

Plant Gene Register

Sequence of the Phytoene Desaturase Locus of Tomato¹

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PDS catalyzes the second dedicated step in carotenoid biosynthesis in plants (Bartley et al., 1994). Recently, Giuliano et al. (1993) detailed the regulation and chromosomal localization of the *PDS* gene. Expression of the *PDS* mRNA is induced in specific organs (flower, fruit) as well as in response to environmental signals, such as photooxidation (Giuliano et al., 1993; B. Aracri, unpublished data). Therefore, it is of interest to locate the *cis*-regulatory sequences that mediate this pattern of expression. Here we report the complete sequence of cDNA and genomic clones of the *PDS* gene from tomato (*Lycopersicon esculentum* cv Ailsa Craig) (Table I). Our *PDS* cDNA sequence is co-linear to the one reported previously by others (Pecker et al., 1992), with the exception that the first intron (positions 1107–1338 in our submitted sequence) is present in the cDNA reported by Pecker et al. (1992) and spliced in the cDNA reported here. Unpublished data (B. Aracri) indicate that mRNAs in which the first intron is spliced and unspliced co-exist in poly(A⁺) RNA from ripening tomato fruits.

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The EMBL/GenBank accession number for the sequence reported in this article is X78271. An independent sequence of the tomato *PDS* locus (cv UC82-B) has been obtained by others (EMBL/GenBank accession number X71023).

LITERATURE CITED

Bartley GE, Giuliano G, Scolnik PA (1994) Molecular biology of carotenoid biosynthesis in plants. *Annu Rev Plant Physiol Plant Mol Biol* (in press)

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Abbreviation: PDS, phytoene desaturase.

Table I. Characteristics of the tomato *PDS* locus

Organism:

Tomato (*Lycopersicon esculentum* cv Ailsa Craig).

Techniques:

Three genomic clones from a genomic library in λ EMBL3 and two cDNA clones from a ripening fruit library in λ gt11 (Clontech, Palo Alto, CA) were isolated using a soybean *PDS* probe (Bartley et al., 1991) at low stringency. Complete double-stranded sequence was obtained by dideoxy sequencing of subclones.

Features of the Sequence:

Total length: 8943. Regions represented on cDNA; exon 1, 794–1106; exon 2, 1339–1567; exon 3, 1657–1789; exon 4, 2584–2672; exon 5, 3217–3274; exon 6, 3512–3667; exon 7, 3892–4040; exon 8, 4203–4322; exon 9, 5021–5234; exon 10, 5326–5428; exon 11, 5785–5832; exon 12, 6367–6412; exon 13, 7034–7221; exon 14, 7380–7542; exon 15, 8138–8449; start codon, 1343–1345; stop codon, 8195–8197.

Characteristics of the Deduced Protein:

583-amino acid polypeptide with a predicted mass of 65 kD and a calculated isoelectric point of 6.4. PDS is posttranslationally imported in plastids (Bartley et al., 1991).

Regulation:

mRNA is induced in flowers (anthers, petals), ripening fruits, and in seedlings subjected to photooxidative stress (Giuliano et al., 1993).

Gene Copy Number and Chromosomal Localization:

Single copy gene located on chromosome 3 (Giuliano et al., 1993).

Bartley GE, Viitanen PV, Pecker I, Chamovitz D, Hirschberg J, Scolnik PA (1991) Molecular cloning and expression in photosynthetic bacteria of a soybean cDNA coding for phytoene desaturase, an enzyme of the carotenoid biosynthesis pathway. *Proc Natl Acad Sci USA* **88**: 6532–6536

Giuliano G, Bartley GE, Scolnik PA (1993) Regulation of carotenoid biosynthesis during tomato development. *Plant Cell* **5**: 379–387

Pecker I, Chamovitz D, Linden H, Sandmann G, Hirschberg J (1992) A single polypeptide catalyzing the conversion of phytoene to ζ -carotene is transcriptionally regulated during tomato fruit ripening. *Proc Natl Acad Sci USA* **89**: 4962–4966