Photoperiodic Control of Flowering in *Lemna perpusilla*

THE factors controlling flowering in the Lemnaceae are largely unknown. Kandeler[1] showed that certain strains of *Lemna gibba* would flower under long days, and that 'stale' media appeared to hasten flowering under such conditions. Landolt[2] reported that a strain of *Lemna perpusilla* (designated by him as 6746) flowered in old, crowded cultures under all day-lengths tested. I have recently confirmed Landolt's observations, but with the significant addition that, even in fresh medium, strain 6746 flowers rapidly under short days, and appears to respond as a typical short-day plant. These experiments, like those cited, were done under aseptic conditions.

A typical experiment showing the effects of day-length was done with cultures grown in 250-ml. Erlenmeyer flasks each containing 150 ml. of Hutner's[3] medium, *p*H 6·5, with 1 per cent sucrose. Each flask was inoculated with one 3-frond 'colony' of 6746 taken from week-old stock cultures grown under continuous light. All experimental cultures were then grown at 23–26° C. under 550–600 ft.-candles of white fluorescent light. The results are shown in Table 1.

Table 1

Photoperiod	No. of cultures	No. of cultures flowering on day 8	9	14	20
8 hr.	4	0	4	4	4
16 hr.	4	0	0	0	0

The flower-promoting effects of short days (long nights) are abolished by red-light interruptions of the dark period, as shown by the following experiment. Cultures were started as before, but using 50-ml. flasks containing 25 ml. of medium. For four successive 24-hr. cycles, all experimental cultures received 10 hr. of white fluorescent light (150–200 ft.-candles) and 14 hr. of darkness, at 26–27° C. Red-light interruptions, if any, were given in each cycle after 7 hr. of darkness had elapsed, with a red fluorescent tube as the light-source. On the fifth day all cultures were placed under the 16-hr. photoperiod conditions used previously, and observed until flowering occurred. The results are in Table 2. Cultures not flowering were dissected on day 9 and no flower primordia[1] were found, although they are easily detected after 6 days under short-day conditions.

Table 2

Red-light interruptions (min.)	(k.ergs/cm.²)	No. of cultures	No. of cultures flowering on day 8	9
None	None	4	0	4
1	about 15	4	0	0
10	about 150	4	0	0

Over a period of several months, I have been unable to detect any stage of flower development in vigorously growing cultures maintained on fresh medium by frequent transfer, except under short days. Experiments to be reported elsewhere indicate that the critical day-length for this strain lies between 13 and 15 hr. Flowering in *L. perpusilla* 6746 may thus be controlled by two at least initially unrelated factors: photoperiodism and the 'stale' medium effect. This should prove valuable for further work on the basic mechanisms controlling flowering. It is also interesting to note that this plant together with Kandeler's *L. gibba* provide an instance of both short- and long-day flowering responses occurring in the same genus.

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[2] Landolt, E., *Ber. schweiz. bot. Ges.*, **67**, 271 (1957).
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Nature of Some Decay-retardant Extractive Components in Incense Cedar Heartwood (*Libocedrus decurrens* Torrey)

THE marked durability of certain heartwoods in service is attributed to the presence of extractive components which are inhibitory to wood-destroying fungi. Among some of the more durable heartwoods are those of such native species as bald cypress (*Taxodium distichum* (L.) Rich.), redwood (*Sequoia sempervirens*)[1], western red cedar (*Thuja plicata* Donn)[2,3], osage-orange (*Maclura pomifera* (Raf.) Schneid.)[4], and black locust (*Robinia pseudoacacia* L.). There is an excellent review of the types of chemical components in heartwood which may exhibit fungicidal action by Erdtman[5].

During the past few years, the University of California Forest Products Laboratory has been investigating the extractive components present in incense cedar heartwood (*Libocedrus decurrens* Torr.)[6,7]. The heartwood of this species is prized for fence posts, rails and other uses requiring resistance to decay. This reputation for durability has not hitherto occasioned any chemical investigations as to the nature of its heartwood extractive components. In the present investigation, the decay-retarding properties with respect to various wood-destroying fungi were determined, in co-operation with the U.S. Forest Products Laboratory, for the purified compounds isolated thus far from the heartwood.

Six compounds were isolated and identified among the products present in the steam-volatile oil from incense cedar heartwood. These compounds included the following (figures represent percentage present on dry wood bases): (1), λ-thujaplicin (0·07); (2), carvacrol (0·77); (3), *p*-methoxythymol (1·00); (4), *p*-methoxycarvacrol (0·04); (5), hydrothymoquinone (0·02); and (6), thymoquinone (0·10). A cryptophenolic compound, libocedrol (1·00), was identified among the non-volatile extractive components.

The decay-retarding characteristics of each of these compounds were determined, except for minor deviations, by the standard soil-block bioassay procedure (Tentative Method of Testing Wood Preservatives by Laboratory Soil-Block Cultures. A.S.T.M. Designation: *D*1413–56*T*, 1956), which involves appraisal of the resistance of blocks containing various quantities of chemical to decay by pure cultures of selected wood-destroying fungi. The testing was done in wood rather than in an artificial medium in order to bring into the result any action of a compound detrimental to wood-decomposing