Abstract
Acetyl-CoA carboxylase (ACCase) catalyses the first committed step in fatty acid biosynthesis [1]. There are two isoforms known in higher plants. ACCase I is a multifunctional homodimer capable of carboxylating acetyl-CoA or propionyl-CoA [i.e. it has a propionyl-CoA carboxylase (PCCase) activity]. This predominantly cytosolic isoform provides malonyl-CoA for, amongst other pathways, the elongation of fatty acids and synthesis of waxes [2,3]. ACCase II is a plastidial heteromer, consisting of four non-identical monomers, which carries out the acetyl-CoA carboxylation reaction only and in dicotyledonous plants is responsible for de novo fatty acid biosynthesis. Brassica napus L. is the only species reported to date that also has an isozyme of ACCase I present in the plastid as well as ACCase II [4,5]. We have now determined the distribution of the PCCase activity of ACCase I in developing embryos of wild type B. napus c.v. Topas.

Introduction
Acetyl-CoA carboxylase (ACCase) catalyses the first committed step in fatty acid biosynthesis [1]. There are two isoforms known in higher plants. ACCase I is a multifunctional homodimer capable of carboxylating acetyl-CoA or propionyl-CoA [i.e. it has a propionyl-CoA carboxylase (PCCase) activity]. This predominantly cytosolic isoform provides malonyl-CoA for, amongst other pathways, the elongation of fatty acids and synthesis of waxes [2,3]. ACCase II is a plastidial heteromer, consisting of four non-identical monomers, which carries out the acetyl-CoA carboxylation reaction only and in dicotyledonous plants is responsible for de novo fatty acid biosynthesis. Brassica napus L. is the only species reported to date that also has an isozyme of ACCase I present in the plastid as well as ACCase II [4,5]. We have now determined the distribution of the PCCase activity of ACCase I in developing embryos of wild type B. napus c.v. Topas.

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activity increased approx. 2-fold from the mid-to late-cotyledon stages of development (3.5–7.0 \text{ nmol \cdot min}^{-1 \cdot \text{embryo}^{-1}}). In desiccating seed, total embryo PCCase activity fell to approx. 4.0 \text{ nmol \cdot min}^{-1 \cdot \text{embryo}^{-1}}. On average, across all developmental stages analysed, 8.7 \pm 2.4\% of the PCCase activity measured was plastidial, indicating that the majority of ACCase I is cytosolic.

Total PCCase activity was determined in late-cotyledon-stage embryos of \textit{B. napus} c.v. Westar DH and the two transgenic lines, C4S6-16 and C7S1-2 (Table 1). Total PCCase in late-cotyledon-stage embryos from transgenic plants was less than that in the wild-type embryos whatever the basis of expression.

### Table 1

**Total PCCase activity in late-cotyledon-stage embryos of \textit{B. napus} c.v. Westar DH, C4S6-16 and C7S1-2**

Results are displayed as activity per embryo, per mg of embryo and per mg of protein, and are the means\pm S.E.M. of three independent preparations. Figures in parentheses are the activity in the transgenic lines expressed as a percentage of the respective wild-type value.

<table>
<thead>
<tr>
<th>Line</th>
<th>Activity per embryo</th>
<th>Activity per mg of embryo</th>
<th>Activity per mg of protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Westar DH</td>
<td>1.3\pm 0.2</td>
<td>0.3\pm 0.1</td>
<td>9.0\pm 1.4</td>
</tr>
<tr>
<td>C4S6-16</td>
<td>0.6\pm 0.1 (49%)</td>
<td>0.1\pm 0.02 (40%)</td>
<td>5.6\pm 0.9 (63%)</td>
</tr>
<tr>
<td>C7S1-2</td>
<td>0.8\pm 0.2 (64%)</td>
<td>0.2\pm 0.03 (58%)</td>
<td>5.7\pm 1.0 (64%)</td>
</tr>
</tbody>
</table>

As sucrose is the predominant soluble sugar in the developing embryo, the increase in the transgenic lines may affect the osmotic status of the embryo and contribute to the wrinkled phenotype of the mature seed. In \textit{Pisum sativum}, mutations that reduce starch synthesis lead to an increase in soluble sugars and a wrinkled phenotype [14].

### Figure 1

**Sucrose content (\mu mol/embryo) of mature (a) and fructose content (\mu mol/embryo) of late-cotyledon (b) embryos of \textit{B. napus} Westar DH, C4S6-16 and C7S1-2**

Each data point is the mean\pm S.E.M. of six independent preparations.
References


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