

Effect of *Solanum erianthum* aqueous leaf extract on *Plasmodium berghei berghei* in mice

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Summary

The aqueous leaf extract of *Solanum erianthum* collected in May was administered orally to albino Swiss mice infected with *Plasmodium berghei berghei*. The schizontocidal activity on early infection was assessed by administering the extract of *S. erianthum*, chloroquine, or distilled water as single daily dose from the day of infection for 4 days. Microscopic examination made on the fifth day from all the mice, showed *S. erianthum* extract producing a dose-related schizontocidal effect, with the highest having a chloroquine equivalent of 1.7 mg/kg. The residual activity of this extract was assessed by administering it to mice for 3 days prior to the day of inoculation with parasites. Seventy-two hours after infecting the mice, microscopic examination of the blood smears was made from all the mice. The extract produced dose-related activity. The highest dose and 1.2 mg/kg pyrimethamine produced 78.9 and 80.5% chemosuppression, respectively. Its effect on the established infection was studied by administering the drugs daily 72 h after infecting the mice, and for 5 days. The level of parasitaemia was assessed daily. The results show that the extract did not produce any significant suppression of infection. The observations are interesting and promising in view of the fact that the crude extract was used and also because controversy exists as to its usefulness as an anti-malarial agent.

Introduction

In many developing countries of the world, the use of herbal medicines to prevent or treat various diseases dates back to many centuries ago. The fact that plants are potential sources

of new drugs, alongside the current problems in malaria prevention, have spurred the interest of many physicians and scientists into research on herbal medicines. Some of the plants commonly used to treat malaria in Nigeria include *Azadirachta indica*, *Morinda lucida* and lemon grass (Dalziel, 1948).

In the Western part of Nigeria, controversy exists as to the usefulness of *Solanum erianthum* leaf juice as an anti-malarial agent. While some people strongly claim that an aqueous extract of the freshly cut leaves possesses anti-malarial properties, others believe that the most popular use of the plant is in the washing of oily plates and other household utensils. The anti-malarial activity of this plant was investigated using *Plasmodium berghei berghei*-infected mice because of the strong claim of its anti-malarial properties by some people despite no available literature to support this claim.

Materials and methods

Preparation of Solanum erianthum leaf extract

Freshly cut leaves (50 g) collected in May were pounded in a mortar. The squeezed juice was regarded as the stock solution. Various dilutions as required were made using distilled water and repeated for each experiment. This method of preparing the extract is in compliance with the way it is used by some Nigerians to treat fever.

Animals used and evaluation of parasitaemia

Details about the animals used, the inoculation of the animals and evaluation of parasitaemia appeared in an earlier publication (Makinde & Obih, 1985).

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Administration of the drug or extract

The drugs or extracts were administered to the mice orally through a special cannula.

Evaluation of the blood schizontocidal activity of the extract on an early infection in mice (4-day test)

The technique used was similar to that described by Peters (1965) and Porters and Peters (1975). Details of this appeared in an earlier publication (Obih & Makinde, 1985).

Evaluation of the blood schizontocidal activity of the extract on an established infection

Details of this method appeared elsewhere (Obih & Makinde, 1985).

Repository activity of the extract in vivo

This method was based on that described by Peters (1965). Details of it appeared in an earlier publication (Obih & Makinde, 1985).

Results

Blood schizontocidal activity of *Solanum erianthum* leaf extract on an early infection in mice (4-day test)

The results of this study are summarized in Fig. 1 and Table 1. The stock solution and its various dilutions produced a dose-related schizontocidal effect with the highest dilution producing 56.2% suppression. Chloroquine also produced a dose-dependent schizontocidal

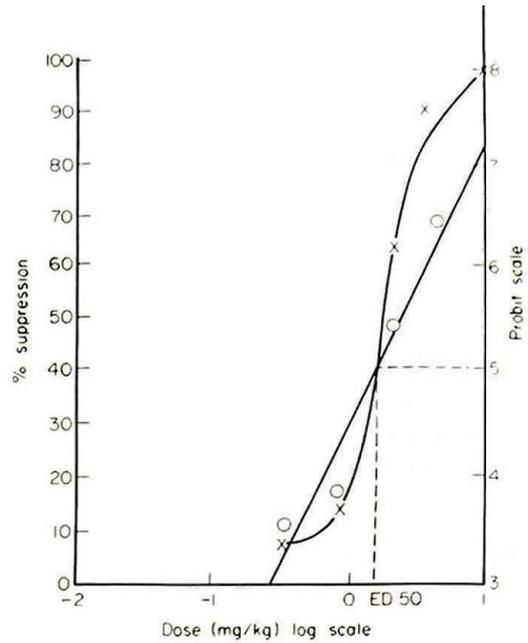


Fig. 1. Determination of ED_{50} of chloroquine. Drug was administered from D_0 to $D_0 + 3$ orally and % suppression (X) was assessed on $D_0 + 4$ (O) probit response.

effect. The suppression produced by the original stock juice of *S. erianthum* leaves was significantly lower than that of 5 mg/kg chloroquine ($P < 0.05$). The chloroquine equivalent of the stock solution (determined from Fig. 1) was 1.7 mg/kg.

Blood schizontocidal activity of *Solanum erianthum* leaves on an established infection

Fig. 2 summarizes the results of this study.

Table 1. Evaluation of the schizontocidal activity of the juice of *Solanum erianthum* against *Plasmodium berghei berghei* in mice using the 4-day test

Drugs	Average % suppression	Probit	Chloroquine equivalent (mg/kg)
<i>S. erianthum</i> — stock	56.2	5.1560	1.7
<i>S. erianthum</i> — $\frac{1}{2}$ stock	46.3	4.9071	1.4
<i>S. erianthum</i> — $\frac{1}{4}$ stock	35.1	4.6174	1.1
<i>S. erianthum</i> — $\frac{1}{8}$ stock	20.0	4.1584	0.7

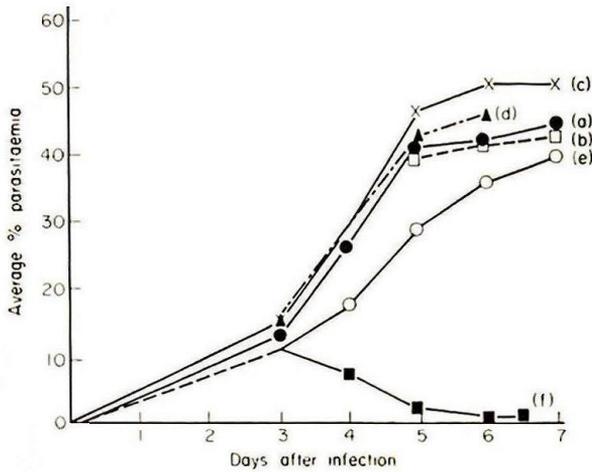


Fig. 2. Schizontocidal activities of the juice of *Solanum erianthum* leaves in an established infection (a) Stock, (b) 1/2 stock, (c) 1/4 stock, (d) 1/8 stock, (e) control (distilled water), (f) chloroquine 5 mg/kg.

Average percentage parasitaemia increased steadily from the fourth day of inoculation, $D_0 + 3$, in the control group of mice from 11.4 to 38.7% on $D_0 + 7$, as well as in all the groups treated with the different dilutions of the juice. The average percentage parasitaemia fell steadily from 12.7% on $D_0 + 3$ to 1.1% on $D_0 + 7$ in the group of mice that was treated with 5 mg/kg chloroquine.

Evaluation of the repository action of the juice of Solanum erianthum leaves in vivo

The results of this experiment are shown in Fig. 3. The various dilutions of *S. erianthum* used in this test all produced a dose-related repository effect with the stock solution producing as high as 78.9% chemosuppression, compared with 1.2 mg/kg pyrimethamine, which produced 80.5%.

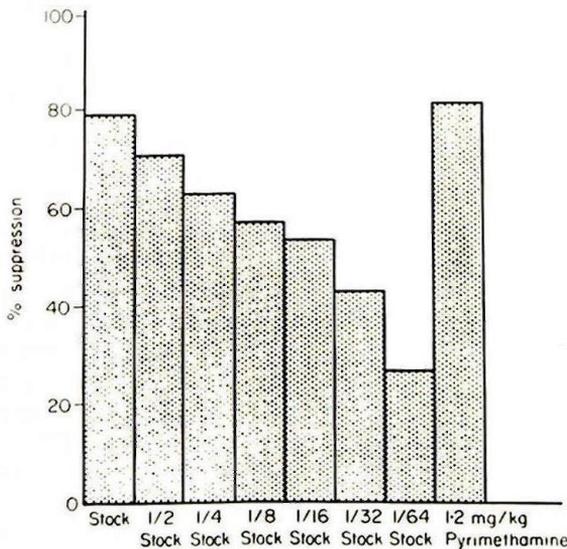


Fig. 3. Repository action of orally administered aqueous juice of *Solanum erianthum* leaves.

Discussion

The sensitivity of the *P. berghei berghei* used in this work is demonstrated by the effectiveness of chloroquine on the parasites.

Solanum erianthum aqueous leaf extract has been shown to possess a fairly dose-related schizontocidal activity in an early infection, the highest dose having a chloroquine equivalent of 1.7 mg/kg. The effect of all the four dose levels of the extract on an established infection was similar to that of the control; none produced reduction in parasitaemia. As far as the repository effect of the extract was concerned a dose-dependent activity was observed with the stock solution producing as high as 78.9% chemosuppression, compared to 1.2 mg/kg pyrimethamine, which produced 80.5%.

It is indeed worth noting that *S. erianthum* collected in May had some schizontocidal effect on an early infection with *P. berghei berghei* in mice but was not effective in an established infection. The residual effect observed in this study is also very encouraging. These observations are very interesting in view of the fact that crude extract was used and controversy exists as to its usefulness as an anti-malarial agent. Further investigation on this plant is necessary.

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