RELATION OF CAROTINOID PIGMENTS TO SEXUAL REPRODUCTION IN PLANTS

When certain typical plants, such as Cosmos (Cosmos bipinnatus), Salvia (Salvia splendens) and soybeans (Soja max) are exposed to a short photoperiod (7- to 8-hour day) and a relatively long one (14- to 15-hour day) they exhibit conspicuous differences in rate of growth, time of sexual reproduction and greenness of foliage. The short-day soybean plants, for instance, are lighter in color early in their development, but soon match with the long-day plants and, during the period of reproduction, become intensely green. Since the color of the foliage is due primarily to chloroplast pigments, a survey has been made during the past 3 years of the concentration of chlorophyll (α and β), carotin and xanthophyll in various parts, but mainly leaves, of these plants.

The results of a large number of determinations show that in the leaves of both short- and long-day group of Cosmos, Salvia and Soja approximately the same concentration of chlorophyll is present, but plants that have changed from vegetative development to the reproductive state have an increased carotin and xanthophyll content, as the following records show:

<table>
<thead>
<tr>
<th>Milligrams in 10-gram sample of leaves</th>
<th>Carotin and xanthophyll in leaves of soybeans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorophyll (α and β)</td>
<td>Milligrams</td>
</tr>
<tr>
<td>Cosmos</td>
<td>Vegetative (long day)</td>
</tr>
<tr>
<td></td>
<td>Reproductive (short day)</td>
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<tr>
<td>Salvia</td>
<td>Vegetative (long day)</td>
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<tr>
<td></td>
<td>Reproductive (short day)</td>
</tr>
<tr>
<td>Soja</td>
<td>Vegetative (long day)</td>
</tr>
<tr>
<td></td>
<td>Reproductive (short day)</td>
</tr>
</tbody>
</table>

Moreover, the concentration of the two carotenoids seems to reach a maximum at the time of flowering and then decreases. This is illustrated by reproductive (short-day) soybean plants, var. Biloxi.

The exact meaning of this phenomenon and its bearing on the metabolism of plants is unknown at present. There is, however, a suggestive analogy in animals. The carotenoids are present in conspicuous quantities in various organs and secretions associated directly or indirectly with reproduction (corpus luteum, egg yolks, milk, etc.). Furthermore, it has been observed that these yellow pigments move from certain parts of the body to the reproductive organs, as in the case of some breeds of domestic fowl, dairy cattle, etc.

The now well-established relation of carotin, and possibly xanthophyll, to vitamin A, may be but one, though important, phase of the metabolic function of the carotenoids. Are they, especially carotin, merely "provitamins" for the formation of vitamin A or have they some other important activity in sexual reproduction of both plants and animals? The demonstration which seems to indicate that predominantly more yellow pigments are present in female than male plants of dioecious species (Rhamnus) or races (Mucor) is interesting evidence having a bearing on the possible physiological role of these substances.

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