

表 2 天山雪莲中与胁迫相关的基因的克隆及功能研究

Table 2 *Saussurea involuerata* Kar.et Kir. in gene cloning and functions studies related tolerance

基因 Gene	来源 Source	转化方法 Transfer Approach	作用 Function	文献 Document
sikPIP_3	质膜水孔蛋白基因 plasma membrane aquaporin protein gene	农杆菌转化法将目的基因导入烟草品种 NC89 The target gene was introduced to tobacco(NC89) by Agrobacterium-mediated transfer method	与水孔蛋白相关抗寒性强 Is related to aquaporin, strong cold resistance	(焦天奇等, 2012) (Jiao et al., 2012)
LEA14	叶片 Leaves	农杆菌转化法导入烟草 introduced to tobacco by Agrobacterium-mediated transfer method	抗冻和耐盐 Antifreezing and salt-tolerant	(张林华等, 2013) (Zhang et al., 2013)
PsaH	叶片 Leaves	农杆菌转化法导入烟草 introduced to tobacco by Agrobacterium-mediated transfer method	与光合作用相关 Related to Photosynthesis	(张林华等, 2013) (Zhang et al., 2013)
PsbO	叶绿体 Chloroplast	农杆菌转化法导入烟草 introduced to tobacco by Agrobacterium-mediated transfer method	与光合作用相关基因 Related to Photosynthesis	(彭晓明等, 2008) (Peng et al., 2008)
SikGLP	类萌发素蛋白基因 GLP gene	Real time-PCR 检测,SikGLP 基因受低温、甲基紫精和 PEG 诱导表达 Real time-PCR Test, SikGLP gene can be induced expression at low temperature,methyl viologen and PEG	可能在胁迫初期对提高植物防御起作用 React to improving the ability of defending under initial intimidation	(刘超等, 2013) (Liu et al., 2013)
Trxh 和 GLP	硫氧还蛋白和类萌发素蛋白基因 thioredoxin gene and GLP gene	生物信息学分析和 Real time-PCR 分析, 通过农杆菌介导叶盘转化烟草 Bioinformatics Analysis and Real time-PCR Test, Agrobacterium mediated leaf-disk tobacco transformation	抗低温、抗干旱, 具有较强的抗逆性 resistance to low temperature, resistance to drought, high adverse resistance	(刘超, 2010) (Liu, 2010)
BCsp	根边缘细胞特异蛋白	以 cDNA 文库单克隆为模板,通过 PCR 克隆得到 BCsp,转化天山雪莲愈伤组织获得转基因雪莲苗 The BCsp gene was cloned from cDNA library by PCR,the transgenic Saussureainvoluerata Kar.etKir. was obtained	能抑制或促进根际周围微生物的生长,中和根际周围一些有毒物质,调节根部环境,在抵抗环境胁迫起防御保护作用 Inhibit or promote growth of Rhizosphere Microbes, neutralize toxic substances around rhizosphere,regulate roots environment, defensive guard function when resisting the environment stress	(阴志刚和祝建波, 2011) (Yin and Zhu, 2011)
SikSD-82	未知蛋白基因,主要定位于细胞核 an Unknown Protein-encoding Gene, primarily located in the nucleus	农杆菌转化法导入烟草 introduced to tobacco by Agrobacterium-mediated transfer method	较强的耐铝性 Strong Aluminum tolerance	(王海霞等, 2014) (Wang et al., 2014)
DAD1	内质网内膜 The endoplasmic reticulum membrane	农杆菌转化法导入烟草 introduced to tobacco by Agrobacterium-mediated transfer method	提高抗旱性和抗盐性 Improve the drought resistance and salt resistance	(孙建富等, 2011) (Sun et al., 2011)
几丁质酶基 (XCH)	叶片 Leaves	RT-PCR 技术 RT-PCR technique	可能具有抗冻活性 Maybe has antifreeze activity	(李璐等, 2005) (Li et al., 2005)
siCOR	冷调节蛋白基因	农杆菌介导法导入烟草,再用 RT-PCR 技术对转	具有较强的抗寒性	(郭新勇等, 2012)

	CORP gene	基因烟草进行鉴定 introduced to tobacco by Agrobacterium-mediated transfer method,use RT-PCR for specific identification of the transgenic tobacco	Strong cold resistance	(Guo et al., 2012)
SikMT2	叶片 Leaves	以 cDNA 文库单克隆为模板,进行 RT-PCR,产物 转入大肠杆菌 DH5 α The gene was cloned from cDNA library by RT-PCR,then transformed into escherichia coli DH5 α	参与了许多生理过程,解除重金属离 子的毒害、调节金属离子特定运输 take part in many physiological processes, rescinding toxicity of Heavy Metal Ions, regulating the specific transportation of mental ions	(陈泉等, 2015) (Chen et al., 2015)
sikPIP2; 7	叶片 Leaves	农杆菌介导法 agrobacterium-mediated method	提高雪莲低温抗胁迫能力 Improve Saussureainvoluerata Kar.etKir. Tolerance to Abiotic Stresses at low temperature	(刘逸冷等, 2015) (Liu et al., 2015)