

## Determination of Suitable Pollinizers for Almond (*Prunus dulcis*) Cultivars and Genotypes “Shahrood 12”, “Shokoufeh” and “K-4-10” Using Specific Amplification of S-alleles

Ershadi<sup>1\*</sup>, A., Kalhori<sup>2</sup>, M., Imani<sup>3</sup>, A., Valizadeh<sup>2</sup>, B. and Dashti<sup>1</sup>, F.

### Abstract

In this study, S-alleles of 16 almond cultivars and genotypes were determined using allele-specific and consensus primers. Likewise, the flowering coincidence among these cultivars and “Shahrood 12”, “Shokoufeh” and “K-4-10” were determined. Twelve different S-alleles were distinguished in studied cultivars. Using allele-specific primers five S-alleles S<sub>1</sub>, S<sub>2</sub>, S<sub>7</sub>, S<sub>8</sub> and S<sub>9</sub>, and compatibility allele, S<sub>f</sub>, were amplified. In five cultivars both S-alleles, in seven cultivars only one S-allele and in four cultivars no S-allele were amplified. Using second intron consensus primers 31 out of 32 S-alleles of studied cultivars were identified. In 15 cultivars both S-alleles and in “Genotype 7” only one S-allele (S<sub>5</sub>) were distinguished. S<sub>1</sub> and S<sub>3</sub> were the most frequent S-alleles and found in eight and five cultivars, respectively. Beginning of flowering, full bloom and end of flowering of cultivars and genotypes were recorded and their flowering coincidence with “Shahrood 12”, “Shokoufeh” and “K-4-10” were determined. Considering S-allele genotype and flowering coincidence of cultivars, suitable pollinizers were determined. For “K-4-10” genotypes “K10-11”, “K14-12”, “K-16-30”, “K16-25”, “K12-4” and cultivars “Shahrood 12” and “Marcona”; for “Shahrood 12” genotype “K4-10” and “Marcona”; and for “Shokoufeh” cultivars “Supernova”, “Sahand”, “Touno”, and “Genotype 8”, “Genotype 7”, and “K16-25” are recommended as suitable pollinizers.

**Keywords:** pollination, self-incompatibility, PCR, stone fruit

### References

- Anonymous. (2007). Plant year production. FAO. 530 pp.
- Asai, W.K., Micke, W.C., Kester, D.E. and Rough, D. (1996). “The evaluation and selection of current varieties of almonds in California”. Proc. Natl. Acad. Sci. USA. 93: 12059-12065.
- Boskovic, R., Tobutt, K.R., Ortega, E., Sutherland, B.G. and Godini, A. (2007). “Self-(in)compatibility of the almonds *P.dulcis* and *P.webbii*: detection and cloning of ‘wild-type Sf’ and new self-compatibility alleles encoding inactive S-RNases”. Mol Genet Genomics. 278: 665-676
- Channuntapipat, C., Withensohn, M., Ramesh, S.A., Batlle, I., Arus, P., Sedgley, M. and Collins, G. (2003). “Identification of incompatibility genotypes in almond (*Prunus dulcis* Mill.) using specific primers based on the introns of the S-alleles”. Plant Breeding. 122: 164-168.
- De Cuyper, B., Sonneveld, T., and Tobutt, K.R. (2005). Determining self-incompatibility genotypes in Belgian wild cherries. Mol. Ecol. 14: 945-949.
- Doyle, J.J. and Doyle, J.L. (1987). “Rapid DNA isolation procedure for small quantities of fresh leaf tissue”. Phytochemical Bulletin. 19: 11-15.
- Ershadi, A. 2002. “Study the pollination, fruit set and evaluation of Iranian apple cultivars using molecular markers”. Ph.D. thesis. Tehran University. 122 p.
- Gulcan, R. (1985). “Descriptors list for Almond (*Prunus dulcis*)”. International Board for Plant Genetic Resources. P.33.
- Jansens, G.A., Godris, I.J. and Broekaert, W.F. (1995). A molecular method for S-alleles identification in apple based on alleles specific PCR. Theor. Appl. Genet. 91: 691-698.
- Lopez, M., Vargas, F.J. and Batlle, I. (2006). “Self-(in)compatibility almond genotypes: A review”. Euphytica. 150: 1-16.
- Ortega, E., Sutherland, B.G., Dicenta, F., Boskovic, R. and Tobutt, K.R. (2005). “Determination of incompatibility genotypes in almond using first and second intron consensus primers: detection of new S alleles and correction of reported S genotypes”. Plant Breeding. 124: 188-196.
- Sanchez-Perez, R., Dicenta, F. and Martinez-Gomez, P. (2004). “Identification of S-alleles in almond using multiplex PCR”. Euphytica. 138: 263-269.

1. Assistant Professors, Horticulture Department, Faculty of Agriculture, Bu-Ali Sina University, Hamedan.

2. Former M.Sc. students, Horticulture Department, Faculty of Agriculture, Bu-Ali Sina University, Hamedan

3. Assistant Professor, Horticulture Research Department, Seed and Plant Improvement Research Institute, Karaj

\*: Corresponding author

- ocias i Company, R., Gomez Aparisi, J. and Alonso S.J.M. (2005). "Year and enclosure effects on fruit set in an autogamous almond". *Scientia Horticulturae*. 104: 369-377.
- Sutherland, B.G., Robbins, T.P. and Tobutt, K.R. (2004). "Primers amplifying a range of Prunus S-alleles". *Plant Breeding*. 123: 582-584.
- Tamura, M., Ushijima, K., Sassa, H., Hirano, H., Tao, R., Gradziel, T.M. and Dandekar, A.M. (2000). "Identification of self-incompatibility genotypes of almond by allele-specific PCR analysis. *Theor. Appl. Genet.* 101: 344-349.

To look at the figures and tables, please refer to the Persian text (pages: 7-15= 7-15).

Archive of SID