ALEXANDRIA UNIVERSITY

High Institute of Public Health

AMBROSIA MARITIMA (DAMSISSA)

FOR SNAIL CONTROL

SPONSERED BY IDRC

Centre File: 3-P-87-0204

FINAL REPORT

Dear Dr. Don De Savigny,

We have the pleasure to present to you the Final Report on Phase IV of the project. The details of its four parts are included with a discussion of the findings and suggestions for further studies. We feel that success in control of schistosomiasis with Damsissa is not so far, but still is in need of your support.

We will be glad to know your comments and we are ready for any discussion. We hope to see you soon in Egypt.

Sincerely Yours

Principal Investigator

Prof. Dr. M. F. El-Sawy

ENVIRONMENTAL AND COMMUNITY STUDIES ON THE EVALUATION OF DAMSISSA FOR SCHISTOSOMIASIS CONTROL IN EGYPT

International Development Research Centre
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by

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Thanks to the sincere and helpful cooperation of Dr. Don de Savigny IDRC Health Sciences Division.

I am grateful to Prof. Dr. F. Kishk the Regional IDRC Director for effective and helpful administration.

I am greatly indebted to the integrated team of workers who were my students and now are my sincere colleagues. They did their best to execute and investigate the Project problems scientifically

Gratitude to Dr. J. Duncan IDRC expert who shared actively in the project and gave great efforts in the field investigations.

To all who helped by some means or another to fulfil this work I am indeed obliged.

I hope that this work with IDRC can help our natives to overcome the ancient endemic problem of schistosomiasis in Egypt.

TABLE OF CONTENTS

INTRODUCTION

The annual herb, Ambrosia maritima, known under the vernacular name Damsissa, is a member of the family compositae. It occurs in the Nile Valley. This plant has been shown to possess molluscicidal properties. It has lethal effects on the snails and their eggs. Moreover it is lethal to Schistosoma miracidia and cercariae.[1] Preliminary studies in the laboratory as well as field trials have pointed to significant reductions in the snail populations when the whole plants were placed into water channels. The extracted active substances, damsin, ambrosin and tribromo-damsin, proved to be highly molluscicidal. Damsissa is non-toxic to cattle and sheep which commonly graze on the plant, to fish and also to man. In falks medicine decoction and infusions from the flowering parts are used as antispasmodic in colics, as diuretic and as a sedative for haematuria in Schistosoma haematobium infection.

AIM OF THE PROJECT

The over all aim of the project was to develop a simple, cost effective delivery system for operational use of the plant molluscicide, Ambrosia maritima, in sustained control of schistosomiasis in Egypt.

SUMMARY OF PHASES I & II

During Phases I and II of the project, the effectiveness of Damsissa and the molluscicidal properties were fully investigated.[3, 4, 7]

- Ambrosia maritima was studied as regards its growth in different types of soil. Salty soil was found the least suitable for its development(Report to IDRC 1980).
- As regards its growth in the different seasons, the seeds were found to germinate during the colder months, i.e. late October and till February. When cultivated in November, the full vegetative growth was attained in May when the height of the plant reached 60-100 cm.
- The molluscicidal activity of the fresh and dry plant material in the months of May and June were studied with no statistical differences.[2, 5, 8]
- The optimum concentration of the plant as a molluscicide was studied. It was very active at the dose of 35 ppm. However 70 ppm was prefered to ensure maximal effect.
- When applied in May, the snail reduction was maintained to the end of the year.

It was conclude that schistosomiasis transmission might be controlled, by a correctly timed, single, annual application.

- Studies on the spatial and temporal distribution of Biomphalaria alexandrina in villages of the Nile Delta demonstrated that infected snails were found in most canal and drain types related to the villages. Infected snails were found from May to December, but 80% of the annual transmission potential was confined to the period June to August.

- In view of the dispersed nature of both infected snails and human water contact, in the Nile Delta, it was recommended that effective transmission control should cover all village irrigation water courses.

The cost of growing Damsissa and the cost of its application were studied.

- A model for growing Damsissa was deviced and assessed.
- The possibility that the plant might cause allergic reactions was excluded by doing a skin patch test and obtaining negative results (Report 1980).

Phase III:

During this phase a field study was designed to evaluate the plant in control of schistosomiasis.

Ten villages, five from El Maamora and five from Abis were chosen and a pilot study was carried.

Depending on the results, it was decided to begin the study in two starter villages from El Maamora area: El Prince and Kazouli.

The prevalence in the two villages was 78% and the geometric mean counts for the positives were 150 and 128 eggs/gm.

Very few cases of S.haematobium were diagnosed.

Almost all patients were treated with praziquantel. The cure rate in the two villages was 77%. Damsissa was applied to all water channels in Kazouli, El Prince was left as control.

Transmission indices in the following year were determined.

Analysis of the results lead to the conclusion that : a single application of Ambrosia maritima, following chemotherapy, had an important role in lowering schistosomiasis transmission when compared to the effect of chemotherapy alone. However transmission in the Damsissa treated area did not stop inspite of a tremendous reduction in snail density and absence of snail infection. This was due to the movements of the people to neighbouring areas where they are exposed to infection.

Participation of the inhabitants in control works was poor.

Phase IV:

This phase had as specific objectives:

1- To confirm the application dose of A.maritima in various water situations, in an established and a newly reclaimed area.

2- To determine the socio-behavioural aspects towards facilitating the growing and acceptance of A.maritima by the community.

3- To perform toxicological studies on A.maritima and investigate its effect on aquatic non-target organisms.

Accordingly;

1- The study in the established farming area of high prevalence was continued.

2- The same approach was applied to a reclaimed area (Area II) with different ecological conditions.

3- Toxicological studies on A.maritima were undertaken and its effect on aquatic non-target organisms was investigated.

4- A KAP study was undertaken to estimate the requirements of sustained self help in A.maritima snail control in both areas.

Parasitological Studies

Area I

PARASITOLOGICAL STUDY

AREA I

1. Introduction:

The present study was designed to assess the effect of annual single application of *A. maritima* to water courses in the control of schistosomiasis in an endemic area in lower Egypt.

Phase III of the project entailed the study of two villages (Kazouly as a test village, where the plant was applied and El-Prince as the control village). The plan of the work was as follows:

1.1 * Stool examination: an attempt was made to collect stool samples from all inhabitants of the two villages in October 1985, April 1986 and April 1987. Stool samples were examined using Kato technique.

1.2 * Antibilharzial Treatment (March 1986) an attempt was done to treat all infected individuals on both villages. Biltricid was administered in a single oral dose of 40 mg/kg body weight.

1.3 * *A. maritima* application (May 1986)
Dry plant was applied to all irrigation canals in the fields surrounding the test village (Kazouly) in a dose of 70 p.p.m.

The results of stool examination revealed lower prevalence rate (33.7%), incidence rate (23.4%) corrected index of potential contamination (255.4%) in the test village compared to the control village (44.4%, 40.5% and 632.3%respectively).

The previous results show that the application of o. A. maritima preceeded by the administration of antibil. ·zial drug to infected individuals have lead to a marked decrease in schistosomiasis transmission compared to that obtained by using antibilharzial treatment alone.

2. Objectives:

2.1. To assess the effect of combination of a single anti-bilharzial treatment administratiion and single annual application of *Ambrosia maritima* in the control of schistosomiasis.

2.2. To assess the effect of the continuation of single annual application of *A. maritima* without further anti-bilharzial treatment administration on the control of schistosomiasis (in the two startar villages).

3. Material and Methods:

3.1. Study area:

3.1.1. Kazouli and El-Prince: the two startar villages studied in phase III of the project.

- Kazouli, the test village where Damssissa was applied. Population: 321 individuals.
- El-Prince: The control village where no Damssissa was applied. Population 470 individuals.

3.1.2. Lashin and Mohsen: Two villages newly introduced in the present study.

- Lashin: the test village. Population: 438 individuals.
- Mohsen: the control village. Population: 601 individuals.

3.2. Methods:

3.2.1. Parasitological study: stool samples were collected from the inhabitants of the four villages. Two Kato slides were prepared from each sample and were examined microscopically for counting Schistosome eggs present.

Parasitological study was performed in the two startar villages during March and April 1988, 1989, 1990, 1991. In the other two villages (Lashin and Mohsen) it was done twice in 1989 (pre and post anti-bilharzial treatment) and then yearly after that.

3.2.2. Antibilharzial treatment. Biltricid, 40 mgm/kg body weight, was administered orally in a single dose to infected individuals in Lashin and Mohsen (March and April 1989).

3.2.3. Ambrosia maritima (Damssissa) application. Dry plant was applied annually in all water courses in the fields surrounding the two test villages, Kazouli and Lashin, in June 1988, 1989, 1990 and 1991.

3.2.4. Sentinel mice experiment:

- Swiss Albino mice were exposed to infection in different sites near Kazouly and El-Prince villages in June, July and August.

- 10 mice, in a floating cage, were immersed in each station from 11 AM to 1 PM. Then mice were brought back to the High Institute of Public Health.

- 6-8 weeks later, mice were sacrificed and their livers and mesentries perfused for collection of Schistosoma worms if present.

- Stations: Certain sites were chosen for exposure of mice in each village taking into consideration the type of the stream and distance from the village.

Kazouly: 13 stations were chosen: (Fig. 1)

Station 1: 2ndry canal, 50 meters from the village
Station 2: 2ndry drain, 155 meters from the village
Station 3: 2ndry canal, 50 meters from the village
Station 4: 2ndry drain, 150 meters from the village
Station 5: 3ry drain, 50 meters from the village
Station 6: 3ry drain, 50 meters from the village
Station 7: 3ry drain, 50 meters from the village

Station 9: 3ry drain, 50 meters from the village

Station 10: 3ry drain, 20 meters from the village

Station 11: collector 100 meters from the village

Station 12: 3ry drain, 50 meters from the village

Station 13: 3ry drain, 100 meters from the village

El-Prince: 4 stations were chosen, (Fig. 2)

Station 1: 2ndry canal, 100 meters from the village

Station 2: 2ndry drain, 100 meters from the village

Station 3: 3ry drain, 50 meters from the village

Station 4: 3ry drain, 50 meters from the village.

4. Results:

4.1. The results of the parasitological study are presented in tables 1 to 20.

4.2. The results of sentinel mice are presented in tables 21 and 22.

Table (1)

S. mansoni prevalence by age and sex (Mohsen 1991)

Age in years \ Sex	Male			Female			Total		
	No.	No.	%	No.	No.	%	No.	No.	%
< 5	13	2	15.4	13	0	0.0	26	2	7.7
5	38	11	28.9	36	6	16.7	74	17	23.0
10-	25	22	88.0	20	10	50.0	45	32	71.1
15-	16	14	87.5	15	8	53.3	31	22	71.0
20-	22	14	63.6	29	13	44.8	51	27	52.9
30-	22	13	59.1	9	4	44.4	31	17	54.8
40-	5	2	40.0	7	0	0.0	12	2	16.7
50-	9	3	33.3	13	7	53.8	22	10	45.5
Total	150	81	54.0	142	48	33.8	292	129	44.2

Table (2)

S. mansoni prevalence by age and sex (Mohsen 1990)

Sex / Age in years	Male			Female			Total		
	No. exam.	No. pos.	%	No. exam.	No. pos.	%	No. exam.	No. pos.	%
< 5	28	6	21.4	24	2	8.3	52	8	15.4
5	45	24	53.3	44	13	29.5	89	37	41.6
10-	30	24	80.0	28	18	64.3	58	42	72.4
15-	15	9	60.0	20	13	65.0	35	22	62.9
20-	21	11	52.4	38	16	42.1	59	27	45.8
30-	24	15	62.5	17	8	47.1	41	23	56.1
40-	8	4	50.0	11	6	54.5	19	10	52.6
50-	11	2	18.2	13	6	46.2	24	8	33.3
Total	182	95	52.2	195	82	42.1	377	177	46.9

Table(3)

S. mansoni prevalence by age and sex (Mohsen 1989)

Age in years \ Sex	Male			Female			Total		
	No. exam.	No. pos.	%	No. exam.	No. pos.	%	No. exam.	No. pos.	%
< 5	34	3	8.8	31	2	6.5	65	5	7.7
5	33	10	30.3	29	8	27.6	62	18	29.0
10-	26	9	34.6	21	5	23.8	47	14	29.8
15-	13	6	46.2	21	9	42.9	34	15	44.1
20-	23	4	17.4	36	16	44.4	59	20	33.9
30-	16	6	37.5	11	4	36.4	27	10	37.0
40-	3	0	0.0	7	2	28.6	10	2	20.0
50-	10	0	0.0	14	5	35.7	24	5	20.8
Total	158	38	24.1	170	51	30.0	328	89	27.1

Table (4)

S. mansoni prevalence by age and sex (Mohsen 1988)

Sex / Age in years	Male			Female			Total		
	No. exam.	No. pos.	%	No. exam.	No. pos.	%	No. exam.	No. pos.	%
< 5	44	10	22.7	44	15	34.1	88	25	28.4
5	43	25	58.1	23	8	34.8	66	33	50.0
10-	26	17	65.4	22	10	45.5	48	27	56.3
15-	17	12	70.6	31	15	48.4	48	27	56.3
20-	31	22	71.0	32	16	50.0	63	38	60.3
30-	14	10	71.4	7	3	42.9	21	13	61.9
40-	5	2	40.0	18	9	50.0	23	11	47.8
50-	13	8	61.5	8	4	50.0	21	12	57.1
Total	193	106	54.9	185	80	43.2	378	186	49.2

Table (5)

S. mansoni prevalence by age and sex (Lashin 1991)

Sex / Age in years	Male			Female			Total		
	No. exam.	No. pos.	%	No. exam.	No. pos.	%	No. exam.	No. pos.	%
< 5	8	2	25.0	3	0	0.0	11	2	18.2
5	39	33	84.6	37	23	62.2	76	56	73.7
10-	13	13	100.0	24	19	79.2	37	32	86.5
15-	18	16	88.9	21	16	76.2	39	32	82.1
20-	24	17	70.8	39	29	74.4	63	46	73.0
30-	12	11	91.7	18	13	72.2	30	24	80.0
40-	7	7	100.0	13	3	23.1	20	10	50.0
50-	8	3	37.5	10	5	50.0	18	8	44.4
Total	129	102	79.1	165	108	65.5	294	210	71.4

Table (6)

S. mansoni prevalence by age and sex (Lashin 1990)

Sex / Age in years	Male			Female			Total		
	No. exam.	No. pos.	%	No. exam.	No. pos.	%	No. exam.	No. pos.	%
< 5	12	5	41.7	12	3	25.0	24	8	33.3
5	29	18	62.1	36	22	61.1	65	40	61.5
10-	17	14	82.4	25	16	64.0	42	30	71.4
15-	17	15	88.2	17	9	52.9	34	24	70.6
20-	16	12	75.0	39	22	56.4	55	34	61.8
30-	11	7	63.6	16	9	56.3	27	16	59.3
40-	10	7	70.0	11	1	9.1	21	8	38.1
50-	6	3	50.0	10	4	40.0	16	7	43.8
Total	118	81	68.6	166	86	51.8	284	167	58.8

Table (7)

S. mansoni prevalence by age and sex (Lashin 1989)

Age in years \ Sex	Male			Female			Total		
	No. exam.	No. pos.	%	No. exam.	No. pos.	%	No. exam.	No. pos.	%
< 5	17	2	11.8	10	2	20.0	27	4	14.8
5	16	5	31.3	30	11	36.7	46	16	34.8
10-	15	7	46.7	25	10	40.0	40	17	42.5
15-	17	10	58.8	16	2	12.5	33	12	36.4
20-	15	10	66.7	23	8	34.8	38	18	47.4
30-	8	1	12.5	16	4	25.0	24	5	20.8
40-	8	0	0.0	10	1	10.0	18	1	5.6
50-	6	1	16.7	8	2	25.0	14	3	21.4
Total	102	36	35.3	138	40	29.0	240	76	31.7

Table (8)

S. mansoni prevalence by age and sex (Lashin 1988)

Age in years \ Sex	Male			Female			Total		
	No. exam.	No. pos.	%	No. exam.	No. pos.	%	No. exam.	No. pos.	%
< 5	22	16	72.7	23	12	52.2	45	28	62.2
5	22	15	68.2	39	32	82.1	61	47	77.0
10-	17	14	82.4	19	14	73.7	36	28	77.8
15-	17	11	64.7	27	18	66.7	44	29	65.9
20-	16	12	75.0	24	11	45.8	40	23	57.5
30-	8	6	75.0	14	12	85.7	22	18	81.8
40-	14	10	71.4	14	10	71.4	28	20	71.4
50-	11	6	54.5	8	5	62.5	19	11	57.9
Total	127	90	70.9	168	114	67.9	295	204	69.2

Table (9)

S. mansoni prevalence by age and sex (Prince 1991).

Age in years \ Sex	Male			Female			Total		
	No. exam.	No. pos.	%	No. exam.	No. pos.	%	No. exam.	No. pos.	%
< 5	2	1	50.0	2	0	0.0	4	1	25.0
5	24	13	54.2	23	12	52.2	47	25	53.2
10-	19	13	68.4	20	17	85.0	39	30	76.9
15-	8	7	87.5	14	10	71.4	22	17	77.3
20-	7	7	100.0	20	10	50.0	27	17	63.0
30-	10	8	80.0	19	9	47.4	29	17	58.6
40-	10	6	60.0	4	1	25.0	14	7	50.0
50-	4	3	75.0	14	2	14.3	18	5	27.8
Total	84	58	69.0	116	61	52.6	200	119	59.5

Table (10)

S. mansoni prevalence by age and sex (Prince 1990)

Age in years \ Sex	Male			Female			Total		
	No. exam.	No. pos.	%	No. exam.	No. pos.	%	No. exam.	No. pos.	%
< 5	3	2	66.2	4	1	25.0	7	3	42.9
5	22	14	63.6	25	15	60.0	47	29	61.7
10-	19	18	94.7	22	17	77.3	41	35	85.4
15-	11	8	72.7	11	10	90.9	22	18	81.8
20-	10	9	90.0	22	14	63.6	32	23	71.9
30-	10	8	80.0	19	9	47.4	29	17	58.6
40-	8	6	75.0	5	1	20.0	13	7	53.8
50-	10	7	70.0	13	7	53.8	23	14	60.9
Total	93	72	77.4	121	74	61.2	214	146	68.2

Table (11)

S. mansoni prevalence by age and sex (Prince 1989)

Age in years \ Sex	Male			Female			Total		
	No. exam.	No. pos.	%	No. exam.	No. pos.	%	No. exam.	No. pos.	%
< 5	1	1	100.0	5	1	20.0	6	2	33.3
5	31	16	51.6	27	11	40.7	58	27	46.6
10-	17	11	64.7	28	15	53.6	45	26	57.8
15-	19	14	73.7	16	9	56.3	35	23	65.7
20-	16	10	62.5	27	5	18.5	43	15	34.9
30-	14	7	50.0	18	4	22.2	32	11	34.4
40-	6	3	50.0	5	2	40.0	11	5	45.5
50-	7	3	42.9	15	5	33.3	22	8	36.4
Total	111	65	58.6	141	52	36.9	252	117	46.4

Table (12)

S. mansoni prevalence by age and sex (Prince 1988)

Sex / Age in years	Male			Female			Total		
	No. exam.	No. pos.	%	No. exam.	No. pos.	%	No. exam.	No. pos.	%
< 5	3	0	0.0	2	0	0.0	5	0	0.0
5	27	18	66.7	33	15	45.5	60	33	55.0
10-	19	15	78.9	18	10	55.6	37	25	67.6
15-	8	6	75.0	10	6	60.0	18	12	66.7
20-	7	4	57.1	20	10	50.0	27	14	51.9
30-	13	10	76.9	15	7	46.7	28	17	60.7
40-	6	2	33.3	2	1	50.0	8	3	37.5
50-	3	0	0.0	11	7	63.6	14	7	50.0
Total	86	55	64.0	111	56	50.5	197	111	56.3

Table (13)

S. mansoni prevalence by age and sex (Kazouly 1991)

Sex / Age in years	Male			Female			Total		
	No. exam.	No. pos.	%	No. exam.	No. pos.	%	No. exam.	No. pos.	%
< 5	3	1	33.3	0	0	0.0	3	1	33.3
5	16	9	56.3	14	5	35.7	30	14	46.7
10-	8	7	87.5	9	6	66.7	17	13	76.5
15-	4	4	100.0	7	5	71.4	11	9	81.8
20-	5	2	40.0	11	8	72.7	16	10	62.5
30-	5	1	20.0	10	3	30.0	15	4	26.7
40-	7	6	85.7	4	2	50.0	11	8	72.7
50-	4	3	75.0	9	1	11.1	13	4	30.8
Total	52	33	63.5	64	30	46.9	116	63	54.3

Table (14)

S. mansoni prevalence by age and sex (Kazouly - 1988)

Age in years \ Sex	Male			Female			Total		
	No. exam.	No. post.	%	No. exam.	No. pos.	%	No. exam.	No. pos.	%
< 5	4	0	0.0	5	2	40.0	9	2	22.2
5	18	10	55.6	19	5	26.3	37	15	40.5
10-	8	6	75.0	10	5	50.0	18	11	61.1
15-	9	6	66.7	13	8	61.5	22	14	63.6
20-	5	2	40.0	9	5	55.6	14	7	50.0
30-	8	4	50.0	16	5	31.3	24	9	37.5
40-	6	4	66.7	3	2	66.7	9	6	66.7
50-	2	0	0.0	15	4	26.7	17	4	23.5
Total	60	32	53.3	90	36	40.0	150	68	45.3

Table (15)

S. mansoni prevalence by age and sex (Kazouly 1990)

Sex / Age in years	Male			Female			Total		
	No. exam.	No. pos.	%	No. exam.	No. pos.	%	No. exam.	No. pos.	%
< 5	4	2	50.0	7	2	28.6	11	4	36.4
5	12	8	66.7	11	3	27.3	23	11	47.8
10-	12	9	75.0	15	13	86.7	27	22	81.5
15-	6	6	100.0	7	6	85.7	13	12	92.3
20-	9	7	77.8	9	4	44.4	18	11	61.1
30-	7	4	57.1	16	9	56.3	23	13	56.5
40-	8	6	75.0	4	1	25.0	12	7	58.3
50-	3	2	66.7	9	3	33.3	12	5	41.7
Total	61	44	72.1	78	41	52.6	139	85	61.2

Table (16)

S. mansoni prevalence by age and sex (Kazouly 1989)

Sex / Age in years	Male			Female			Total		
	No. exam.	No. pos.	%	No. exam.	No. pos.	%	No. exam.	No. pos.	%
< 5	6	0	0.0	9	2	22.2	15	2	13.3
5	13	5	38.5	19	8	42.1	32	13	40.6
10-	11	10	90.9	5	4	80.0	16	14	87.5
15-	6	3	50.0	7	4	57.1	13	7	53.8
20-	1	0	0.0	13	7	53.8	14	7	50.0
30-	6	2	33.3	12	6	50.0	18	8	44.4
40-	6	3	50.0	5	1	20.0	11	4	36.4
50-	4	2	50.0	10	2	20.0	14	4	28.6
Total	53	25	47.2	80	34	42.5	133	59	44.4

Table (17)

Prevalence rate and geometric mean of *S. mansoni* eggs/gm stools (GMEC), Kazouli and El-Prince

Year	Prevalence		GMEC			
			Total		Infected	
	Kazouli	El-Prince	Kazouli	El-Prince	Kazouli	El-Prince
1988	45.3	56.3	9.0	15.1	126.9	124.3
1989	44.4	46.4	8.5	8.7	125.6	105.2
1990	61.2	68.4	19.7	30.4	130.4	148.9
1991	54.3	59.5	13.7	16.9	124.6	115.8

Table (18)

Incidence rate and geometric mean of *S. mansoni* eggs/Gm stools among infected individuals (Kazouli and El-Prince)

Year	Incidence		GMEC	
	Kazouli	El-Prince	Kazouli	El-Prince
1988	25.5	26.2	80.3	67.8
1989	33.3	51.2	98.3	77.6
1990	25.0	22.0	79.0	45.6

Table (19)

Prevalence rate and geometric mean of S. mansoni eggs/gm stools (GMEC) Lashin and Mohsen

Year	Prevalence		GMEC			
			Total		Infected	
	Lashin	Mohsen	Lashin	Mohsen	Lashin	Mohsen
1989 Pre-treatment	69.2	49.2	35.5	9.5	174.1	98
1989 Post-treatment	31.7	26.6	4.3	3.6	96.9	123.1
1990	58.8	46.7	15.8	7.2	109.5	67.7
1991	71.4	44.2	34.1	6.5	139.7	69

Table (20)

Incidence rate and geometric mean of *S. mansoni* eggs/gm stools among infected individuals (Lashin and Mohsen)

Year	Incidence		GMEC	
	Lashin	Mohsen	Lashin	Mohsen
1989	53.0	38.2	100.4	57.5
1990	55.4	24.4	76.8	50.4

Table (21)

Results of Dissection of Sentinel mice exposed in June, July and August 1989(Kazouly)

No. of station	Exposed 19 June		Exposed 25 July		Exposed 26 August	
	Dissected mice	No. of infected	Dissected mice	No. of infected	Dissected mice	No. of infected
1	7	0	9	0	10	0
2	6	0	10	0	10	0
3	9	0	5	0	6	0
4	9	0	8	0	9	0
5	7	0	9	0	5	0
6	6	0	8	0	6	0
7	7	0	9	0	8	0
8	3	0	8	0	9	0
9	9	0	7	0	7	0
10	8	0	10	0	8	0
11	7	0	-	0	10	0
12	7	0	-	0	9	0
13	7	0	-	0	9	0

Table (22)

Results of dissection of sentinel mice exposed in June, July and August 1989(El-Prince)

No. of station	Exposed 9 June		Exposed 26 July		Exposed 28 August	
	Dissect. mice	No. of collected worms	Dissect. mice	No. of collected worms	Dissect. mice	No. of collected worms
1	7	4	9	0	10	0
2	10	0	8	0	2	0
3	8	7	9	1	6	S.m. eggs
4	8	0	1	0	6	S.m. eggs

control village (El-Prince) than the test village (Kazouli), but in the 3rd year (1990) the picture was reverced and the incidence rate became higher in Kazouli. The GMEC of newly infected cases was higher in Kazouli than El-Prince during the three years (1988, 1989, 1990).

If we study the above findings taking into consideration the results of the snail survey in both villages which demonstrate clearly the low number of living snails and the absence of infected snails in Kazouly-except for May 1989 in one 2ndry drain- one can suggest strongly that the transmission of Schistosoma infection to the inhabitants of Kazouly occurred outside their village. This can be supported by the findings of sentinel mice experiment where not a single infection was detected in mice exposed in 13 stations in different water courses of Kazouly. Also, the fact that in this area (as rural Egypt) the villages are v ery close and movement of their inhabitants couldn't be restricted specially many farmers work in fields belonging to other near villages. Furthermore, there are no schools in Kazouly and the children have to walk for one km or more to go to the nearest schools, thus, being exposed to infection in these areas where there is no Damssissa applied.

A striking finding was observed in El-Prince in 1989 where both prevalence rate and mean epg in 1989 were lower than the previous year (1988), although Schistosomiasis transmission during this year was documented by the detection of new cases with an incidence rate of 26.2%. The same observation, but to a less extent, was observed in Kazouly where the prevalence rate and mean epg were nearly the same in both years (1988 and 1989) although the incidence rate was 25.5%. The same finding was observed in 1991.

The previous findings can be attributed to the national campaign of treatment where praziquantel was offered free in the rural health units combined with a vast mass media health education program which was followed by a very higher response for seeking diagnosis and treatment this might have lead to cure of a certain percentage of the village population which could not be compensated for by the new infection thus leading to decrease in the net prevalence rate.

Lashin and Mohsen:

The study done in February and March 1989 showed that the initial prevalence rate of S. mansoni infection was much higher in Lashin than Mohsen. Also the Geometric mean of epg in Lashin was nearly 4 times that in Mohsen. However, after giving antibilharzial treatment to most of the infected individuals in both villages the difference between the post-treatment prevalence rates of the two villages became minimal and the GMEC were nearly equal.

5. Discussion:

5.1. Startar villages:

The results of the parasitological surveys done in Kazouli (test village) and El-Prince (control village) show that the prevalence rate of S. mansoni infection was higher in control village than the test village. The difference was great in 1988, it became minimal in 1989, then it increased again in 1990 and 1991. The same pattern was observed with the geometric mean of number of eggs/gm stools (GMEC) calculated for both infected and free individuals during the same period. However, GMEC estimated for infected individuals in the the test village (Kazouli) showed relative stability during the whole follow up period (from 1989 to 1991) regardless the level of prevalence rate found. This might indicate that new infections were contracted in sites-outside the village-where schistosomiasis transmissions is stable and not affected neither by antibilharzial treatment as in case of the control village (El-Prince). In El-Prince the GMEC of infected individuals showed fluctuations which accompany those observed in the prevalence rate.

The study of the incidence rate show that although the rate of occurrence of new infections during 1988 was approximately the same in both villages, yet during the next year (1989) the rate was much higher in the

Two year later, the parasitological surveys carried out in March and April 1990 and 1991 demonstrates that the prevalence rates and mean epg stools are evidently higher in Lashin than in Mohsen. Furthermore, the incidence rates and the mean epg of newly infected individuals are also much higher in Lashin village. Although Damssissa plant was applied to all water-courses of the fields of this village in May 1989 and May 1990. At the same time the snail survey done in Lashin and Mohsen demonstrates the presence of very few snails in Lashin and most of the sampled canals and drains were free of snails in comparison to Mohsen where large number of living snails were collected from the tested water-courses. Also none of the snails collected from Lashin was infected while several snails collected from Mohsen shedded schistosome cercariae.

The above results let us suggest that Lashin inhabitants get their infection from transmission sites in fields other than those belonging to their village. This can be acertained by the observation that Lashin is very close to other villages where schistosomiasis infection prevails viz Quardahy, Faroon and El-Ebiary where schistosomiasis infection was estimated(in 1985) to be 78.8%, 78.8% and 75% respectively. As no Damssissa was applied to these villages, this mean the presence of several foci of schistosomiasis transmission in the vicinity of Lashin which are not affected by the plant application to Lashin.

On the other hand, the control village (Mohsen) is not close to other villages with high rates of schistosomiasis and the transmission in its fields was initially relatively low which may be documented from the relatively low prevalence rate and mean of epg detected in March 1989, and incidence rates mean epg of individuals who got infected during the years 1989, 1990.

CONCLUSION

The study shows that a single annual application of Ambrosia maritima to all water courses of the test villages (Kazouli and Lashin) had a consistant drastic effect on Biomphalaria snails population which was evident through the whole study period. However, this was not accompanied by a comparable significant decrease in the transmission of schistosomiasis in the same villages. The pretreatment infection indices were regained in the test villages within 2-5 years after antibilharzial administration inspite of sustained very low snail population reached.

Thus it can be concluded that transmission of infection was going on mainly from transmission sites outside the test villages due to the proximity of the villages in this area. Also the mobility of the population increases the chances of exposure to infection in areas where no control measures were undertaken.

Thus in order to design a study for control of schistosomiasis to assess the use of Damssissa as plant mollusciside, integrated control measures have to be applied and the following must be taken into consideration:

1- The test village has to be chosen not close to other villages as much as possible.

2- Application of Damssissa not only to the fields of the test village, but also to the fields of an area surrounding it with a diameter of 3-5 km in addition to treatment of the inhabitants of the surrounding villages, to decrease infection foci and minimize the chances of test village inhabitants get infected when moving to other near places.

3- Choosing a village with a moderate prevalence rate of S. mansoni infection and not close to other highly infected villages, for Damssissa application. The effect of plant molluscicide application can be evaluated by comparing the results of successive years before and after antibilharzial treatment of its inhabitants.

4- Antibilharzial treatment must be administered yearly to infected individuals after each parasitological survey.

Ressettlement Area

Area II

Area II: Ressettlement Area

Mariout area, which extends along the Alexandria - Cairo desert road, constitutes a wide project of land reclamation over the desert. Its main water supply is a branch from El-Nubariah canal. The population has been settled in this area since 1967 and according to a census performed in 1979, 16,35[illegible] individuals inhabited 26 villages.

In the present work, Mariout area was chosen as a representative of ressettlement areas in which agriculture constitutes the main activity and in which schistosomiasis has extended.

Following the plan presented in the protocol, the studies were carried and satisfied the yearly objective.

First Year: August 1988- July 1989:-

Efforts in the first year were denoted to study the extent of the problem of schistosomiasis in the locality.

Methodology:-

Human Survey:-

- Seven villages were chosen randomly out of the 26 villages.
- Census data were collected.
- Maps were prepared for all houses and water bodies.
- A pilot study concerning the prevalence of schistosomiasis in the villages was undertaken through examination of a

sample of the populations.

- Depending on preliminary findings, four small villages were excluded (*S. mansoni* prevalence was 3% - *S. heamatobium* was absent).
- The study focused on the three large villges. All individuals enrolled and urine and stool samples were collected and examined.

Snail Survey:

- Maps of all water channels relevant to the villages were prepared. Canals and drains were numbered and examined.
- A systematic snail survey was performed .
- Snails collected were examined for trematodes by exposure to light and crushing.

Results:-

- Table 1 presents the population size in the seven villages chosen. The study was then carried in the three large villages: Orabi (1241 inhabitants), El-Gazayer (1813 inhabitants) and Palestine (3404 inhabitants). A total of 6458 inhabitants were asked to participate in the study.
- The compliance rate in the three villages was 65%, 56% and 58% and a total of 3892 individuals were examined for *S. mansoni* infection by the Kato technique.
- Urinary schistosomiasis was completely absent.

- Table 2 presents the prevalence of S. mansoni in the three villages.

  The prevalence rate were 21.9% in Orabi, 40% in El-Gazayer and 27.5% in Palestine.

- Tables 3,4,5 present the prevalence of S. mansoni by age and sex in the three villages. It matches the well known pattern of schistosomiasis in Egypt.

- Tables 6,7,8 and 9,10,11 present the geometric mean egg count for positives only and for negatives and positives in the three villages by age and sex.

  Mean egg counts were parallel to the prevalence in the three villages.

- Table 12 presents the length of water channels in the three villages. It amounted to 36 kms in Orabi, 16 kms in El-Gazayer and 15.2 kms in Palestine.

- During the months of June and July, it was observed that 80% 55% and 72% of the water courses were dry.

- No Bulinus truncatus were found in the locality.

Table 13 presents the results of the snail survey in the three villages. Snail numbers represented the summation of collections of two months, June and July.

- Biomphalaria alexandrina were prevalent in canals with permanent water only.

- The distribution of infected snails pionted towards foci of transmission. Infection rates reached 11% and 7% in El-Gazayer and Palestine respectively. Infected snails could not be detected in Orabi during the summer months.

- There was a direct relationship between snail infection and prevalence of schistosomiasis in the human host in the three villages.

Discussion:-

In the reclamation projects western of Alexandria, several factors supposed to prevent the establishment and to suppress the transmission of schistosomiasis. These factors are related to the snail environment as well as to the sanitation in the villages:

- Essentially, the lands in Mariout area are sandy and the amount of water is not abundant; accordingly the majority of the water channels were found completely dry in between the irrigation rounds, particularlyduduring the hot summer. Biomphalaria snails could not survive in these channels; however, they found all the suitable conditions in few canals and drains which contained water permanently and in which a rich vegetation offered shelter and food.
- Regarding the community, sanitation measures were made availa- in the form of a latrine and potable water in every house. These measures were expected to diminish the contamination factor and to decrease water contact.

Inspite of all these factors, schistosomiasis has become established all-over the locality. However, prevalence and intensity of infection were lower than the values reported for villages in the Nile Delta. In Orabi village, where no infected snails could be detected, sbhistosomiasis was probably aquired (1) from a minimal number of infected snails (that were not detected), (2) through cercariae entering the area with the water of irrigation (3) through movement of the population to work in nearby areas or to their home provinces.

In Palestine and El-Gazayer, the snail infection rates were extremely high compared to the known values in Egypt. It was observed that latrines were allowed to drain in the water channels.

Table (1): Number of houses and population size of the chosen villages.

Village	Number of houses	Population size
Orabi	190	1241
El-Gazayer	248	1813
Palestine	459	3404
El-Yemen	999	621
El-Iraq	79	498
Mostapha Kamel	76	488
Abou-Bakr	79	212

Table (2): Prevalence of *S. mansoni* in the three villages (1988 - 1989)

	Orabi	El-Gazayer	Palestine
Number of individuals examined	788	1019	2094
Number positive	173	408	577
Proportion positive	21.95	40.4	27.55

Table (3): Prevalence of *S. mansoni* by age and sex

Orabi, 1988

Age group	Male	Female	Total
5	7.50	12.50	10.00
5-	20.00	15.00	17.78
10-	39.29	13.21	26.61
15-	35.90	33.33	34.62
20-	30.77	25.71	28.87
30-	32.43	25.81	29.41
40-	16.67	20.69	18.87
50 , Over	22.22	18.52	20.63
All ages	24.31	19.50	21.95

Table (4): Prevalence of S. mansoni by age and sex El-Gazayer (1988-1989).

Age group	Male	Female	Total
5	17.07	10.61	14.19
5-	33.70	18.29	26.44
10-	54.02	37.14	46.50
15-	69.64	35.59	52.17
20-	67.39	49.40	55.74
30-	70.69	42.19	55.74
40-	52.94	22.86	37.68
50 ,Over	53.57	24.49	40.00
All ages	49.12	30.91	40.04

Table (5): Prevalence of S. mansoni by age and sex Palestine (1989).

Age group	Male	Female	Total
5	9.40	12.70	10.90
5-	22.78	17.08	19.92
10-	39.19	28.57	34.03
15-	48.65	39.65	43.15
20-	46.37	34.01	37.96
30-	42.31	26.19	31.37
40-	33.78	32.94	33.33
50 Over	41.57	27.50	34.46
All ages	30.28	25.20	27.55

Table (6): Geometric mean egg counts for positives only by age and sex, Orabi (1989).

Age group	Male	Female	Total
5	46.39	59.61	54.50
5-	81.96	55.62	69.11
10-	98.63	67.91	88.33
15-	90.91	75.65	85.70
20-	84.96	83.17	83.81
30-	79.56	71.35	76.61
40-	80.70	90.63	84.69
50 Over	72.08	73.50	72.66
All ages	84.01	72.56	78.81

(Table (7): Geometric mean egg counts for positives only by age and sex, El-Gazayer (1989).

Age groups	Male	Female	Total
5	69.15	72.50	70.59
5-	82.15	106.39	90.07
10-	154.66	70.75	113.32
15-	127.25	74.24	102.02
20-	117.19	86.32	100.13
30-	109.49	79.71	95.23
40-	85.49	79.70	83.84
50 Over	89.65	73.19	84.69
All ages	108.49	80.27	96.01

Table (8): Geometric mean egg counts for positives only by age and sex Palestine (1989)

Age groups	Male	Female	Total
5	73.07	56.92	63.19
5-	73.78	72.93	73.39
10-	87.20	119.01	98.96
15-	105.52	100.76	102.95
20-	85.53	80.71	82.83
30-	91.08	77.84	84.36
40-	116.82	74.52	92.69
50 Over	92.01	74.53	84.76
All ages	89.08	82.55	85.85

Table (9): Geometric mean egg counts by age and sex Orabi, 1988.

Age group	Male	Female	Total
5	1.33	1.69	1.50
5-	2.52	1.86	2.20
10-	6.06	1.74	3.30
15-	5.05	4.25	4.63
20-	3.94	3.13	3.45
30-	4.03	3.12	3.59
40-	1.96	2.49	2.24
50 Over	2.56	2.16	2.38
All ages	2.91	2.32	2.60

Table (10): Geometric mean egg counts by age and sex El-Gazayer (1988-1989).

Age group	Male	Female	Total
5	2.05	1.54	1.81
5-	4.63	2.39	3.39
10-	15.58	5.02	9.39
15-	29.74	4.52	11.31
20-	23.50	8.65	12.12
30-	29.33	6.63	13.16
40-	11.62	2.91	5.77
50 Over	12.76	2.94	5.16
All ages	10.31	3.88	6.33

Table (11): Geometric mean egg counts by age and sex Palestine (1989).

Age group	Male	Female	Total
5 5	1.50	1.66	1.58
5-	2.64	2.08	2.34
10-	5.76	3.89	4.76
15-	9.65	6.21	7.37
20-	8.55	4.32	5.38
30-	6.81	2.90	4.02
40-	4.75	4.27	4.49
50 Over	6.76	3.22	4.67
All ages	3.90	3.03	3.41

Table (12): Number and lengths of water channels in the three villages

	Orabi	El-Gazayer	Palestine
Number of canals	67	21	14
Number of drains	35	36	64
Total number of channels	102	67	78
Length of canals (Km.)	23.750	7.460	4.910
Length of drains (Km.)	12.210	9.100	10.310
Total length of channels (Km.)	35.960	16.560	15.220
Length of dry channels (Km.)	28.960	9.060	10.860
Length of channels containing water (Km.)	7.00	7.510	4.360
Proportion of channels with water (%)	19.47%	45.35%	28.65%

Table (13): Snail survey in the three villages June and July 1989.

	Orabi	El-Gazayer	Palestine
Snails			
Total number of snails collected	160	319	65
Total number of infected snails	0	38	5
Proportion of infected snails (O)	0	11.2	7.6
Infested channels			
Number of channels with *B. alex.*	0	4	0
Number of drains with *B. alex.*	1	4	1
Length of infested canals (Km.)	0	3.38	0
Length of infested drains (Km.)	1.5	1.72	0.5
Total length of infested channels (Km.)	1.5	5.10	0.5
Proportion of infested channels to water network (%)	4.17	30.8	3.29
Infected channels			
Number of channels with infected snails	0	1	0
Number of drains with infected snails	0	1	1
Length of infected canals (Km.)	0	0.350	0
Length of infected drains (Km.)	0	0.700	0.500
Proportion of infected channels to water network (%)	0	6.34	3.29

Second Year Study (1989-1990)

Aim of the Study:

The second year was considered the attack phase and works were designed to fulfill the following:-

1- Study of incidence before Damsissa application, to allow for comparison with incidence after Damsissa.

2- Treatment of infected individuals with praziquantel.

3- Application of Damsissa to all water courses with particular attention to the snail foci.

Methodology:

Study of incidence:

After allowing enough time for worm maturation and oviposition after the transmission season of 1989, examination of the population in the three villages was undertaken.

Treatment activities:

- In regular visits, the team administered praziquantel to positive cases.
- People became motivated, and some individuals who had not provided stool specimens during the first year, gave their samples.
- Stool specimens were examined in the laboratory and cases found positive were registered and included in treatmet.
- All people who were called for therapy and responded were given the proper dose of praziquantel after medical examination. This entailed repetition of the visits to the villages.
- Stool examination for drug evaluation was performed three and six months after therapy.

Snail studies and Damsissa Application:

- A monthly snail survey was undertaken in the three villages.
- Damsissa, in the dose of 70 p.p.m. was applied to all water courses containing water on harbouring snails

during the months of April i.e before snail breeding season.

- The monthly snail survey was continued.

RESULTS

1- Studies on Incidence:

Table 14 presents the incidence of *S. mansoni*, after the summer season 1989. It is observed that 14.1% of the negatives in the area were infected during the transmission season.

2- Treatment Studies-

Table 15 presents the number of individuals that presented for examination during the treatment activities and the proportion of *S. mansoni* infected individuals. It is observed that the prevalence in this group coincided with the overall prevalence in each village.

Table 16 presents the number of patients who were treated. It is observed that 82% of all cases received the proper dose of praziquantel.

Table 17 presents the cure rate three months after praziquantel. It varied between 91% and 96%.

Table 18 presents the geometric mean egg count for positive cases after treatment and compares it with the mean before treatment.

Table 19 presents the cure rate six months after therapy; some cases reverted to positive during this period.

3- Prevalence and Intensity of *S. mansoni* in the year 1990

Tables 20 and 21 compare the prevalence and intensity of infection in the years 1989 and 1990. Lower figures are observed in the year 1990 due to the effect of therapy.

Tables 22,23,24 and 25,26,27 present the geometric mean egg counts for negatives and positives and for positives only in the three villages.

Damsissa Works:

In Orabi village a total of 2.5 Kms. of water channels were treated by 364 Kgms. of Damsissa.
In El-Gazayer, 5.46 Kms. were treated by 504 Kgms. of Damsissa.
In Palestine, 1.85 Kms. were treated by 230 kgms. of Damsissa.

Snail survey revealed dead snails in the water channels treated. Very few snails still alive in the month of April, but non of them was infected.
In May and June all collected snails were dead.
In July, five snails were collected alive but non was infected.
In August; nine snails were collected alive, three of them were found infected (size 9-13 mm). They were collected from El-Gazayer village.

Table (14): Incidence of *S. mansoni* infection after the summer 1989.

Village	Number Neg. (1989)	Number Pos. (1990)	Incidence rate
Orabi	324	55	16.9%
El-Gazayer	385	55	14.3%
Palestine	985	126	12.8%
Total	1694	236	14.1%

Table (15): Prevalence of *S. mansoni* infection among individuals presenting for examination during treatment administration.

Village	Persons examined	Number positive	Number negative	Proportion positive
Orabi	188	45	143	23.0%
El-Gazayer	336	123	213	36.6%
Palestine	530	149	381	28.1%
Total	1054	317	737	30.0%

Population of the three villages : :6458.

Population examined before treatment : 4955.

Compliance rate in the three villages: 76%.

Table (16): Proportions of patients treated and re-examine after three months in the three villages.

Village	Number Pos.	Number R	Proportion R	Number Re-exam.	Proportion Re-exam.
Orabi	220	175	80.0%	74	42.3%
El-Gazayer	531	463	87.0%	214	46.2%
Palestine	726	570	78.5%	248	43.5%
Total	1475	1216	82.1%	536	44.0%

Table (17): Cure rate after praziquantel in the three villages (Three months after treatment).

Village	No. R and re-exam.	No. cured	Cure rate
Orabi	74	70	94.6%
El-Gazayer	214	195	91.1%
Palestine	248	238	95.5%
Total	536	503	93.8%

Table (18): Geometric mean egg counts/gm. stools (for positive only) before and three months after treatment.

Village	Before treatment		After treatment	
	No. Pos.	G.M. egg count	No. Pos.	G.M. egg count
Orabi	220	78.8	4	40.4
El-Gazayer	531	93.3	19	32.7
Palestine	726	86.1	10	34.7

Table (19): Cure rate six months after praziquantel.

Village	No. R and re-exam.	No. neg.	Cure rate
Orabi	90	76	84.4%
El-Gazayer	201	181	90.0%
Palestine	330	303	91.8%

Table (20): Comparison of the prevalence of *S. mansoni* by village , years 1989 and 1990.

Village	1989		1990	
	No. exam.	Prevalence	No. exam.	Prevalence
Orabi	788	21.95%	498	18.5%
El-Gazayer	1019	40.04%	751	14.9%
Palestine	2094	27.55%	1573	15.4%

Table (21): Geometric mean egg count for positives by village , years 1989 and 1990.

Village	Egg counts	
	1989	1990
Orabi	79.92	52.32
El-Gazayer	93.26	49.18
Palestine	86.14	48.66

Table (22): Geometric mean egg counts by age and sex Orabi (1990).

Age group	Male	Female	Total
5	1.15	2.04	1.47
5-	1.23	1.22	1.22
10-	3.20	2.14	2.60
15-	3.39	2.50	2.88
20-	3.31	2.27	2.53
30-	3.57	4.74	4.09
40-	2.19	1.42	1.66
50 Over	1.94	1.57	1.96
All ages	2.17	1.98	2.09

Table (23): Geometric mean egg counts by age and sex El-Gazayer (1990).

Age group	Male	Female	Total
5	1.10	1	1.05
5-	1.48	1.28	1.38
10-	1.97	1.82	1.89
15-	4.00	1.82	2.59
20-	2.77	1.48	1.90
30-	2.14	1.92	2.03
40-	1.62	1.71	1.76
50 over	2.81	1.43	1.97
All ages	2.06	1.55	1.78

Table (24): Geometric mean egg counts by age and sex Palestine (1990).

Age group	Male	Female	Total
5	1.46	1.21	1.32
5-	1.48	1.25	1.36
10-	2.10	1.62	1.82
15-	2.75	2.40	2.55
20-	2.98	1.87	2.17
30-	2.02	1.91	1.95
40-	2.10	1.64	1.81
50 over	1.50	1.39	1.45
All ages	1.81	1.56	1.67

Table (25): Geometric mean egg counts for positives only by age and sex Orabi (1990).

Age group	Male	Female	Total
5	0	45.91	39.03
5-	24	38.09	29.25
10-	56.97	71.80	62.49
15-	71.45	39.54	53.30
20-	74.48	40.34	49.49
30-	52.52	57.32	55.00
40-	112.56	41.56	68.40
50 over	36.37	38.09	48.92
All ages	53.22	49.13	52.32

Table (26): Geometric mean egg counts for positives only by age and sex El-Gazayer (1990).

Age group	Male	Female	Total
5	0	0	0
5-	42.46	27.56	35.96
10-	73.02	46.23	58.10
15-	40.35	39.69	40.12
20-	43.24	62.00	49.05
30-	98.55	55.64	74.12
40-	49.43	37.56	43.09
50 over	54.90	60.47	56.36
All ages	51.62	45.73	49.18

Table (27): Geometric mean egg counts for positives only by age and sex Palestine (1990).

Age group	Male	Female	Total
5	41.37	35.22	39.09
5-	43.33	35.17	40.10
10-	56.05	41.37	49.72
15-	65.51	57.72	61.14
20-	52.44	59.61	54.17
30-	74.48	39.23	49.75
40-	48.23	43.61	46.06
50 over	49.81	42.78	46.48
All ages	52.60	44.58	48.65

Report on the Research Activity In the New Ressettlement Area in the Period August 1990 - July 1991.

Aim of Work:-

Works during this period aimed at the evaluation of the effect of Damsissa application :

- On the prevalence and incidence of Schistosoma mansoni in the population.
- On the snail population density and infection.

Methodology:-

Human Survey:

- Field visits were carried regularly during the period December 1990 - March 1991. i.e. after the transmission season of 1990.
- Stool specimens were collected and examined by the Kato technique.

Snail Survey:-

All water courses were surveyed monthly. Survey aimed at collection of the maximum number of snails.
In the laboratory snails were examined by light exposure and by crushing and any trematode parasite was noted.

Results

Compliance rate:- is presented in Table (28).

Prevalence of *S. mansoni* in the three villages:-

Table (29) presents the prevalence of *S. mansoni* in the three villages. It was 17%, 14% and 12% in Orabi El-Gazayer and Palestine respectively.
The prevalence by age and sex in the three villages is presented in Tables 30, 31 and 32.
The prevalence was higher in males and a plateau was observed in the three villages starting at the age of 10 till the age of 40.

Intensity of Infection:-

Taking in consideration positives and negatives, the geometric mean egg counts was 1.9, 1.7 and 1.6 in the three villages Orabi, El-Gazayer and Palestine. Intensity was thus parallel to the prevalence (Table 33). Tables 34, 35, 36 present the geometric mean egg counts by age and sex (taking in consideration all individuals). Intensity was parallel to the prevalence by age and sex

Tables 37- 40 present the geometric mean egg counts for positives only by age and sex in the three villages. Values in the three villages and in all ages were considered low.

Incidence by Villages:-

Table 40 presents the incidence after the transmission season of 1990.
It was 17%, 12.7% and 8% in the three villages.

Comparison between prevalence and incidence of schistosomiasis in each of the three villages, before and after application of Damsissa and praziquantel administration, are illustrated in diagrams.

Snail Survey:-

Monthly snail survey revealed the presence of few live snails.
On exhaustive search, 2.5%, 4% and 4% of them were found infected in Orabi, El-Gazayer and Palestine respectively. However, the majority of infected snails were diagnosed on crushing that revealed sporocysts. Only two snails in Palestine village were shedding cercariae.

Table 41 present the results of the snail survey in the three villages before and after Damsissa application.

Table (28): Compliance rate in the three villages year 1991.

Village	Total Population	Number examined	Compliance rate
Orabi	1241	499	40%
El-Gazayer	1813	931	52%
Palestine	3404	1605	48%
Total	6458	3035	47%

Table (29): Prevalence of S. mansoni in the three villages (1991).

	Orabi	El-Gazayer	Palestine
Number of individuals examined	499	931	1605
Number positive	85	132	194
Proportion positive	17.034	14.178	12.087

Table (30): Prevalence of S. mansoni by age and sex

Orabi, 1991.

Age	Male				Female				Total			
group	Ex.	-ve	+ve	+ve%	Ex.	-ve	+ve	+ve%	Ex.	-ve	+ve	+ve%
5	4	3	1	25.00	2	2	0	0	6	5	1	16.66
5-	72	68	4	5.56	70	63	7	10.00	142	131	11	7.74
10-	33	20	13	39.39	40	36	4	10.00	73	56	17	23.29
15-	32	23	9	28.13	36	30	6	16.67	68	53	15	22.06
20-	25	17	8	32.00	42	35	7	16.67	67	52	15	22.39
30-	28	20	8	28.57	20	17	3	15.00	48	37	11	22.92
40-	13	9	4	30.77	21	19	2	9.52	34	28	6	17.65
50 Over	27	23	4	14.82	33	28	5	15.15	61	55	9	14.75
All ages	234	183	51	21.79	264	230	34	12.88	499	414	85	17.034

Table (31): Prevalence of S. mansoni by age and sex El-Gazayer (1991).

Age Group	Male				Female				Total			
	Ex.	-ve	+ve	+ve%	Ex.	-ve	+ve	+ve%	Ex.	-ve	+ve	+ve%
5	7	7	0	0	10	10	0	0	17	17	0	0
5-	114	107	7	6.14	107	100	7	6.64	221	207	14	6.33
10-	75	58	17	22,67	71	59	12	16.90	146	117	29	19.86
15-	63	49	14	22.22	60	52	8	13.33	123	101	22	17.88
20-	64	44	20	31.25	86	78	8	9.30	150	122	28	18.67
30-	52	39	13	25.00	64	55	9	14.06	116	94	22	18.96
40-	35	31	4	11.43	41	38	3	7.31	76	69	7	9.21
50over	40	34	6	15.00	42	38	4	9.52	82	72	10	12.19
All ages	450	369	81	18.00	481	430	51	10.60	931	799	132	14.18

Table (32): Prevalence of S. mansoni by age and sex Palestine(1991)

Age group	Male				Female				Total			
	Ex.	-ve	+ve	+ve%	Ex.	-ve	+ve	+ve%	Ex.	-ve	+ve	+ve%
5	62	60	2	3.23	63	62	1	1.58	125	122	3	2.40
5-	221	205	16	7.24	228	207	21	9.21	449	412	37	8.24
10-	150	128	22	14.67	117	107	10	8.54	267	235	32	11.98
15-	64	52	12	18.75	72	59	13	18.05	136	111	25	18.38
20-	67	47	20	29.85	120	106	14	11.66	187	153	34	18.18
30-	69	58	11	15.94	107	87	20	18.69	176	145	31	17.61
40-	58	45	13	22.41	67	60	7	10.44	125	105	20	17.39
50 over	67	63	4	5.97	61	56	5	8.19	128	119	9	7.03
Others	4	3	1	25.0	8	6	2	25.00	12	9	3	20.00
All ages	762	661	101	13.25	843	750	93	11.03	1605	1411	194	12.08

Table (33): Prevalence of S. mansoni and Geometric mean egg counts in the three villages (1991).

Village	Prevalence	Geometric Mean
Orabi	17.034	1.935
El-Gazayer	14.178	1.698
Palestine	12.087	1.555

Table (34): Geometric mean egg counts by age and sex Orabi, 1991.

Age group	Male	Female	Total
5	2.21	1	1.69
5-	1.22	1.51	1.36
10-	4.45	1.39	2.96
15-	3.51	1.89	2.52
20-	3.19	1.92	2.32
30-	3.24	1.76	2.51
40-	3.43	1.49	2.05
50 Over	1.60	1.76	1.67
All ages	2.33	1.64	1.94

Table (35): Geometric mean egg counts by age and sex El-Gazayer (1991).

Age group	Male	Female	Total
5	1	1	1
5-	1.23	1.25	1.24
10-	2.29	1.81	2.04
15-	2.37	1.54	1.92
20-	3.69	1.47	2.18
30-	2.67	1.64	2.05
40-	1.49	1.26	1.36
50 over	1.69	1.40	1.53
All ages	1.99	1.46	1.70

Table (36): Geometric mean egg counts by age and sex Palestine (1991).

Age group	Male	Female	Total
5	1.147	1.051	1.098
5-	1.289	1.363	1.326
10-	1.728	1.340	1.546
15-	2.084	1.988	2.033
20-	3.206	1.011	2.053
30-	1.804	1.941	1.886
40-	2.364	1.457	1.824
50 over	1.221	1.342	1.277
All ages	1.642	1.481	1.555

Table (37): Geometric mean of S. mansoni for positives only by age and sex Orabi (1991).

Age group	Male	Female	Total
5	0	0	0
5-	40.36	62.18	53.14
10-	44.45	28.54	40.05
15-	86.79	45.75	67.18
20-	37.56	50.39	43.08
30-	61.74	43.61	56.16
40-	55.20	67.88	59.14
50 over	24.00	42.78	33.08
All ages	48.74	47.46	48.22

Table (38): Geometric mean of S. mansoni for positives only by age and sex El-Gazayer (1990).

Age group	Male	Female	Total
5	0	0	0
5-	32.30	32.30	32.30
10-	39.24	33.75	36.87
15-	48.77	26.17	38.89
20-	65.55	66.79	65.91
30-	51.32	35.02	43.89
40-	33.94	24.00	29.25
50 over	33.94	33.94	33.94
All ages	46.63	35.41	41.93

Table (39): Geometric mean of *S. mansoni* for positives only by age and sex Palestine (1991).

Age group	Male	Female	Total
5	72.00	0	49.92
5-	33.33	24.77	28.07
10-	41.78	22.53	33.98
15-	50.31	45.06	47.50
20-	49.56	56.51	52.31
30-	40.59	34.84	36.78
40-	46.47	36.82	42.83
50 over	26.54	36.37	32.66
All ages	42.89	34.12	38.41

Table (40): Incidence of *S. mansoni* by village after the transmissio season of 1990.

Village	No. Neg. (1990)	No.Pos. (1991)	Incidence
Orabi	238	41	17.2%
El-Gazayer	409	52	12.7%
Palestine	815	67	8.2%
Total	1462	160	10.94%

Table (4): Snail survey before and after Damsissa application in the three villages.

Village	June 1989-April 1990 Number collected	Infected snail No.	%	May 1990 - April 1991 Number collected	Infected snail No.	%
Orabi	530	8	1.5%	40	1	2.5%
El-Gazayer	757	48	6.3%	121	5	4.1 %
Palestine	582	51	8.7%	101	4	4.0%
Total	1969	107	5.43%	262	10	3.81%

Reduction in number of snails = 86.70%.

Reduction in number of infected snails = 90.66%.

Table 42 Summary of the indices in Area II.

	Year 1989 Base line data		1990 After Treatment		1991 After Damsissa
Orabi					
Prevalence	22%		18.5%		17%
Geom. mean for pos.	79		52		48
Geom. mean for all	2.6		2.1		1.9
Incidence		17%		17%	
Reversal		10%		68%	
El Gazayer					
Prevalence	40%		15%		14%
Geom. mean for pos.	96		49		42
Geom. mean for all	6.3		1.8		1.7
Incidence		14%		13%	
Reversal		11%		79%	
Palestine					
Prevalence	28%		15.4%		12%
Geom. mean for pos.	86		48		38
Geom. mean for all	3.4		1.7		1.5
Incidence		13%		8%	
Reversal		13%		66%	

Orabi Village

Total population 1343 individuals

498 (examined in 1990)

72 Not done | 324 Negative | 102 Positive (In 1989)

56 Neg. | 16 Pos. | 266 Neg. | 55 Pos. | 84 Neg. | 18 Pos.

84 Neg.: 76 R | 8 Not

18 Pos.: 14 R | 4 Not

<u>Prevalence</u>

22.2%

<u>Incidence</u>

16.97%

<u>Cure rate after 6 month</u>

84.4%

<u>Reversion</u>

9.52%

Orabi Village

Total Population 1343 Individuals

499 (examined in 1991)

204		238		57 (in 1990)	
Not done		Neg.		Pos.	
178	26	197	41	39	18 (1991)
Neg.	Pos.	Neg.	Pos.	Neg.	Pos.
Prevalence== 12.75%		Incidence = 17.22%		Reversion = 68.42 %	

Repetition: 27 (exam.)
+2 (positive)
i.e. 7% positive

Mean egg counts:
24 (12) egg/gm.

El Gazayer Village

Total Population 1839 individuals

751 (examined in 1990)

135	385	231	
Not done	Negative	Positive	(in 1989)

104	31	330	55	205	26	
Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	(in 1990)

Prevalence

23 %

Incidence

14.3 %

181	24	20	6
R	Not	R	Not

Cure rate after 6 months

90%

Reversion

11.70%

El-Gazayer Village

Total Population 1839 Individuals.

931 (examined in 1991)

453	409	69 (in 1990)
Not done	Neg.	Pos.

388	65	357	52	54	15 (in 1991)
Neg.	Pos.	Neg.	Pos.	Neg.	Pos.

Prevalence = 14.34%

Incidence = 12.71%

Reversion= 78.26

Repetition:

31 (exam.)

+5 (positive)

i.e. 16% positive.

Mean egg counts:

43 egg/gm.

Palestine Village

Total Population 3471 individuals

1573 (examined in 1990)

201	985	387	
Not done	Negative	Positive	(in 1989)

157	44	859	126	347	40	
Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	(in 1990)

Prevalence

21.8%

Incidence

12.9%

303	44	27	13
R	Not	R	Not

Cure rate after 6 months

91.8%

Reversion

12.68%

Palestine Village

Total Population 3495 Individuals

1605 (examined in 1991)

677		815		113 (in 1990)	
Not done		Neg.		Pos.	
586	91	748	67	75	38 (in 1991)
Neg.	Pos.	Neg.	Pos.	Neg.	Pos.
Prevalence = 13.44%		Incidence = 8.22%		Reversion= 66.37%	

Repetition:

37 (exam.)

+5 (positive)

i.ei 8%

Mean egg counts:

32 egg/gm.

Discussion:

The efforts undertaken during the three years in the ressettlement area have sudceeded to control S.mansoni in the three villages.
Prompt control with reduction of prevalence was observed after therapy. The application of Damsissa lowered the prevalence

Intensity of infection showed a significant parallel decrease.
Incidence revealed decrease when compared to the values before damsissa. However some new infections were diagnosed.
Reversal rate was high even when repeated examination of the negatives was undertaken to exclude the possibility that the diagnosis missed the cases with very light infections.

Snail survey revealed about 90% decrease in the number of total and of infected snails. Taking in consideration that the technique adopted in snail survey after Damsissa was exhaustive search and collection (not sampling), the real decreaqe is definitely greater than the presented results.

Comparison of the results in the three years:

Table 42 and Figs. 1 and 2 compare the results as regards prevalence, intensity of infection, incidence and reversion rates in the years 1989, 1990 & 1991.

It is observed that prevalence decreased significantly after treatment. After damsissa application, the prevalence decreased in the three villages

Intensity of infection, showed a diminution after praziquantel that persisted after damsissa.

Incidence of infection was lower after damsissa application in El Gazayer and Palestine. No decrease in incidence was observed in Orabi village.

Reversion from positive to negative among patients who did not receive treatment by the team was 9.5%, 11.7% and 12.7% in the three villages in the period 1989 - 1990. This rate was very high in the three villages in the period 1990 - 1991.

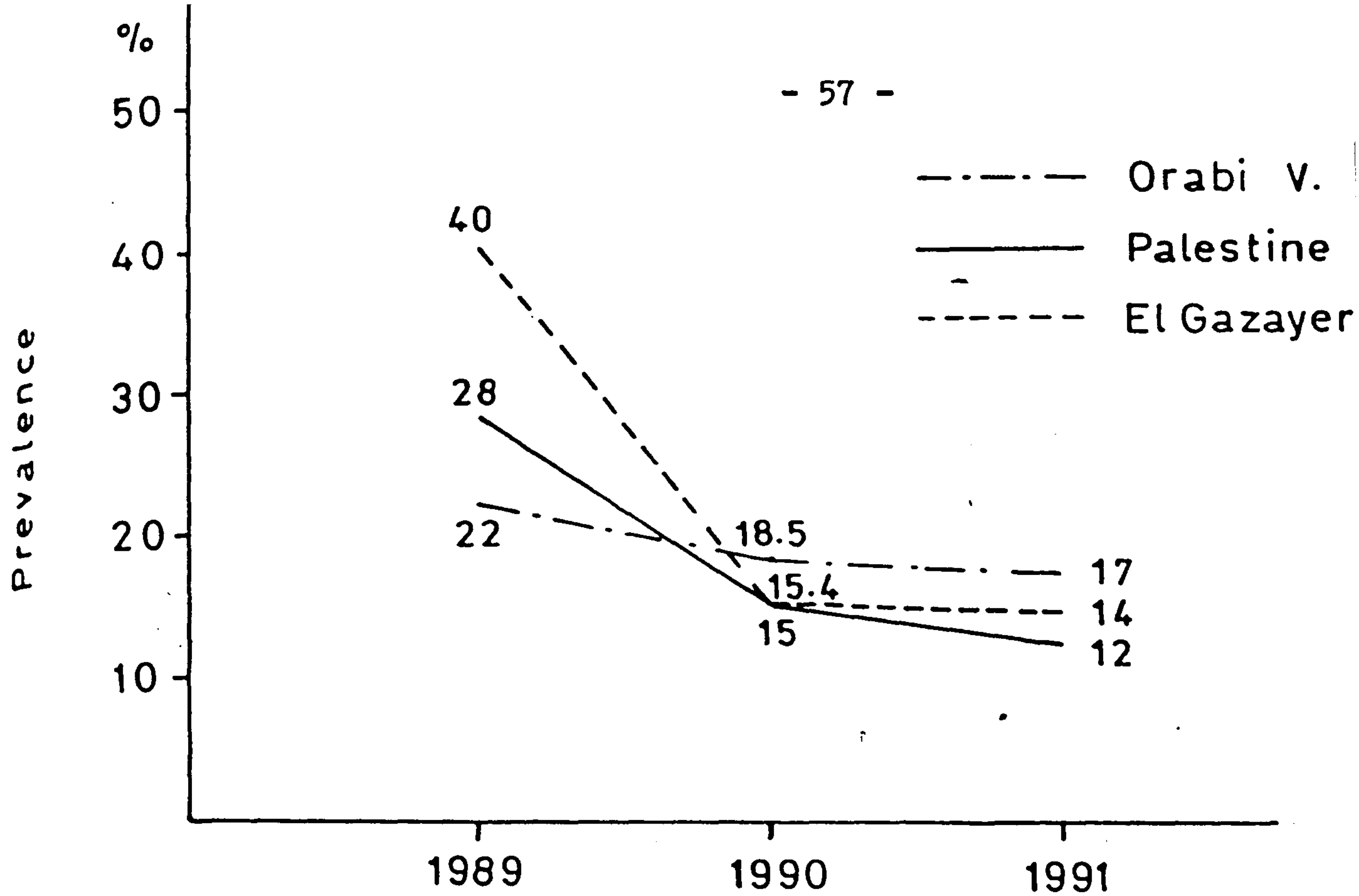

%
Prevalence
50
40
30
20
10
Orabi V.
Palestine
El Gazayer
40
28
22
18.5
15.4
15
17
14
12
1989
1990
1991
Years

Fig. 1

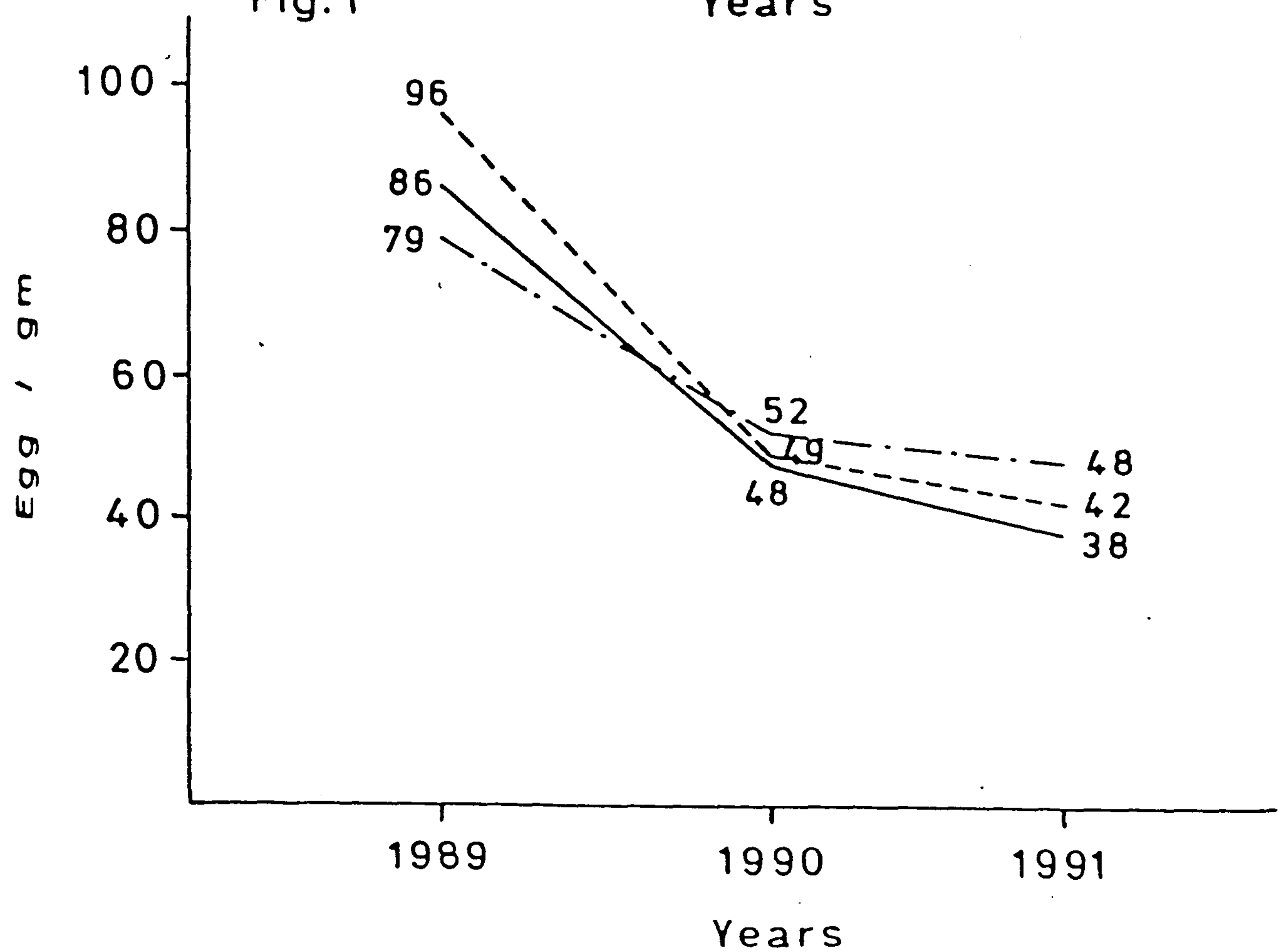
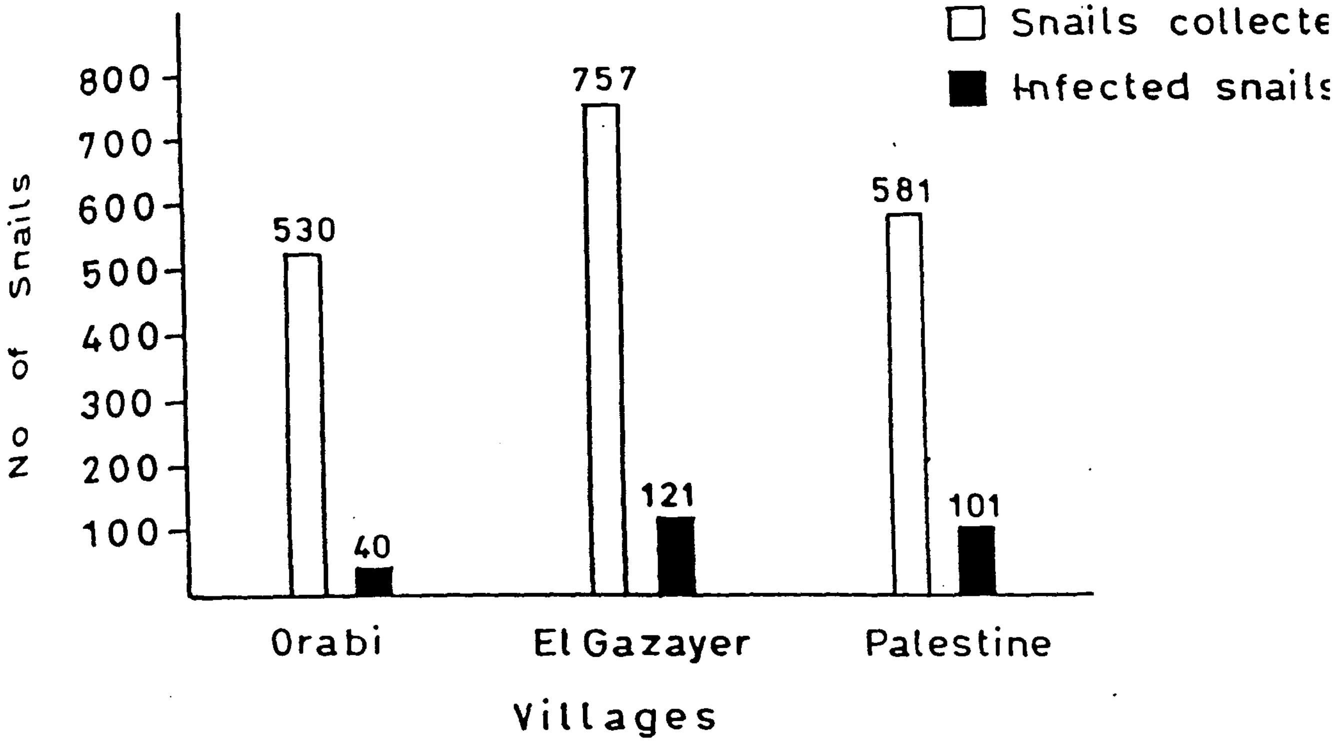
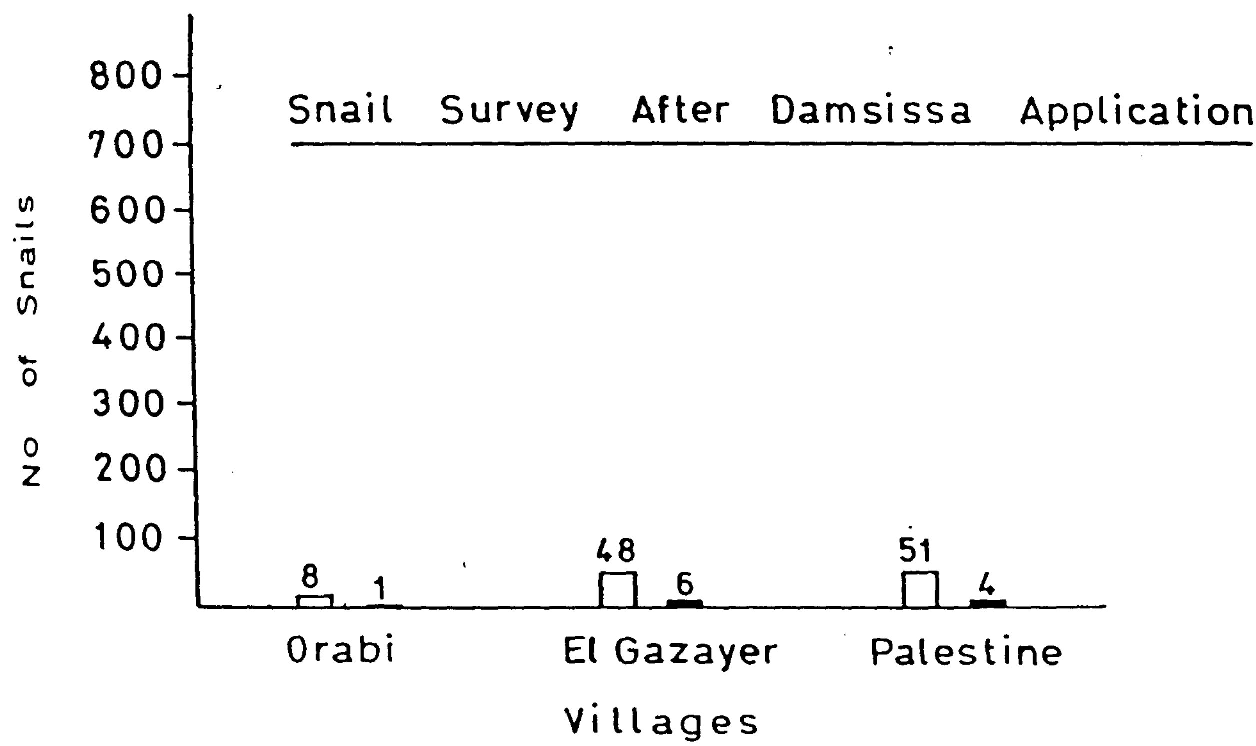

Egg / gm
100
80
60
40
20
96
86
79
52
49
48
48
42
38
1989
1990
1991
Years

Fig. 2

Snail Survey before Damsissa Application





Conclusion:

The efforts undertaken during the three years in the ressettlement area have succeeded to control *Schistosoma mansoni* in the three villages.

Prompt control with reduction of prevalence was observed after therapy. The application of Damsissa lowered the prevalence by a small magnitude.

Intensity of infection showed a significant parallel decrease.

Incidence revealed decrease when compared to the values before Damsissa.

Reversal rate was high even when repeated examination of the negatives was undertaken.

Snail survey revealed about 90% decrease in the number of total and of infected snails taking in consideration that the technique adapted in snail survey after Damsissa was exhaustive search and collection, the real decrease is definitely greater than the presented results.

It is hoped that the project be extended for another period of three years to clarify several findings and to give a complete picture of the role of Damsissa and of community participation, particularly in the ressettlement areas that have a particular transmission patern.

Bio – Toxicological Studies

FINAL REPORT ON THE FIRST YEAR BIO-TOXICOLOGICAL STUDIES OF AMBROSIA MARITIMA (DAMSSISA) TOWARDS SOME NON-TARGET ORGANISMS

Introduction:

The water streams where the plant molluscicide *A. maritima*, is applied, serve as a reservoir for tremendous amounts of non- target organisms representing the normal aquatic ecosystem. Thus biotoxicological studies concerning the effect of *A. maritima* on such organisms can act as a reference for the safety of the plant.

Aim of the Study:

1- Determination of the acute toxicity (LC_{50}'s) of *A, maritima* towards some local aquatic organisms using standard bioassay methods.

2- Determination of the activity of some vital body enzymes and constituents in *T. nilotica* (Boulti fish) after various time intervals of continuous exposure to a high concentration (1/2 LC_{50}) of *A. maritima*. Data would be helpful in explaining the molluscicidal action of the plant.

3- A parallel study using the chemical molluscicide "Bayluscide" would be performed.

Materials and Methods:

1- Extraction of the active ingredient:

The aquous extract of the dry whole plant of *A. maritima* up to the concentration of 3×10^3 ppm failed to show any mortalities among the tested organisms. So, extraction of the active ingredient of the plant was done using various organic solvents where ethanol (absolute)was proved to be the most efficient.

2- Test organisms:

Culex pipiens larvae, *Daphnia magna*, tad pole, gambusia fish, *Tilapia nilotica* (Boulti fish) and 3 green unicellular algae (Chlorlla Ankistrodesmus and Scenedesmus species, Fig. 1) were selected as test organisms for the present biotoxicity studies. All the chosen test organisms were collected from the water streams neighbouring Alexandria which kept for 3 weeks under standard laboratory conditions for acclimatization except *T. nilotica* fish. Maryout fish plant provided us with 2,000 juvenile fish having the same size (4-5 cm).

3- Bioassay tests:

The chosen organisms were exposed to serial concentrations of the tested molluscicides, kept at 25°C, mortalities were recorded after 24, 48 and 96 hours. A linear regression equation was calculated each time according to Litchfield and Wilcoxon method (1949), converting the test concentration and the corresponding mortalities into logarithms and probits respectively. A special technique was used for isolation and culturing the chosen fresh water green unicellular algae. The pipetting method was used for transferring single cell, under the microscope to the culture medium. Incubation of the media at 25°C allowed the growth of the culture. Reading of the cells count/litre was done, using the haemocytometer, at various time intervals among both control and treated media with the different molluscicidal concenterations.

4- *In-vivo* biochemical studies:

The effect of acute exposure of *T. nilotica* fish to a relatively high concentration (1/2 LC_{50}) of the tested molluscicides for a short period upto 48 (hours), on the *in-vivo* activity of some vital enzymes and body constituents was studied. The brains and livers of both control and exposed fish were removed, weighed chilled on ice then homogenized into 10 volumes (weight/volume) using 0.1 M phosphate buffer pH 8.0. The homogenate was centrifuged at 6000 g for 20 minutes at 4°C. The supernatants were used to determine the chosen enzymes activity and body constituents using Bohringer Mannheim GmbH diagnostic kits. Adrenaline and nor-adrenaline in the brain were determined according to the method of Euler and Hamberg (1949).

Results and discussion:

1- Data concerning the bioassay tests for determination of the acute toxicity or $LC_{50's}$ of both A. maritima (Damssisa) and the chemical molluscicide, Bayluscide towards the chosen aquatic non-target organisms are shown in tables (1-15). The tested organism according to their susceptibility to A. maritima were: tad pole, gambusia fish, T. nilotica(Boulti fish), Daphnia magna and Culex pipiens larvae. The chemical molluscicide, Bayluscide showed too much toxicity towards these test organisms. The ratio of A. maritima $LC_{50's}$ values to that of Bayluscide ranged from 328 folds in the case of C. pipiens larvae (after 24 hours), table (3)to 11500 folds in the case of tad pole (after 96 hours)

The above data denotes clearly the safety of A. maritima (Damssisa) towards the aquatic non-target organisms, as all the recorded $LC_{50's}$ were too much higher than the currently used molluscicidal concentration. In the meantime the determined $LC_{50's}$ of Bayluscide towards the same test-organisms were too less than the molluscicidal concentration except in the case of C. pipiens larvae and Daphnia magna .

2- The effects of various concentrations of the tested molluscicides on the growth rate (cells count/litre)of the chosen unicellular fresh water green algae are shown in Figs(12-17). A. maritima revealed no significant inhibition of the growth rate of these algae up to the concentration of 300 ppm allover the study period. In the meantime a concentration ranged from 3-10 ppm of the chemical molluscicide, Bayluscide led to significant inhibition of the algal growth, especially after 8 days of incubation.

3- No in-vivo biochemical changes were detected following acute exposure of juvenile T. nilotica fish to the field molluscicidal concentration of A. maritima. Thus a relatively high concentration 1/2 LC_{50}(370 ppm) ethanol extract) was used. The resulted data in the case of the two tested molluscicide are illustrated in Figs(18-26). It is obvious that there is some changes in the activity of brain:ACh, adrenaline, nor-adrenaline and protein contents beside liver: alkaline phosphatase, GPT, GOT and protein and lipids contents, among the continuously exposed T. nilotica fish to 370 ppm A. maritima.

The corresponding changes observed in the case of Bayluscide using a concentration of 1/2 LC_{50} (0.11 ppm) were significant though using a concentration (3363)folds less than that of A. maritima.

Table (1): Acute toxicity ($LC_{50's}$) of *A. maritima* (ethanol extract) against the mosquito larvae *C. pipiens*.

Time of exposure	LC_{50} ppm	Confidence limits	Slope function	Slope
24 hours	1.50×10^4	$1.62 \times 10^4 - 1.38 \times 10^4$	1.33	8.06
48 hours	1.15×10^4	$1.25 \times 10^4 - 1.05 \times 10^4$	1.36	7.50
96 hours	1.09×10^4	$1.18 \times 10^4 - 1.00 \times 10^4$	1.34	7.80

Table (2) Acute toxicity ($LC_{50's}$) of Bayluscide against the mosquito larvae, *C. pipiens*.

Time of exposure	LC_{50} ppm	Confidence limits	Slope function	Slope
24 hours	38	41 - 35.1	1.49	5.78
48 hours	35	52.5 - 23.3	1.52	5.52
96 hours	27	29.7 - 24.5	1.61	5.00

Table (3): Comparison between the acute toxicity($LC_{50's}$)of the tested molluscides against the mosquito larvae *C. pipiens*.

Molluscicide	LC_{50} ppm After 24 hours	After 48 hours	After 96hours
A. maritima	1.50×10^4	1.15×10^4	1.09×10^4
Bayluscide	38	35	27
Ratio or safety factor.	394	328	403

Table (4): Acute toxicity ($LC_{50's}$) of A. maritima (ethanol extract) against Daphnia magna.

Time of exposure	LC_{50} ppm	Confidence limits	Slope function	Slope
24 hours	1.7×10^4	$2.29 \times 10^4 - 1.25 \times 10^4$	1.35	7.69
48 hours	1.5×10^4	$1.63 \times 10^4 - 1.37 \times 10^4$	1.48	5.84
96 hours	1.3×10^4	$14.30 - 1.18 \times 10^4$	1.45	6.21

Table (5): Acute toxicity ($LC_{50's}$) of Bayluscide against Daphnia magna.

Time of exposure	LC_{50} ppm	Confidence limits	Slope function	Slope
24 hours	13.5	14.9 - 12.1	1.73	4.34
48 hours	11.5	12.1 - 18.2	1.35	7.69
96 hours	10.0	8.3 - 9.20	1.98	3.37

Table (6): Comparison between the acute toxicity($LC_{50's}$) tested molluscicides against Daphnia magna.

Molluscide	LC_{50} ppm After 24 hours	After 48 hours	After 96 hours
A. maritima	1.7×10^4	1.5×10^4	1.3×10^4
Bayluscid	13.5	11.5	10.0
Ratio or safety factor.	1259	1304	1300

Table (7): Acute toxicity ($LC_{50's}$) of *A. maritima* (ethanol extract) against tad pole.

Time of exposure	LC_{50}	Confidence limits	Slope function	Slope
24 hours	280	319.2 - 245.6	1.51	5.71
48 Hours	240	266.4 - 216.2	1.41	7.41
96 hours	230	250.7 - 211.0	1.33	8.13

Table (8): Acute toxicity($LC_{50's}$) of Bayluscide against tad pole.

Time of exposure	LC_{50} ppm	Confidence limits	Slope function	Slope
24 hours	0.025	0.290 - 0.021	1.65	4.6
48 hours	0.021	0.025 - 0.020	1.76	4.1
96 hours	0.020	0.024 - 0.016	1.65	4.1

Table (9): Comparison between the acute toxicity($LC_{50's}$) of tested molluscicides against tad pole

Molluscide	LC_{50} ppm After 24 hours	After 48 hours	After 96hours
A. maritima	280	240	230
Bayluscide	0.025	0.021	0.020
Ratio of safety factor.	11200	11428	11500

Table (10): Acute toxicity (LC_{50}'s) of *A. maritima* (ethanol extract) against Gambusia fish.

Time of exposure	LC_{50} ppm	Confidence limits	Slope function	Slope
24 hours	305	350 - 265	1.63	4.7
48 hours	260	301 - 224	1.65	4.5
96 hours	200	234 - 170	1.68	4.4

Table (11): Acute toxicity (LC_{50}'s) of Bayluscide against Gambusia fish.

Time of exposure	LC_{50}	Confidence limits	Slope function	Slope
24 hours	0.170	0.229 - 0.125	2.47	2.56
48 hours	0.140	0.189 - 0.103	2.73	2.32
96 hours	0.110	0.148 - 0.081	2.80	2.27

Table (12): Comparison between the acute toxicity (LC_{50}'s) of the tested molluscides against Gambusia fish.

Molluscide	LC_{50} ppm		
	After 24 hours	After 48 hours	After 96 hours
A. maritima	305	260	200
Bayluscide	0.170	0.140	0.110
Ratio or safety factor	2058	1857	1818

Table (13): Acute toxicity (LC_{50}'s) of *A. maritima* (ethanol extract) against *Tilapia nilotica* fish.

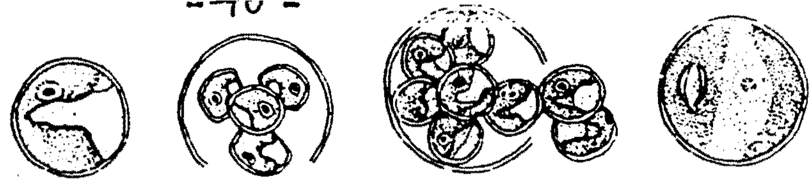
Time of exposure	LC_{50} ppm	Confidence limits	Slope function	Slope
24 hours	740	765.9 - 714.9	1.09	24.3
48 hours	710	741.9 - 679.4	1.14	17.5
96 hours	656	669.1 - 643.0	1.10	25.0

Table (14): Acute toxicity (LC_{50}'s) of Bayluscide against *Tilapia nilotica* fish.

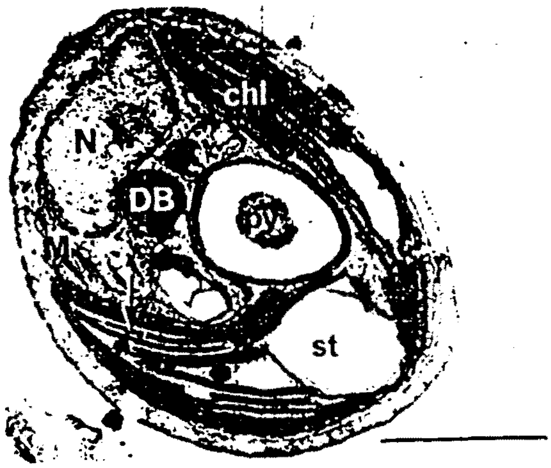
Time of exposure	LC_{50} ppm	Confidence limits	Slope function	Slope
24 hours	0.220	0.227 - 0.212	1.07	33.3
48 hours	0.215	0.221 - 0.209	1.10	23.8
96 hours	0.200	0.205 - 0.194	1.10	23.8

Table (15): Comparison between the acute toxicity (LC_{50}'s) of the tested molluscides against *Tilapia nilotica*.

Molluscide	LC_{50} ppm After 24 hours	After 48 hours	After 96 hours
A. maritima	740	710	656
Bayluscide	0.220	0.215	0.200
Ratio or safety factor.	3363	3302	3280



(a) (b) (c) (d)

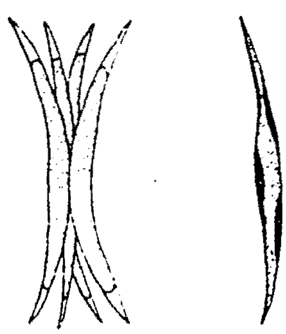


(e)

Chlorella (electron micrograph). (*a*)-(*c*) ***Chlorella*** sp. (*a*) Vegetative cell. (*b*), (*c*) Autosporogenesis. (*d*) *C. vulgaris* Beij. var. *vulgaris* Fott. (*c*) *C. minutissima* Fott and Nori. DB, dense body; chl, chloroplast; m, mitochondrion; n, nucleus; py, pyrenoid; st, starch. (*a*)-(*d*) X 1875; (*e*) scale = 1 μm. [(*e*) After Dempsey et al., 1980.]

(a) (b)

Scenedesmus quadricauda (Turp.) Bréb. (*a*) Living coenobia. (*b*) Two coenobia, S.E.M. (*a*) X 210; (*b*) X 527. [(*b*) After Pickett-Heaps, 1975.]



Ankistrodesmus falcatus (Corda) Ralfs. Group and single cell showing plastid. X 900. (After Komárková-Legnerová, 1969.)

Fig.(1): Showing the three fresh water algal species chosen for the present study: Chlorella, Scenedesmus and Ankistrodesmus.

Fig. 12 The effect of A. maritima on the growth rate (Cell count / litre) of Chlorella Spp.

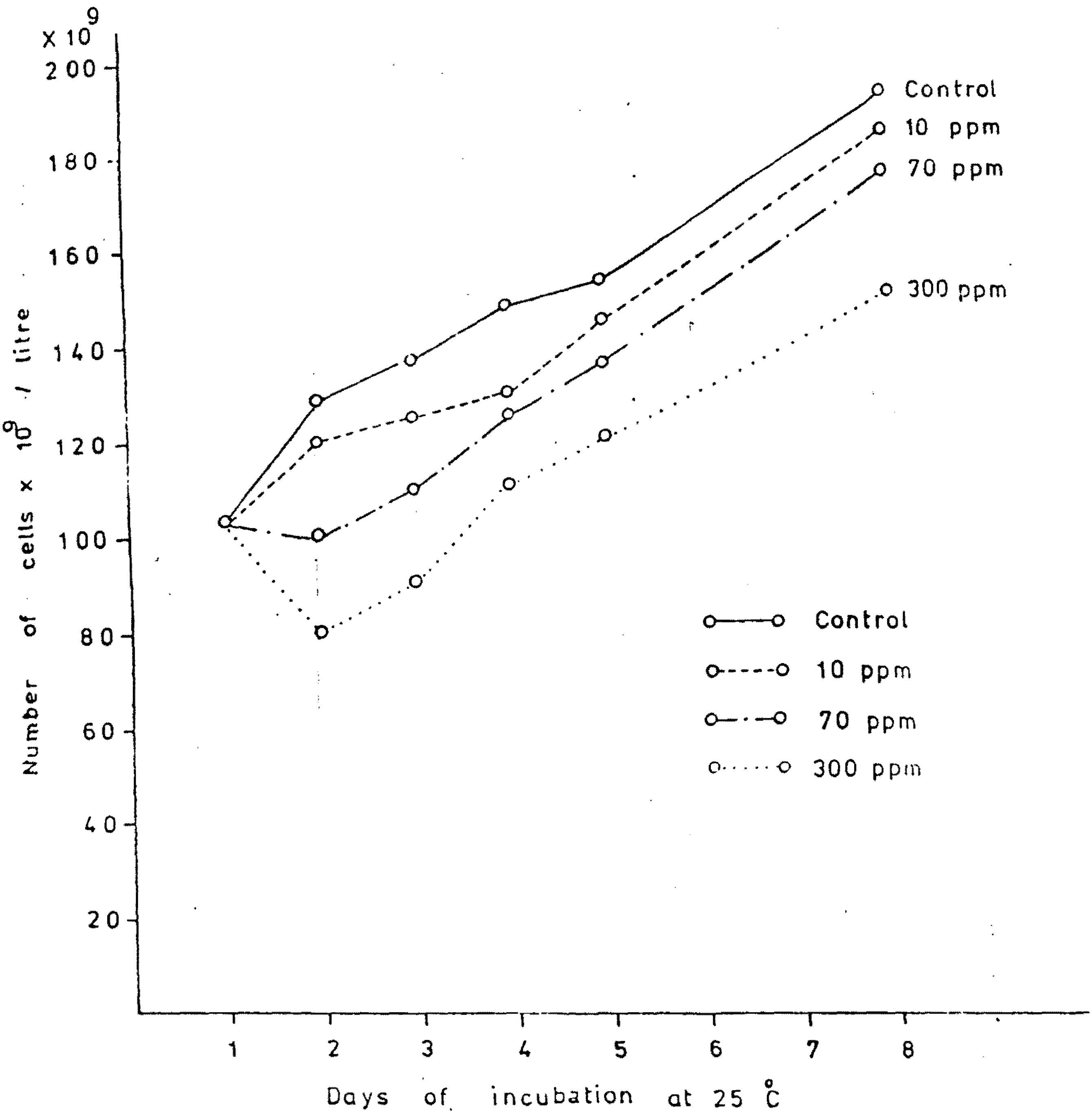


Fig. 13 The effect of Bayluscide on the growth rate (Cell count / litre) of <u>Chlorella Spp.</u>

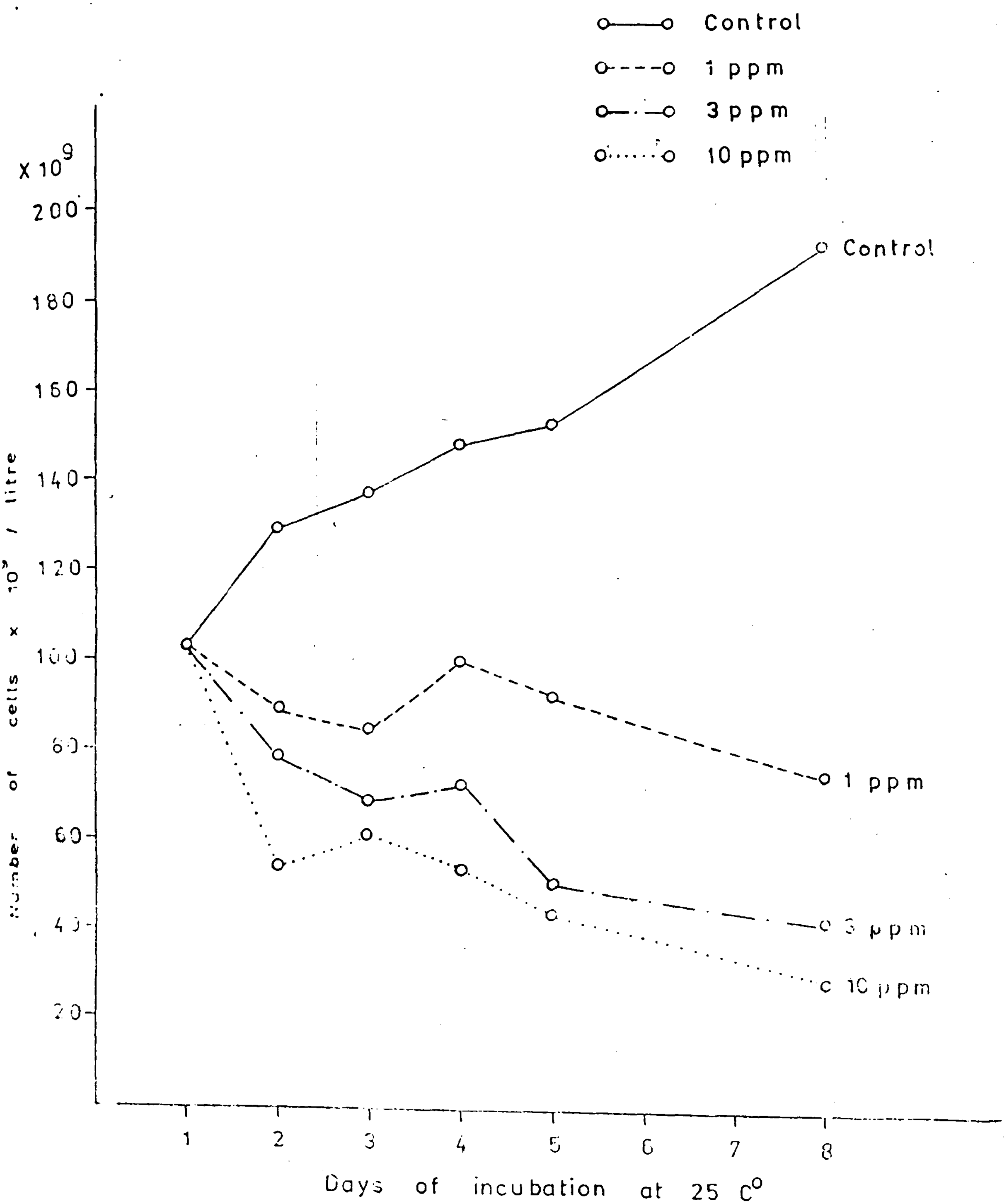


Fig.14 . The effect of A. maritima on the growth rate (cell count / litre) of **Scenedesmus** spp

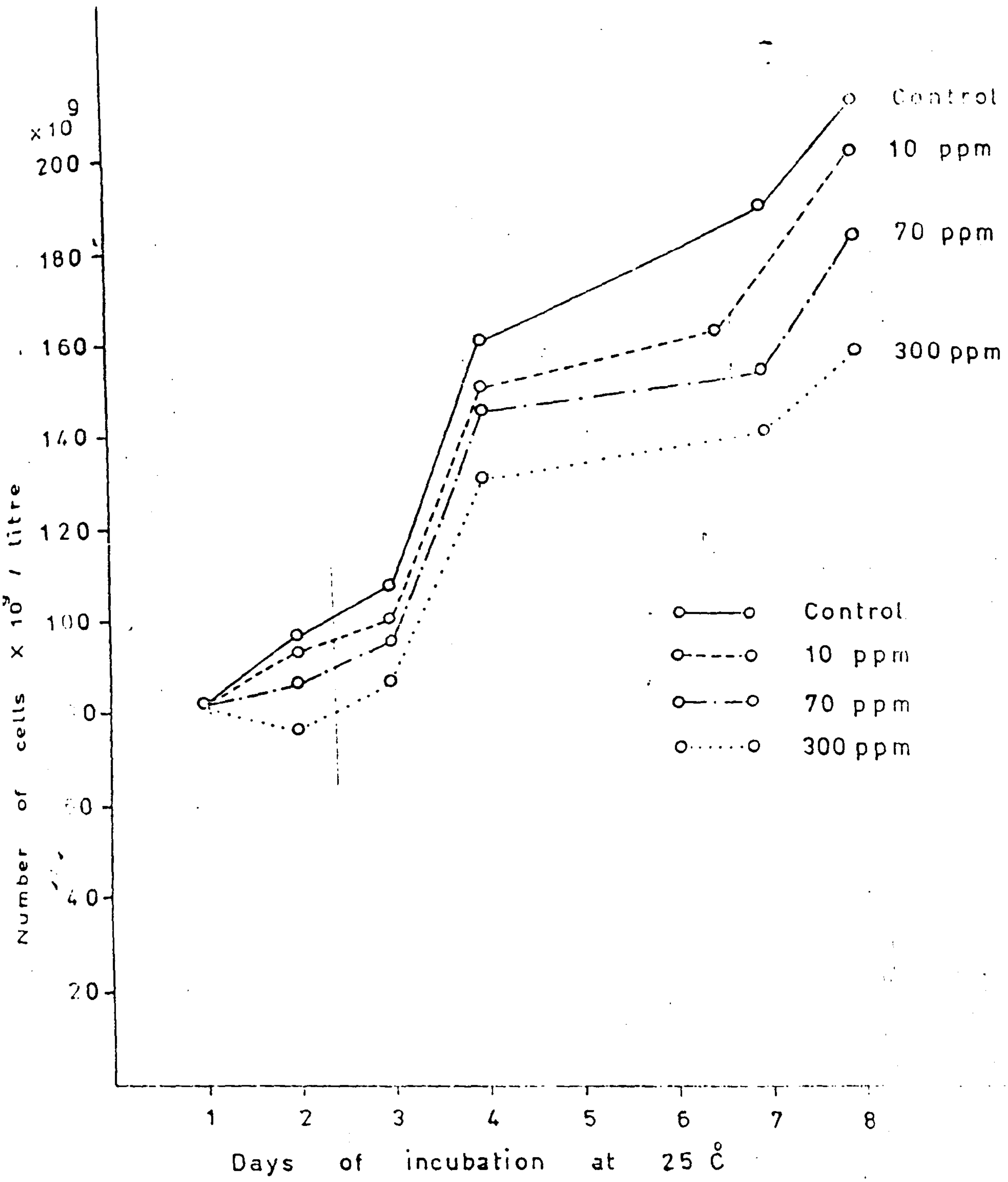


Fig. 15 The effect of Bayluscide on the growth rate (Cell count / litre) of Scenedesmus spp.

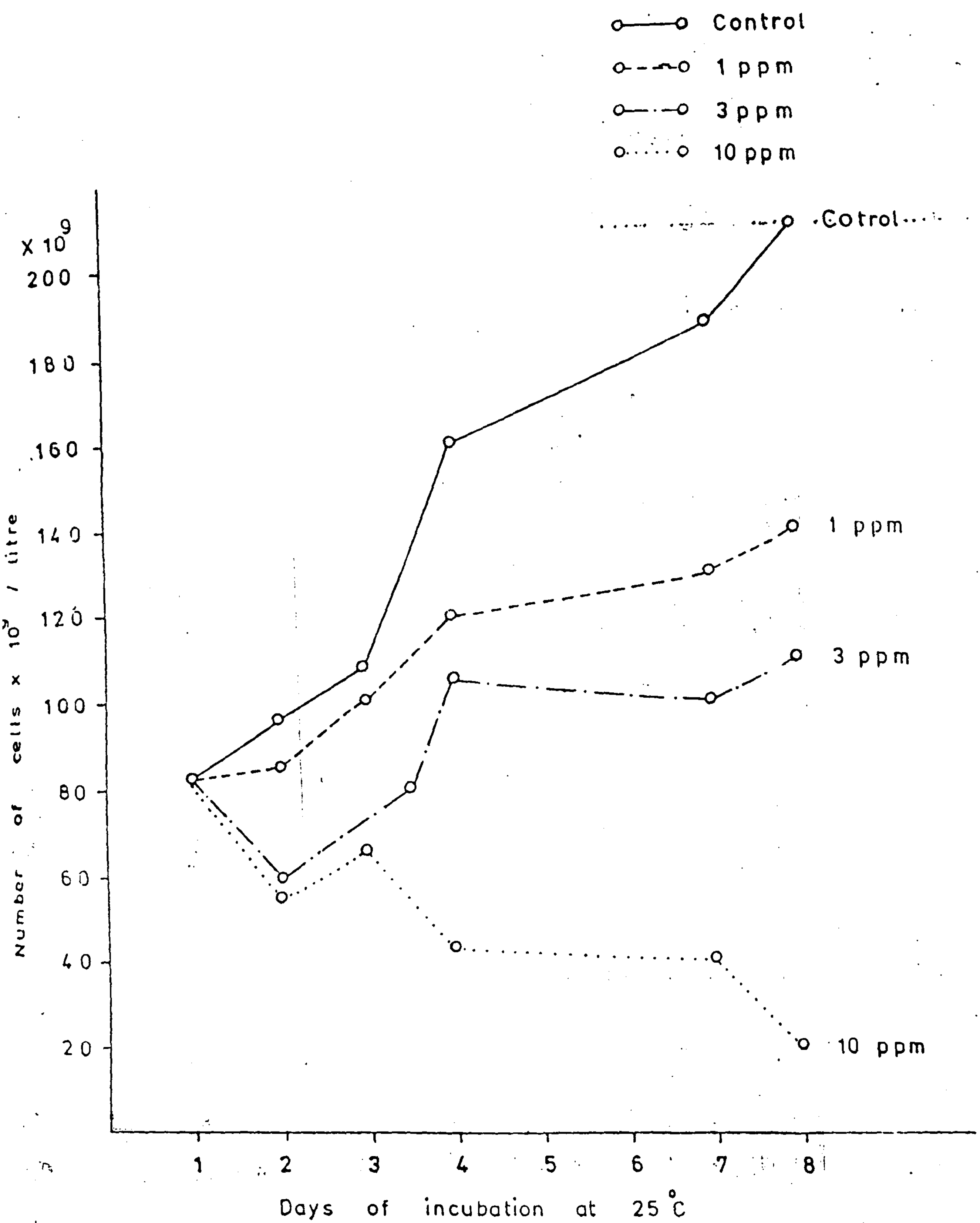


Fig. 16 The effect of *A. maritima* on the growth rate (Cell count / litre) of *Ankistrodesmus* spp.

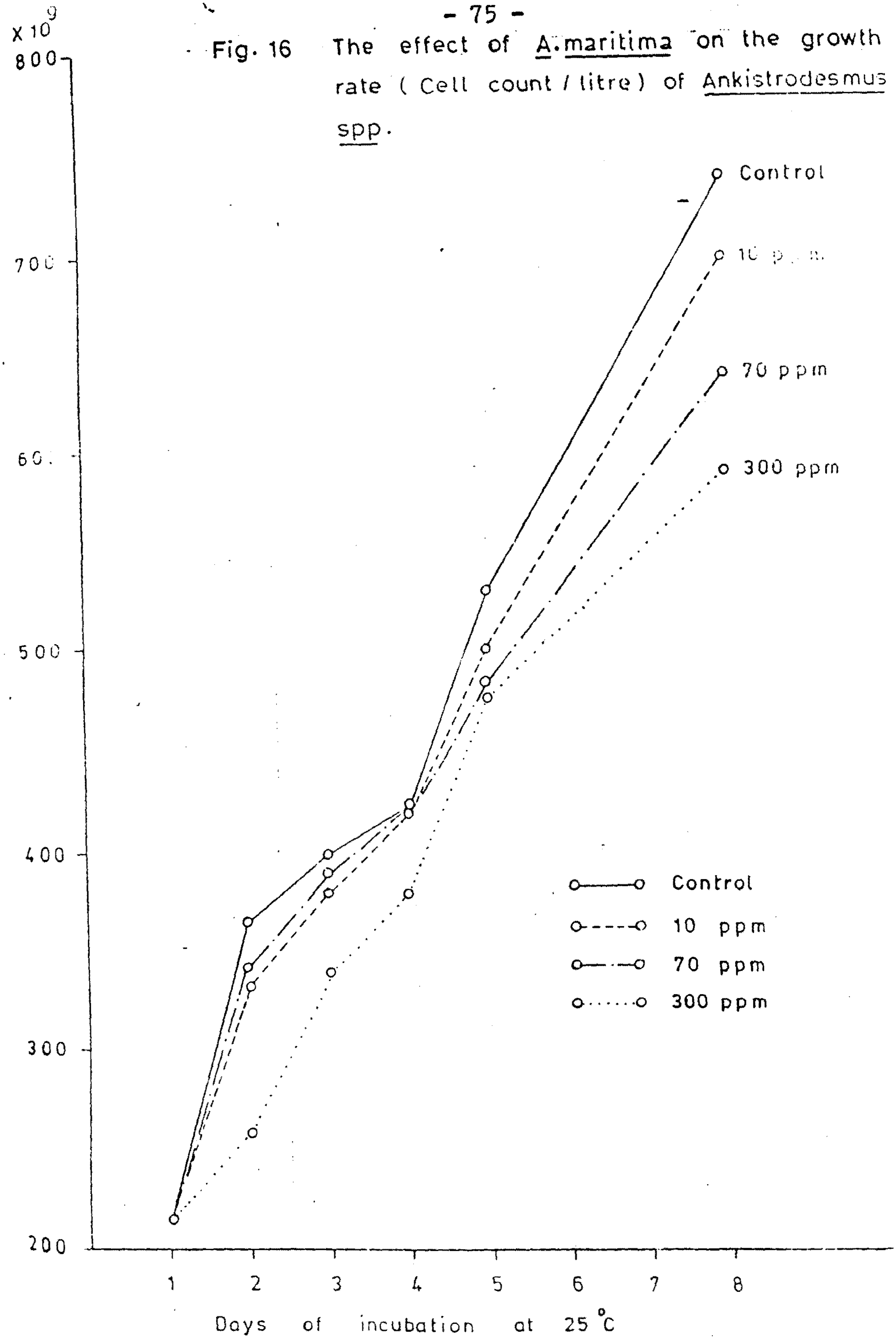


Fig. 17 The effect of Bayluscide on the growth rate (Cell count / litre) of <u>Ankistrodesmus spp.</u>

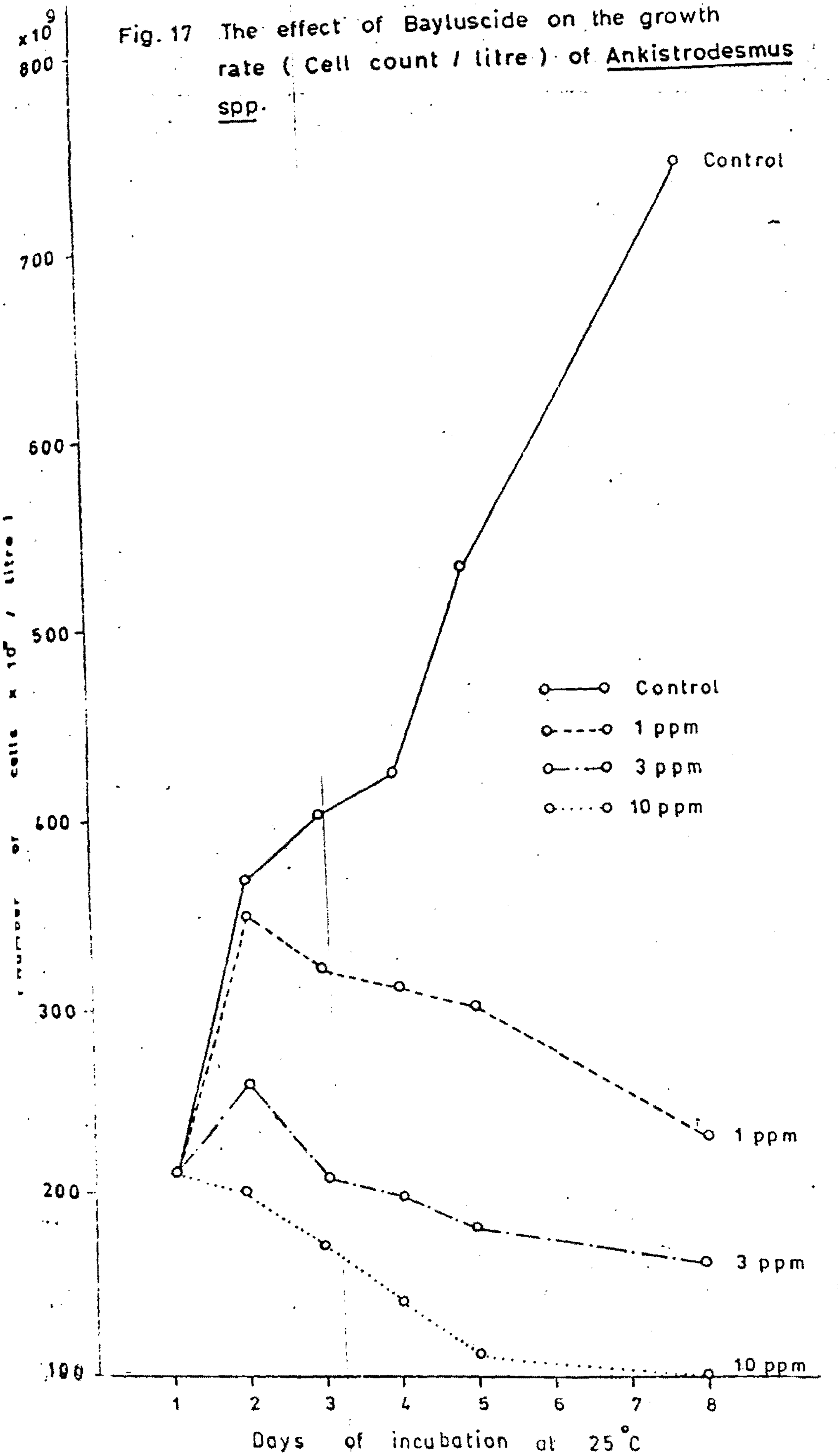


Fig. 18 In-vivo effect of acute exposure to ($\frac{1}{2}$ LC_{50}) concenteration of the tested molluscicides on Brain AChE activity of *T. nilotica* fish.

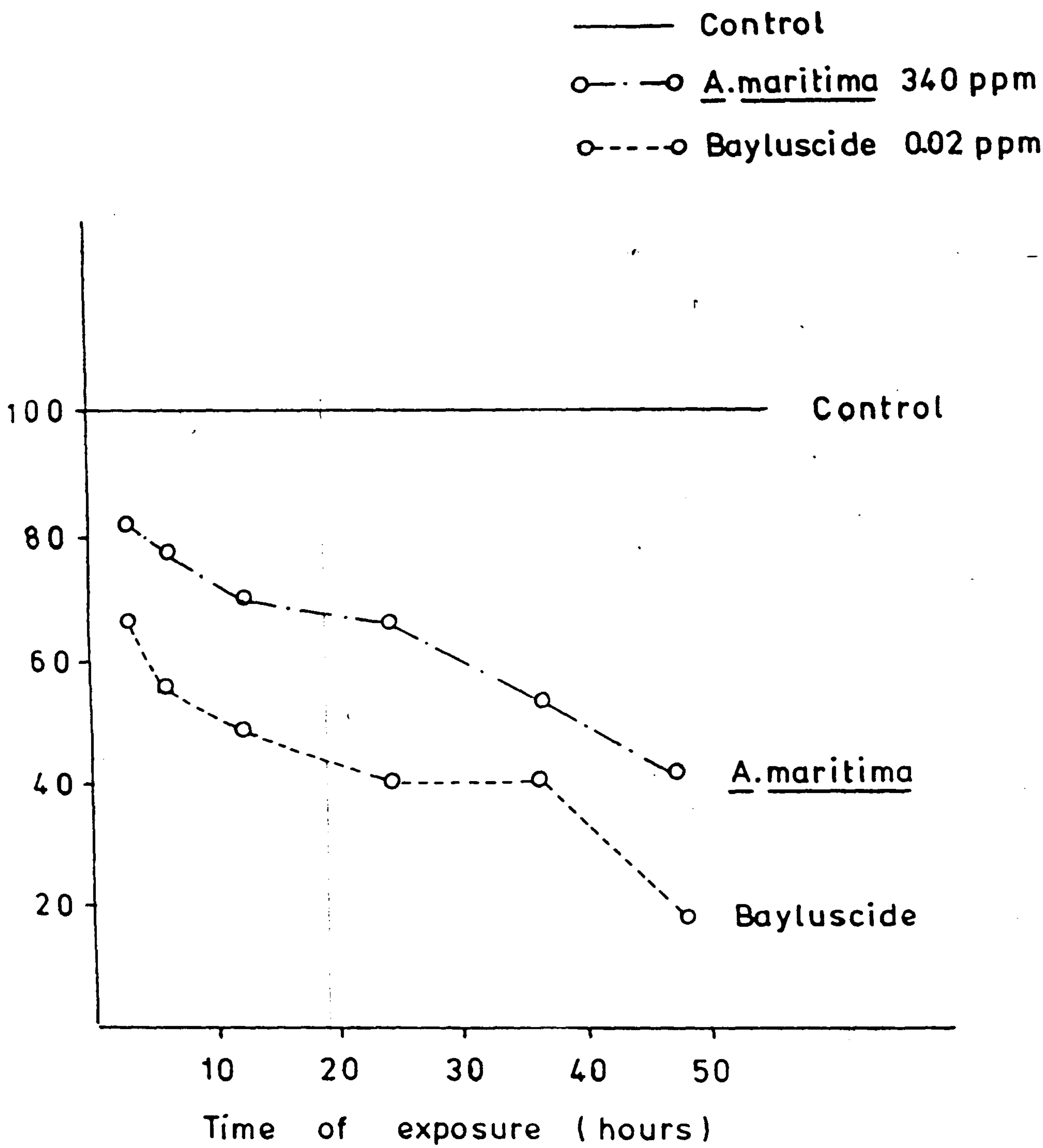


Fig. 21 In-vivo effect of acute exposure to ($\frac{1}{2}$ LC_{50}) concenteration of the tested molluscicides on Brain protein of *T. nilotica* fish.

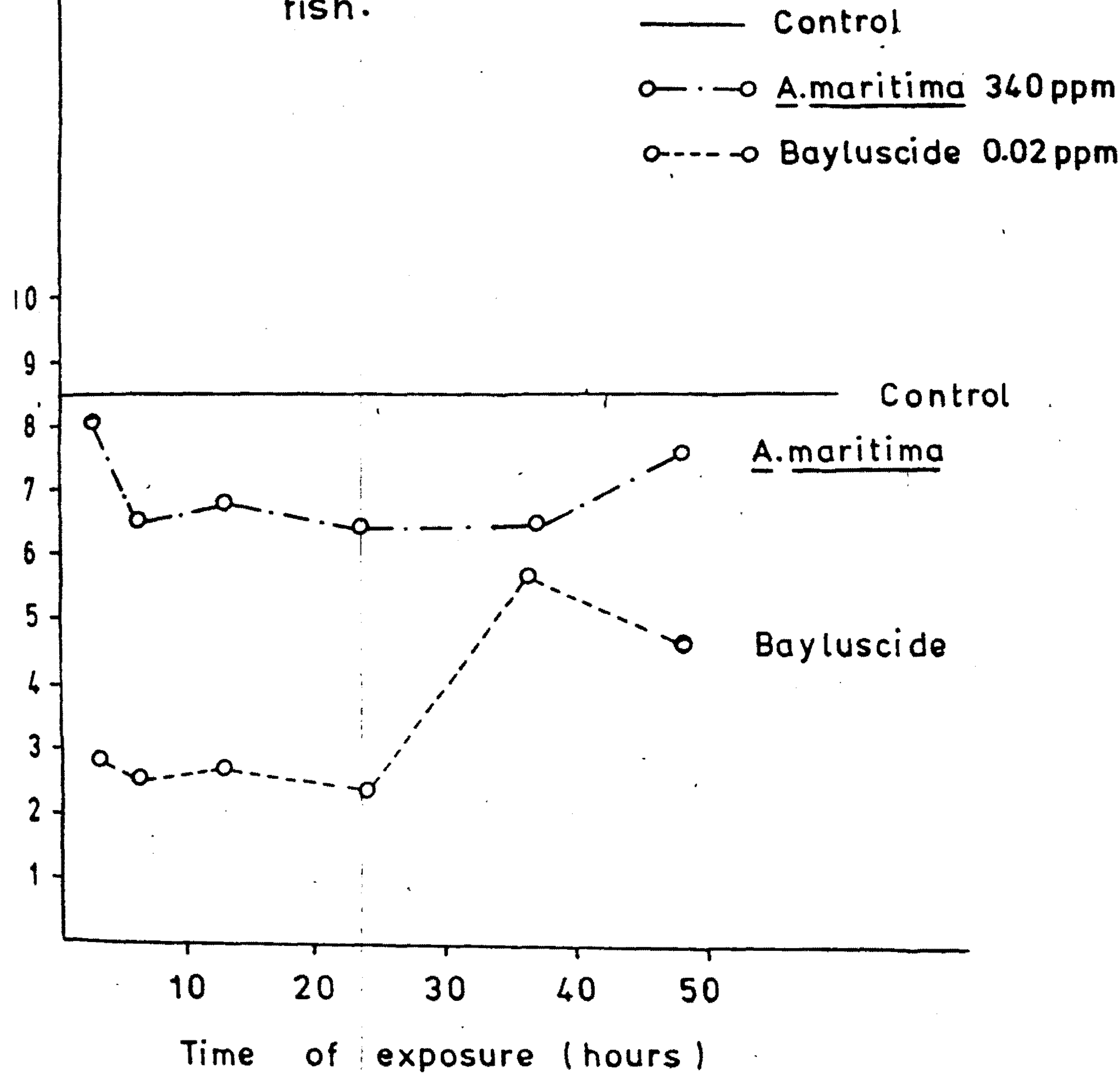


Fig.22 In-vivo effect of acute exposure to ($\frac{1}{2}$ LC_{50}) concenteration of the tested molluscicides on liver alkaline phosphatase of *T. nilotica* fish.

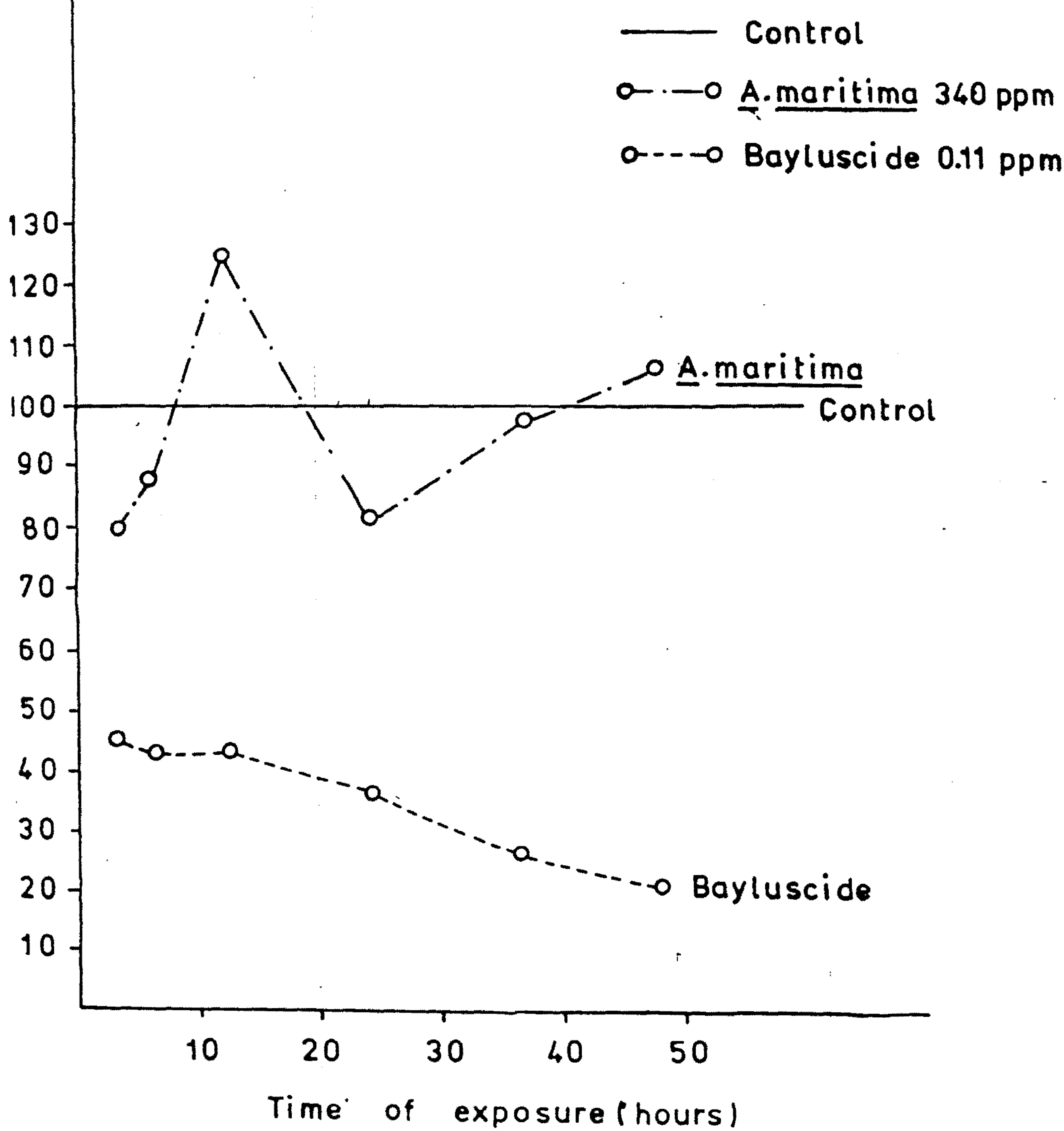


Fig. 23 In-vivo effect of acute exposure to (½ LC_{50}) concenteration of the tested molluscicides on liver GpT activity of *T. nilotica* fish.

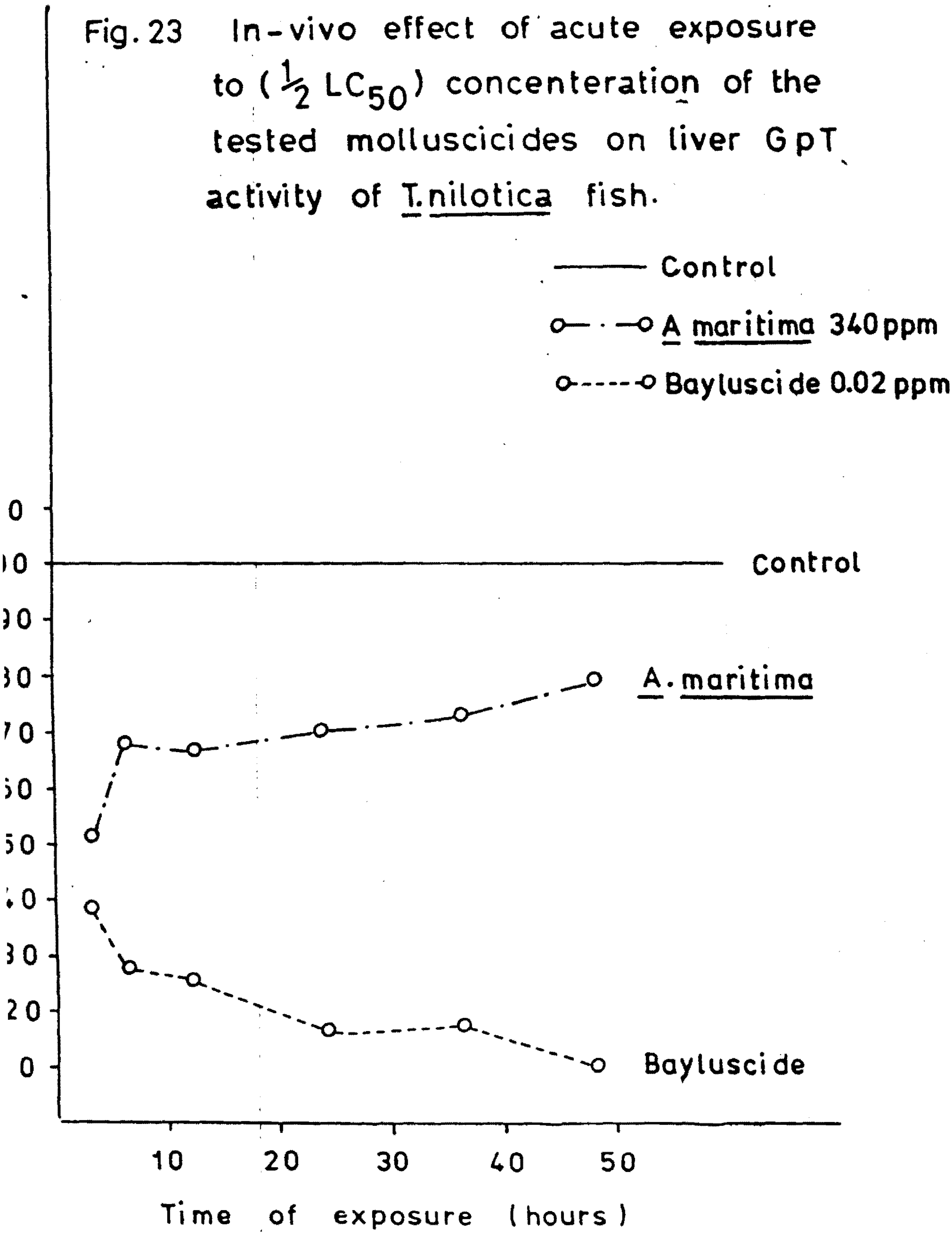


Fig. 24 In-vivo effect of acute exposure to ($\frac{1}{2}$ LC_{50}) concenteration of the tested molluscicides on liver GOT activity of *T. nilotica* fish.

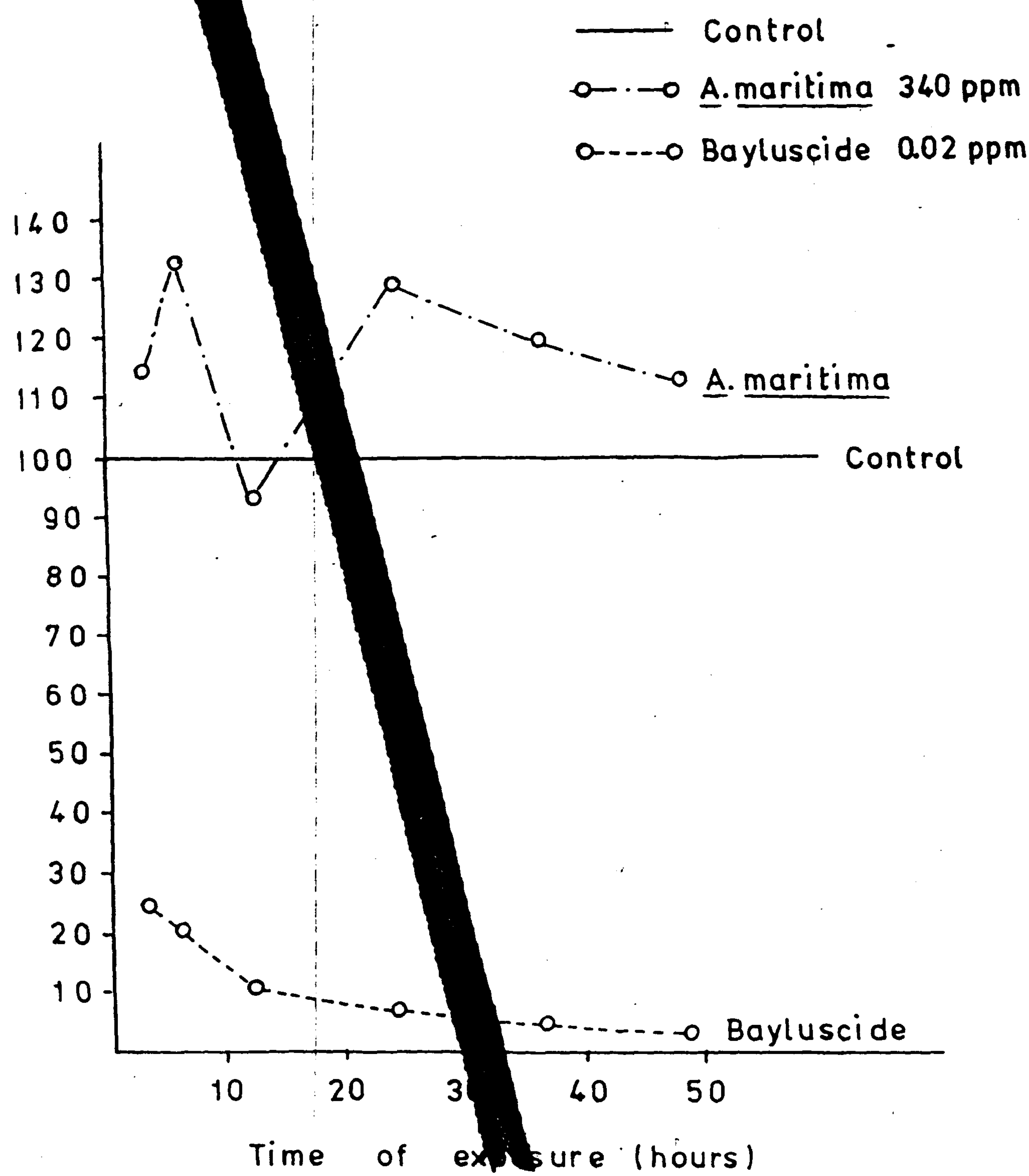


Fig. 25 In-vivo effect of acute exposure to ($\frac{1}{2}$ LC_{50}) concenteration of the tested molluscicides on liver total protein of *T. nilotica* fish.

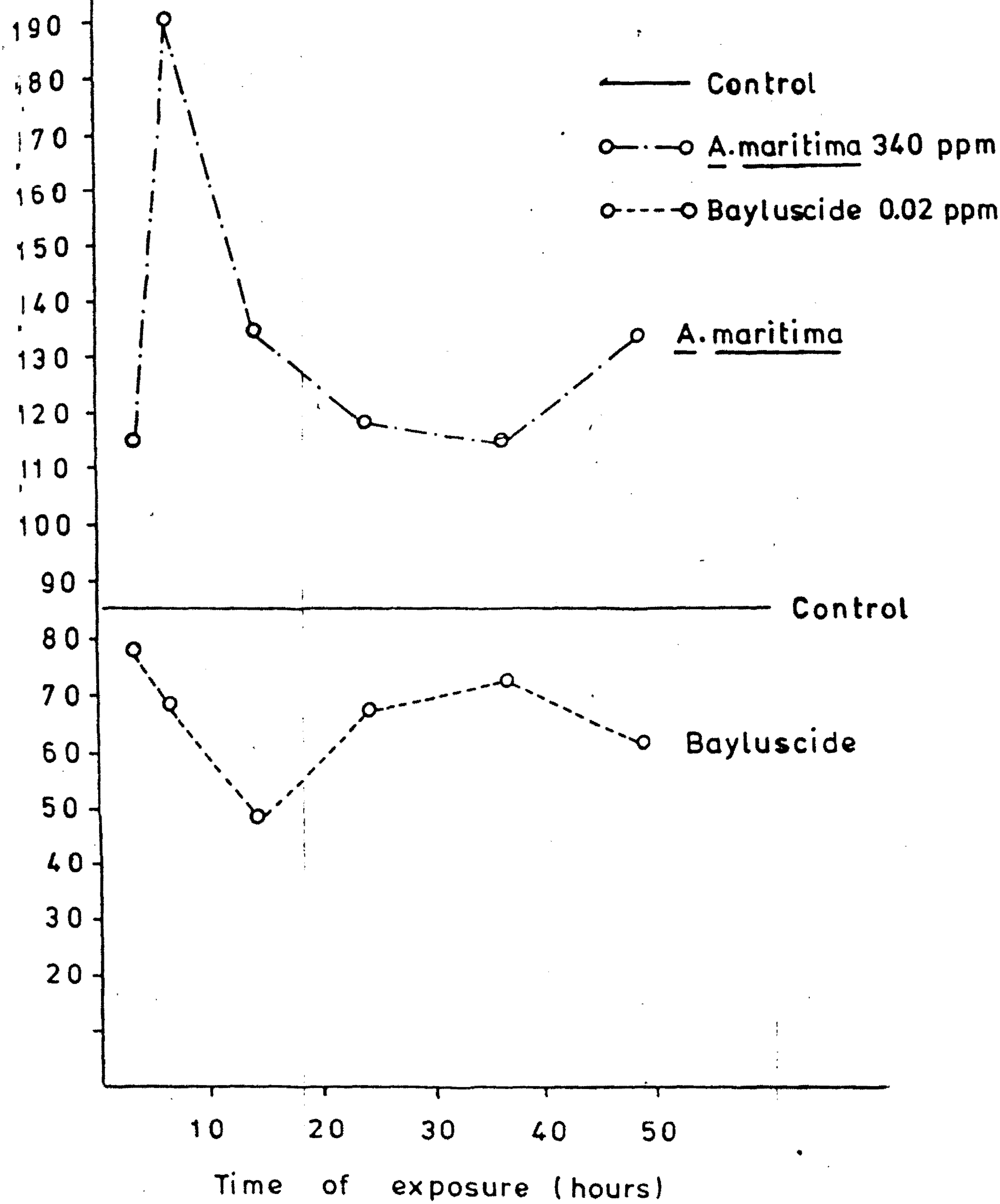


Fig.19 In-vivo effect of acute exposure to ($\frac{1}{2}$ LC_{50}) concenteration of the tested molluscicides on Brain adrenaline of *T. nilotica* fish.

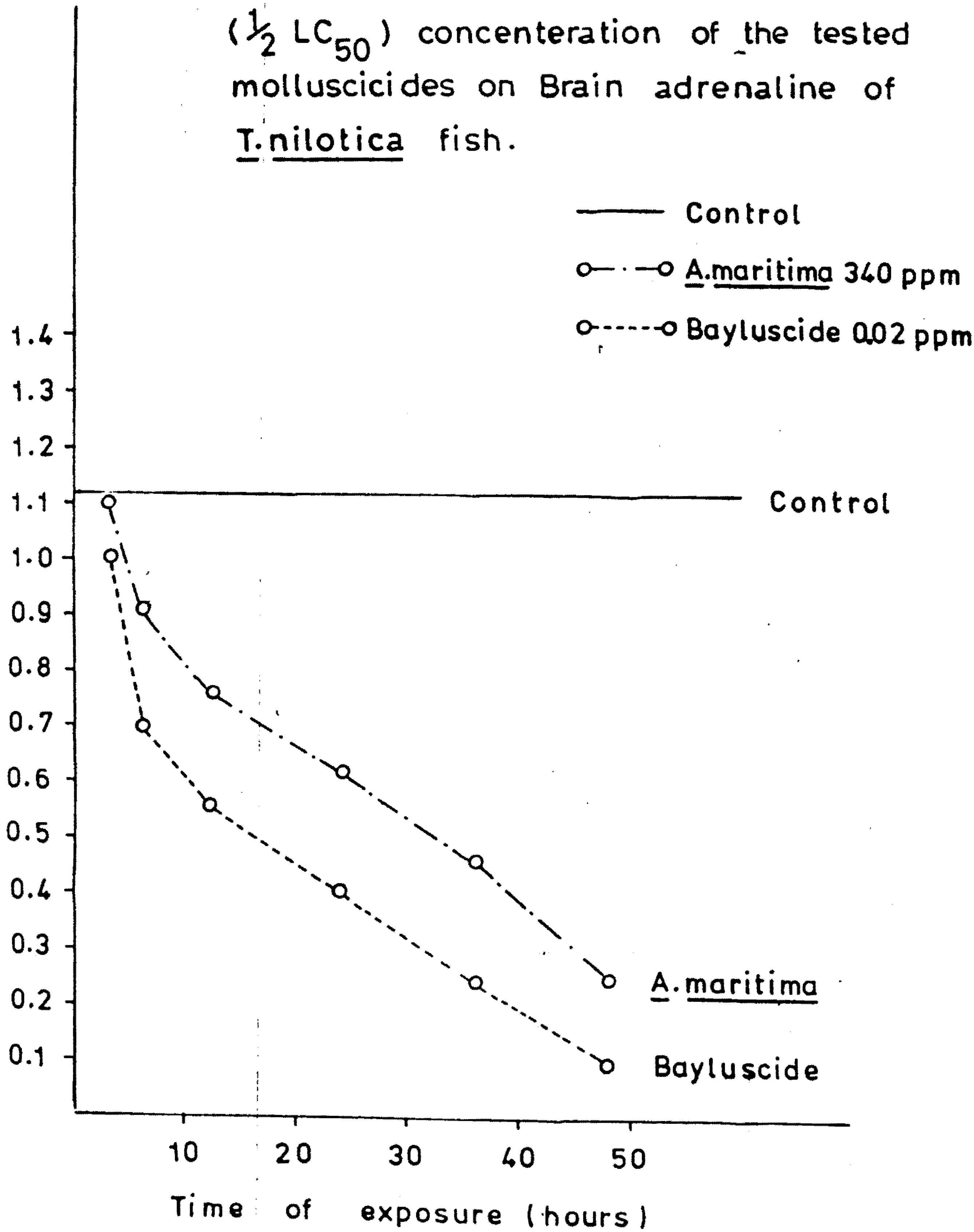


Fig. 20 In-vivo effect of acute exposure to (½ LC_{50}) concenteration of the tested molluscicides on Brain nor-adrenaline of *T. nilotica* fish.

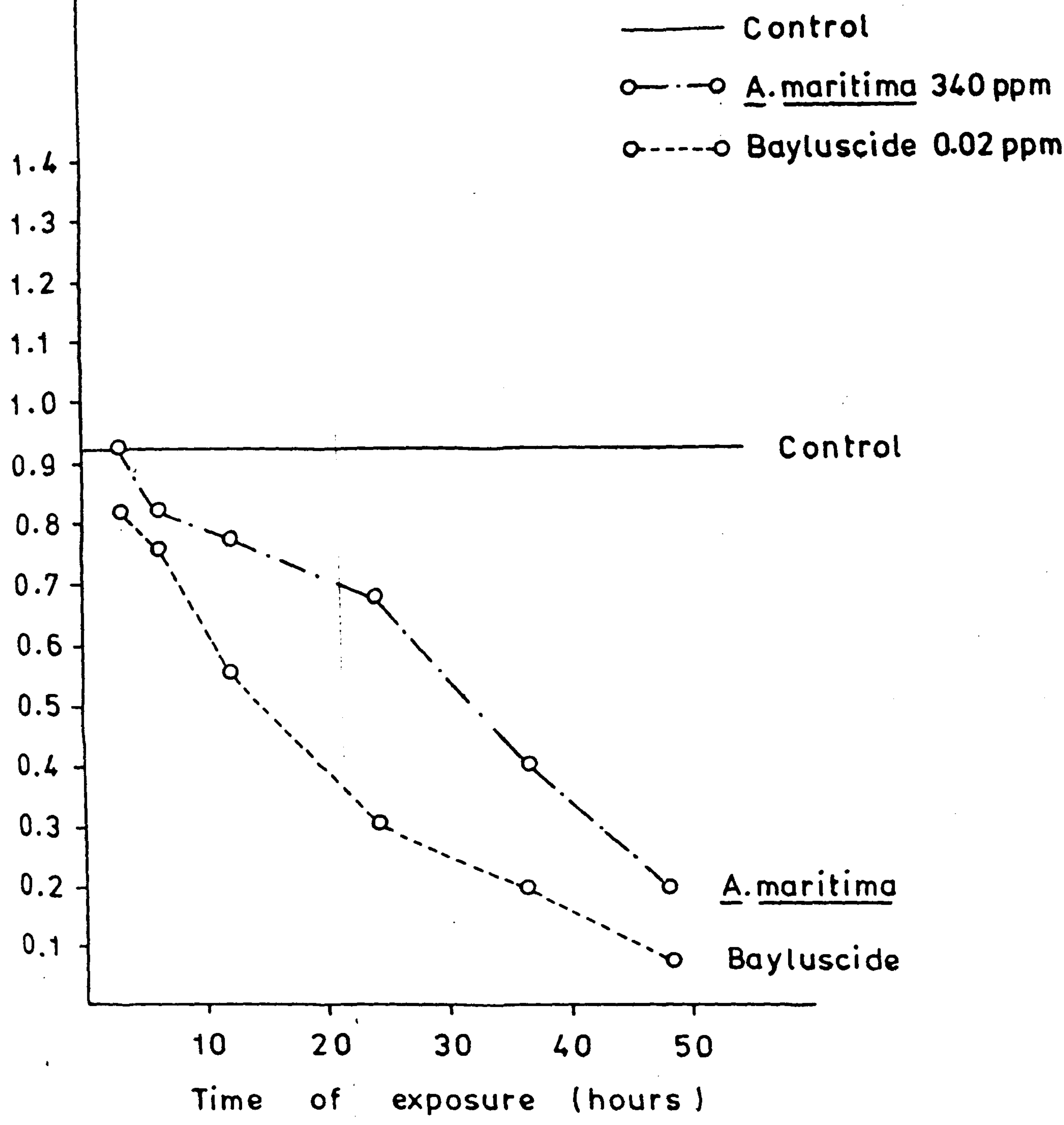
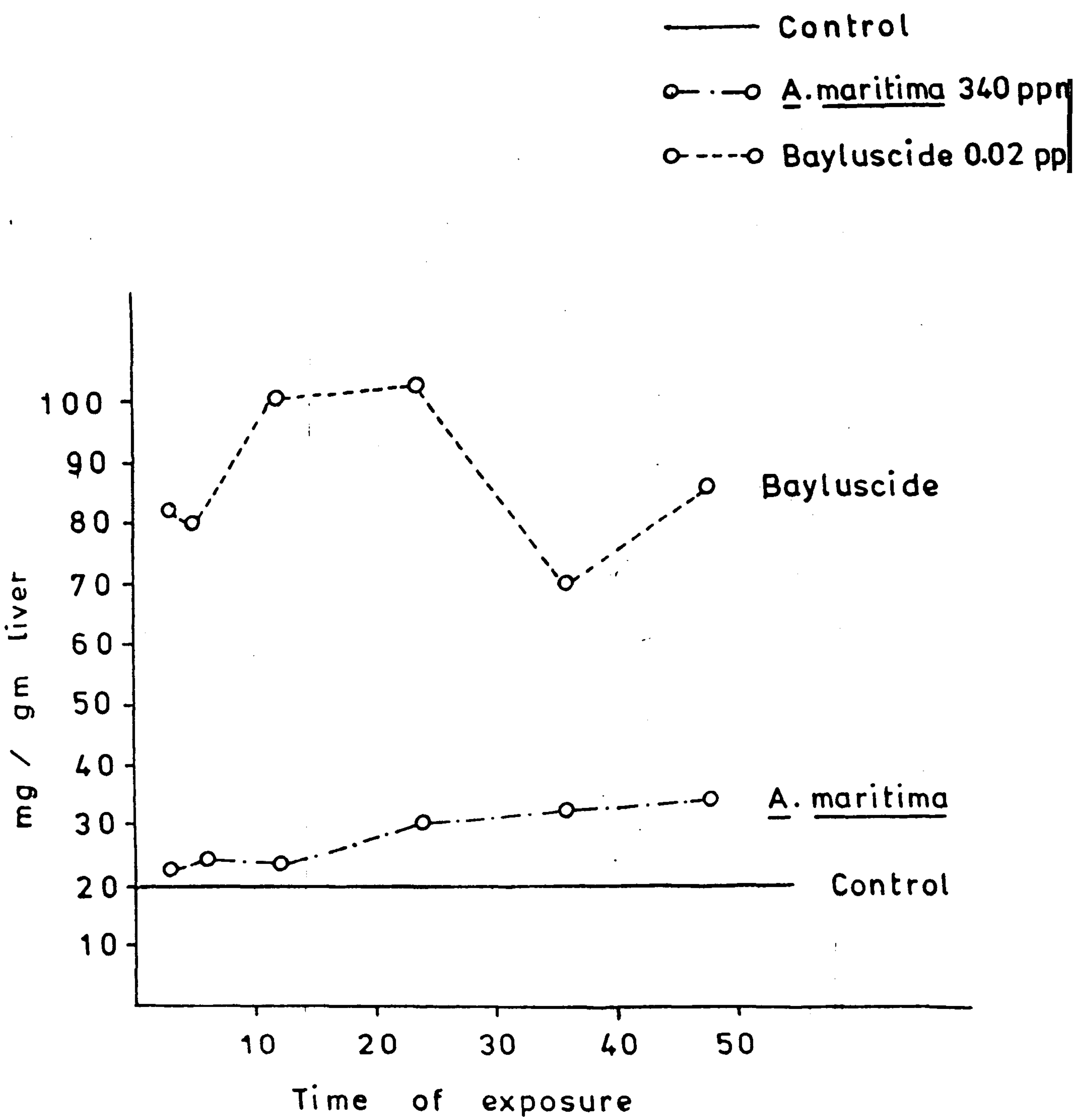


Fig. 26 In-vivo effect of acute exposure to ($\frac{1}{2}$ LC_{50}) concenteration of the tested molluscicides on liver lipids of _T. nilotica_ fish.



FINAL REPORT ON THE 2nd YEAR TOXICOLOGICAL STUDIES

Chronic toxicity of *A. maritima* (Damssisa) towards juvenile *T. nilotica* fish under both laboratory and field conditions:

Introduction:

In the last few years *A. maritima* had been successfuly used for the control of the snail vectors of schistosomiasis. The recommended field concentration was 70- 100 ppm, using the whole green or dried plant. In the meantime, laboratory experiments showed that 24 hours- LC_{98} of the plant against *B. alexandrina* snails was about 1000 ppm. This denotes that *A. maritima* exert more molluscicidal activity under prolonged field conditions though using a sub-lethal concentration.

Aim of the study:

1- Study the biotoxicological changes among chronically exposed (3 months), juvenile *T. nilotica* fish to the sub-lethal concentration (1/10 LC_{50})of *A. maritima* under both laboratory and field conditions.

2- Investigation of the histopathological changes among chronically exposed fish in the laboratory to either *A. maritima* or Bayluscide.

Material and methods:

1- The same biochemical parameters employed for the 1st year acute studies, were examined among chronically exposed *T. nilotica* fish to 1/10 LC_{50} (74 ppm) of *A. maritima* for 3 months in the laboratory aquaria.

2- Histopathological changes were investigated in liver, small intestine, gills and brain specimens of chronically exposed fish (3 months) to 1/10 LC_{50} of either *A.maritima* (74 ppm) or Bayluscicide (0.02 ppm).

3- A field experiment was carried out to study the biochemical changes among caged *T. nilotica* fish kept for 3 months in water channels treated with 1/10 LC_{50} of *A.maritima* (74 ppm).

Results and discussion:

1- The biochemical changes obtained in the present study following the chronic exposure of *T. nilotica* fish to *A. maritima* (74 ppm for 3 months), were compared with the corresponding changes recorded in the 1st year following the acute exposure (370 ppm for 48 hours) in the laboratory. Table (16) illustrates that the tested parameters suffered less changes following the chronic exposure of the fish to the sub-lethal concentration of the plant. So, it is preferable to apply *A. maritima* in the water streams for the control of the snail vectors under such chronic circumstances i.e. prolonged low concentration.

Also, it shows that the in-vivo biochemical changes following the field chronic exposure of the caged fish to treated water streams with A. maritima were evidently more than that observed following the chronic laboratory exposure using the same concentration. This led to a suggestion that the molluscicidal activity of the plant is more pronounced under the field conditions due to the dynamic action of the surrounding ecosystem. A further investigation is needed to prove such suggestion.

3- Microscopic examination of the organs specimens of T. nilotica fish following the chronic laboratory exposure (3 months) to the sub-lethal concentration of A. maritima, showed no histopathological changes. This proved the safety of the plant towards the aquatic non-target organisms. In the meantime, examination of the corresponding organs specimens following the chronic laboratory exposure of the fish to the sub-lethal concentration of Bayluscide, revealed the injourious effect of this chemical mulluscicide. The liver cells showed severe fatty degeneration and necrosis, Fig.(28). The small intestine examination showed degenerqtion of the villi as shown by distortion of mucosal epithelium and loss of brush border, Fig. (30). Also, gills had suffered extensive damage where complete distortion of the gills filament and lammellar organization was obvious, Fig. (32). The cerebral cortex of the brain lost its normal structure, where massive area of degenerqtion was observed due to centeral chromatolysis in the cells, Fig. (34).

Table (16): The biochemical changes observed among acute and chronically exposed *T. nilotica* fish to *A. maritima* in the laboratory and also among chronically exposed fish in the field at the end of the experiment.

The tested parameter (control value)	Laboratory exposed fish		Field exposed fish
	Acute for 48 hours at 370 ppm	Chronic for 3 months at 74 ppm	Chronic for 3months at 74 ppm
1- Brain ChE (100%)	40.8	89.1	77.5
2- Brain Adrenaline (1.12 mg/g)	0.25	0.92	0.71
3- Brain nor-adrenaline (0.92 mg/g)	0.20	0.79	0.61
4-Alkaline phosphatase (100%)	106.0	97.3	78.1
5- GPT (100%)	79.2	100.0	82.9
6- GOT (100%)	112.9	85.7	80.0
7- Liver total protein (85 mg/g)	133.0	73.0	82.1
8- Liver total lipids (20 mg/g)	34.0	22.5	26.5
9- Brain total protein (8.5mg/g)	7.6	8.2	7.8

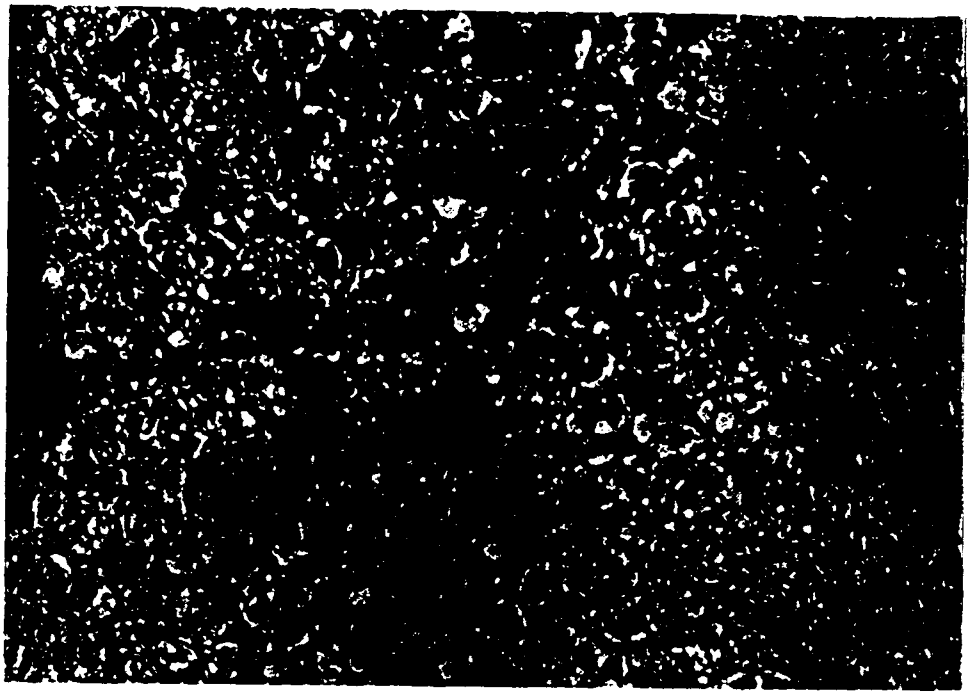


Fig. (27): Section from control liver of Tilapia nilotica showing normal parenchyma.

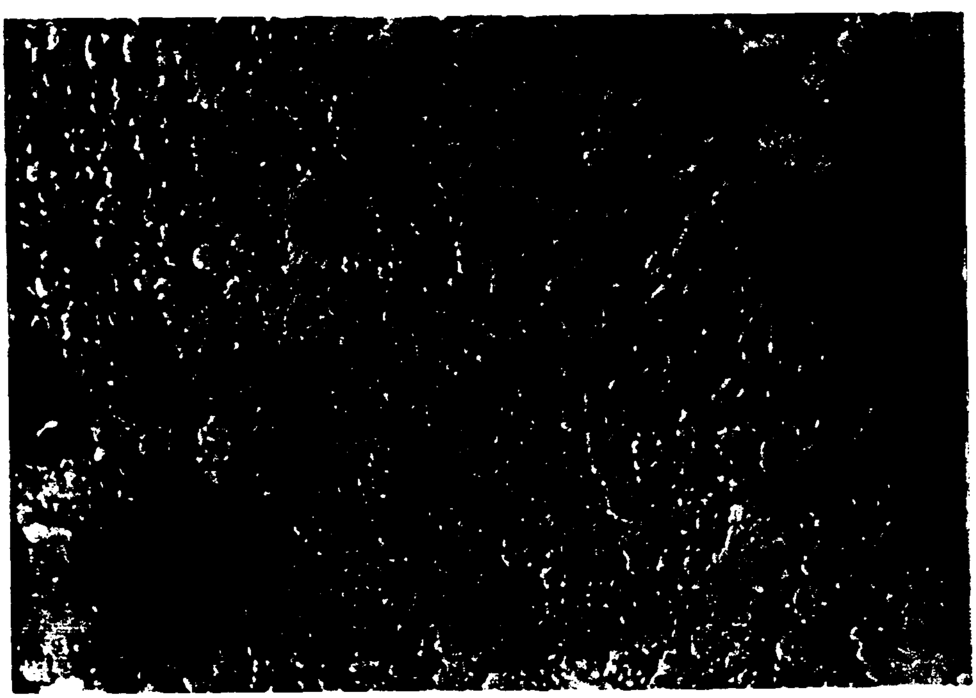


Fig.(28): Section from liver of Tilapia nilotica fish following chronic Laboratory exposure to Bayluscide showing parenchymatous extravasation and necrosis.

Fig. (29): Section of control small intestine of *Tilapia nilotica* fish showing compact mucosal epithelium of the villi.

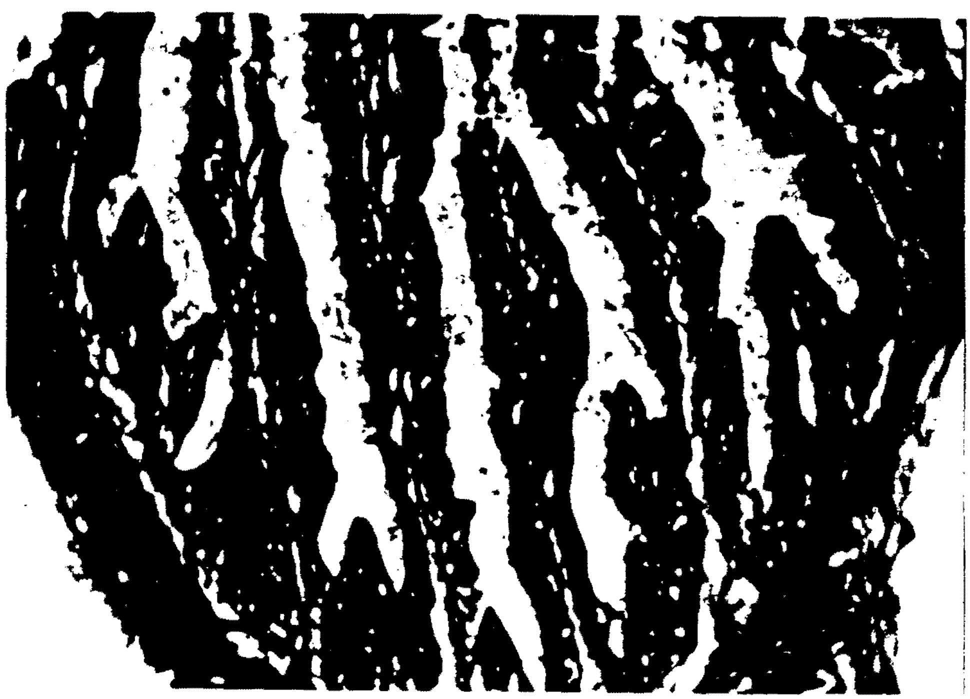


Fig.(30): Section of small intestine of *Tilapia nilotica* fish following chronic Laboratory exposure to Bayluscide showing degeneration of the villi.

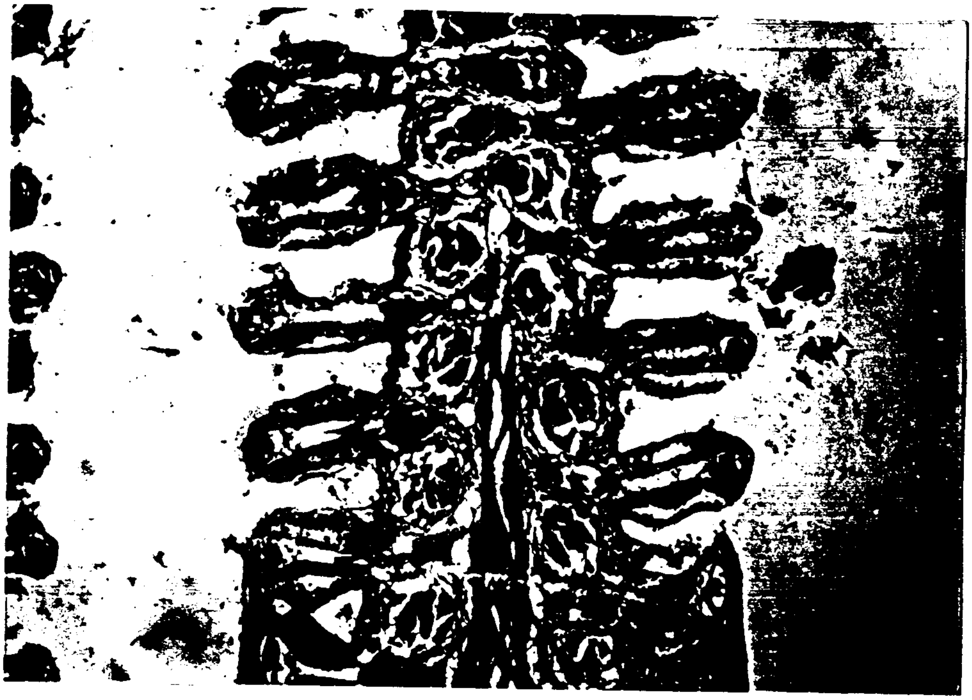


Fig.(31): Section of control gills of Tilapia nilotica fish showing normal lamellae and filaments.

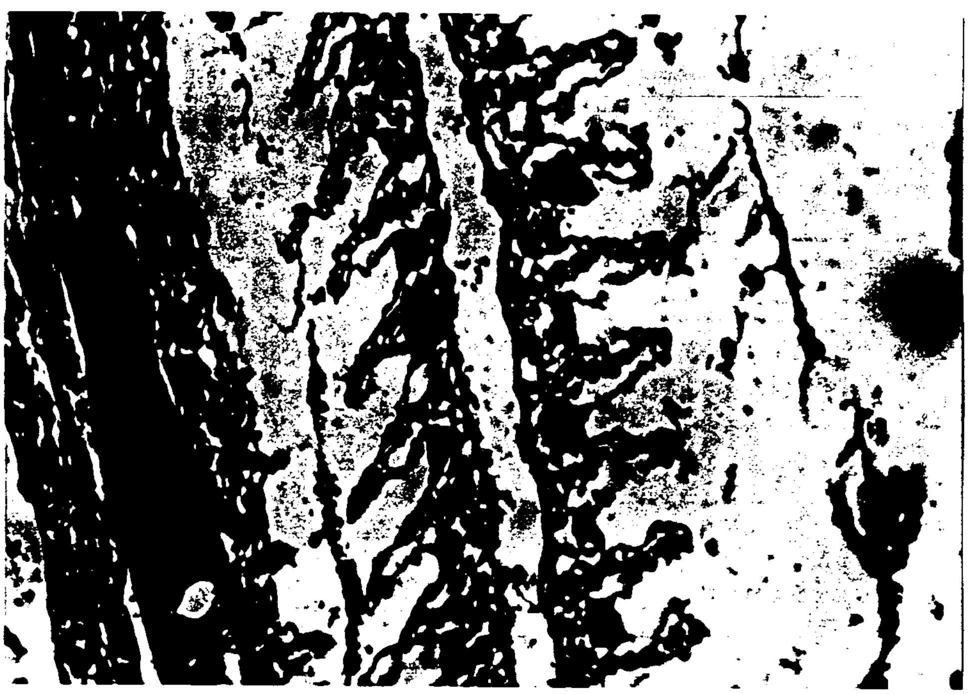


Fig. (32): Section of gills of Tilapia nilotica fish following chronic Laboratory exposure to Bayluscide showing damage to lamellae and filaments.

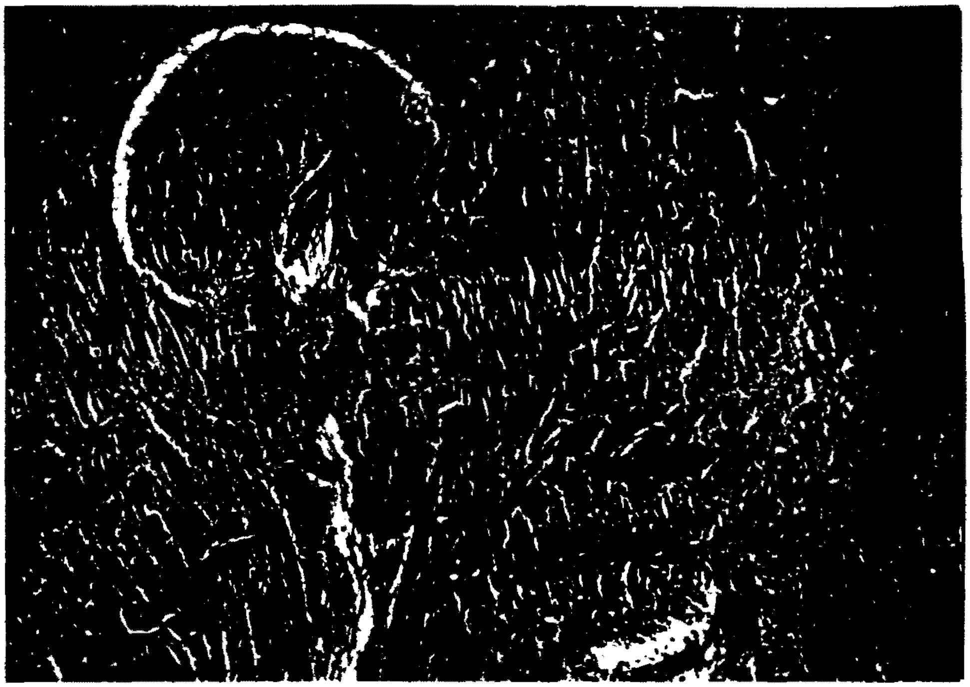


Fig. (33): Section of control brain of T. nilotica fish showing normal cerebral cortex.

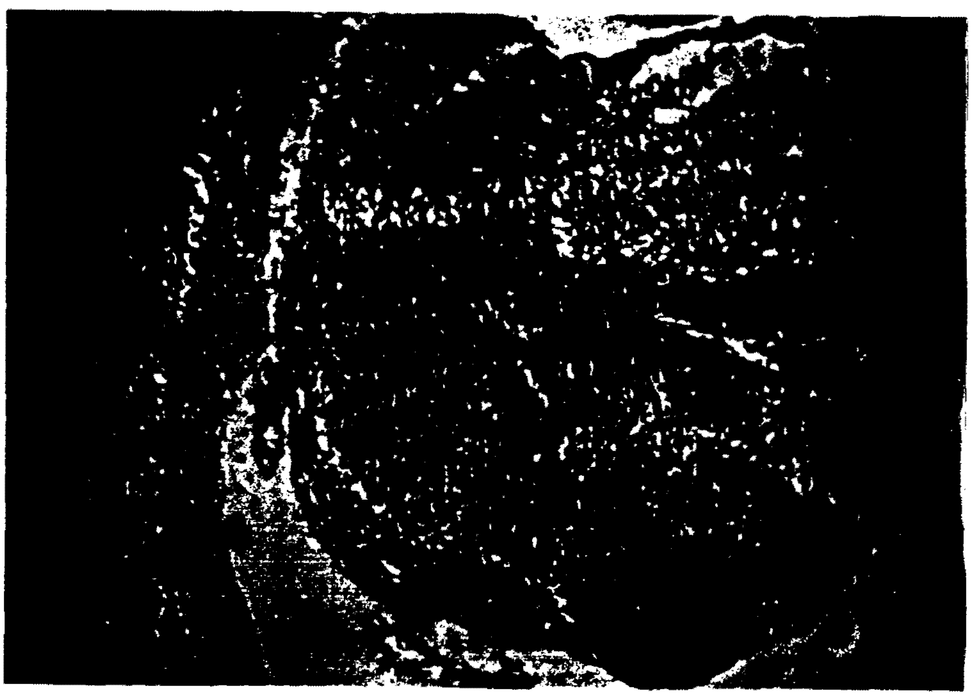


Fig.(34): Section of brain of Tilapia nilotica fish following chronic laboratory exposure to Bayluscide showing massive degeneration of cerebral cortex cells.

KAP Studies

COMMUNITY PARTICIPATION IN AMBROSIA MARITIMA CULTIVATION/APPLICATION FOR SCHISTOSOMIASIS CONTROL

Final Report (1991)

by

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Prof. of Primary Health Care
Tropical Health Department, High Institute of Public Health

Field trials have indicated the effectivity of *Ambrosia maritima* in the control of the snail schisto vector; provided, it is correctly applied to irrigation watercourses in May of each year. For this to be a continuous process, seed planting should occur in the previous November/December; and the plant should continue growing after the May harvest and watercourse application through September, so as to provide new seeds for the following year (El-Sawy *et al*. 1987).

Active village participation is thus a necessity to generate a long term, self sustained control scheme, understood and acceptable to the rural population. The farmer would need to spare one working day in November or December, a few hour in May and one hour in September. Thus full cooperation is required of the villager. Sufficient knowledge about schistosomiasis transmission and risks should be available to the villagers in order to obtain the self help enthusiastic attitude, towards participation in long term and continuous snail control.

Objectives of this study:

1- Identification of villager knowledge about schistosomiasis transmission, infection risks, complications and possible reinfection; besides ways of prevention.

2- Determination of villager attitudes towards the acceptance of self help in prevention and control.

3- Assessment of actual villager practices taken up towards schisto prevention and control.

4- Identification of informal leaders, through whom effective implementation of active community participation could be initiated and assessment of their willingness to lead selfhelp in schisto control.

Methods applied:

Study villages: This sector of the project was applied on a sample within each of the two major study areas (Nile Delta and Mariut reclamation area).

In the Delta area four villages were totally included in the study, two of which (namely Lashin and Kazouli) were subject to Ambrosia cultivation; and two (El-Prince and Kerdahi) from the control group. A total sample of 836 was interviewed.

In area II (reclaimed West Alexandria area) a systematic random sample of households (every fourth) from each of the villages subject to study was chosen. The interviewed sample totalled 955 (namely El-Gazaer, Phelestine and Ahmed Orabi).

<u>KAP questionnaire:</u> A KAP questionnaire was constructed comprising two main sections:

1- Knowledge, attitude and practice(KAP) concerning schistosomiasis infection and control (including questions tackling cooperation with control projects).
2- KAP regarding Ambrosia and snail control community participation.

Each section was concluded with a scoring system using the attitude Likert scoring technique described by Khairy (1970).

The constructed KAP questionnaire was subjected to three consecutive pilot studies to try it out; each time followed by group discussions by the study team for its further development and improvement. These pilot studies and discussions served also to facilitate good training of the team, clarify objectives of the questionnaire study and unify the interviewing technique applied.

Meanwhile, physician team members performed medical examination, consultations and referrals where needed, thus securing community cooperation and good relationships with community leaders.

Questionnaires were then applied to the chosen sample. Special care was given to interviewing personnel participating in Ambrosia cultivation during harvesting and application periods. Males who were missed during working hours on working week days were made special visits in the evenings or during the Friday noon prayers. The KAP study followup continued through the second project year, after which manual statistical processing of questionnaires took place for score calculation. Finally data was subjected to computer analysis.

RESULTS OF THE KAP STUDY:

Knowledge about schistosomiasis and its prevention and control:

Table (1) shows that the degree of knowledge about schistosomiasis varies from one village to another so that overall knowledge level extremes appear relatively high in Lashin (Delta village), (52.7%) and 11.5%) while partial knowledge predominates in Kazouli (80.9%) (Delta village) and adequate knowledge in Kerdahi (Delta) (61.4%) . Reclaimed area villages all gave the same picture of predominance of partial knowledge.

As regards the knowledge of reinfection possibility the lowest rate appeared in Kazouli and Lashin villages (14.6% and 21.3% no knowledge) as shown in table (2) Though knowledge rates in other villages were still not high.

Knowledge about schistosomiasis was higher in males than females as shown in table (3). Adequate knowledge was scored by 52.4 % of males versus 36.3% of females.

Knowledge levels did not differ greatly in age categories from 10 to 30 years dropping clearly in older age groups. This is apparent in table (4).

Meanwhile knowledge levels rise quite obviously with the rise in educational standard as in shown in table (5). Illiterates gave the lowest rate of adequate knowledge (39.02%). The highest percentage of adequate knowledge was given by students (61.2%) while the lowest rate appeared in housewives (35.9%) followed by farmers (48.6%). Table (6) illustres this difference.

<u>Attitude towards schistosomiasis control (S.C.) community participation:</u>

It is clear in table (7) that community participation in schistosomiasis control was mostly partially accepted in all the studied villages. However, the highest rate of good acceptance of community participation in S.C. appeared in Lashin (Delta) village (11.5%) followed by Kerdahi (Delta) village (6.3%) (The some distribution is evident in the schistosomiasis control practice demonstrated in table (14).

Both sexes show high rates of partial acceptance of community participation in S.C. (Table 8) . However females show a higher rate of poor acceptance (11.5%).

No significant difference appears in acceptance rate by age.

Meanwhile, the highest rate of poor acceptance is apparent among illiterates, while full acceptance rates tend to rise with the educational level as in demonstrated by table (9).

In table (10) it is shown that the highest full acceptance rates lie in clerical occupations (10 %) and students (7.5%) whilst the highest rate of poor acceptance is among housewives (11%).

Compliance with urine and stool analysis campaigns and services:

Table (11) shows the high rates of "no periodical analysis". The highest rate of negligence of periodical analysis however, appeared in Ahmed Orabi (93.8%) and El-Gazaer (86.7%) villages (both in the reclaimed area) followed by Kazouli (77.5%)(delta). The latter meanwhile gave the highest rate of refusal to provide samples for analysis even in case of being approached by investigators. This is evident in table (12) where Kazouli village gives a distinguished rate of 23.1% to no analysis submission".

Causes for this are shown in table (13).

Schistosomiasis prevention control practice:

The highest rate of partially good schistosomiasis prevention control practice is evident in El-Prince(Delta) village (84% plus 5.1%) followed by Kazouli (Delta) (85.1% plus 1.9%). Table (14) illustrates this also showing the fact that the poorest practice prevails in the reclaimed area villages, which coincides with attitude findings in table (7).

No significant differences in practice appeared between the two sexes.

Meanwhile, all age groups showed close ranges of partial and poor prevention/control practice rates. Little difference appeared in prevention/control practice rates between the age groups.

Table (15) shows that the highest good practice rates are by far among the clerical occupations (12,5%) and the students (8.2%), whereas the highest poor practice rates are in the farmers (31.4%) and the housewives (28.1%).

Knowledge about *Ambrosia maritima*:

In table (16) it is demonstrated that the highest rate of adequate knowledge about Ambrosia is apparent in

Lashin village (27.9%) , whereas Kazouli gives the highest rate of partial knowledge (60.7%). Both are delta villages, while on the other hand, reclaimed area villages show the highest rates of poor knowledge.

The knowledge about Ambrosia maritima uses illustrated in table (17) is highest in Lashin village, where snail control was most commonly mentioned as a use (32.2%) followed by Kerdahi (14.9%) and Kazouli (12.2%). All are delta villages and some had experienced Ambrosia cultivation through the project.

Males gave higher rates of knowledge about Ambrosia, though both sexes showed poor knoledge(table 18).

Table (19) shows that the poorest knowledge level about Ambrosia lies among children (3.6% adequate knowledge).

Whereas the highest knowledge level appears in age group 15-30 (5.6%). Moreover, the highest knowledge level appeared in the secondary higher educational levels(9.4% and 10.0% respectively). This is apparent in table (20) Meanwhile, table (21) shows that though the highest rate of adequate knowledge about Ambrosia is in students(7.5%) yet farmers have the highest rate of partial knowledge (32.1%) and the lowest rate of poor knowledge (61.3%).

Community acceptance of *Ambrosia maritima*:

Cultivation and application:

It is evident from table (22) that "full acceptance" is highest in Lashin (56.1%) and Kerdahi (40.8%) while in Kazouli though "partial acceptance" is high (65.4%), yet "poor acceptance" is the highest among villages (30.2%). Meanwhile, partial acceptance prevails in the reclaimed area.

Table (23) shows that acceptance is higher in males (26.3% full acceptance versus 19% in females); meanwhile, adults above 30 years showed the poorest acceptance rate (19% poor acceptance). The latter is shown in table(24).

The highest acceptance rate is among the preparatory and secondary school educational level categories of the community (only 6.2% and 10.9% poor acceptance respectively) (Table 25).

In Table (26) it is apparent that students have a relatively higher rate of full plus partial acceptance (25.4% ± 64.9%) followed by farmers (31% plus 55.1%).

Ambrosia maritima cultivation practice:

The highest rate of correct Ambrosia cultivation practice is realized in Lashin village (14.6%) as table (27) demonstrates. Table (28) shows that males had better practice than females (3.2% plus 5.5% versus 1.6% plus 2.9% respectively); with better rates in the secondary school educational level category of the cultivation (7.8% plus 10.9%) (table 29).

It is also clear that farmers in table (30) have the highest total Ambrosia cultivation practice rate (4.2% plus 6%).

Table (1): Knowledge about schistosomiasis by village.

	Adequate		Partial		Poor		Total	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Kerdahi	183	61.41	94	31.54	21	7.05	298	100
E-Prince	68	39.31	90	52.02	15	8.67	173	100
Lashin	87	52.73	59	35.76	19	11.52	165	100
Kazouli	21	13.4	127	80.9	9	5.7	157	100
El-Gazaer	134	48.2	141	50.7	3	1.1	278	100
Phalestin	156	92.6	178	48.6	32	8.7	366	100
Ahmed Orabi	98	38.0	152	58.9	8	3.1	258	100

Table (2): Knowledge of schistosomiasis reinfection possiblity by village.

	Poor		Partial		Adequate		Total	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Kerdahi	43	14.53	29	9.8	220	74.32	292	100
El-Prince	13	7.39	1	0.57	160	90.91	174	100
Lashin	35	21.34	18	10.98	111	67.68	164	100
Kazouli	23	14.56	27	17.09	108	68.35	158	100
El-Gazaer	37	13.21	9	3.21	234	83.57	280	100
Phelestin	21	5.69	84	22.76	259	70.19	364	100
Ahmed Orabi	21	8.17	53	20.62	183	71.81	257	100

Table (3): Knowledge about schistosomiasis by sex.

Sex / Knowledge	Male		Female	
	No.	(%)	No.	(%)
Adequate knowledge	438	52.39	315	36.29
Partial knowledge	358	42.82	487	56.11
Poor knowledge	40	4.79	66	7.60
Total	836	100.00	868	100.00

Table (4): Knowledge about schistosomiasis by age.

Table (4): Knowledge about schistosomiasis by age.

Knowledge \ Age	10		15		20		30		40		50	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Adequate knowledge	118	46.27	154	49.20	137	44.59	142	46.71	78	42.39	84	33.20
Partial knowledge	128	50.20	142	45.37	191	49.23	144	47.37	92	50.0	154	57.31
Poor knowledge	9	3.53	17	5.43	24	6.18	18	5.92	14	7.61	24	9.49
Total	255	100.00	313	100.00	388	100.00	304	100.00	184	100.00	253	100.00

Table (5): Knowledge about schistosomiasis by education level.

Knowledge \ Education	Illiterate		Read and write		Primary		Preparatory		Secondary		Universit	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Adequate knowledge	464	39.26	127	54.74	32	45.07	74	65.49	42	65.63	8	80.
Partial knowledge	628	53.13	97	41.81	39	54.93	39	34.51	20	31.25	2	20
Poor knowledge	90	7.61	8	3.45	0	0.0	0	0.0	2	3.12	0	0
Total	1182	100.00	232	100.00	71	100.00	113	100.00	64	100.00	10	100

Table (6): Knowledge about schistosomiasis by occupation.

Knowledge \ Occupation	Housewife		Farmer		Student		Driver		Clerk		Trader	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Adequate knowledge	260	35.86	300	48.62	82	61.19	20	50.0	21	52.5	51	51.
Partial knowledge	415	57.24	273	44.25	51	38.06	19	47.5	19	47.5	43	43.
Poor knowledge	50	6.90	44	7.13	1	0.75	1	2.5	0	0	6	6.
Total	725	100.0	677	100.0	134	100.0	40	100.0	40	100.0	100	100

Table (7): Acceptance of participation in schistosomiasis control.

		Full	Partial	Poor	Total
Kerdahi	No.	19	245	36	300
	%	6.33	81.67	12.00	100.00
El-Prince	No.	4	167	4	175
	%	2.27	94.89	2.27	100.00
Lashin	No.	19	128	16	163
	%	11.52	77.58	9.70	100.00
Kazouli	No.	0	143	16	159
	%	0	87.73	9.82	100.00
El-Gazaer	No.	10	261	8	279
	%	3.56	92.89	2.85	100.00
Phelestin	No.	8	317	47	372
	%	2.14	84.99	12.60	100.00
Ahmed orabi	No.	9	208	41	258
	%	3.47	80.31	15.83	100.00

Table (8): Acceptance of participation in schistosomiasis control by sex.

	Male		Female	
	No.	%	No.	%
Full acceptance	46	5.50	22	2.54
Partial acceptance	723	86.48	746	85.94
Poor acceptance	67	8.02	100	11.52
Total	836	100.00	868	100.00

Table (9): Acceptance of participation in schistosomiasis control by educational level.

Educational level / Acceptance	Illiterate		Read and write		Primary		Preparatory		Secondary		University	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Full acceptance	28	2.37	16	6.90	2	2.82	10	8.85	9	14.06	2	20.0
Partial acceptance	1019	86.21	204	87.93	68	95.77	99	87.61	52	81.25	8	80.0
Poor acceptance	135	11.42	12	5.17	1	1.41	4	3.54	3	4.69	0	0.0
Total	1182	100.0	232	100.0	71	100.0	113	100.0	64	100.0	10	100.0

Table (10): Acceptance of participation in schistosomal control by occupation.

Occupation / Acceptance	Housewife		Farmer		Student		Driver		Clerical occup.		Trader	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Full acceptance	18	2.48	29	4.7	10	7.46	1	2.5	4	10.0	5	5.0
Partial acceptance	627	86.48	257	85.41	119	88.81	36	90.0	36	90.0	85	85.0
Poor acceptance	80	11.04	67	9.89	5	3.73	3	7.5	0	0.0	10	10.0
Total	725	100.0	617	100.0	134	100.0	40	100.0	40	100.0	100	100.0

Table (11): Practice of periodical urine and stool analysis by village.

		No	Yes for schisto.	Yes for other conditions	Total
Kerdahi	No.	215	79	2	296
	%	72.64	26.69	0.68	100.0
El-Prince	No.	123	50	3	176
	%	69.89	28.41	1.70	100.0
Lashin	No.	111	54	0	165
	%	67.27	32.73	0	100.0
Kazouli	No.	117	32	2	151
	%	77.48	21.79	1.33	100.0
El-Gazaer	No.	242	26	11	279
	%	86.74	9.32	3.94	100.0
Phelestin	No.	224	123	13	360
	%	62.22	34.17	3.61	100.0
Ahmed Orabi	No.	240	14	2	256
	%	93.75	5.47	0.78	100.0

Table (12): Acceptance of submission to urine and stool analysis by village.

		No	Yes	Total
Kerdahi	No.	10	280	290
	%	3.45	96.55	100.0
El-Prince	No.	2	174	176
	%	1.14	98.86	100.0
Lashin	No.	7	158	165
	%	4.24	95.76	100.0
Kazouli	No.	37	123	160
	%	23.13	76.87	100.0
El-Gazaer	No.	4	277	281
	%	7.42	98.58	100.0
Phelestin	No.	27	342	369
	%	7.32	92.68	100.0
Ahmed Orabi	No.	18	239	257
	%	7.00	93.00	100.0

Table (13): Causes of urine and stool analysis refusal by village.

		Don't want	No need	No treatment given	No result given	Total
Kerdahi	No.	1	0	4	5	10
	%	10.0	0	40.0	50.0	100.0
El-Prince	No.	2	0	0	0	2
	%	100.0	0	0	0	100.0
Lashin	No.	2	1	0	3	6
	%	33.3	16.7	0	50.0	100.0
Kazouli	No.	0	4	5	16	25
	%	0	16.0	20.0	64.0	100.0
El-Gezaer	No.	1	0	0	2	3
	%	33.3	0	0	66.7	100.0
Phelestin	No.	4	2	8	14	28
	%	14.3	7.1	28.6	50.0	100.0
Ahmed Orabi	No.	1	0	1	10	12
	%	8.3	0	8.3	83.3	100.0

Table (14): Schistosomiasis prevention/control practice by v village.

		Good	Partial	Poor	Total
Kerdahi	No.	18	207	74	299
	%	6.02	69.23	24.75	100.0
El-Prince	No.	9	147	19	175
	%	5.14	84.0	10.86	100.0
Lashin	No.	16	107	42	165
	%	9.70	64.85	25.45	100.0
Kazouli	No.	3	137	21	161
	%	1.86	85.09	13.04	100.0
El-Gazaer	No.	4	163	112	279
	%	1.43	58.42	40.14	100.0
Phelesin	No.	10	228	133	371
	%	2.70	61.46	35.84	100.0
Ahmed Orabi	No.	13	170	72	255
	%	5.10	66.67	28.23	100.0

Table (15): Schistosomiasis prevention/control practice by occupation, and control practice.

	Housewife		Farmer		Student		Driver		Clerical occup.		Trader	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Good practice	24	3.31	25	4.05	11	8.21	2	5.0	5	12.5	4	4.0
Partial practice	497	68.55	398	64.51	97	72.39	29	72.0	30	75.0	77	77.0
Poor practice	204	28.14	194	31.44	26	19.40	9	22.0	5	12.5	19	19.0
Total	725	100.0	617	100.0	134	100.0	40	100.0	40	100.0	100	100.0

Table (16): Knowledge about <u>Ambrosia maritima</u> by village.

		Adequate	Partial	Poor	Total
Kerdahi	No.	18	66	215	299
	%	6.02	22.07	71.9	100.0
El-Prince	No.	-	31	145	176
	%	-	17.61	82.39	100.0
Lashin	No.	46	64	54	164
	%	27.88	38.79	32.73	100.0
Kazouli	No.	5	99	56	160
	%	3.07	60.74	34.36	100.0
El-Gazaer	No.	1	45	225	271
	%	0.36	16.01	80.07	100.0
Phelestin	No.	2	95	275	372
	%	0.54	25.47	73.73	100.0
Ahmed Orabi	No.	0	37	219	256
	%	0	14.34	84.88	100.0

able (17): Knowledge about Ambrosia maritima uses by village.

		Don't know	Fodder	Treat. of gall and renal colics	For ansil control	Other wrong answer	Combination of uses	Total
Kerdahi	No.	13	3	20	7	1	3	47
	%	27.66	6.38	42.55	14.89	2.13	6.38	100.0
El-Prince	No.	0	1	0	0	0	1	2
	%	0	50.0	0	0	0	50.0	100.0
Lashin	No.	11	4	39	29	2	5	90
	%	12.22	4.44	43.33	32.22	2.22	5.56	100.0
Kazouli	No.	6	8	72	12	0	0	98
	%	6.12	8.16	73.47	12.24	0	0	100.0
El-Gazaer	No.	0	0	3	0	0	3	6
	%	0	0	50.0	0	0	50.0	100.0
Phelastin	No.	0	1	6	0	0	0	7
	%	0	14.29	85.71	0	0	0	100.0
Ahmed Orabi	No.	0	0	0	0	0	0	0
	%	0	0	0	0	0	0	0

Table (18): Knowledge about Ambrosia maritima by sex.

Knowledge \ Sex	Male		Female	
	No.	%	No.	%
Adequate knowledge	49	5.86	23	2.65
Partial knowledge	241	28.83	195	22.47
Poor knowledge	546	65.31	650	74.88
Total	836	100.0	868	100.0

Table (19): Knowledge about <u>Ambrosia maritima</u> by age.

Age / Knowledge	5- 15		15- 30		30- 50	
	No.	%	No.	%	No.	%
Adequate knowledge	20	3.62	39	5.60	11	2.51
Partial knowledge	127	22.97	178	25.57	130	29.61
Poor knowledge	406	73.41	479	68.82	298	67.88
Total	553	100.0	696	100.0	439	100.0

Table (20): Knowledge about <u>Ambrosia maritima</u> by educational level.

Education / Knowledge	Illiterate		Read and write		Primary		Preparatory		Secondary		University	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Adequate knowledge	41	3.47	11	4.74	5	7.04	6	5.31	6	9.38	1	10.0
Partial knowledge	296	25.05	62	26.72	19	26.76	30	26.55	26	40.62	1	10.0
Poor knowledge	845	71.78	159	68.54	57	66.20	77	68.14	32	50.0	8	80.0
Total	1182	100.0	232	100.0	71	100.0	113	100.0	64	100.0	10	100.0

able (21): Knowledge about <u>Ambrosia maritima</u> by occupation.

Knowledge \ Occupation	Housewife		Farmer		Student		Driver		Clerk		Commerce	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
dequate knowledge	18	2.48	41	6.65	10	7.46	0	0	1	2.5	2	2.5
artial knowledge	159	21.93	198	32.09	30	22.39	7	17.5	8	20.0	26	26.0
oor knowledge	548	75.59	378	61.26	94	70.15	33	82.5	31	77.5	72	72.0
Total	725	100.0	617	100.0	134	100.0	40	100.0	40	100.0	100	100.0

Table (22): Acceptance of participation in <u>Ambrosia maritima</u>

		Full acceptance	Partial acceptance	Poor acceptance	Total
Kerdahi	No.	122	138	39	299
	%	40.80	46.15	13.04	100.0
El-Prince	No.	22	147	7	176
	%	12.50	83.52	3.98	100.0
Lashin	No.	92	49	23	164
	%	56.10	29.88	14.02	100.0
Kazouli	No.	7	104	48	159
	%	4.40	65.41	30.79	100.0
El-Gazaer	No.	34	211	25	270
	%	12.59	78.15	9.26	100.0
Phelastin	No.	66	236	68	370
	%	17.84	63.78	18.38	100.0
Ahmed Orabi	No.	31	158	68	257
	%	12.06	61.48	26.46	100.0

Table (23): Community acceptance of participation in Ambrosia maritima cultivation/application by sex.

Attitude \ Sex	Male		Female	
	No.	%	No.	%
Full acceptance	220	26.31	156	17.97
Partial acceptance	455	54.43	551	63.48
Poor acceptance	161	19.26	161	18.55
Total	836	100.00	868	100.00

Table (24): Community acceptance of participation in Ambrosia maritima cultivation/application of age.

Attitude \ Age	10- 15		20- 30		30- 50	
	No.	%	No.	%	No.	%
Full acceptance	121	21.84	166	23.92	85	19.41
Paritial acceptance	355	64.08	416	59.94	270	61.64
Poor participation	78	14.08	112	16.14	83	18.95
Total	554	100.0	694	100.0	438	100.0

Table (25): Community acceptance of participation in Ambrosia maritima cultivation/application by educational level.

Attitude \ Education	Illiterate		Reads and writes		Primary		Preparatory		Secondary		University	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Full acceptance	249	21.07	56	24.14	19	26.76	24	21.24	20	31.25	1	10.0
Partial acceptance	729	61.68	144	62.07	44	61.97	82	72.57	37	57.81	9	90.0
Poor acceptance	204	17.25	32	13.79	8	11.27	7	6.19	7	10.94	0	0
Total	1182	100.0	232	100.0	71	100.0	113	100.0	64	100.0	10	100.0

Table (26): Community acceptance of participation in Ambrosia maritima cultivation/application by occupation.

Occupation / Attitudes	Housewife		Farmer		Student		Driver		Clerk		Commerce	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Full acceptance	126	17.38	191	30.96	34	25.37	1	2.5	3	7.5	12	12.0
Partial acceptance	472	65.10	340	55.11	87	64.93	32	80.0	35	87.5	69	69.0
Poor acceptance	127	17.52	86	13.93	13	9.70	7	17.5	2	5.0	19	19.0
Total	725	100.0	617	100.0	134	100.0	40	100.0	40	100.0	100	100.0

Table (27): Ambrosia maritima cultivation practice by village.

		Good	Partial	Poor	Total
Kerdahi	No.	13	1	248	298
	%	4.33	0.33	94.67	100.0
El-Prince	No.	1	0	175	176
	%	0.57	0	99.43	100.0
Lashin	No.	24	20	119	163
	%	14.55	12.12	72.12	100.0
Kazouli	No.	2	47	108	157
	%	1.23	28.83	66.26	100.0
El-Gazaer	No.	1	1	265	267
	%	0.36	0.36	94.31	100.0
Phelastin	No.	0	1	360	361
	%	0	0.27	96.51	100.0
Ahmed Orabi	No.	0	0	256	256
	%	0	0	100.0	100.0

Table (28): *Ambrosia maritima* cultivation practice by sex.

Sex / Practice	Male		Female	
	No.	%	No.	%
Good practice	27	3.23	14	1.61
Partial practice	46	5.50	25	2.88
Poor practice	763	91.27	829	95.51
Total	836	100.0	868	100.0

Table (29): Ambrosia maritima cultivation practice by educational level.

Education / Practice	Illiterate		Reads and writes		Primary		Preparatory		Secondary		University	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Good practice	25	2.12	6	2.59	1	1.41	3	2.65	5	7.81	0	0
Partial practice	45	3.81	10	4.31	4	5.63	4	3.54	7	10.94	0	0
Poor practice	1112	94.07	216	93.10	66	92.96	106	93.81	52	81.25	10	100.0
TOTAL	1182	100.0	232	100.0	71	100.0	113	100.0	64	100.0	10	100.0

HEALTH EDUCATION PROGRAM TO STIMULATE COMMUNITY PARTICIPATION IN SCHISTOSOMIASIS CONTROL USING AMBROSIA MARITIMA

A KAP study was performed on four villages in the Delta study area and three villages in the resettled area, west of Alexandria; the results of which showed marked variations between the two areas, besides different levels of knowledge between the villages particularly in the Delta region. Since the four delta villages induced two where *Ambrosia maritima* cultivation was attempted and two where no Ambrosia cultivation had taken place, levels of acceptance of participation in Ambrosia cultivation/application were clearly higher in the former two villages.

Nevertheless, followup visits by the KAP team revealed the removal of the plant before the application season in various localities and investigation exposed among the farmers insufficient knowledge about its value in schisto. control and infact insufficient knowledge about the role of the snail vector in the disease transmission. This apparently had lead to underestimation of the importance of the plant and the carelessness during canal and drain clearing procedures.

Information available is thought to be enough to build upon a health education program to raise the level of knowledge and participation which would stimulate the long-term practice of Ambrosia cultivation and application.

Objectives of the program:

1- Motivated active farmer participation in Ambrosia growing and application procedures for snail control (Program Objective).

2- Farmers and most villagers can describe schistosomiasis transmission and the role of Ambrosia in snail control, besides its other uses(cognitive behavioural objective).

3- Farmers can grow and apply Ambrosia in the most effective way for snail control (Cognitive behavioural objective).

4- When subjected to a KAP study for participation in schisto control using Ambrosia, will give significantly higher rates than before health education implementation (Effective behavioural objective).

Methods:

Duration: Three years (two years health education program, plus one year KAP evaluation).

Study site: Lashin village has been chosen for implementation of the program, it being one of the villages where Ambrosia was being grown during the present phase of the project and where the KAP study has shown some knowledge of the plant and partial knowledge about schisto. transmission. The village population totals 407 of which a large ratio are farmers, and farming hands in their land are usually from the village with almost no help from outside dwellers.

Health education methods:

1- Home visit sessions and group discussions and demonstrations.
2- Mosque and social group meetings.
3- Field educational sessions and counselling.

Material:

1- Video films.
2- Projector slides.
3- Posters.

Activities:

1- Staff selection and training.
2- Acquisition of equipment, material and facilities.
3- Recruitment and training of local health educators (leaders)
4- Recruitment of farmers and villagers into the program.
5- Implementation of health education methods.

Evaluation of health education program:

A- Built in evaluation system; A KAP study on 10 % of recruited villagers will be performed every six months period.

B- End of program evaluation: A KAP study will be performed on all the recruited villagers at the end of the program.

Chronogram:

First year:

Staff train

Recr. villagers

* KAP on

Acq. equip+ material

Health education implementatio

Recr.+train local health education

Second and third year:

Year II

Year III

Health education implementation

* KAP on 10%

* KAP on 10%

Final evaluation

Statistical analysis and final report.

Dr. Amal Khairy

Discussion, Conclusion and Recommendations

During phase IV of the project, it was planned to assess the integrated approach of schistosomiasis control, using A.maritima for snail control and praziquantel for case treatment. This approach was evaluated in two areas : an established farming area of high prevalence and a reclaimed ressettlement area with a different ecological set up.

In the first area, the study comprised four villages. Two of them were under study in phase III and two were newly enterdd in phase IV. The prevalence of S.mansoni before any control measure was 78%, 78%, 69% and 49%. The snails intermediate hosts were found dispersed in all types of channels and snail infection rate was about 1%. It was decided to treat the patients in the four villages and to apply Damsissa to two villages leaving the other two as controls.

In area II, before any control measure, the prevalence of S.mansoni in the three villages chosen was 22%, 28% abd 40%. No S.haematobium cases could be detected. The distribution of Biomphalaria alexandrina in the area could be considered focal and limited to the water channels with permanent waters. A large proportion of the canals was found dry. The proportion of infected snails was high (10%) if compared with the known values in Egypt. This confirmed the statement that with smaller numbers of snails collected, higher infection rates are recorded.

In area II, it was decided to treat all positive cases with praziquantel and to apply Damsissa to the three villages. Evaluation thus depended on the trend of indices year after year, rather than comparison between the villages.

In the present discussion, comparison of the results of the two areas will be attempted, hoping in a better clarification of the findings.

Prevalence and intensity of infection:

Regarding these two indices, prevalence was higher in area I than in area II. Intensity of infection, expressed as geometric mean egg counts for positives was found to correlate positively with prevalence. When intensity was related to the total population, it became an indicator of the community dose of infection and accordingly of the quantum of contamination. This index which was small at low prevalence levels, increased tremendously with high prevalences clarifying the importance of the community dose of contamination in maintaining the high level of transmission in the first area before any control measure.

Role of chemotherapy:

Treatment was offered to almost all of the infected individuals after their assessment clinically. The cure rate was high. It was inversly related to the prevalence rates and the intensity of infection.It reached 95% in villages with low prevalence and 77% in villages with high prevalence. In all cases, the effect of therapy was remarkable in lowering the prevalence rates significantly in all the villages. The intensity of infection dropped accordingly.

Role of Damsissa on the snail intermediate host:

Damsissa was then applied to all water bodies in,Kazouli and Lashin villages of area I and in the three villages of area II. In area I, the number of live snails collected during one year after application of the plant was found to amount to 5% of the number collected from the control villages. No S. mansoni infected snails could be collected (100% reduction).

In area II, the number of snails after damsissa amounted to 13% the number collected in the previous year. Reduction in the number of infected snails amounted to 91%.

Role of Damsissa 0n S;mansoni transmission:

Incidence : when we considered the transmission index, it was found to fluctuate in the different years, reaching sometimes high values even in the treated villages in area I.

In area II, the incidence decreased after application of damsissa compared with the results of the previous year , however, there were still some newly infected individuals.

This persistence of transmission, inspite of the obvious snail control needed an explanation. Accordingly sentinel mice were exposed to infection in the different water channels in area I. The results came confirming absence of infectivity of the waters after damsissa, while mice became infected when exposed in the non treated waters.

The only explanation for continuation of transmission was thus population movement. In fact, in the first area,the villages are so close to each other , that the inhabitants could not escape infection through exposure to water bodies outside their villages.

In area II, inspite of a greate distance between the villages, population mobility for search of work remained the only explanation for the cases that were newly infected. This may explain why, one of the villages, the one that suffered most from lack of water for irrigation, did not reveal lowering of incidence; probably, a greater proportion of the inhabitants searched work outside the domaine of their own village.

Reversion rate:

Very high reversion rates (positive to negative) were observed in the villages of the resettlement area, after treatment and damsissa, as compared to reversion values in the previous year. A similar increase but of smaller extent,was observed in the damsissa treated villages of area I. It is probable that this high reversion was an important factor leading to the lowering of the over all prevalence in area II.

Reversion from positivity to negativity may be due to the following : 1) individuals received treatment outside the project team

2) low infection intensity and self cure.

3) a small proportion may have escaped diagnosis due to a very low egg count in the second examination.

Bio-toxicological studies of A.maritima and its effect on aquatic non-target organisms:

The aqueous extract of the dry whole plant of *A.maritima*, up to the concentration of 3×10^3 ppm. failed to show any mortality

of culex pipiens larvae, Daphnia magina., tad pole, gambusia fish, Tilapia nilotica and three green unicellular algae. These test organisms were all collected from the water streams.
This finding denotes the safety of A.maritima applied to the waters in the concentration of 70 ppm.
Biotoxicological studies on non-target organisms were then carried with the active ingredient of the plant extracted by ethanol.
The findings were compared with ½ LC 50 of Bayluscide.
It was again concluded that A. maritima, was safe towards the aquatic non-target organisms. It revealed no inhibition of the growth of algae. Acute exposure of Tilapia nilotica to the molluscicidal concentration of the plant, did not induce any in-vivo biochemical changes.

The effect of chronic toxicity of A.maritima towards juvenile Tilapia nilotica fish, was studied both in the laboratory and in the field. Biochemical parameters as well as histopathological changes of the different organs and tissues were studied after exposure of the fish for a period of three months to 1/10 LC 50 of A. maritima. Results revealed few changes in these parameters.

KAP study:

A KAP study, to estimate the requirements of sustained self help in A.maritima snail control, in both established and reclaimed areas was undertaken. A sample of the population in the two areas was interviewed. A KAP questionnaire was constructed comprising a section on the knowledge about schistosomiasis, its prevention and control; the second section was about A.maritima and community participation in control.

Building on the findings, which revealed insufficient knowledge of the villagers about the role of the snail vector and about damsissa, it was felt that a Health Education program is essential for stimulation of the population to participate actively in the control program.

Conclusion and recommendations:

From the studies undertaken in phase IV of the project, we could come to the following conclusions:

- A single annual application of Damsissa in the concentration of 70 ppm. has succeeded to control Biomphalaria alexandrina snails , in the water channels in both area I and area II. The total snail population as well as snail infection were decreased by 90% to 95%.
- Transmission from the Damsissa treated waters stopped , as demonstrated by the mice experiments.
- In area I, the control of the snail vector was not accompanied by the expected cessation of transmission. New infections continued to appear. They were probably acquired in waters outside the domaine of the villages under consideration.
- The situation was better in the ressettlement area. In the villages studied, the overall prevalence which was lowered by treatment, continued to reveal a decreasing trend. This decrease was due to a higher reversion rate and to a lower incidence. Interruption of transmission in this area may be attained in view of the following: (1) the transmission of S.mansoni in the area is mostly focal, (2) villages are more spaced, (3) the prevalence is relatively lower.
- Damsissa was found safe for the aquatic non-target organisms.

Accordingly to complete the study and fulfill the aim of the project, the following points are suggested:

1- In the established area : widening of the area of Damsissa application so that it covers the sites of population movement. This is expected to control transmission in one village to be chosen as the centre of a circle. The radius of this circle should be equal to the longest walking distance from the village (3 - 5 Km.).

2- In the ressettlement area,: the yearly application of Damsissa in the three villages is to be continued, with study of the trend of transmission. With the low prevalence already attained it seems reasonable to look for successful maintained control

3- A Health Education program informing the population about Damsissa and its importance in control of schistosomiasis may initiate the effective participation of the community in the control activities.

4- A properly designed study, including histopathological and histochemical studies, on the snails exposed to Damsissa in the laboratory and in the field is of great necessity.

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Papers Presented:

9. A paper was presented in the fifth Medical Research Institute Conference and the first Egyptian-Italian workshop held in the Medical Research Institute in the Period 20 - 22 October 1990, entitled "SCHISTOSOMIASIS IN THE RECLAIMED LANDS EGYPT" Abst. pp. 14.

10. Barakat, R.; Soliman, N. and El-Sawy, M. (1988): Role *Ambrosia maritima* (Damsissa) in the control of schistosomiasis, preliminary results. Presented in the XII th International Congress on Tropical Medicine and Malaria. Amsterdam, September 1988.

Snail Survey

Snail Survey in Lashin and Mohsen Village, August 1990 - July 1991.

Months	Lashin								Mohsen (Control)							
	2ndy Drain(near)		3ry Drain(near)		2ndy Canal(far)		3ry Drain(far)		2ndy Drain(near)		3ry Drain(near)		2ndy Canal(far)		3ry Drain(far)	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
ugust	2	16	0	7	4	6	0	1	17	12	21	3	75	8	53	12
eptember	1	9	3	18	3	1	0	0	14	2	33	0	105	19	34	26
ctober	0	4	0	6	0	0	2	5	27	5	21	6	66	7	44	11
ovember	1	1	2	2	5	12	0	6	63	2	16	0	49	10	33	0
ecember	0	0	0	0	1	0	0	0	49	18	18	3	27	7	19	2
anuary	0	0	0	0	3	0	0	0	32	9	7	0	Dry		13	0
ebruary	2	0	1	1	Dry		Dry		Dry		Dry		19	0	15	2
arch	2	2	3	6	2	0	2	0	2	0	0	0	62	3	21	0
pril	4	0	Dry		6	1	2	0	12	1	0	1	55	1	9	0
ay	1	3	Dry		2	3	2	1	36	5	16	2	63	4	24	1
une	0	2	0	3	0	1	0	0	32	3	22	4	95	9	32	5
uly	0	1	0	2	1	1	1	0	52	6	44	6	85	3	18	7

Application of Damsissa 4, 5, 6/5/1991 70 p.p.m. in Lashin, only.

A: alive D: dead

Snail Survey in Kazouli and Prince Village, August 1990 - July 1991.

Months	Kazouli								Prince (Control)							
	2ndy Drain(near)		3ry Drain(near)		2ndy Canal(far)		3ry Drain(far)		2ndy Drain(near)		3ry Drain(near)		2ndy Canal(far)		3ry Drain(far)	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
August	2	11	1	3	4	14	1	1	34	1	59	6	105	14	77	6
September	0	7	0	6	4	5	0	2	47	2	106	3	89	9	63	0
October	2	4	2	9	0	10	0	0	26	0	83	0	Dry		46	7
November	0	1	0	0	0	3	2	4	46	0	35	5	73	0	56	2
December	6	2	4	1	12	9	0	0	100	7	44	4	52	2	33	1
January	0	0	1	2	0	0	1	0	Dry		72	2	Dry		17	1
February	8	7	0	1	18	3	3	7	Dry		36	0	34	0	29	1
March	9	9	0	3	Dry		Dry		14	0	95	1	46	3	45	8
April	18	3	4	1	27	3	7	0	12	2	87	12	Dry		51	0
May	5	12	1	2	11	15	0	5	42	0	90	4	31	2	88	3
June	3	15	0	4	4	19	1	4	40	3	110	9	49	3	109	2
July	1	9	2	3	0	8	0	2	55	1	90	12	38	6	150	12

Application of Damsissa 1, 2, 3/5/1991 70 p.p.m. in Kazouli only.

A: alive D: dead

Percentage of <u>Biomphalaria</u> <u>alexandrina</u> with S. mansoni, August 1990- July 1991.

Kazouli:

Channels	Aug.	Sept.	October	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July
2ndy drain(near)	0	0	0	0	16.6*	0	0	0	0	0	0	0
3ry drain (near)	0	0	0	0	0	0	0	0	0	0	0	0
2ndy canal(far)	0	0	0	0	8.3*	0	0	0	0	0	0	0
3ry canal(far)	0	0	0	0	0	0	0	0	0	0	0	0

Prince: (Control)

Channels	Aug.	Sep.	October	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July
2ndy drain(near)	5.8	0	0	0	.9*	0	0	0	0	0	0	1.8
3ry drain (near)	0	0	0	0	0	0	0	0	.3.4	0	2*	2.2
2ndy canal(far)	0	0	0	2.7	5.7	0	0	0	0	0	0	0
3ry canal(far)	0	0	0	0	0	5.9	0	0	0	0	2.7	6*

* Single Tail.

Percentage of <u>Biomphalaria alexandrina</u> with <u>S. mansoni</u>, August 1990 - July 1991.

Lashin:

Channels	Aug.	Sept.	October	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July
2ndy drain(near)	0	0	0	0	0	0	0	0	0	0	0	0
3ry drain (near)	0	0	0	0	0	0	0	0	0	0	0	0
2ndy canal(far)	0	0	0	0	0	0	0	0	0	0	0	0
3ry drain (far)	0	0	0	0	0	0	0	0	0	0	0	0

Mohsen: (Control)

Channels	Aug.	Sept.	October	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July
2ndy drain(near)	0	0	.3.7	0	0	0	0	0	0	.0	6.2	1.9
3ry drain (near)	0	0	0	0	0	0.	0	0	0	12.5*	0	2.0*
2ndy canal(far)	0	.4.7	0	0	0	0	0	.3.2	0	0	4.0*	1.2
3ry drain (near)	0	.5.9*	0	0	0	0	0	0	0	0	0	0

*Single Tail.

These two tables show the number of snails gathered along one year from the two treated villages (Kazouli and Lashin) and the two control villages (Prince and Mohsen). It is clear that snails in the treated villages are few to be neglected as such little numbers cannot act actively as an intermediate host in the field.

The other two tables show the percentage of infected snails giving cercariae in the channels of the treated and control villages. No cercariae of Schistosoma were found in the snails from treated channels while the snails from control channels shed cercariae. This finding was emphasized by sentinel mice getting no infection from treated channels while they were infected in control ones.

ANNEX I

ADVANTAGES OF <u>AMBROSIA</u> <u>MARITIMA</u> (DAMSISSA) AS A BIOLOGICAL TOOL FOR SNAIL CONTROL:

1- The plant belongs to the local ecosystem so no chance to invite foreign pests.

2- The plant can grow in different kind of snail except marine soil

3- The plant as a whole is active whether green or dry and no need for the expensive extracting of the active material.

4- It does not affect non target organisms and does not kill fish which is a cheap source of animal protein in the community.

5- The plant kills snails of <u>Schistosoma</u> and <u>Fasciola</u> and their eggs. Fasciola is a problem to livestock and an increasing problem among humans now. Also it kills the aquatic stages of the bilharzia viz: meracidiae and cercariae.

6- Application of the plant does not need special technology also the people can share in the control through primary health care programmes.

7- The plant keeps its activity for years if kept in a dry environment.

8- In folks medicine people use the plant decoction to relief colics and drive out urinary tract stones.

9- Application does not need any foreign currency.

ANNEX II

HOW TO USE *AMBROSIA MARITIMA* (DAMSISSA) IN THE FIELD FROM OUR PRACTICAL FIELD EXPERIENCE:

1- The least expensive method is to encourage the people to grow the plant along the shores of water channels every 10-20 steps.

2- The plant can be cultivated in lands not used for crops, then gathered to be applied in piles green or dry and dispersed submerged along the shores of water channels.

3- Dry plant can be compressed into sheets, tablets, cakes or brickets to disperse in infested channels.

Financial Report

UNIVERSITY OF ALEXANDRIA
High Institute of Public Health
Bilharzia Egypt Phase IV
Centre File 3-P-87-0204

Financial Report from August 4, 1988 to August 3, 1991

	Total Budget L.E.	Actual expenses in Year 1 L.E.	Actual expenses in Year 2 L.E.	Actual expenses in Year 3 L.E.	Total expenses L.E.	Variance L.E.
1- **Personnel:**						
Parasitologist	11910	3599	3960	3980	11539	371
Assist.parasitologist	19060	5760	6340	6680	18780	280
Malacologists	11910	3599	3960	4180	11739	171
PHC specialist	11910	3599	3960	3980	11539	371
Toxicologist	7560	3599	3960	-	7559	1
Physicians	12700	3836.4	4220	4174	12230.4	469.6
Health educator	3650	2516.4	483	570	3569.4	80.6
PHC assistant	2430	1675.6	315	384.7	2375.3	54.7
Snail survey technician	6350	1919	2110	2265	6294	56
Laboratory technician	30980	9359.4	10290	11138	30787.4	192.6
Laboratory attendants	15880	4799	5280	5777	15856	24
Field surveyors	12700	3837.6	4220	4590	12647.6	52.4
Field attendants	2320	1600	292	345	2237	83
Epidemiology technician	5570	3839.8	748	856	5443.8	126.2
Agriculture managers	7940	2399	2640	2870	7909	31
Farm labourers	13900	4198.1	4620	4909	13727.1	172.9
Accountants	9930	2995	3300	3260	9555	375
Storekeepers	3970	1199.6	1320	1445	3964.6	5.4
Drivers	11910	3598	3960	4300	11858	52
Secretaries	5970	1799.2	1980	2150	5929.2	40.8
Students	3020	1438.8	1580	-	3018.8	1.2
Statisticians	5340	2400	1440	1360	5200	140
Total	216910	73566.9	70978	69213.7	213758.6	3151.4

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UNIVERSITY OF ALEXANDRIA
High Institute of Public Health
Bilharzia Egypt Phase IV
Centre File 3-P-87-0204

	Total Budget L.E.	Acutal expenses in Year 1 L.E.	Actual expenses in Year 2 L.E.	Actual expenses in year 3 L.E.	Total expenses L.E.	Variance L.E.
2- Equipments						
Laboratory supplies	6000	3792.75	997.19	1007.52	5797.46	202.54
Glassware	9000	4937.06	1113.50	1936.25	7986.81	1013.19
Office supplies	13000	6958.75	1992.96	2415.57	11367.28	1632.72
Treatment incentives	8400	2800	2665	2710	8175	225
Fertilizer	6000	1996	1950	1980	5926	74
Farm equipment	2000	1578	-	-	1578	422
Land rental	9000	3000	3000	2950	8950	50
Damsissa seeds	2000	1980	-	-	1980	20
Total	55400	27042.56	11718.65	12999.34	51760.55	3639.45
3- Transportation:						
Vehicle gasoline and maintenance	30000	9904.68	9881.59	9711.64	29497.91	502.09
4- Per Diems						
Co-Investigators	27800	8399	9115	9167	26681	1119
5- Data analysis	4000	-	-	1375	1375	2625
6-Administration Fees (10%)	33300	12000	10500	9844.50	32344.50	955.50
Total in Egyptian pounds	367410	130913.14	112193.24	112311.18	355417.56	11992.44

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The Cash Position for the Project, August 4,1988 to August 1991

he received amount:	Date	US$
st payment	11. 9. 1988	32786.89
nd payment	5. 4. 1989	33411.29
rd payment	21. 1. 1990	25627.88
th payment	12. 7. 1990	8502.68
th payment	18.10. 1990	26007.96
th payment	14. 1. 1991	7304.92
otal received amount		133641.62

	US$	L.E.
otal expenditure:	133157.75	355417.56
anking charges	143.63	371.85
rand total expenditure	133301.38	355789.41
alance in the Bank account	340.24	
laries due in July 91	1000.00	3300
ill not received ------ om DRC have to be nt.	659.76	

Financial Controller

(Ibrahim Abdou El-Eraki)

Principal Investigator

(Prof. Dr. M.F. El-Sawy)