Greener Journal of Biological Sciences

ISSN: 2276-7762 ICV: 5.99

Submitted: 16/07/2017
Accepted: 19/07/2017
Published: 30/07/2017

DOI: http://doi.org/10.15580/GJBS.2017.4.071617087

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Hajara Sani Labaran, Samaila A.B., Umar A.F., Nayaya A.J., Danladi Muhammed Umar, Musa Muktar, AbdulWahab Aliyu and Nazeef Idris Usman

Research Article (DOI: http://doi.org/10.15580/GJBS.2017.4.071617087)

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Hajara Sani Labaran[1]*, Samaila AB[1], AF Umar[1], Nayaya AJ[1], Danladi Muhammed Umar[2], Musa Muktar [3], AbdulWahab Aliyu[4] and Nazeef Idris Usman[5]

[1]Department of Biological sciences, Abubakar Tafawa Balewa university Bauchi, Bauchi state Nigeria.
[2]Department of Biological sciences, Gombe State University.
[3]Biochemistry Department, Gombe State University.
[4]Pharmacy Department Gombe State University.
[5]Bauchi State University Gadau.

*Corresponding Author Email: slhajara @gmail. com

ABSTRACT

The need for new compounds active against malaria parasites is made more urgent by the rapid spread of drug-resistance to available anti-malaria drugs. The crude methanolic extract of Albizia chevalieri leaves was investigated for its anti-malarial activity against Plasmodium berghei (NK65) during early and established infections. The level of parasitaemia, mean survival time and weight variation of rats were used to determine the antimalarial activity of the extract. The Phytochemical screening of the crude extract were evaluated to elucidate the possibilities of its antimalarial effects. The safety of the extract was also investigated in rats of both sexes by the acute oral toxicity limit test. The leaf extract demonstrated significant (P<0.01) dose dependent activity against the parasite in the suppressive and curative, and also had repository activity. The antimalarial effect of A.chevalieri is comparable to that of artermether. The leaf extract also prolonged the survival time of the infected rats. The LD_{50} of the plant extract was established to be ≥3000mg/kg body weight in rats. The results showed that the leaf extract of the plant has potential antiplasmodial activity, which can be exploited in malaria therapy. Accordingly with further studies, this plant could serve as a potential source of new and novel antimalarial drug for the control of malaria

Keywords: *A. Chevalieri*, *Plasmodium Berghei*, parasitaemia, suppression.

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INTRODUCTION

Malaria is a serious hazard to humanity and the major cause of mortality and morbidity in the malaria- endemic countries. Even though the distribution of the disease is substantially varied, sub-Saharan Africa, Asia and central and Latin America is the most affected regions. About 50% of populations in the world live in malaria risk areas. In 2013, it was estimated that 198 million cases of malaria and 584,000 malarial deaths have been occurred in the world. The burden of the disease is heaviest in Africa, where 82 and 90% of all global cases and deaths were occurred, respectively[Rui et al.2009,].

In the absence of effective malaria vaccines, effective chemotherapy remains the mainstay of malaria control. The potentially lethal malaria parasites have shown themselves capable of developing resistance to nearly all used anti-malarial drugs, and resistance strains have rapid extension. For obvious reasons malaria will continue to cause morbidity and mortality on a large scale in tropical and sub-tropical countries, the alarming rise at which the parasite (particularly *Plasmodium falciparum*) have developed resistance to currently used anti-malarial drugs makes it imperative to search for newer, more effective therapeutic agents [Rui et al.,2009].

The loss of effectiveness of chemotherapy constitutes the greatest threat to the control of malaria. Therefore, to overcome malaria, new knowledge, products and tools are urgently needed, especially new drugs [Abdel-Kader et al.,2001]. The anti-malarial potential compounds derived from plants is proven by example such as quinine, obtained from cinchona species and artemisinins obtained from artemesia Species. Traditional methods of malaria treatment

could be promising source of new anti-malarial compounds. In Africa, more than 80% of people use traditional medicines and most families have recourse to this medicine based on plants extracted for the curative treatment of malaria [Iork, 1983]

Albizia is a large genus of trees, of the pea family (*fabaceae*), native to warm regions of the old world. The plant *Albizia chevalieri* is a tree that grows up to 12m high or a shrub under harsher conditions of dry savannah from Senegal, Niger and Nigeria. It has an open and rounded or umbrella shaped canopy, bark pale-grayish, twigs pubescent with white lenticles, leaves with 8-12 pairs of pinnate and 20-40 pairs of leaflets each was reported to contain alkaloids and also tannins sufficient for use in tanning in Nigeria and Senegal [Trease et al.,1989]. The common name of *Albizia chevalieri* is *jaree-hi/je*, Hausa local name is Kasari, is a tree of the dry deciduous forest. Found in well-watered places, sandy terraces, not gregarious, nor common [sofowora, 1993]

MATERIALS AND METHODS

Collection of Plant Material

Fresh leaves of A. Chevalieri were collected from jejin Jigawa around Kumo road, Akko Local Government Area, Gombe State, Nigeria and were duly authenticated by a Botanist using a taxonomic key in the herbarium laboratory in the Department of Biological Sciences, Gombe State University, Gombe, Nigeria.

Extraction of plant material

The leaves of Albizia chevalieri were air-dried at room temperature (25-30^{0}C) under shade and pulverized. Three hundred grams of the powered leaves was soaked with absolute methanol (3.5L, Merck, Germany). The extraction process was facilitated in an orbital shaker at 120rpm for 72hours. The crude extract was filtered twice through cotton wool and then through what man no. 1 filter paper The filtrate was concentrated at 40^{0}C using a rotary evaporator and to complete dryness in an aerated oven.

Phytochemical Screening of the Plant

Chemical tests were carried out to screen for the presence of different secondary metabolites: Alkaloids, Tannins, Flavonoids, Saponins, Glycosides, and Phenols, using standard procedures Trease and Evans [Akuodor et al., 2010].

Experimental Animals

White albino Wister rats of both sexes weighing between 100 and 200 free from infections were used for the study. The rats were bred and kept in the animal house, Department of Pharmacology and Clinical Pharmacy, Gombe State University.

The animals were housed in cages at room temperature and moisture, under naturally illuminated environment of 12:12 hour dark/light cycle. They were fed on standard diet and had free access to water. Treatment of the animals was in accordance with the principles of Laboratory Animal care.

Acute Toxicity of the Plant Extract

The lethal dose 50 (LD50) of the methanolic leaf extract of A.chevalieri was determined in rats using the method as described by [Rui et al.,2009]. Rats of both sexes were fasted overnight for the toxicity test. The study was done in two phases. In the initial phase, 3 groups of rats per cage were administered with 250, 500 and 1000mg/kg of the extract respectively. The rats were observed for signs of toxicity and mortality for the first 4 hours and 24hours. In the second phase, another fresh set of rats were randomized in to 4 groups of 2 rats in each cage and were further administered 1500, 2000, 2500 and 3000mg/kg of the leaf extract of Albizia chevalieri respectively. The rats were also observed for signs of toxicity and mortality at regular intervals for 24hours, 48hours and 72hours respectively.

Malaria Parasites

The Plasmodium specie that was used in this work is that which is mostly employed in rodent malaria parasite Plasmodium berghei (NK65) chloroquine – sensitive strain and was used to assess the antimalarial activity of *A. chavaleiri* leaf extract . The parasite was obtained from National Institute for Pharmaceutical Research and

Development (NIPRD) Abuja, the donor rats were kept at the Department of Pharmacology and Clinical Pharmacy, Gombe State University, Gombe. The Parasites were maintained by continuous re-infestation in rats.

Parasite inoculation

Donor rat blood infected with the *P. berghei* was used for inoculum preparation. Thus was by determining percentage parasitamia and the erythrocytes count of the donor rat and diluting them with normal saline in proportions a method adopted by Akuodor [8]. Each rat was inoculated intraperitoneally with infected blood suspension (0.2ml) containing $1x10^6$ *P.berghei* parasitized red blood cells.

In-Vivo Antimalarial Assays

A series of in-vivo antimalarial assays were carried out to evaluate the in-vivo anti-malarial activities of the methanolic extract of Albizia chevalieri leaves at 100, 200, 400 and 800mg/kg doses as compared to control groups treated with distilled water and reference groups treated with standard drug Artemether injection (80mg/kg).
Malaria infection was established in rats by the intraperitoneal administration of donor rat blood containing about $1x10^6$ parasites. The percentage parasitaemia was determined by counting the parasitized red blood cells out of 1000RBC's in random fields of microscope:

$$\% \text{ Parasitaemia} = \frac{\text{No. of Parasitized RBC}}{\text{Total No. of RBC counted}} \times 100$$

Average percentage suppression was calculated as:-
$\frac{100xA-B}{}$ where A = mean percentage parasitaemia in negative control group
B= mean percentage parasitaemia in the test of group

Suppressive Activity (early Malaria infection)

Suppressive activities of the extract were assessed using the method described by Akuodor et al.,2010 and Mbah [9]. Thirty Wistar Albino rats of both sexes weighing (100-160 kg) were inoculated intraperitoneously with standard inoculum of *P. berghei* containing 1×10^6 infected erythrocytes. Four hours after inoculation, the infected rats were randomly divided into groups of 5 rats per cage and treated for five consecutive days (Do-D4). Group 1 received 0.2ml of normal saline (Drug-fire control). Groups 2, 3, 4, and 5 received 100, 200, 400 and 800 mg/kg of the methanol leaf extract respectively; while group six received 80mg/kg of arthemeter injection. All doses were administered intraperitoneously. On the fifth day (D4), thin and thick films were made from the tail blood of each rat. The films were fixed with methanol, stained with 10% Giemsa and Parasite density was determined microscopically.

Curative Test

On the first day (D0), thirty Wister albino rats were passage intraperitoneally with standard inoculum of $1x10^7$ of *P. berghi* infected erythrocytes. Seventy two hours after, the rats were randomly divided into six groups of five rats per cage. Group 1 received 0.2ml of normal saline (Drug-free control). Group 2, 3, 4 and 5 received 100,200,400 and 800mg/kg of the methanol extract respectively. All doses were administered intraperitoneally. Treatment continued daily until the seventh day when their films were made from the tail blood of each rat. The films were fixed with methanol, stained with Giemsa and parasitemia density examined by microscopically counting the parasitized red blood cells on at least 1000 red blood cells in 10 different fields [Akuodoret al.,2010]. The mean survival time of each group was determined by finding the average survival time (days) of the rats in each group over a period of 28 days (D0 -D27).

Statistical Analysis

Result obtained were expressed as mean + S.E.M. The significance of difference between the control and treated groups were determined using one-way analysis of variance (ANOVA) ($P<.0.01$ and 0.05).

RESULTS

Phytochemical Screening of the Plant

Results obtained from the Phytochemical screening of methanol leaf extract of Albizia chevalieri showed the presence of Alkaloids, Tanins, flavonoids, Saponins, glycosides, Terpenoides while Steroids and Anthroquinones were absent (Table 1).

Acute toxicity Study of methanolic leaf extract of A. Chevalieri in Albino Wistar Rats

Acute toxicity evaluation of the leaf extract of Albizia chevalieri at various dosages from 250mg/kg to 30000mg/kg body weight showed to be safe as no death was recorded nor visible signs of toxicity nor mortality after 24, 48 and 72 hours in the initial and second phase of acute toxicity. this means that the extract is safe even at 3000mg/kg body weight.(Table 2)

Chemo-suppressive antimalarial activity of methanolic leaf extract of *A. chevalieri*

The result obtained from this study showed significant decrease in parastemia of *P. berghei* after treatment with the leaf extract of *Albizia chevalieri.* The significant decrease in parastemia observed in this study was dose dependent. Artemether, a standard antimalarial drug at a dose of 80 mg/kg body weight showed significant high percentage suppression ($p > 0.01$) when compared with the negative control and with the methanol extract groups. It clearly showed that, artemether has the highest activity when compared with the negative control and the extract treated groups and is statistically significant ($p > 0.001$). Group 3 received 100 mg/kg of the plant extract, at this dose; the treatment was insignificant except at Day 3 and effectivity reduced at Day 4 and 5. Group 4 received 200 mg/kg of the plant extract, at this dose; it was found to be effective from Day 1 – 3 and the effectivity reduced with time from Day 4 – 5. Group 5 rats received 400 mg/kg of the leave extract, at this dose; there was a significant difference ($p > 0.01$) when compared to the negative control from Day 1 – 5, there was no resistivity. Group 6 received the highest dose of 800 mg/kg of the plant extract and the treatment was the most effective even when compared with the positive control, their effect was almost comparable. The parasites density was calculated for each group over a period of five days (Table 3a-3e)

Effect of methanolic leaf extract of *A. chevalieri* on body weight

In the current study there was a progressive increase in body weight of rats treated with a standard drug at a dose of 80mg/kg body weight and that treated with 400mg/kg body weight of the plant extract which were significantly different ($p > 0.01$) when compared with the negative control. Groups that were treated with 100, 200 and 800 mg/kg body weight are insignificantly different ($p < 0.01$) when compared with the negative control. (Table 4a-4b)

Effect of methanolic leaf extract of A. chevalieri on the mean survival time

In this study, rats treated with 200, 400 and 800 mg/kg body weight and that treated with the standard drug at a dose of 80 mg/kg body weight had lived longer than the negative control group (Table 5).

Repository Effect of Methanolic Leaf Extract of A. chevaleiri in Rats

The methanolic leaf extract of A. *chevalieri* exhibited significant ($P<0.05$) dose defendant reduction in parasitemia density of 50%, 75%, 85% and 90% at 100, 200, 400, and 800mg/kg respectively, whereas artemether treated group caused 97% reduction in parasitemia density in the test (table 6).

Curative Effect of Methanolic Leaf Extract of A. chevaleiri in Rats

There was a dose dependent reduction in the level of parasitemia in the treated group unlike in the saline control group in which there is consistent increase in the blood parasite density. The mean survival time also increased dose dependently. Death was observed in the control group on day 8 and by day 10; all the rats in the group died (mean survival time of 9 days). On the other hand, rats in the group that received 100,200,400 and 800mg/kg survived beyond 20 days. Arthermeter treated group survived the 30 days durations of observation (Table 7).

Comparison of Artemeter with Methanolic Leaf Extract of A. chevalieri

Arthemeter a standard antimalarial drug at a dose of 80mg/kg body weight demonstrated significant high percentage suppression in the four day suppressive antimalarial test with 66.67%, methanolic leaf extract of Alibizia chevari at 100, 200, 400 and 800mg/kg respectively suppresses the parasite with 34.68%, 33.92%,54.63%, 63.61% respectively. The suppression of parasitaemia was dose dependent and their effect is almost comparable with the standard antimalarial drug (Table 8).

Table 1: Phytochemical screening of methanolic leaf extract of A. Chevalieri

Phytochemical components	Qualitative abundance
Flavonoids	++
Terpenoids	+
Steroids	–
Anthraquinones	–
Glycosides	+
Alkaloids	+
Saponins	+
Tannins	++

Key:
+ Present in moderate amount
++ Present in high amount
- Absent

Table 2: Acute toxicity Study of methanolic leaf extract of *A. Chevalieri* in albino wistar rats Phase 1 and Phase 2

Groups	Rats	Body Weight (g)	Dosage (mg/kg)	Behavioral Changes	Death
Phase 1					
Group1	R1	195	250	No	None
	R2	185			None
Group 2	R1	168	500	No	None
	R2	158			None
Group 3	R1	168	1000	No	None
	R2	164			None
Phase 2					
Group 1	R1	260	1500	No	None
	R2	260			
Group 2	R1	282	2000	No	None
	R2	270			
Group 3	R1	298	2500	No	None
	R2	300			
Group 4	R_1	330	3000	No	None
	R_1	315		No	

Table 3a: Chemo-suppressive Activity of Methanolic Leaf Extract of *A. chevalieri* against *P. berghei* at Day 1

Groups	Extract drug	Dosage (mg/kg)	% Parasitemia		% Parasitemia	% Suppression
			Mean	SEM		
1	Artemether	80.00	2.50 ± 0.65		30.65	73.36[a]
2	Normal Saline	0.20 ml	33.00 ± 7.04		110.92	0.00
3	*A.chevalieri*	100.00	18. 50 ± 0.96		108.82	1.93[b]
4	*A.chevalieri*	200.00	27.00 ± 2.04		71.17	35.84[a]
5	*A.chevalieri*	400.00	16.50 ± 1.32		49.94	54.98[a]
6	*A.chevalieri*	800.00	7.50 ± 2.02		38. 41	65.37[a]

Key:
a* Suppression significant
b* Suppression insignificant

Table 3b: Chemo-suppressive Activity of Methanolic Leaf Extract of *A. chevalieri* against *P. berghei* at Day 2

Groups	Extract drug	Dosage (mg/kg)	% Parasitemia		% Parasitemia	% Suppression
			Mean	SEM		
1	Artemether	80.00	3.75 ± O.48		31.71	69.22[a]
2	Normal Saline	0.2 ml	8.00 ± 1.47		103.01	0.00
3	*A.chevalieri*	100.00	9.25 ± 1.70		93.31	10.40[b]
4	*A.chevalieri*	200.00	8.50 ± 0.87		65.17	36.73[a]
5	*A.chevalieri*	400.00	8.50 ± 1.19		40.21	60.97[a]
6	*A.chevalieri*	800.00	5.75 ± 2.06		34.00	67.00[a]

Key:
a* Suppression significant
b* Suppression insignificant

Table 3c: Chemo-suppressive Activity of Methanolic Leaf Extract of *A. chevalieri* against *P. berghei* at Day 3

Groups	Extract drug	Dosage (mg/kg)	% Parasitemia		% Parasitemia	% Suppression
			Mean	SEM		
1	Artemether	80.00	2.5 ± 0.29		28.57	66.67[a]
2	Normal Saline	0.2 ml	10.5 ± 2.18		85.71	0.00
3	*A.chevalieri*	100.00	7.25 ± 0.25		63.64	34.68[a]
4	*A.chevalieri*	200.00	6.75 ± 0.48		56.64	33.92[a]
5	*A.chevalieri*	400.00	5.25 ± 0.25		38.89	54.63[a]
6	*A.chevalieri*	800.00	4.75 ± 0.48		31.19	63.61[a]

Key:
a* Suppression significant

Table 3d: Chemo-suppressive activity of methanolic leaf extract of *A. chevalieri* against *P. berghei* at Day 4

Groups	Extract drug	Dosage (mg/kg)	% Parasitemia		% Parasitemia	% Suppression
			Mean	SEM		
1	Artemether	80.00	1.75 ± 0.25		26.78	60.72[a]
2	Normal Saline	0.2 ml	7.50 ± 0.65		68.18	0.00
3	*A.chevalieri*	100	6.75 ± 0.63		58.70	16.15[b]
4	*A.chevalieri*	200.00	5.25 ± 0.48		52.26	23.35[b]
5	*A.chevalieri*	400.00	3.50 ± 0.29		33.95	50.21[a]
6	*A.chevalieri*	800.00	2.75 ± 0.48		29.71	56.42[a]

Key:
a* Suppression significant
b* Suppression insignificant

Table 3e: Chemo-suppressive activity of methanolic leaf extract of A. chevalieri against P. berghei at Day 5

Groups	Extract drug	Dosage (mg/kg)	% Parasitemia		% Parasitemia	% Suppression
			Mean	SEM		
1	Artemether	80.00	0.50 ± 0.29		13.13	76.06[a]
2	Normal Saline	0.2 ml	7.00 ± 1.22		54.85	0.00
3	*A.chevalieri*	100	4.50 ± 1.50		52.00	5.48[b]
4	*A.chevalieri*	200.00	3.75 ± 0.48		43.52	20.66[b]
5	*A.chevalieri*	400.00	1.75 ± 0.48		25.21	54.04[a]
6	*A.chevalieri*	800.00	1.50 ± 0.28		19.58	64.30[a]

Key:
a* Suppression significant
b* Suppression insignificant

Table 4: Effects of methanolic leaf extract of A. chevalieri on mean body weight of P. berghei infected rats.

Groups	Treatment	Dosage	Mean Weight (D0)	Mean Weight (D4)
1	Artemether	80.00	87.4 ± 6.70[a]	87.5 ± 7.10
2	Normal Saline	0.2 ml	74.0 ± 8.50	72.4 ± 8.70
3	*A.chevalieri*	100.00	157.0 ± 6.90[b]	157.7 ± 6.80
4	*A.chevalieri*	200.00	157.6 ± 3.40[b]	158. 5 ± 3.50
5	*A.chevalieri*	400.00	97.4 ± 5.80[a]	98.0 ± 5.50
6	*A.chevalieri*	800.00	106. 4 ± 2.60[b]	107.0 ± 2.80

Values expressed as Mean ± Standard Error Mean; n = 5
a Showed significant difference (at p>0.01)
b Showed insignificant difference (at p <0.01)

Table 5: Effects of methanolic leaf extract of A.chevalieri on the mean survival times of P. berghei infected rats

Groups	No. of animals	Treatment	Dosage(mg/kg)	Death	Mean survival times
Group 1	5	Artemether	80.00	0	1.00
Group 2	5	Normal Saline	0.20	2	0.40
Group 3	5	*A.chevalieri*	100.00	1	0.80
Group 4	5	*A.chevalieri*	200.00	0	0.80
Group 5	5	*A.chevalieri*	400.00	0	1.00
Group 6	5	*A.chevalieri*	800.00	0	1.00

Table 6: Repository effect of methanolic leaf of extract of A. chevaleiri in rats

Drug	Dose (mg/kg)	Non parasiteems density (D9)	% Suppression
Normal saline	0.2ml	25.6+0.5	-
A. chevaleri	100	6.2+0.3	50*
	200	4.4+0.1	75*
	400	2.1+0.0	85*
	800	1.4+0	90*
Arthemeter	100	1.0+0.1	97*

D7=Day seven, *significantly different from control at P<0.05 (n=5)

Table 7: Curative Effect of Methanolic Leaf Extract of A. chevaleiri in Albino wister Rats

Drug	Dose (mg/kg)	Mean parasitamia Pre (D3)	Pre (D7)	Mean survival time (Days
Normal saline	0.2ml	25.5+0.5	30.0+05*	9.1+1.0
A. chevaleri	100	24.0+04	10.0+0.3*	20.5+1.5
	200	23.3+0.5	8.4+0.4*	22.2+1.7
	400	26.0+0.4	5.0+0.6*	25.1+1.2
	800	29.1+0.5	4.0+0.5*	28.0+0.4
Arthemeter	80	30.8+0.02	3.1+0.3*	30.0+0.0

D3=Day three, D7=Day Seven,*Significant different from control at P>0.05 (n=5). All rats treated with Arthemeter survived until day 30.

Table 8: Comparison of Artemeter with Methanolic Leaf Extract of A. chevalieri

Groups	Extract drug	Dosage (mg/kg)	% Parasitemia		% Parasitemia	% Suppression
			Mean	SEM		
1	Artemether	80.00	2.5 ± 0.29		28.57	66.67[a]
2	Normal Saline	0.2 ml	10.5 ± 2.18		85.71	0.00
3	*A.chevalieri*	100.00	7.25 ± 0.25		63.64	34.68[a]
4	*A.chevalieri*	200.00	6.75 ± 0.48		56.64	33.92[a]
5	*A.chevalieri*	400.00	5.25 ± 0.25		38.89	54.63[a]
6	*A.chevalieri*	800.00	4.75 ± 0.48		31.19	63.61[a]

DISCUSSION OF RESULTS

The Phytochemical constitute an integral part of medicinal plants and are responsible for their numerous bioactivities. Numerous plants containing a wide variety of phytochemicals as their bioactive principle have antiplasmodial activities (Matur et al., 2009). Although the mechanism of the actions of the leaf extract has not been evaluated in the present study, some of the constituents debated have however been implicated in antiplasmodial activities by different mechanisms. The anti-plasmodial activity of Berlina grandiflora has been traced to the alkalonds, Flavonoids and teripenoids contained in the plant (WHO, 2011).

The extract might be considered very safe since there were no observed unto wards effects during the toxicity tests. There was no mortality in rats even at 3000mg/kg body weight. In addition, gross physical and behavioral observation also revealed no visible signs of acute toxicity. The result of the current study showed that the LD50 of the leaf extract of the plant was found to be greater than 3000mg/kg, which may be accepted as safe . Other workers have reported different LD50 value for different plant extracts. The oral (rat) LD30 of ethanol extract of vitex leucoxylon leaf (>3000mg/kg) of Aramcaria bidwill (250mg/kg) have been reported. The LD50 of Boerhavia diffuse has been reported to be >200mg/kg body weight in both mice and rats (Orisakwe et. al., 2003). A. chevalieri leaf extract was also reported to be greater than 3000mg/kg in rats (Rui et al.,2009).

Chemo-suppressive test is a standard test commonly used for antimalarial screening. The result obtained from this study showed significant decrease in parastemia of P. berghei after treatment with the leaf extract of Albizia chevalieri. The significant decrease in parastemia observed in this study was dose dependant. Artemether, a standard antimalarial drug at a dose of 80 mg/kg body weight showed significant high percentage suppression ($p > 0.01$) when compared with the negative control and with the methanol extract groups.

When a standard antimalarial drug is used in rats infected with P. berghei, it suppresses the parastemia to a non-detectable level (keseko et al.,2000). The percentage suppression of parastemia of the extract treated groups changed significantly from those of the negative control showing that the extract has an antimalarial activity supporting the folk use of the plant as antimalarial herb, a compound is considered as active when percentage suppression in parastemia is 30% or more (krettli,2009) which support the findings of the current study. From the results obtained, it clearly showed that, artemether has the highest activity when compared with the negative control and the extract treated groups and is statistically significant ($p > 0.001$).

According to (kaseko et al.,2000) body weight change is another parameter that evaluates the antimalarial activity of plant extracts. In the current study there was a progressive increase in body weight of rats treated with a standard drug at a dose of 80mg/kg body weight and that treated with 400mg/kg body weight of the plant extract which were significantly different ($p > 0.01$) when compared with the negative control. Groups that were treated with 100, 200 and 800 mg/kg body weight are insignificantly different ($p < 0.01$) when compared with the negative control. Thus this may be an indication that the drug does not affect the feed utilization ratio of the animals.

Mean survival time is another parameter that evaluates antimalarial activity of plant extracts. An extract that results in survival time greater than that of infected non-treated rats was considered as active (Adebayo et al.,2010). The result of the current study revealed that the leaf extract of Albizia chevalieri prolong the survival time of an infected rat in the four day suppressive test. Plant materials that can prolong the survival time of infected experimental animals compared to the negative control are considered active agents against malaria (Oliveira et al., 2009). Which is in line with the current study.

In the established infection, the methanolic leaf extract at various doses showed significant dose dependent schizonticidal activity. The observed anti -malarial of the leaf extract is consistent with the use of the plant as herbal medication against the disease and indication of its potential as a chemotherapeutic anti-malaria agent. The plant extract has a noteworthy anti -malarial activity as the mean survival time values which at does used were twice or more than that of control group.

In this study arthemeter was used as the standard anti-malaria drug. Artemether has been used for curative, suppressive and prophylactic anti -Plasmodial activities. In early and established infection, artemether interrupts with the heme polymerization by forming FP-artemether complex. This complex is responsible for the disruption of the parasite's cells membrane function and ultimately leads to auto digestion. Although, artemether exhibited higher suppressive, prophylactive and curative anti plasmodial activities by the extent of inhibition of parasitemia, the leaf extract of A. chevaleiri also showed similar anti -Plasmodial activities.

In this study, rats treated with 200, 400 & 800mg/kg body weight had lived longer than negative control, the mean survival time is that of the standard control in the five day suppressive test, this might be due to the anti-plasmodial activity of the plants extracts. The current finding was in agreement with studies done on medicinal plants used for malaria (Abdel-Kader et al.,2001).

With respect to the anti-Plasmodial activity, artemether a standard antimalarial drug at the dose of 80mg/kg body weight showed significant high percentage suppression when compared to the negative control. The parasitemia of the extract treated group changed significantly from those in the negative control showing that the

extract has antimalarial activity supporting the folk use of the plant as antimalarial herb. A compound is considered as active when percentage suppression in parasitemia is 30% or more (Krettlli et al., 2001). methanolic leaf extract of Albizia chevalieri had 90% suppression of parasitaemia.

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Cite this Article: Hajara SL, Samaila AB, Umar AF, Nayaya AJ, Danladi MU, Musa M, AbdulWahab A and Nazeef IU (2017). In-vivo Screening of Antiplasmodial activity of Methanolic Leaf Extract of *Albizia chevalieri* against *Plasmodium berghi* Model. Greener Journal of Biological Sciences, 7(4):034-044, http://doi.org/10.15580/GJBS.2017.4.071617087