

パラコート処理によるマツノマダラカミキリの誘引に関する研究Ⅰ

パラコートおよびエセホンの樹幹処理効果

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論 文

Luring of Japanese Pine Sawyer *Monochamus alternatus* HOPE by Paraquat-Treated Pine Trees (I) The Effect of Paraquat and Ethephon on Pine Trees*

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YAMASAKI, Toru, HATA, Katsumi & OKAMOTO, Hidetoshi: **Luring of Japanese pine sawyer *Monochamus alternatus* HOPE by paraquat-treated pine trees (I) The effect of paraquat and ethephon on pine trees** J. Jap. For. Soc. 62: 99~102, 1980 Aqueous paraquat and ethephon solutions were injected into the trunks of Akamatsu, Japanese red pine, *Pinus densiflora* S. & Z. and Kuromatsu, Japanese black pine, *P. thunbergii* PARL. The parts of the trunks receiving chemicals secreted large quantities of oleoresin. At the same time Japanese pine sawyers, *Monochamus alternatus* HOPE, started laying eggs in these areas of the trunks. The number of egg-laying slits increased drastically, their density becoming more than 10 times than those on trunks of pines blighted by pine nematodes, *Bursaphelenchus lignicolus* M. & K. The secretion areas probably release powerful oviposition attractants for the Japanese pine sawyers.

山崎 徹・幡 克美・岡本秀俊：パラコート処理によるマツノマダラカミキリの誘引に関する研究 (I) パラコートおよびエセホンの樹幹処理効果 日林誌 62: 99~102, 1980 本邦産アカマツおよびクロマツの樹幹にパラコートあるいはエセホン水溶液を注入したところ、多量の生松脂が分泌した。同時に多数のマツノマダラカミキリが飛来し、生松脂分泌部に集中的に産卵しはじめた。生松脂分泌部における産卵痕密度はマツノザイセンチュウによる通常の枯損木の約 10 倍以上に達した。生松脂分泌部はマツノマダラカミキリの強力な産卵誘引物質を発散しているものと考えられる。

I. Introduction

BEERS(1), and HERTEL and WILLIAMS(2) reported that ambrosia beetles, *Platypus flavicornis* F., black turpentine beetles, *Dendroctonus terebrans* OLIVER, and *Ips* bark beetles (Coleoptera: Scolytidae) as well as other inner bark borers (Coleoptera: Cerambycidae and Buprestidae) of secondary infestation species cause damage when attracted to slash pines, *Pinus elliotii* ENGELM. var. *elliotii*, and loblolly pines, *P. taeda* L., having trunk application of paraquat. This study was made to clarify the activity of Japanese pine sawyers, *Monochamus alternatus* HOPE, on Akamatsu, Japanese red pine, *P. densiflora* S. & Z. and Kuromatsu, Japanese black pine, *P. thunbergii* PARL. treated with paraquat and ethephon.

II. Materials and Methods

Investigations were carried out in a mixed stand of 23-year-old Japanese red and black pines in Kagawa Prefecture, suffering slight damage from

pine nematodes, *Bursaphelenchus lignicolus* M. & K. In this work trees were selected at about 5m intervals on a single straight line within the forest and scheduled for paraquat or ethephon treatment by randomization. Eight trees were treated by way of a frill with 5 ml of water solution of paraquat dichloride containing 0.1% Tween 20 wetting agent as described previously(4). Table 1 shows the diameter at breast height of each tree treated with paraquat dichloride, concentrations of paraquat, and treating dates. Four pines were treated with 5% water solution of commercial ethephon by way of a borehole (1.8×4 cm²) at a point 1.4m above the ground by using a dropper. Table 2 shows the diameter at breast height of each tree treated with ethephon, the quantity of ethephon solution, and treating dates. The same quantity of 0.1% water solution of Tween 20 was injected by way of a frill (in the case of the paraquat treatments) or a borehole (ethephon treatments) opposite to the treatment wounds.

The trees were examined for egg-laying slits in

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Table 1. Pines treated with paraquat dichloride

Individual No.	DBH* (cm)	Concentration (%)	Date treated
<i>P. densiflora</i>			
1	16	5	4/26/1978
2	14	1	4/26/1978
3	15	0.25	4/26/1978
4	19	0.25	4/26/1978
5	15	0.25	4/26/1978
<i>P. thunbergii</i>			
6	22	5	4/26/1978
7	22	5	7/ 1/1978
8	21	5	7/ 1/1978

* Diameter at breast height

Table 2. Pines treated with ethephon

Individual No.	DBH* (cm)	Volume (ml)	Date treated
<i>P. densiflora</i>			
9	11	100	6/ 7/1978
		100	6/29/1978
10	19	400	7/ 5/1978
<i>P. thunbergii</i>			
10	15	400	7/ 4/1978
12	14	400	7/ 4/1978

* Diameter at breast height

the bark and for feeding marks on the young twigs by Japanese pine sawyers. Early the next spring, after felling the trees and lopping the branches, the trunks of trees Nos. 1, 2, 4, 6, 9, and 12 and eight trees in the same stand blighted by pine nematodes were cut into 0.8m sections and kept in separate netted huts in the field. Species and number of adults emerging from the host trunks were determined each day.

III. Results and Discussion

No visual abnormalities of the needles were observed in any of the trees treated with paraquat and 100 ml ethephon solutions, whereas in the case of treatments with 400 ml ethephon solutions abnormalities were found only on the lower branches.

The treatment wounds, and the areas adjacent to them, on the trunks were secreting excessive quantities of oleoresin within about two weeks to one month after treatment. Then the parts of the trunks receiving chemicals showed extensive oleoresin secretion; about two months after the treatments, secretions were seen at about 0.5 to 5.0m above the treatment wounds. The content of hydrocarbon extractives increased rapidly (4).

Concurrently with this extensive secretion, Japanese pine sawyers started laying eggs in the secreting areas of the trunks. First, egg-laying slits were found on trees Nos. 1 and 2 on

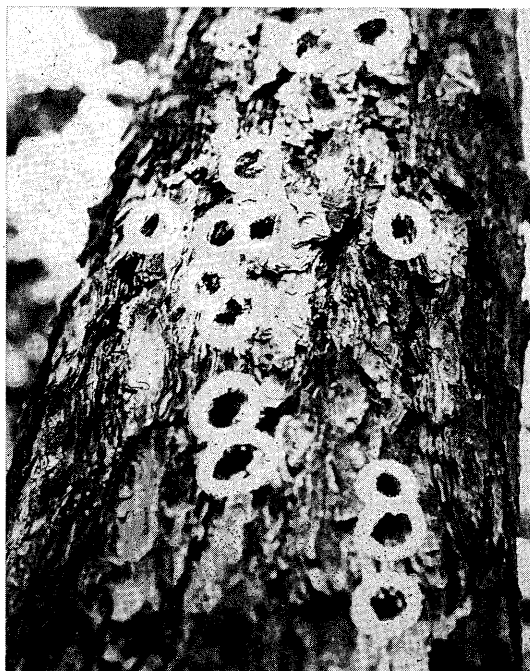


Fig. 1. Egg-laying slits made by *Monochamus alternatus* in the bark of *Pinus densiflora* treated with paraquat
Slits are enclosed by white circles.

June 29. The number of egg-laying slits in the secreting areas increased rapidly (Fig. 1). During the survey of July 28, however, no slits were observed on the control sides opposite to the secretion sides. It appears that the secreting areas of the trunks probably release powerful oviposition attractants for the Japanese pine sawyers. It has been reported that the Japanese pine sawyer prefers to lay eggs on the bark of pines blighted by pine nematodes which rarely stimulate oleoresin production (3). The results of this work are in sharp contrast to that view. Pine trees treated with paraquat or ethephon are the most suitable for the study of the attack mechanism of Japanese pine sawyers.

Table 3 shows the density of egg-laying slits examined from September 10 to 13 in the bark of the pines treated with paraquat or ethephon. Numerous egg-laying slits were observed on the secreting areas of the trunks compared to those on the control areas. The average density of those on the secretion sides of the pines treated in April and June was 310, whereas the average for the pines treated early in July was only 130. This probably was due to a population-drop of the Japanese pine sawyers. Density on the secreting areas of the pines treated with 0.25% paraquat solution varied widely

Table 3. Density of egg-laying slits made by *Monochamus alternatus* in the bark of pines treated with pesticides

Month treated	Individual No.	Height* (m)	Number per m ²		
			Control side**	Secretion side**	Entire trunk**
April	1	3.6	120	370	250
	2	2.6	40	190	120
	3	3.4	110	110	110
	4	3.4	180	500	340
	5	5.0	0.0	0	0.0
	6	3.0	30	200	120
June	9	4.0	190	800	500
Average			100	310	210
July	7	3.6	20	60	40
	8	4.0	10	160	90
	10	4.0	10	90	50
	11	2.4	0.0	180	90
	12	2.6	10	160	90
Average			10	130	70

* Observed above the ground

** Examined on 9/10~13/1978

Table 4. Density of egg-laying slits made by *Monochamus alternatus* in the bark of pines blighted by *Bursaphelenchus lignicolus*

	Individual No.	DBH* (cm)	Height** (m)	Density*** (Number per m ²)
<i>P. densiflora</i>	1	11	3.8	10
	2	11	4.0	20
	3	9	4.0	0.0
	4	18	4.6	80
	5	23	3.2	30
	6	14	4.2	40
<i>P. thunbergii</i>	7	19	4.0	0
	8	18	4.5	20
	9	15	4.5	40
	10	29	8.0	10
	11	25	9.0	30
Average				25

* Diameter at breast height

** Observed above the ground

*** Examined on 9/12~13/1978

zero to 500. However, secretion in these pines was insignificant. The difference in slit density among the test trees probably is a result of the different location of each tree and the different ambient conditions. In the case of test trees Nos. 1, 2, 4, 6, 8, 9 and 12, after the egg-laying slits had increased drastically, oleoresin secretion ceased, and then these infested pines died. In fact, numerous feeding marks were seen on the bark of the twigs and shoots of these seven test pines, and pine nematodes were found in the trunks. Conversely, test trees Nos. 3, 5, 7, 10, and 11 were alive with Nos. 5, 10, and 11 still secreting oleoresin. No pine nematodes were found in the trunks of these five trees, although feeding marks were observed. When egg-laying slits on the secreting areas

increased rapidly, the Japanese pine sawyers started laying eggs on the bark of the control sides opposite to the secretion sides. The egg-laying slits then increased gradually.

Larvae under the bark of a paraquat-treated tree were examined on August 12. Forty-two out of 45 larvae of various sizes were identified as Japanese pine sawyers, and two were identified as *Temnochila japonica* REITTER. Residual one was ambiguous as to species.

Table 4 shows the density of egg-laying slits of Japanese pine sawyers in the bark of pine trees blighted by pine nematodes, within the same stand. The average of those in the bark of the blighted pines was not more than 25 per square meter. The density of those on oleoresin secretion areas of paraquat- or ethephon-treated trunks was more than 10 times as much as that on the trunks of the pines blighted by pine nematodes.

From the host trunks of six chemically treated trees, only 54 Japanese pine sawyers emerged, whereas from the eight trees blighted by nematodes in the same stand, 143 pine sawyers together with 165 *Acanthocinus griseus* FABRICIUS and 57 *Shirahoshizo insidiosus* ROELOFS emerged. Therefore, the pine trees treated with paraquat or ethephon seem to selectively attract Japanese pine sawyers.

These results suggest that the use of paraquat- or ethephon-treatments would have the possibility of controlling Japanese pine sawyers by creating insect trap trees with or without accompanying insecticides.

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* Only in Japanese. The title is a tentative translation from the original Japanese title by the author.

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訂正とお詫び

本誌 62 巻 2 号に掲載の論文 Noboru FUJIWARA & Minoru KAMIIZAKA 著 "The Transition of Forest Road Density in Timber Production Areas—An Investigation in the Imaichi District" のうち、39 ページの著者名 (英文) に誤りがありましたので、下記のとおり訂正してお詫びいたします。

誤

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正

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