USE OF EXPANDED POLYSTYRENE BEADS FOR THE CONTROL OF MOSQUITOES IN AN INDUSTRIAL COMPLEX AT HARDWAR, INDIA

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Reiter (1978, 1985) demonstrated that mosquito breeding can be controlled by the application of expanded polystyrene beads (EPSB). The method is simple, inexpensive and did not incur the problem of insecticide resistance. Sharma (1984) reported that EPSB application produced high larval and pupal mortality and prevented oviposition by *Culex, Anopheles* and *Aedes* in the laboratory and also was effective against mosquito breeding in abandoned wells, bio-gas plants (Sharma et al. 1985), soakage pits and pit latrines (Curtis and Minjas 1985), and overhead tanks Chandrahas and Sharma 1987). In this note, we report results of EPSB treatment of 3 other breeding sites: 1) sluice valve chambers, 2) underground tanks, and 3) sewage manholes. Attempts to control mosquitoes in these habitats by minor engineering methods and with larvivorous fishes had been unsuccessful. The work was part of a project on bioenvironmental vector control of malaria by application of noninsecticidal methods in an industrial complex at Bharat Heavy Electricals Limited (BHEL), Ranipur, Hardwar (Uttar Pradesh), India (Dua et al. 1988).

Twenty-nine breeding sites were treated with EPSB. All were situated in the BHEL complex. These included 10 flooded chambers (Fig. 1) under leaking sluice valves that were breeding *Anopheles culicifacies* Giles and *An. stephensi* Liston, 9 rectangular underground tanks of various sizes that collect the overflow from adjacent pump houses or rain water pools and supported heavy breeding of *An. culicifacies*, and 10 open manholes to a blocked sewage line that were supporting heavy breeding by *Culex quinquefasciatus* Say and some *An. subpictus* Grassi and *An. splendidus* Koidzumi. Sluice valve chambers and underground tanks were the main sources of permanent anopheline breeding at the BHEL industrial complex, particularly of *An. culicifacies* and *An. stephensi,* both of which are important malaria vectors in India. Sewage manholes were temporary breeding sites for *Culex quinquefasciatus,* an important filariasis vector.

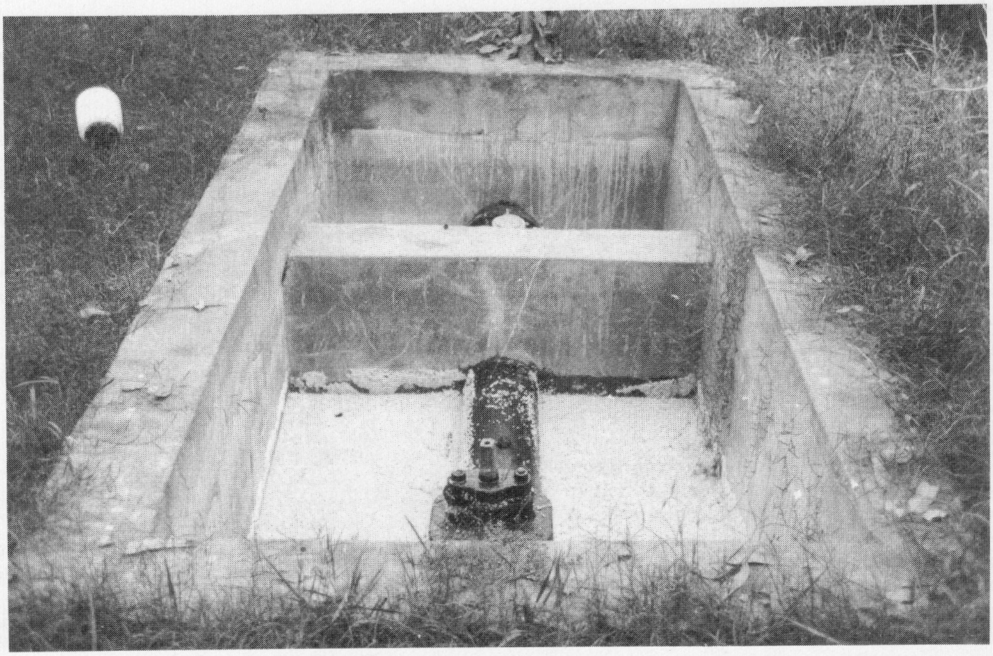

Fig. 1. Flooded chamber under leaking sluice valve treated with expanded polystyrene beads.

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Table 1. Application of EPS beads for the control of mosquitoes at Hardwar, Uttar Pradesh, India

Sites treated (no.)	Pretreatment larval density*	Posttreatment larval density* (1988)						
		Weeks in July						
		1st	2nd	3rd	4th	Aug.	Sept.	Oct.
Sluice valve chambers (10)	9.92	1.78	1.93	0.29	0.20	6.43	0.0	0.0
Underground tanks (9)	64.24	14.54	1.23	0.0	0.10	0.92	0.3	0.0
Open manholes (10)	166.50	0.0	0.0	0.0	0.0	0.10	0.0	0.0
Control (Sluice valve (1) chamber)	7.80	8.40	11.20	19.20	28.60**	3.80	0.0	0.0

Note: EPS-beads were applied ca. 100 gm/m^2.
* Mean number of larvae in 5 dips.
** Control site was also treated with EPSB after 4th week of observation because it was in the experimental area and affecting the control program.

The experiment began in the first week of July 1988. Pretreatment larval density was measured by dipping with a 10-cm diameter enamel bowl (250 ml). Five dips were taken from each site. Anophelines and culicines were separated, counted and allowed to emerge in the laboratory for identification. Expanded polystyrene beads (2–4 mm diam) were applied at 100 g/m^2 by hand using a 2-liter capacity plastic bowl containing 40 g of EPSB by volume. The EPSBs formed a 1-cm thick layer over the water surface. One sluice valve chamber was also selected as a control to observe natural population fluctuations. The control chamber was observed for 1 month only; this site was also treated with EPSB because it was in the experimental area and was affecting the control program.

Results of the treatment are summarized in Table 1. In the sewage manholes there was 100% elimination of larvae. At the other sites, some breeding persisted. This was due to disruption of the layer by water continuously dripping into the sluice valve chambers, and heavy rain and frogs in the sewage manholes and underground tanks.

The EPSBs are nontoxic, inexpensive (cost of EPSB application approximately $0.40(U.S.)/m^2); and one application may last for years. The EPSBs do not change physical properties even under direct sunlight. Small fluctuations in water level in treated sites did not affect the barrier around the edges. Our results indicate that application of EPSB in sluice valve chambers, underground tanks, problematic sewage manholes and similar situations can greatly reduce mosquito nuisance and disease transmission. However, it should be noted that the efficacy of the EPSB treatment is dependent on periodic checking of treated sites for the detection of broken surfaces. Subsequent reapplication of EPSB is necessary to ensure effective control of mosquito breeding. The technique is mainly applicable in small, wind protected and very specialized mosquito habitats.

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