
FLOWER-PROMOTING ACTIVITY OF PEA SEED DIFFUSATES 1,2

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It has been established that certain varieties of peas can be vernalized (3). Cold treatment of the germinating seeds of such pea varieties induces a number of changes in the subsequent growth of the seedlings at normal temperature. Of these changes one of the most interesting is an acceleration of flowering. The physiological mechanisms by which such cold treatment affects the seed have, however, remained obscure. In this paper it will be shown that an extract may be prepared from pea seeds which may be used to replace low temperatures in the treatment of other seeds. This extract, like low temperatures, is effective in reducing the number of nodes to the first flower in non-cold treated but vernalizable pea varieties.

Pea diffusates of seeds were prepared by a modification of the method of Bonner, Haagen-Smit and Went (1): one end of a glass cylinder 5 cm long and 7.5 cm in diameter was wrapped in gauze and put into a 600-ml beaker. The beaker and the cylinder, immersed in glass distilled water, were covered with paper toweling and sterilized. Dry seeds were sterilized by immersion for 10 min in a 0.05 % solution of sodium hypochlorite.

They were then washed four to six times with sterile distilled water. About 80 sterile seeds were next put on the gauze and sufficient water put in the beaker so that when the seeds had become completely turgid they were partially immersed in the remaining liquid. The beakers were covered with paper toweling. The beakers containing the seeds were then subjected to the following conditions: 1) 4°C in dark for 25 days; and 2) 22°C in dark for 5 days. At the end of these treatment periods, the germinating seeds were removed and planted. Most of these plants did not survive; those that did, were damaged and could not be examined for flowering. The liquid (diffusate) which remained in the beakers was used for soaking fresh dry seed. The period of soaking in the diffusate was approximately 10 hours at 20 to 23°C. The plants after soaking were grown under conditions of a 24-hour cycle made up of eight hours natural light at 20°C, eight of artificial light at 17°C, and eight hours dark at 17°C.


<table>
<thead>
<tr>
<th>Table I</th>
<th>EFFECT OF PEA DIFFUSATES ON THE SUBSEQUENT FLOWERING OF PEA</th>
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<tbody>
<tr>
<td>TREATMENT</td>
<td>MEAN NODE TO FIRST FLOWER</td>
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<tr>
<td>Control (H₂O)</td>
<td>20.2 ± 0.54</td>
</tr>
<tr>
<td>4°C Diffusate</td>
<td>18.4 ± 0.828*</td>
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<tr>
<td>22°C Diffusate</td>
<td>17.83 ± 1.34*</td>
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</tbody>
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Diffusates made at low (4°C) or high (23°C) temperatures. Seeds soaked for 10 hrs in these diffusates or in distilled H₂O as the control and then grown at high temperature (20°C day, 17°C night).

* Differences from control significant at the 1% level.

Table I shows the data of one of a series of experiments in which dry seeds were soaked either in the diffusate or in water. It can be seen that both diffusates, i.e., from 4°C (vernalized) and 23°C (unvernalized) seed, are effective in reducing the number of nodes to the first flower.

The data show that the diffusate contains an active principle capable of replacing cold treatment for this variety of pea which is normally quantitatively vernalizable. Diffusates were found to be inactive in the Avena section growth test, and it is therefore unlikely that the active principle is an auxin. It may however be a flowering hormone or possibly a precursor of a flowering hormone.

Earlier work, summarized by Fries (2) has shown that pea diffusates contain a substance or substances which causes appreciable growth of excised leaves. Removal of the cotyledons from otherwise normal etiolated pea seedlings resulted in a marked decrease in the subsequent growth of the leaves.

The present studies indicate the presence of still another factor in pea diffusates, namely a factor active in the promotion of flowering.

LITERATURE CITED
3. Highkin, H. R. In manuscript.