RESEARCH NOTE

Efficacy of a New Formulation of *Bacillus sphaericus* 2362 against *Culex quinquefasciatus* (Diptera: Culicidae) in Montes Claros, Minas Gerais, Brazil

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Culex quinquefasciatus Say 1823 is one of the most frequent urban and anthropofilic mosquitoes in Brazil, that besides causing intense nuisance also transmits bancroftian filariasis in some states of the country (R Consoli & R Lourenço de Oliveira 1994 *Principais mosquitos de importância sanitária no Brasil,* Ed. FIOCRUZ, Rio de Janeiro, 225 pp.). The concerns about growing vector resistance, the long term detrimental effects of usual chemical insecticides on non target organisms, as well as environmental polution have led to the search for safer and more target specific alternatives. Among these, *Bacillus sphaericus* has been considered the most important, specially in relation to *Cx. quinquefasciatus* control (J Weiser 1991 *Biological control of vectors,* UNDP/World Bank/TDR, 189 pp.). Owning to an agreement between Fundação Oswaldo Cruz (FIOCRUZ) and INPAL SA Indústrias Químicas a new production and formulation process has been developed using *B. sphaericus* 2362, serotype H-5a5b, that is being presently patented. This product, an emulsified concentrate, now being produced experimentally on a pre-industrial scale, presented in laboratory conditions a mean LC 50 of 1.3 ± 0.6 mg/l and LC 90 of 5.5±1.5 mg/l (dry weight basis) for L_3/L4 *Cx. quinquefasciatus* larvae after 48 hr (L Rabinovitch et al. 1996 2nd En Gedi Conference on Bact Cont Agri Insect Pests Vectors Human Dis, Shoresh, Israel, Abst. 42, R Consoli et al. 1996 V SICONBIOL, Foz do Iguaçu, Brazil, Abst. 7).

The city of Montes Claros, State of Minas Gerais (16°43¢S, 43°51¢W) was selected for field trials: presenting an all year hot climate, poor sewage destination in several areas but nevertheless a motivated municipality staff eager to control the mosquito pest represented by *Cx. quinquefasciatus*, oriented our choice. Tests took place at a highly sewage poluted urban streamlet, named "Córrego do Carrapato" measuring 1.9 km in extension. Six experimental sections, measuring 250, 250, 300, 300, 250, 250 and 300 m, delimitated by seven collecting points and an initial control area of 100 m were established. The control section presented relatively straight margins and quick flow, both of these features reducing gradually; point 1 is near a small fall (60 cm) and has a stony botton; point 2 is also stony; point 3 is sandy and relatively deep (20/100 cm); point 4, also sandy but 5/20 cm in depth only; point 5, even shallower (5/20 cm) is placed at a broad curve; point 6 is broad, sandy and only about 5 cm deep; the same as point 7 which depth reaches 20 cm. Experiments took place during 46 days, ambiental temperature ranging between 35.8ºC and 13.2°C, very little rain occurring in this period. Treatments using the emulsified concentrate were made on days 1 (0.06 g/m^2), 10, 17, 37 and 44 (0.12 g/m^2) on all experimental points except on day 44 when only points 1 to 5 were treated. Each one consisting of four daytime knapsack sprayer treatments with 3 hr intervals covering both margins and preceded by a larval survey, by means of 5 dips (about 150 ml) made at both margins of each point. Table and Fig. present the results. In all cases only *Cx. quinquefasciatus* larvae were found. On day 0 a preliminary survey was made. On day 3 larvae were collected: while in the control section larvae had increased 90.5%, experimental points showed a decrease between 70.6% (3) and 97.9% (7). On day 9, in relation to 3, larvae had added too largely in control, at points 2 and 3 first and second stage larvae prevailed but appeared in small number or were absent at the re-

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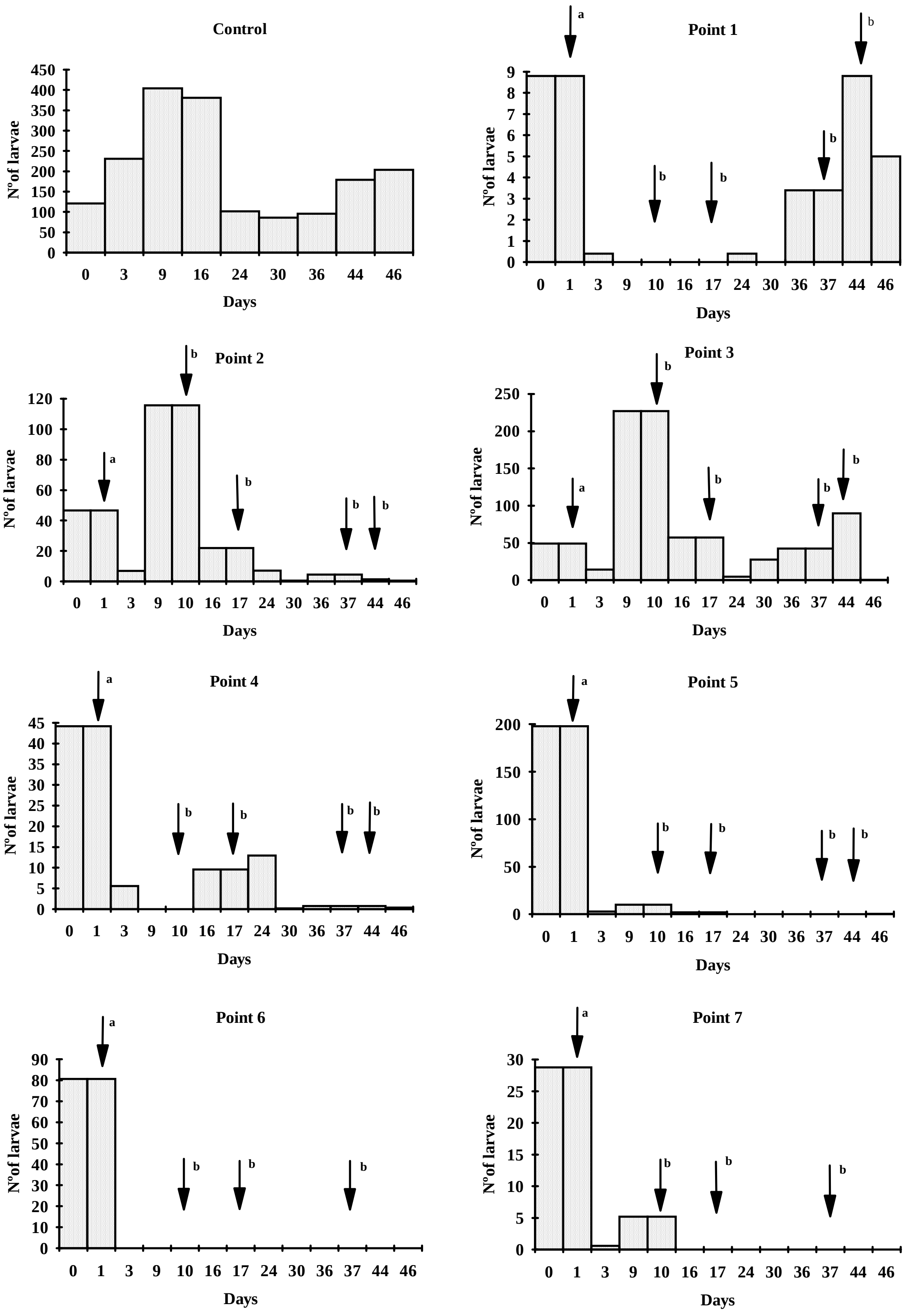

Mean number of *Culex quinquefasciatus* larvae collected per dip at 7 experimental sections and control. ↓ Treatments; a= 0,06 g/m^2 b= 0,12 g/m^2

maining ones. On day 10 a second treatment took place, this time of 0.12 g/m^2, owning to the intensive polution and large adult population present. This time due to the absence of rain, the extension of margins in section 1 increased 430 m. Day 16 presented a decrease of 5.7% larvae in control, but at points 2, 3 and 5 the reduction was 81%, 74.8% and 80% respectively and no larvae were found at other locations except at point 4 that showed a small increase. From day 24 to 30 larvae declined a few percent in control, but augmented thereafter ceaselessly. At point 1, near the control area, after declining to zero at day 30, a low mean persisted to the end; points 2 and 4 showed a constant decrease, but point 3 remained with higher means, perhaps related to the larger depth there. Larvae were completely absent from points 5 to 7, except for a few on day 46 at point 5. Attention must be also paid to the fact that other breeding places, not yet treated were not far and certainly in the flying range of ovigerous mosquito females. Longer and more complete experiments, including comparisons with other products, are planned. Present preliminary data seems to compare favourably with other control experiments of this mosquito species employing other *B. sphaericus* formulations (A Kumar et al. 1996 *J Mosq Control Ass 12*: 409-413, R Bhalwar et al. 1993 *Med J Armed Forces India 49*: 57-60, M Hougard et al. 1993 *Bull WHO 71*: 367-375).

TABLE

Means and standard deviations (x/s) of the number of *Culex quinquefasciatus* larvae per dip at the chosen points

Points	Day # x / s								
	0	3	9	16	24	30	36	44	46
C	121.1/82.3	230.7/130.6	404.0/372.6	381.1/194.3	101.6/102.5	86.3/104.8	95.6/120.5	179.1/133.3	203.9/195.0
1	8.8/2.9	0.4/0.8	0	0	0.4/0.8	0	3.4/7.0	8.8/19.6	5.0/8.5
2	46.6/20.9	7.0/3.4	115.6/85.1	22.0/39.4	7.2/6.0	0.6/0.8	4.6/6.3	1.4/1.6	0.6/1.3
3	49.0/34.2	14.4/4.2	227.2/347.0	57.2/50.7	4.6/3.7	27.8/37.6	42.6/36.1	89.8/73.6	0.6/0.8
4	44.2/35.3	5.6/9.7	0	9.6/9.2	13.0/18.3	0.2/0.4	0.8/1.3	0.8/1.1	0.4/0.8
5	198.0/114.3	2.8/2.1	10.0/21.3	2.0/2.0	0	0	0	0	0.2/0.4
6	80.6/38.1	0	0	0	0	0	0	0	0
7	28.8/11.5	0.6/0.9	5.2/9.9	0	0	0	0	0	0

C : control