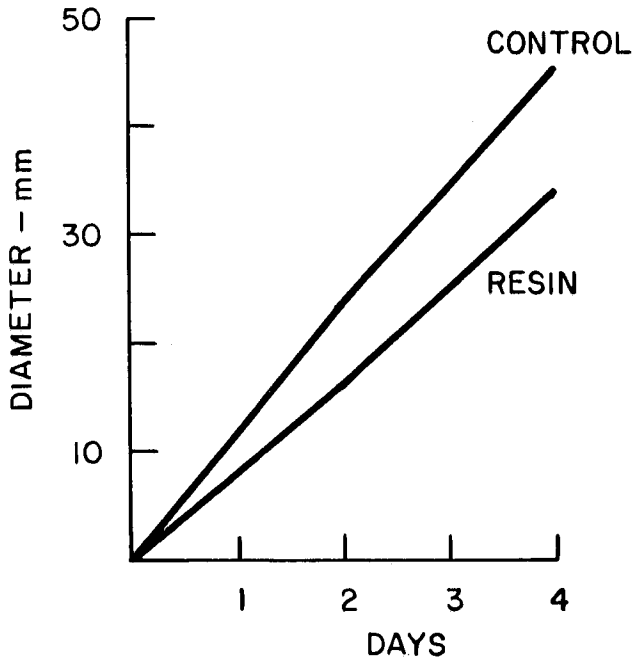

Figure 4. Linear growth of *E. clavigerum* on a medium containing an oily wood extract. The values given are the average for three cultures.

however, the advancing hyphae of both species grew in the medium just beneath the surface film of oil (Figs. 1 and 2) and avoided the embedded zones of oil. About 5-10 mm behind the advancing hyphal front, hyphae grew up through the groups of small holes that broke the otherwise continuous oil layer on the surface. Further behind the hyphal front, hyphae emerging from the small holes gradually developed a dense aerial mat and spread into the oil-containing areas within the medium. Linear growth of *C. montia* is shown in Fig. 3 and of *E. clavigerum* in Fig. 4.

Even though the advancing margin of hyphal growth was in areas of the agar with no apparent oil content, there was an effect from the oil; growth rates were lessened. The advancing hyphae were prevented from growing on the agar surface by the surface film of oil and avoided the oil-rich zones within the medium. However, later growth into the oil-containing areas shows that these oily extractives are not a permanent barrier to hyphal growth. Our observation that oil-rich areas in the medium are colonized after the fungi are in direct contact with the atmosphere suggests that an increase in oxygen is required if hyphae are to grow in contact with the resinous substances produced by lodgepole pine in response to wounding. The growth inhibition, the tendency for hyphae to avoid resins, and the possibly increased requirement for oxygen before growth through oil-containing areas may explain why fungi can be isolated from resin-soaked tree tissues but grow slowly through such tissue.—D.M. Shrimpton and H.S. Whitney, Pacific Forest Research Centre, Victoria, B.C.

A Survey of Ontario Forestry Nurseries for the Presence of *Cylindrocladium floridanum*.—*Cylindrocladium floridanum* Sob. and Seymour, a cause of root rot in forestry nurseries, was found for the first time in Ontario in 1974 (Myren et al., Bi-mon Res. Notes 31:34, 1975). The fungus was isolated from the roots of black spruce (*Picea mariana* [Mill.] B.S.P.) seedlings grown at the Provincial Forest Nursery at Midhurst, Ont. The Forest Insect and Disease Survey Unit of the Great Lakes Forest Research Centre subsequently conducted surveys in a number of forest nurseries in Ontario to determine the distribution of this pathogen.

Soil samples were taken from four nurseries in 1975 and from six in 1976. In the larger nurseries, nine soil samples were collected from each of 15 randomly selected compartments and from up to 14 additional compartments if seedling mortality was present. At small nurseries, all compartments were sampled. The soil was tested for the presence of *C. floridanum* by means of the spot plate technique (Thies and Patton, Phytopathology 56:1116-1117, 1966). The results of the survey are presented in Table 1.

TABLE 1
Compartments yielding *Cylindrocladium floridanum* from soil samples collected at 10 forestry nurseries in Ontario

Nursery location	Compartments sampled (no.)	Compartments yielding *C. floridanum* (%)
Chapleau	6	0
Dryden	17	0
Gogama	5	0
Kemptville	23	13
Longlac[1]	9	0
Midhurst	29	14
Orono	28	4
St. Williams	25	20
Swastika	17	0
Thunder Bay	18	0

[1]Nursery owned by Kimberly-Clark of Canada Ltd.

Cylindrocladium floridanum was found in the four nurseries of southern Ontario — at Kemptville, Midhurst, Orono, and St. Williams — but was not found in any of the six northern nurseries. Although the survey failed to reveal *C. floridanum* in the northern nurseries, it was subsequently isolated from roots of declining black spruce from nurseries at Thunder Bay and Kirkwood (east of Sault Ste. Marie). The latter northern nursery was not included in the general survey. Also, after the survey, *C. floridanum* was found in the Provincial Forest Nursery at Kemptville in a compartment in which it had not been found in the original study. In addition, it was isolated from roots of eastern white pine (*Pinus strobus* L.) and eastern white cedar (*Thuja occidentalis* L.) from the Provincial Forest Nursery at St. Williams.

Thus far, damage caused by this fungus in Ontario forestry nurseries has been fairly light. Results of the special survey indicate that *C. floridanum* is present in southern Ontario nurseries, albeit at fairly low population levels. Failure to detect the fungus in soil samples from the northern nurseries indicated either its absence or a population level too low to detect with the survey technique used.—D.T. Myren, H.L. Gross, and E.B. Dorworth, Great Lakes Forest Research Centre, Sault Ste. Marie, Ont.

SILVICULTURE

Effect of Seed Weight and Germination Rate on the Initial Growth of Japanese Larch.—Recent interest in the potential of *Larix* species for high yield, short rotation crops has led to trials of various populations of Japanese larch, *Larix leptolepis* (Sieb. and Zucc.) Gordon. In 1978, a field test of seed from 88 sources was initiated at Petawawa National Forestry Institute in cooperation with the Ontario Ministry of Natural Resources. A complementary controlled-environment test revealed wide variation in initial size of seedlings. This report examines the relationship of seed weight and germination rate (time required for germination) to seedling size in the first few weeks of growth.

Twelve seeds of each of the 88 seedlots under investigation were weighed individually, stratified for 32 days at 2°C, and sown in BC/CFS Styroblock 2 containers (one seed per cavity) filled with a 3:1 mixture of peat and vermiculite. The Styroblocks were placed in a greenhouse at 18-25°C and soaked three times daily with Ingestad's nutrient solution (Ingestad, pages 265-269 *in* Proc. XIV IUFRO Congress, München III, 1967). Supplementary fluorescent lighting provided a 16-h photoperiod.

Germination began on the fourth day and was recorded daily for 6 wk. The rate of germination was expressed as days from sowing, and was subsequently used to determine individual seedling age. The population was sampled in two ways: for one sample, a single seedling

TABLE 1
Correlation matrix (86 degrees of freedom) for seedlings 35 days after sowing*

	Seed weight	Germination rate	Seedling weight
Seed weight	1.00	0.17 NS	0.36**
Germination rate	—	1.00	0.81**
Seedling weight	—	—	1.00

* Seedlings in this sample ranged in age from 10 to 31 days from germination.
**Significant at p = 0.01.

TABLE 2
Correlation matrix (86 degree of freedom) for 23-day-old seedlings*

	Seed weight	Germination rate	Seedling weight
Seed weight	1.00	-0.16 NS	0.43**
Germination rate	—	1.00	-0.43**
Seedling weight	—	—	1.00

* Seedlings in this sample germinated from 6 to 16 days after sowing.
**Significant at p = 0.01.

was selected at random from each seedlot 35 days after sowing; another sample consisted of one seedling from each seedlot lifted at random 23 days after it had germinated, thus forming a sample population of uniform age. Seedlings in these two samples were oven-dried (95°C) and weighed individually. The remaining seedlings were planted in a nursery for later study (see last paragraph).

Seed weights among the two samples ranged from 3.7 to 10.9 mg with a population mean of 5.7 mg. Despite this wide range, the correlation coefficient between seed weight and dry weight of seedlings 35 days after sowing was only moderate (r = 0.36, significant at p = 0.01, Table 1).This relationship includes some variation resulting from different ages of seedlings; however, when the influence of age was removed, as in the correlation of seed weight with weight of 23-day-old seedlings (Table 2), the correlation coefficient was only slightly improved (from r = 0.36 to r = 0.43).

A much stronger correlation (r = 0.81) was found between germination rate and dry weight of seedlings 35 days after sowing. The multiple correlation coefficient between seedling weight and germination rate and seed weight combined was 0.84.

The results agree with those of Ackerman and Gorman (Pulp Pap. Mag. Can. 70:167-169, 1969), who found that only a small part of the initial variation in seedling size of white spruce, *Picea glauca* (Moench) Voss var. *albertiana* (S. Brown) Sarg., and lodgepole pine, *Pinus contorta* Dougl. var. *latifolia* Engelm., could be accounted for by seed size. They also suggested that rate of germination and genetic factors were possible sources of variation.

The experiment also provided information about germination vigor. The weight of 23-day-old seedlings was negatively correlated with the date of germination (r = -0.43, Table 2). In other words, seeds germinating early produced larger 23-day-old seedlings than those germinating later. Since the rate of germination is indicative of germination-vigor classes, it is suggested that in Japanese larch the vigor of initial seedling growth is related to germination vigor.

Lack of uniformity in the size of stock creates problems in nursery management, whether seedlings are grown in nursery beds or in containers. The results reported here show that, although seed weight has some effect on initial size of Japanese larch seedlings, most of the variation can be accounted for by differences in the rate of germination. Since a principal goal of nursery operations is to produce a uniform crop of seedlings in a short period, treatments favoring early germination will be advantageous in Japanese larch. Whether the influences of seed weight and germination rate extend beyond the first growing season will be the subject of further study with the 880 seedlings remaining from this experiment.—K.T. Logan, Petawawa National Forestry Institute, Chalk River, Ont., and D.F.W. Pollard, Pacific Forest Research Centre, Victoria, B.C.

ENTOMOLOGY

Possible Use of Canopy Light Traps in Predicting Spruce Budworm Egg-mass Counts.—Light traps, illuminated with naptha-

TABLE 1
Counts of spruce budworm pupae, egg masses, and females per canopy light trap and calculated ratios.

Year	Area	Counts/10 m² foliage: Female pupae (1)	Counts/10 m² foliage: Egg masses (2)	Total females in light trap (3)	Ratios: Light-trap females (3) / Female pupae (1)	Ratios: Egg masses (2) / Light-trap females (3)
1974	C	86	668	7,339	85	0.09
1975	C	100	804	10,315	103	0.08
1975	J	27	338	8,500	315	0.04
1976	A	91	380	2,158	24	0.18
1978	ANS	87	245	1,197	14	0.20
1978	Q	27	160	1,158	43	0.14

TABLE 2
Comparison of observed and expected egg-mass densities in 10 plots based on Fig. 1

Plot	Female pupae/10 m² (1)	Total light-trap females (2)	Ratio (2)/(1)	Expected egg masses/light-trap female (Fig. 1)	Egg masses/10 m²: Expected	Egg masses/10 m²: Actual
1	27	297	11	0.23	68	93
2	71	177	2	0.40*	71	65
3	33	339	10	0.25	85	114
4	9	329	37	0.13	43	53
5	4	1,083	271	0.04	43	25
6	1.3	878	675	0.025	22	23
7	1.3	1,357	1,043	0.020	27	20
8	0	592	(592)	(0.025)	(15)	4
9	0	818	(818)	(0.021)	(17)	7
10	0	No data				9

*Extrapolation of Fig. 1.
( ) A female density of 1.0/10m² being assumed, although no pupae were found on plots 8, 9, and 10,in a sample of 36 midcrown branches per plot.

TABLE 3
The number of light-trap females that will likely result in severe defoliation relative to female pupal density

	Female pupal density/10 m² foliage					
	10	20	40	60	80	150
Maximum acceptable count of females in light trap	10,000	6,000	2,500	1,500	1,100	750

fuel lamps and located in forest clearings, have been used for many years in the Maritime Provinces to monitor changes in the abundance of spruce budworm moths at selected locations. In recent years, this monitoring program has been expanded by the use of light traps suspended within the crown canopy to obtain an index of budworm-moth abundance in infested stands. The data were used to compare moth counts in adulticide-treated stands with counts in untreated areas, and to find the relationship between moth abundance (females) and egg-mass counts. The latter project is the topic of this note.

Observations were made in five study areas over 4 yr. Populations were estimated from three different samples taken in each area — pupae plus pupal cases, egg masses, and budworm moths captured during a season (20 ± 3 days) in one light trap suspended within the crown canopy (Table 1). Pupae and egg masses were counted on one midcrown branch per tree on a maximum of 10 trees per location. This small sample size resulted in high intraplot variation.

No relationship was found between the number of female moths taken in a light trap and pupal counts (converted to number of females)