学报, 2014,V41(1): 17-25

GAO Zhen, DI Heng, ZANG Xing-Long etc .Using Differential Thermal Analysis to Analyze Grape Buds Cold Hardiness of 8 Rootstocks and 6 Cultivars[J] ACTA HORTICULTURAE SINICA, 2014,V41(1): 17-25

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