Twenty-five years of blackfly control in a localized moist forest area of Cameroon: a review

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Abstract

The high number of blackfly bites in a moist forest area of Cameroon, around the Sanaga river, was causing considerable nuisance and had led to a local ground-based larval control campaign. We have reviewed the 25 years of almost uninterrupted weekly larvicide applications in this area and emphasized the factors responsible for them: the importance of the mosquito fauna if used at a high discharge (ANONYMOUS, 1990). The main reasons for the renunciation of DDT were its too-great persistence and the accumulation in the environment of its decomposition products which still remain toxic. It was therefore replaced in 1977 with an emulsifiable concentrate of temephos, a highly effective and environmentally friendly compound which proved effective against the rheophilic larval stages of the only cytospecies encountered, \(S. \text{ damnosum} \). The treatments led to a decrease in biting female density by 95\% at Edea to 13\% of its initial level but in 1977, following the expert appraisal by PHILIPPON (1977), DDT was abandoned despite its great efficacy and low cost price.

Introduction

When blackfly bites are many they cause a real nuisance to humans and animals and sometimes constitute a serious obstacle to economic activities in a region, both in temperate (NOIRIN \& \textit{et al.}, 1981; CHARNETSKI \& \textit{HAUPE}, 1981) and tropical (PHILIPPON \textit{et al.}, 1970) countries. In tropical Africa, the blackflies of the \textit{Simulium damnosum} complex are vectors of onchocerciasis. With several adult blackflies at work, the nuisance which the riverine populations find difficult to bear is an obstacle to their agro-industrial development.

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Larviciding was started in this region in 1965 and is being continued successfully at present. It has, however, always posed serious difficulties because of the unfavourable hydrological conditions as well as the problems of resistance of the blackflies to the insecticides and environmental pollution. More than a quarter of a century of intervention has led to a successive use of insecticides sometimes having very unequal performances. The history of these larvicidal treatments over such a long period constitutes a unique source of information whose synthesis will eventually provide the basis for the selection of a strategy to adopt in future years both in this region and at other sites having similar trial conditions.

History of the larvicidal treatments and present status

The first larval control operations were carried out under the supervision of the Helminthiasis Research Unit of Kumba (DUKE, 1966, 1967) and started in 1965 when the Edea hydroelectric dam was constructed. The weekly treatments were firstly made at the Song Ndong rapids and, from 1967, were combined with treatments at Sankbayeme (Fig. 1), in the form of spraying a wettable DDT powder at concentrations varying, according to the discharge, between 0-0125 and 0-05 mg/litre for 10 min. The treatments led to a decrease in biting density from 1980 to 1985). The treatments led to a decrease in biting density at Edea to 13\% of its initial level but in 1977, following the expert appraisal by PHILIPPON (1977), DDT was abandoned despite its great efficacy and low cost price.

After a period of trials during which several compounds were tested, the treatments were continued in 1982 with an emulsifiable concentrate of chlorphoxim, another organophosphorus compound that is slightly less efficacious than the previous but adequate, at the same concentration as temephos, for effective protection of the Song Loulou dam area, a site that had become a priority for blackfly control. After 3 years of uninterrupted weekly larvicide treatments at only one spraying point, resistance to this compound was observed and it was therefore abandoned and replaced with permethrin, a pyrethroid which is moderately toxic to non-target fauna if used at a high discharge (ANONYMOUS, 1990).

Fig. 1. Map of the study area in Cameroon.
mortality more than 33 km from its application point with a river discharge of 520 m³/sec. After 5 years of uninterrupted treatment, a slight increase in susceptibility to this compound was detected but an unintentional interruption of treatment for more than 6 months led to a return of the susceptibility to its initial level. This compound is present used for the protection of the Song Loulou dam site at one spraying point in the rainy season and at 2 points during the low discharge period.

Future of anti-blackfly control at Song Loulou

The performance required for anti-blackfly larvicides (efficacy, range, low toxicity, selectivity, good physical characteristics) already limits the choice of available compounds. The multi-resistance phenomena recorded in the study zone and the high discharges considerably reduce the number of alternatives to permethrin (Discussion, below). Although at that time no decrease had been observed in the efficacy of DDT, this organochlorine compound could no longer be used for safety reasons. Furthermore, susceptibility tests carried out by LOCHOUARN et al. (1987) have shown that temephos resistance has not decreased and that the return of susceptibility to chlorphoxim was only partial (Fig. 2). In order to reduce the chances of resistance developing to permethrin, and relying on the experience gained during the vector control programme in West Africa concerning resistance management (KURTAK, 1986), the use of 2 additional insecticides should be considered immediately, i.e., one chemical insecticide, pyraclofos, and one biological insecticide, Bacillus thuringiensis H-14.

Pyraclofos is an organophosphorus compound which has appeared recently on the market as an anti-blackfly larvicide. Its characteristics are at least equal to those of temephos and, because of its particular mode of action, the possibility of cross-resistance between it and compounds of the same family (temephos and chlorphoxim) is low. Pyraclofos can now be used in rotation with permethrin, or, in cases of resistance to this compound, Bacillus thuringiensis H-14.

Conclusions

The blackfly nuisance control campaign on the lower course of the Sanaga river is being continued at the rate of one weekly treatment throughout the year. The results can be considered as satisfactory since the residual biting rate is, if not close to zero, at least at a level bearable to the local populations and the personnel working at the Song Loulou dam site. It is therefore to be noted that, despite the difficulties encountered during these 25 years of larviciding, it has been possible to prevent blackfly nuisance locally and that very probably there will always be replacement insecticides or new control methods to be made available to the users. However, it should be born in mind that these good results have been obtained only at a considerable cost, estimated at about US$ 200 000 per year, and that the maintenance of the control campaign is due only to the returns expected (blackfly control would not have been undertaken had it not been for the great importance that the country attaches to hydroelectric production). Fortunately, such optimum conditions under which treatments are carried out can sometimes considerably reduce their cost. Thus, in a savanna area in northern Cameroon, an-
Onchocerciasis vector control campaign, which is also of local importance, has made it possible to reduce the blackfly biting rate by 60% at a cost of about US$ 12 000 per year (HOUQARD et al., 1990).

S. squamosum is a vector of onchocerciasis in southern Cameroon, but this is not considered a serious problem at Song Loulou, compared to other areas of the Sanaga basin where the skin lesions are serious and many of the patients are blind (J. P. Chippaux, personal communication). Nevertheless, the high population density at this site has led the health service to distribute ivermectin, a new microfilaricide used in onchocerciasis control (PROD'HON et al., 1991). Therefore the larval control carried out in this region directed against insect bites and the operations undertaken at the Song Loulou dam site can rightly be considered as a model for blackfly nuisance control in areas subjected to reinvagination.

Acknowledgements
We gratefully thank the National Company of Electricity of Cameroon (SONEL) and the Onchocerciasis Control Programme in West Africa (OCP) for their help and financial support through this 25 years of blackfly control.

References


Received 17 July 1991; revised 9 October 1991; accepted for publication 10 October 1991

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