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ANTI-LARVAL ACTIVITIES IN IRAQ

by

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1. Anti-larval Activities

Anti-larval activities as one of the malaria control measures have been mainly carried out in and around Basrah town, particularly in the Ports' Authorities areas, before the MEP. In fact, it was the main weapon of attack during the World War II years and after in the Basrah area.

In Basrah town under MEP, larviciding was introduced in 1964 as a supplemented attack measure, under such epidemiological situations as:

1. when the vector, A.stephensi developed resistance to DLD and DDT;
2. during epidemic/outbreak in Basrah town in 1963;
3. with continued imported cases to Basrah town as a port;
4. with less animal population in Basrah town;
5. when larviciding was feasible due to:
   - Well defined breeding places (palm irrigation canals);
   - availability of larvicide - oil;
   - operational feasibility.

2. Larviciding Operations in Basrah Town

2.1 Area under operations

Topography: Basrah town is situated in the palm belt, an area of countless canals and ditches which stem from Shat El Arab river. The waters of the irrigation canals in the palm gardens are the breeding places for the vector mosquito.

The water surfaces fluctuate with the river level, flooding and tides, the blind ends of the canals are usually stagnant. The two big rivers (the Tigris and Euphrates) join to Shat El Arab river, about 100 km north of Basrah, around which vast marshes extend to the north.

Flooding of the two big rivers in Iraq takes place in April-May, subsequently flood season in Basrah area starts at the beginning of May and ends in late June every year.

The lowest level of water in the Shat El Arab is in October-November.

Area: Basrah town (excluding Ports Authorities area): Approximately 30 km^2. Water surfaces for larviciding: approximately 2.4 km^2. Water surfaces in the Ports Areas in Margil and Fao: approximately 1 km^2.

2.2 Population, Basrah town, 313,000 (1965 Census)

2.3 Period of Operation and Operation Cycle

Throughout the possible breeding (transmission) season; from the second week of February to end of November.

Cycle: Weekly (six working days)

2.4 Larvicide

1964 - 1965: Mixture of crude oil and gas oil, 3:1

1966 - : Mixture of diesel oil and linseed oil (in proportion of 0.5%, the linseed oil as a spreader),

The change of larvicide was:

(a) to increase the spreading power of the main oil, using the linseed oil as spreading agent;

(b) in view of farmers' complaints that dates which fell in the crude oil treated water, and vegetables washed with it, tasted unpleasantly, and for fear of harm to the date crop.

The new diesel oil gives rise to some difficulties; as it is not available in Basrah, and must be brought from Amara town, some 200 km north.

2.5 Oiling equipment

Sprayers: 1964 - 1966: Hudson sprayers, 3 gallons capacity
1967 - : Hudson sprayers, 2 gallons capacity

Nozzles: 1964 - 1965: Teejet HS 8002
1966 - : Cone jet 10.200 litres/hour

Lance: Goose-neck extension.

The change of nozzle was in order to reduce dosage of oil per unit of water surface, to reduce operational loads, and coincident to the change of larvicide from crude oil to diesel oil.

2.6 Logistics and transport

Operation Centre: Regional Headquarters in Basrah with store.

Daily consumption of diesel oil; average 500 gallons.

Transport: 2 tankers, (capacity 950 gallons and 600 gallons) for transportation of diesel oil from Amara town to the operation centre.

3 Dodge P.W. (Pick-up) and one Chevrolet pick-up for distribution of diesel oil to larviciding teams in the field.

21 Drums, 40 gallon-capacity, (one for each squad for the oil depot).

2.7 Manpower

(a) Planned area to be treated: approximately 2 400 000 m^2 of water surface, with a depth of 10-30 cm.

(b) Surface area to be treated daily on weekly intervals: 400 000 m^2.

(c) Target dosage: 6 cc per square metre of water surface.

(d) Daily output per larvicider: 8 gallons.

(e) Strength as included in the Plan of Action is as follows:

Larviciders	100
Squad leaders	20
Team leaders	4
Drivers	9

2.8 Organization and operational units

The larviciding operations are under the supervision of an assistant entomologist. The operational unit is a squad whose leader is the keyman from the point of view of supervision. There are 20-21 squads in Basrah town and its suburbs. Thus the area is divided into 21 blocks, one each for one squad consisting of four larviciders.

Entomological checking of the potential breeding places of A.stephensi for the effectiveness of the larvicide is conducted by two insect collectors under the supervision of the chief of operations.

2.9 Working hours

07.00 - 12.00 and 13.00 61 600 (8 hours)

3. Cost of operations (year)

		Iraqi Dinars
Larvicide:	Diesel oil	2 198 800
	Linseed oil	648 000
Personnel:	Larviciders	10 150 000
	Squad leaders	2 320 000
	Team leaders	580 000
	Drivers	1 566 000
Transport:	Petrol, vehicle maintenance	3 627 200
		21 090 000
Unforeseen:		653 500
	Total:	21 743 500

Per capita cost to population: ID 0.009

4. Evaluation of the operation

(a) Two insect collectors are assigned to examine the treated area by dipping. Supervisors also check larvae at the time of supervision.

(b) Entomological observations by the Governorate entomology teams at fixed capture stations as well as random sampling throughout the larviciding period.

(c) Entomological investigations following the detection of malaria cases.

(d) Epidemiological assessment including parasite incidence and epidemiological investigations.

4.1 Epidemiological data

(a) Entomological

The following table shows the comparison in day-resting vector density per shelter observed between Basrah town (treated area) and Nahia of Shat El Arab (not treated) which is located opposite the town. (Observations in May and October - Peaks of vector density)

Year	Basrah Town		Shat El Arab Nahia		Basrah Governorate	
	May	October	May	October	May	October
1965	0.	0.02	19.0	1.0	4.9	0.3
1966	0.	-	6.6	-	2.0	-
1967	0.03	0.3	49.0	3.9	10.0	2.5
1968	0.	0.2	1.7	5.4	4.3	2.8
1969	0.1	2.3	-	0.04	3.7	0.5
1970	0.2	0.	0.18	0.02	3.8	0.02
1971	0.	0.	1.7	0.	5.0	0.

N.B. In 1969, unusual floods took place.

(b) Malaria incidence

Year	Basrah Town		Other Areas		Total Governorate	
	Cases	API°/oo	Cases	API°/oo	Cases	API°/oo
1963	2 187	8.6	1 848	4.4	4 053	7.1
1964	640	2.5	1 599	3.8	2 239	3.8
1965	64	0.25	578	1.4	642	1.0
1966	77	0.3	612	1.5	689	1.1
1967	119	0.48	971	2.3	1 190	1.7
1968	169	0.5	1 136	3.1	1 305	2.0
1969	424	1.4	2 009	5.6	2 433	3.6
1970	639	2.0	1 362	2.0	2 001	2.9
1971	28	0.08	47	0.01	75	0.1

5. Records of Larviciding Operation

1965: Water surfaces under treatment: approx. 2 400 000 m^2
Period of operation: 42 weeks (February-November)
Number of larviciders: 99 average
Larvicide used: Mixture of crude oil and gas oil 3:1
Oil mixture consumption, year: 271 920 gallons
Daily output per larvicider: coverage approx. 4 500 m^2, 11 gallons
Dosage applied/m^2, average: 10 cc

1966: Water surfaces under treatment: approx. 2 400 000 m^2
Period of operation: 42 weeks (February-November)
Number of larviciders: 73 average
Larvicide used: Mixture of crude oil and gas oil for 15 weeks
Diesel oil and linseed oil (0.5%) for 27 weeks
Oil mixture consumption, year: Crude oil and gas oil 77 942 gallons
Diesel oil 76 910 gallons
Diesel oil, daily/larvicider: 6.6 gallons
Dosage applied/m^2, average: 4.5 cc

1967: Water surfaces under treatment: approx. 1 800 000 m^2
Period of operation: 39 weeks (February-November) interruption for 2 weeks in September.

	Number of larviciders:	50 (48-63)
	Larvicide used:	Mixture of diesel oil and gas oil
	Diesel oil consumption, year:	102 754 gallons
	Daily per larvicider:	8.7 gallons
	Dosage applied/m^2, average:	5.5 cc
1968:	Water surfaces under treatment:	approx. 2 400 000 m^2
	Period of operation:	39 weeks, March to November
	Number of larviciders:	93 - 100
	Larvicide used:	Diesel oil and linseed oil (0.5%)
	Diesel oil consumption, year:	137 176 gallons
	Daily per larvicider:	6.1 gallons
	Dosage applied/m^2, average:	6 cc
1969:	Water surfaces under treatment:	2 400 000 m^2, during this year unusual floods took place and in the meantime linseed oil could not be secured
	Period of operation:	40 weeks
	Number of larviciders:	100
	Larvicide used:	Mixture of diesel oil and linseed oil; the later was not available
	Diesel oil consumption:	126 342 gallons
	Daily per larvicider:	5.2 gallons
	Dosage applied/m^2, average:	5.2 cc
1970:	Water surfaces under treatment:	2 400 000 m^2
	Period of operation:	39 weeks (February-November)
	Number of larviciders:	93 - 100
	Larvicide used:	Mixture of diesel oil and linseed oil
	Diesel oil consumption:	128 438 gallons
	Daily per larvicider:	5.7 gallons
	Dosage applied/m^2, average:	5.2 cc
1971:	Water surfaces under treatment:	2 400 000 m^2
	Period of operation:	40 weeks (February to November)
	Number of larviciders:	78 - 100
	Larvicide used:	Mixture of diesel oil and linseed oil; the later was not available for some months
	Diesel oil consumption:	119 968 gallons
	Daily per larvicider:	5.7 gallons
	Dosage applied/m^2, average	5.7 cc

6. Larviciding operations in the other Governorates

In the other Governorates, anti-larval activities are carried out on a very small scale. One to six squads have been provided for each Governorate

to treat certain open drains and stagnating water in the capital of the respective Governorate, using crude diesel oil. The squads are directed by the Endemic Disease Branch in the Governorate.

Similarly, in the Ports' Authorities areas in Margil and Fao Centre, larviciding operations are carried out throughout the year using crude oil mixed with gas oil in the ratio of 3:1.

7. Gambusia Fish

In many of the irrigation canals of the palm tree gardens aroud Basrah town, Gambusia fish exist. Attempts have been made to transfer and utilize some of the Gambusia in the other irrigation canals in the area. It is still recommended to organize and improve this method.

8. Summary

(a) Larviciding was introduced in Basrah town in 1964, after an epidemic of malaria was encountered in 1963.

(b) The larcividing applied as indicated in malaria incidence in Basrah town since 1964, has contributed to reducing and controlling malaria transmission in the area where the source of infection was potentially high with imported cases.

(c) Operationally and administratively much remains to be improved in the larviciding operations. The following are needed:

- Geographical Reconnaissance of water surfaces to be treated;
- standardization of larviciding techniques;
- solution to problem of operators' turnover;
- strengthening of supervision;
- organization and improvement of the utilization of Gambusia fish;
- reduction of water surfaces areas, other than the irrigation canals by filling wherever possible.

Larviciding in Iraq started during the second World War when the British Army entered the country.

Crude oil and gas oil had been used together until 1962. Since 1963, diesel oil together with some other insecticide are in use.

Gambusia fish were used in some areas and are still in use in Kadhemiyah brick factories, but then effectiveness is very limited.

Trials have been made in Hurriyah and Kadhemiyah areas on Filariol and Abate to study the effectiveness of these two insecticides on mosquito larvae and pupae in comparison with diesel oil.

Results showed that these two insecticides affect larvae only, while diesel oil affects larvae, pupae and even eggs. The minimum residual effect of Abate is four days; for Filariol five days and for diesel oil ten days and even sometimes two or three weeks.

In Annex I a comparison is made between the cost of diesel oil and other insecticides.

COMPARISON BETWEEN THE COST OF

Muhafasat	Exp. 1965		Exp. 1966		Exp. 1967		Exp.
	Diesel	I.D./fils	Diesel	I.D./fils	Diesel	I.D./fils	Diesel
Ninawa							33 400
Erbil	101 314	2 026/280	-	-	68 940	1 378/800	10 000
Sulaymaniya	-						16 000
Kirkuk	-						5 700
Baghdah							144 420
Diela	56 476	1 129/520	-	-	143 160	2 863/200	11 592
Babil							3 160
Anbar							5 000
Qadisiya							4 240
Wasit							4 400
Karbela							28 112
Basrah							123 359
Theqar	294 838	5 896/760	-	-			3 687
Meisan					12 424	248/480	12 170
Duhok	-	-	-	-	-	-	-
Muthanna	-	-	-	-	-	-	-
T O T A L	452 628	9 052/560	-	-	224 524	4 490/480	405 240

DIESEL OIL AND OTHER INSECTICIDES

1968	Exp. 1969		Exp. 1970			Exp. 1971		
I.D./fils	Diesel	I.D./fils	Diesel	I.D./fils	Others	Diesel	I.D./fils	Others
668/000	39 840	796/800	33 040	660/800	-	40 350	807/00	-
200/000	9 600	192/000	12 440	248/800	-	15 680	313/600	-
320/000	21 560	431/200	17 600	352/000	-	17 300	346/000	-
114/000	7 890	157/800	10 280	205/600	-	3 240	64/800	-
2 888/400	25 566	511/320	20 326	406/520	-	15 000	300/000	-
231/840	8 064	161/280	3 644	72/880	-	10 840	216/800	-
63/200	4 680	93/600	2 280	45/600	-	4 280	85/600	-
100/000	2 560	51/200	2 520	50/400	-	3 080	61/600	-
84/800	6 400	128/000	4 320	86/400	-	3 960	79/200	-
88/000	6 000	120/000	6 000	120/000	-	6 080	121/600	-
562/240	7 760	145/200	4 600	92/000	-	21 980	439/600	-
1 467/180	126 342	2 526/840	128 438	2 568/760	562	122 646	2 452/920	10 500
73/740	6 325	126/500	-	-	5 497	6 280	125/600	360
243/400	10 400	208/000	9 790	195/800	-	10 138	202/760	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
7 104/800	282 987	5 649/740	255 278	5 105/560	6 059*	280 854	5 617/080	10 860**

* Cost at 10 fils/gal
Approx. 60 I.D.

**Cost at 10 fils/gal
Approx. I.D. 110/00