A study on "bottom-poison"
Evaluation of the effect of Calcium
arsenicum precipitatum (C. A. P.)
as bottom poison for larvae of
Anopheles sinensis and
Aedes albopictus

BY

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Introduction

An attempt of this experiment is to investigate the effect of Calcium arsenicum precipitatum as bottom poison for 4th instar larvae of *Anopheles sinensis* and *Aedes albopictus*.

Material

Three kinds of glass cylinder which diameter are 20 cm, 40 cm and 70 cm, respectively, are used. Besides them, beaker (5 cm in diameter, 7 cm in depth) and thin glass rod which edge is rounded are used. The latter is used for stimulating larvae.

Larvae of *Anopheles sinensis* and *Aedes albopictus* are collected from a limited place at the suburb of Taipei one day before experiment.

Method

The water is poured into glass cylinders until varying rate of depth is achieved. Calcium arsenicum precipitatum sprinkling over the surface of water is stirred enough with glass rod and it is allowed to stand for some time to let it precipitate evenly at the bottom. Then, 20 cc. of supernatant is collected using syringe and is put into beakers. To each cylinder and beaker, 10 heads for the former species and 2 heads for the latter one are placed and the time is recorded.

The activities of larvae, and temperature of medium are observed at 10, 20, 30, 40 & 50 minutes, and 1, 1½, 2, 3, 4, 5, 10, 24, & 48 hours after larvae are placed.

Result

Death rate (%) of larvae can be shown as follows:

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$$y = 100 \times n / (10 - p)$$

y = death rate of larvae

n = number of dead larvae

p = number of pupae yielded during experiment

From this formula, it is obvious that death rate of larvae (y) may be affected by both number of dead larvae (n) and number of pupae yielded during experiment (p).

1) Effect of Calcium arsenicum precipitatum for *Anopheles sinensis*.

To each of cylinders in which water is filled 10 cm, 20 cm, 30 cm in depth respectively, Calcium arsenicum precipitatum is added in the rate of 0.1 gm/m², 0.2 gm/m², 0.3 gm/m² and 0.5 gm/m² of base surface respectively.

Time to cause death (x) and death rate of larvae (y) in varying environment are shown as Table 1.

Table 1

Depth of water C. A. P.	10 cm	20 cm	50 cm
0.1 gm/m ²	x ≥ 24 y ≤ 25	x ≥ 24 y ≤ 12.5	x ≤ 24 y ≤ 16
0.3 gm/m ²	4 ≤ x ≤ 24 38 ≤ y ≤ 100	3 ≤ x ≤ 10 19 ≤ y ≤ 100	x ≥ 4 20 ≤ y
0.5 gm/m ²	1½ ≤ x ≤ 10 38 ≤ y ≤ 100	3 ≤ x ≤ 24 12 ≤ y ≤ 100	1½ ≤ x ≤ 4 31 ≤ y ≤ 100

C. A. P. . . . Calcium arsenicum precipitatum

x . . . time to death (hour)

y . . . death rate (%)

Almost all of larvae in beakers containing supernatant collected from each cylinder, were alive during the observation; i. g. "n" was zero.

As control, the same experiment was performed using tap water alone (i. g. no Calcium arsenicum precipitatum was added). In this case, "n" was zero. However, as shown in Table 2, when the depth of water increases, the larvae seem to be affected by it. Definite affection is noticed in case of more than 50 cm in depth.

2) Effect of Calcium arsenicum precipitatum for *Aedes albopictus*.

Table 3 shows the results of experiment for *Aedes albopictus*.

As control, tap water alone was also used.

Table 2

Depth of water C. A. P.	10 cm	50 cm	70 cm
0	$x \geq 48$ $y = 0$	$x \geq 24$ $y \leq 70$	$x \geq 24$ $y \leq 70$

Table 3

Depth of water C. A. P.	10 cm	20 cm	30 cm
0.1 gm/m ²	$x \geq 4$ $y \geq 2$	$x \geq 5$ $y \geq 12$	$x \geq 5$ $y \geq 12$
0.3 gm/m ²	$2 \leq x \leq 10$ $12 \leq y \leq 100$	$2 \leq x \leq 24$ $12 \leq y \leq 100$	$3 \leq x \leq 48$ $20 \leq y \leq 100$
0.5 gm/m ²	$2 \leq x \leq 5$ $12 \leq y \leq 100$	$2 \leq x \leq 24$ $12 \leq y \leq 100$	$2 \leq x \leq 24$ $12 \leq y \leq 100$

The "n" was found to be zero.

3) Duration of effect of Calcium arsenicum precipitatum sprinkled.

To measure the duration of the effect of Calcium arsenicum precipitatum in water, following experiment was attempted: various amount (0.5 gm/m², 0.3 gm/m², 0.1 gm/m²) of Calcium arsenicum precipitatum was put into water having 10 cm of depth firstly; to each medium, 10 heads of 4th instar larvae are placed and death rate was observed. This was repeated every 48 hours in the same medium until 14 days after the medium were made. As shown in Table 4, Calcium arsenicum precipitatum was found to be effective for 10 days after treatment.

Table 4

C. A. P.	days	2	4	6	8	10	12	14
0.5 gm/m ²		+	+	+	+	+	+	±
0.3 gm/m ²		+	+	+	+	+	±	±
0.1 gm/m ²		+	+	+	+	+	±	±

+...effective. ±...The effect is indefinite.

4) Minimal effective dose of Calcium arsenicum precipitatum.

To measure the minimal effective dose of Calcium arsenicum precipitatum, death rate of 4th instar larvae of *Anopheles sinensis* was

observed in mediums having various amount of Calcium arsenicum precipitatum and having 10 cm of depth of water. The result is shown in Table 5.

From the data, the minimal effective dose was found to be 50 mg/m².

Table 5 Death rate (%) of the larvae in water containing variable amount of C. A. P.

C. A. P. mg/m ²	99	78	72	61	50	44	38	33	28	22
Case No.										
No. 1	30	30	30	40	10	10	0	0	0	0
No. 2	20	20	20	10	10	0	0	0	0	0
No. 3	40	20	30	20	20	10	0	0	0	0

Discussion

As known from the above mentioned experience the death rate of the larvae of *A. sinensis* and *A. albopictus* are found to be parallel to the amount of C. A. P. in water of 70 cm or less in depth. The death rate of *A. sinensis* is influenced by the depth of water. It is greater in 70 cm than in 50 cm. Feeding activity in the bottom of water in *A. albopictus* is most marked in the depth of 10 cm. The larvae of *A. albopictus* die earlier than *A. sinensis* and the death rate is also greater in the former. This tendency is especially marked in the concentration of 0.1 gm of C. A. P. per 1 m² of base area. In the present study, the only difference of the experimental environment is the temperature of water, that is, 20°C or higher in case of *A. sinensis* and 20°C or lower in case of *A. albopictus*. So the variation of the above mentioned result will show to have a relation with temperature of water. If the temperature of water were not the problem, it could be said that feeding activity in bottom of water of *A. albopictus* is more active than that of *A. sinensis* and the former is more sensitive to C. A. P. than the latter.

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Summary

Sensitivity of *Anopheles sinensis* and *Aedes albopictus* to C. A. P. is studied and minimal effective dose and its duration of the effect are measured.