原　著

The Effect of Five Herbicides on the Aquatic Oligochaete *Branchiura sowerbyi* Bedd.
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Received August 27, 1966. *Botyu-Kagaku* 31, 147. 1966.

20. エラミミズにおよぼす5種の除草剤の影響 ムスタファ　イマム・サミュール　ガブール（カイロ大学理学部　エジプト，アラブ連合）41. 8. 27 受理

フィリッピン，日本，中国などでは数種の水棲ミミズが稲苗を加害することが知られている．そこで日本で最も有害な種類の一つとされているエラミミズについて除草剤の影響をしらべた．

試験は Martin and Wiggans の浸漬法に従い，シマジン，アトラジン，2,4-D，モニュロン，および3-アミノトリアゾールの5種の除草剤についてそれぞれ 1, 10, 100, 500, 1,000 p. p. m. の稀釈液を調製し，100 cc 当たり10匹のミミズを放って2週間観察した．

1および 10 p. p. m. では死亡はみとめられなかったが，100 p. p. m. では 3-アミノトリアゾールで5日後に致死効果がみられ，アトラジンでは永続的な中毒症状がみとめられ，また 1,000 p. p. m. では2,4-Dが最も高い致死効果をしめした．

アトラジンおよび2,4-Dは除草剤として使用される濃度においてエラミミズにたいし中毒ないしは致死効果をしめすと考えられる．

Some aquatic oligochaetes are considered pests of rice in the Philippines[1], Japan[2], and China[3]. The abundant water in the nursery beds, where the young stages of the rice plant are cultivated, makes the oligochaete worms active and these produce heaps of mud around them, so the young seedlings sink rapidly in the muddy soil[4]. One of the most abundant species of these worms in Japan[2] is *Branchiura sowerbyi* Beddard 1892 (Family Tubificidae). Attempts to control this worm in the nursery beds of rice by the use of herbicides may be more economic than by insecticides or vermicides.

Materials and Methods

To test the effect of herbicides on the survival of *B. sowerbyi*, the method of Martin and Wiggans[5] was adopted. The worms were immersed in solutions of strengths of 1, 10, 100, 500 and 1,000 parts per million. Ten worms were placed in each strength in a volume of 100 cc. The herbicides used were atrazine, simazine, 2,4-D acid, monuron (80%), and 3-amino-triazol. Room temperature was 20°C.

Results and Discussion

No deaths occurred in the 1 and 10 p. p. m. solution of any of the five herbicides tested for two weeks when the experiment was stopped. No deaths occurred also for the same period in the 100 p. p. m. solutions except in the 3-anino-triazol solution, where death occurred in 5 days.

Table 1 shows the effect of the rest of the herbicide solutions. At a strength of 100 p. p. m. 3-amino-triazol is the most lethal, while at 1,000 p. p. m. strength 2,4-D is the most lethal. Nevertheless, it seems that a solution of 100 p. p. m. atrazine has a permanent poisonous effect on the nervous system of *B. sowerbyi* because the worms in this solution, from the start of the experiment, did not entwine into a skein as did the other worms in the other solutions of the same strength. This means that 100 p. p. m. atrazine destroys the thigmotactic receptors in this worm.

Table 1. Survival of *B. sowerbyi* in solutions.

Conc. p.p.m. / Herbicide	100	500	1000
Simazine	—	4 days	4 days
Atrazine	no skein	4 d	1 d
2,4-D acid	—	6 d	1 hour
Monuron	—	4 d	1/2 d
3-Amino-triazol	5 days		

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When applied in the field, such a solution stength may be effective in driving the worms out of their burrows and making them more susceptible to other control measures. A concentration of 150 p. p. m. is less than the concentration produced by the technique of application (10-30 lb/acre)[6]. However, 2, 4-D acid is safer to use even at a greater application rate because it is effective with water hyacinth in rice paddies and it does not affect rice[7].

It is noteworthy that the aquatic oligochaete *B. sowerbyi* is more resistant to herbicides than the terrestrial oligochaete *Eisenia foetida*. This latter species had a survival of 90% at 1 p. p. m., 80% at 10 p. p. m., and nil at 100 p. p. m. and 1,000 p. p. m. monuron solutions after an exposure of 26 hours[5]. Other experiments[8] have shown that the resistance of *Allolobophora*, *Pheretima*, and *Alma* to the same herbicides belongs to the class of the *Branchiura* resistance. This means that the resistance of *Eisenia foetida* may be exceptionally lower than many other oligochaetes.

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Seasonal Changes of the Waxy Covering and its Components of a Scale Insect, *Ceroplastes pseudoceriferus* Green. Yoshio Tamaki and Shozo Kawai (Agricultural Chemicals Inspection Station, Kodaira, Tokyo, and Tokyo Agricultural Experiment Station, Tachikawa, Tokyo) Received September 9, 1966. *Botyu-Kagaku*, 31, 148. 1966.

21. ツノロウムシ *Ceroplastes pseudoceriferus* Green の虫体被覆物およびその構成成分の季節的変化

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ツノロウムシの真の虫体重は8月から12月にかけて，ほぼ直線的に増加するが，虫体被覆物の生成速度は8～10月に大，10～12月に小であり，虫体被覆物の生成が生育の初期に活発であることを推定させた．虫体被覆物の全虫体に対する割合は，9月に最高値80%を示し，このときの被覆物中の水性物質（interior honeydew）とロウ質物の比率は77対23であったが，1月にはこれが64%に減少し，interior honeydew とロウ質物の比率は58対42となった．

1～2令幼虫のロウ質物はその後の時期のロウ質物と質的に異なるものであることがうかがわれたが，interior honeydew 中のアミノ酸と糖類の構成は調査した6カ月間でほとんど変わらなかった．

被覆物中の interior honeydew は肛門から排泄される dropped honeydew とくらべてアミノ酸，糖類の構成が非常に異なり，これら2種の物質はたがいに異なった生物的意義を有するものと考えられた．

Many kinds of scale insects have become serious pest of various plants in Japan. However, they are rather difficult to control by insecticides because of the waxy covering which protect the insect body against insecticidal spray. The waxy covering of *Ceroplastes pseudoceriferus* Green which constitutes about 73% of intact adult female on fresh weight basis, is composed of 28% waxy substance and 72% aqueous substance designated as a honeydew (Tamaki 1963).

The present study was undertaken with a view to elucidate the quantitative and qualitative change of the waxy covering during the growth of *C. pseudoceriferus*, and to obtain some informations on biological significance of the aqueous substance in the waxy covering.