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EMERGENCE DATA AND ARTIFICIAL REARING MEDIA FOR AN ASPEN BARK BEETLE, *TRYPHLOEUS POPULI* (COLEOPTERA: SCOLYTIDAE)

David A. Stewart¹, Gary M. Booth¹, and Jerold L. Petty^{1,2}

ABSTRACT.—The aspen bark beetle, *Trypophloeus populi* Hopkins, was studied in nature to determine the number of larvae emerging from galleries. Fifty-five percent of the larvae in aspen galleries in the field developed into adults. An artificial rearing medium for third instar larvae of the beetles was also developed from aspen bark sawdust and nutrient agar. The optimum medium contained a ratio of 1:2 parts of agar to sawdust which gave 70 percent emergence of the beetles and less than 10 percent of adult mortality over the 36 days following emergence.

The bark beetle *Trypophloeus populi* Hopkins has been reported from 13 localities in North America, 6 of which are in northern Utah (Wood, in preparation). Petty (1977) conducted an in-depth study of the bionomics of *T. populi* and compared it to another aspen bark beetle *Procryphalus mucronatus* (LeConte). Later, *T. populi* became the focus of a study on the larvicidal effects of the insecticide dimilin on bark beetles (Stewart, Booth, and Petty, in preparation). Except for two brief taxonomic studies on European *Trypophloeus* (Hagedorn 1904, Palm 1959), nothing else has been published on the bionomics of this genus.

The objectives of this paper are: (1) to report the development of an artificial medium for rearing *T. populi* and (2) to determine the percent emergence of *T. populi* in nature.

MATERIALS AND METHODS

The beetle larvae were collected from two sites in Utah county, Utah. The first site was 1.6 km north of Aspen Grove, and the second site was 1.8 km north of Aspen Grove. Collections were made by removing strips of infested *Populus tremuloides* bark with a hand ax. Larvae were then removed in the laboratory from the bark sections by breaking open larval galleries.

Counts of the emergence holes per parental gallery system in previously infested *P. tremuloides* trees were conducted at both collecting sites. A transparent 10 cm square grid was randomly placed on the trees to make the counts. Larvae in parental galleries were counted as removed from 10 cm square areas of infested bark.

Four artificial media were prepared from the sawdust of aspen bark cut by a radial-arm saw, which was then mixed with varying amounts of nutrient agar and autoclaved at 6.8 kg pressure and 110 C for 15 minutes to suppress microorganism activity (Bedard 1966). Petri dishes containing 30 grams of the medium were stored and used at 22 C. The larvae were transferred into the medium using strict sterile techniques.

RESULTS AND DISCUSSION

The average number of larvae found per gallery in nature during this study was 14.75 (Table 1). Petty (1977) reported 14 eggs per primary egg chamber for *T. populi* and often found two or three other secondary areas where eggs were deposited in smaller numbers. However, there was no estimate of the total number of eggs per gallery.

Each newly emerging adult *T. populi* exits from the tree by boring out, leaving a small

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hole in the bark surface to indicate its departure (Petty 1977). By counting these holes, an estimate of the number of adult beetles that developed from the larvae was found to be 8.16 per galley (Table 2). Dividing the number of exit holes made by emerging adults by the estimated number of larvae indicates that 55 percent of the larvae developed into adults that emerged from the tree.

TABLE 1. Average number of *Trypophloeus populi* larvae per parental gallery in random 10 × 10 cm squares.

Number of galleries per sample	Total larvae found	Larvae per gallery
7	119	17.0
7	106	15.14
7	121	17.29
6	156	26.00
6	68	11.33
6	90	15.00
6	111	18.50
5	60	12.00
5	69	13.80
5	50	10.00
4	48	12.00
4	39	9.75
4	67	16.75
4	40	10.00
3	46	15.33
3	39	13.00
3	41	13.67
2	32	16.00
2	26	13.00
2	6	3.00
2	35	17.50
2	48	24.00
1	7	7.00
1	20	20.00
1	13	13.00
1	19	19.00
1	26	26.00
1	4	4.00
1	13	13.00
1	18	18.00
1	21	21.00
104	1558	14.75 ± 6.10

From 1 to 20 larvae were placed on the artificial media. Development data indicate no significant difference due to number of larvae at the .05 level using the standard t test. Pure nutrient agar and pure sawdust were compared to the results obtained from the media. Emergence of the adults occurred from 21 to 28 days after being placed on the media, and pupation occurred at 16 to 21 days. All larvae placed on the media were of the third or final instar as determined by head capsule size (Petty 1977). Larvae of the first two instars were also successfully reared but records were not kept on them.

Emergence varied from 1.67 percent of the larvae (on pure nutrient agar) to 70 percent of the larvae (two parts bark to one part agar, Table 3). Many of the larvae were able

TABLE 2. Number of *Trypophloeus populi* emergence holes per parental gallery in random 10 × 10 cm squares.

Number of galleries per sample	Number of emergence holes	Emergence per gallery
12	82	6.83
8	91	11.38
6	39	6.50
13	100	7.69
6	56	9.33
7	78	11.14
8	91	11.38
9	83	9.22
8	79	9.88
6	68	11.33
11	85	7.73
7	44	6.29
8	72	9.00
7	66	9.43
6	47	7.83
5	28	5.60
5	21	4.20
4	12	3.00
3	22	7.33
139	1164	8.16 ± 2.42

TABLE 3. Results of an artificial rearing medium for *Trypophloeus populi*.

Medium, parts agar:bark	Number of larvae	Number emerged	Percent emerged	Percent Dead 36 days after emergence
1:0	60	1	2	100
2:1	80	15	18	58
1:1	233	76	31	29
1:2	95	67	70	7
1:3	50	20	40	7
0:1	77	48	65	98

to develop into adults but were unable to feed on the medium and subsequently died shortly after (Fig. 1). It is interesting that the pure sawdust medium caused 98 percent mortality of the larvae after 36 days. This high mortality could have been possibly

caused by changes in moisture content, but no attempt was made to investigate this possibility. Adults feeding on two parts bark to one part agar and three parts bark to one part agar lived on the medium up to 120 days. They constructed galleries but oviposition did not occur.

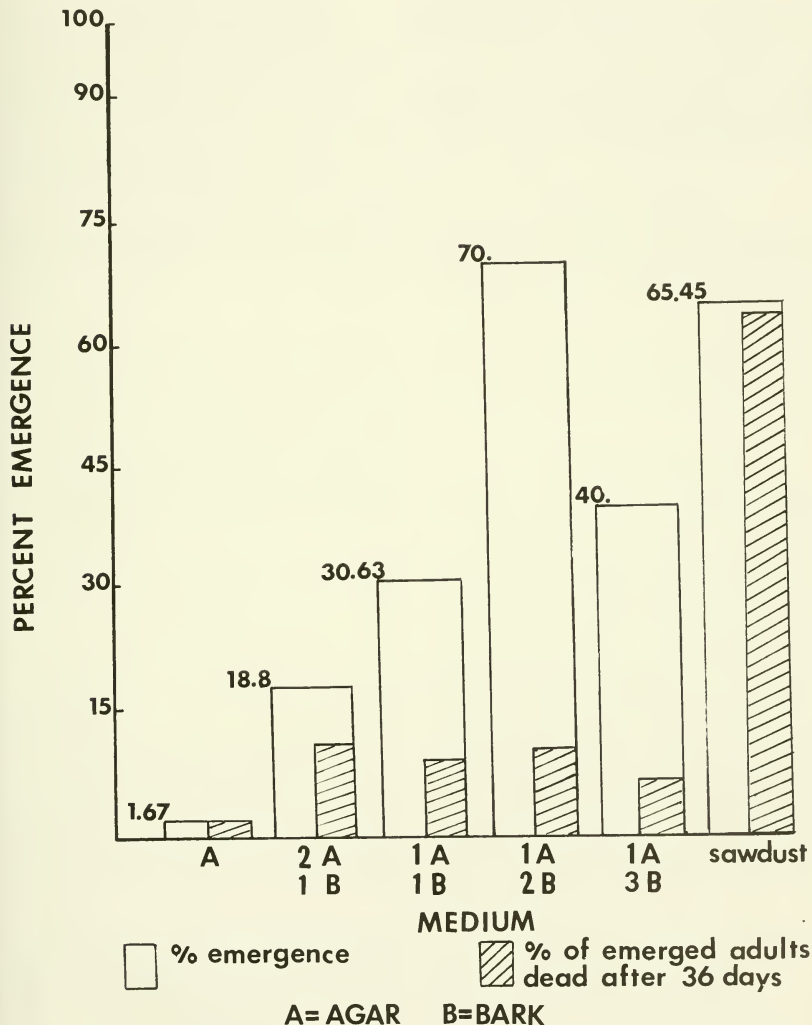


Fig. 1. Percent emergence of *Trypophloeus populi* in artificial media and percent of emerged adults dead after 36 days.

SUMMARY

In nature it was estimated that 55 percent of the larvae produced in a gallery will develop into adults and emerge.

The bark beetle *Trypophloeus populi* was reared from the third instar larva to the adult stage on a medium of nutrient agar and aspen bark sawdust. The optimum concentration of bark to agar was two parts bark to one part agar, with 70 percent of the larvae developing into adults. Adults fed on the medium and excavated galleries, but mating and oviposition were not observed.

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