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Antiplasmodial Activity and Phytochemical Screening of Crude Extracts *Jatropha Curcas*, *Parkia Bicolor* Et *Vernonia Amygdalinathree* Traditional Plants of Ivorian Pharmacopeia

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ABSTRACT: The practice of traditional medicine by plants is highly prized by African populations including those of the Department of Agboville (South-East of Ivory Coast) against various diseases, particularly malaria, which remains the leading cause of consultation in the health structures of the country.

The general objective of this study is the valorization of the Ivorian pharmacopeia.

We have evaluated the claimed antimalarial properties of three plants used in traditional medicine against malaria in the Department of Agboville and we have investigated phytochemical screening by standard protocols. The antimalarial activity was determined by measuring the fluorescence of Sybr green intercalated in the parasite DNA on NF54 and K1 *Plasmodium falciparum* strain. Then the IC50 values were determined by the online software ICEstimator antimalarial version 1.2.

These three plants inhibit the growth of the parasite (*Plasmodium falciparum*).

The different extracts are rich in alkaloid, sterols and polyterpenes, saponin then polyphenols and flavonoids.

KEYWORDS: Traditional medicine; Sybrgreen ;malaria; *Plasmodium falciparum* ; Agboville.

I. INTRODUCTION

Malaria is the world's most important parasitic disease especially when *Plasmodium falciparum* is the causative agent. This disease has been a great challenge to humanity since immemorial time. Approximately 3,2 billion people, approximately half of the world population, is exposed to the malaria risk. In 2015, one estimates at 214 million the number of new cases of malaria, and approximately at 438 000 the number of deaths occur in Sub-Saharan Africa, with children younger than five years of age and pregnant women being the most severely affected [1]. For

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fighting against this disease, the World Health Organization recommended Artemisinin Combination Therapies (ACT) as the first line of treatment for uncomplicated malaria [2]. Unfortunately today, *Plasmodium falciparum* adapts permanently and develops resistances to drugs associations based on artemisinin however advised by the World Health Organization [3-4]. Like consequence, they are the therapeutic failures. Thus, the continuous search for novel and more effective antimalarial compounds especially from medicinal plants extracts is of utmost importance in combating malaria infection [5-6]. The medicinal plants have many therapeutic properties ascribed to their phytochemical constituents [7] and are a promising source of new antimalarial compounds. For proof, the conventional antimalarials such as chloroquine, quinine and artemisinin derivatives originate from plants [8]. In Africa traditional medicinal plants are frequently used to treat or cure malaria. Because these populations are generally poor and the traditional drugs are accessible, less expensive and are registered in the sociocultural practices. This study follows upon an ethnobotanic investigation carried out in the Department of Agboville (South-Eastern of the Ivory Coast) whose principal objective is the valorization Ivorian pharmacopeia [9]. The present study was to evaluate in vitro and ex vivo the antiplasmodial activity and carry out a screening phytochimic crude extracts of three plants from Ivorian pharmacopeia.

II. LITERATURE SURVEY

Malaria seems oldest and most fatal of the tropical diseases. With through the world, of many people dies of this affection by fault of prevention, consultation of a doctor and especially of financial means. Africa (especially Africa Sub-Saharan), from its position on the tropics and its poverty, is the continent more touched by a parasite hématozoaire of the genus *Plasmodium* whose form mortal is *Plasmodium falciparum*. This parasite is able to develop a change and to become resistant to the drugs antimalaria, which is worth to him to be always present despite everything the carried out curative actions. More than 80 % of the died people, that is to say nearly 800 000 each year are children of Africa of less than five years (the disease there keep silent a child every 30 seconds), without forgetting the vulnerability of the pregnant women. In Ivory Coast, paludism especially constitutes 30 to 40% of the morbid states in the children and accounts for 10% of all the causes of mortality. Since the emergence of malariachloroquinorésistant in 1986 in the countries of West Africa, the monitoring and the study of the chimiorésistance of *Plasmodium falciparum* became a concern for our country.

Today, only the derivatives of the artemisinin coming from the Chinese traditional pharmacopeia (*Artemisia annua*) are advised considering their effectiveness on the parasite. However, since 2008 of the resistant stocks were detected in certain countries of the south of Asia and one fears his propagation in other areas in particular in Africa. Considering the extent of the risk of the pharmaco-resistance of the plasmodium falciparum to this treatment and the cost high in the countries in the process of development, it is significant and urgent to find a solution alternate. Today, traditional medicine is a recourse of choice, with the example of quinine and artemisinin. Moreover, it is even recommended by WHO.

It is in this context of valorization of traditional medicine and development of new effective, durable drugs antimalaria, bio-credits and accessible to all that our work is registered.

III. MATERIALS AND METHODS

Collection of plants material

The plants were collected in Department of Agboville (South-Eastern of the Ivory Coast). The plants material were identified by Floristic Center of Félix Houphouët-Boigny University. A voucher herbarium specimen is deposited at the Floristic Center. It are three plants such as barks of stem of *Jatropa curcas L.*, *Parkia bicolor A. Chev.* and *Vernonia amygdalina Delile*.

Preparation of crude extracts of three plants :

The samples of the plants were with the shelter of the sun during two weeks at ambient temperature before being reduced out of fine powder by crushing using a mechanical crusher. According to the protocol of extraction[10], hundred grams (100 g) of powders were dissolved in one (1L) liter of water distilled by crushing in Blender during 10 to

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15 minutes.. The homogenate obtained is first spun in a square of fabric, then filtered successively twice on hydrophilic cotton and once on Whatman paper 3 mm. The filtrate obtained was dried by evaporation in a Venticell oven at 50 ° C. The evaporate will be recovered in the form of a powder which constituted our aqueous extracts. The same operation was repeated with 70% ethanolic solvent leading to our ethanolic extracts. This allowed us to have 6 extracts including 3 aqueous extracts and 3 ethanolic extracts.

Antiplasmodial evaluations

Parasitemia is determined but in case of parasitaemia greater than 0.3%, a dilution with healthy O + cells was performed to have parasitaemias < 0.3%. Then the inoculum is prepared from parasitized blood pellets and RPMI 1640 supplemented with 0.5% of albumax (complete medium) to obtain a hematocrit of 5%. For in vitro tests, the chloroquine-sensitive (NF54) and chloroquine-resistant (K1) strains were maintained in continuous culture [11]. Then parasitized red blood cells were exposed to the different drugs, then incubated for 72 hours at 37 ° C under a candle bell.

The Rieckmannmicrotest technique adopted by WHO [12] was used and the Florescence was measured after exposure to SYBR green in the dark for one hour at room temperature.

The antimalarial activity or the inhibition of erythrocyte schizogony was determined by measuring the fluorescence of Sybr green intercalated in the parasite DNA, using a spectrofluorimeter. Then the IC₅₀ values (concentration of extract inhibiting 50% of parasite growth) were determined by the online software ICEstimator antimalarial version 1.2 [13-14].

Phytochemical screening

The phytochemical screening was done using the standard protocols [15-16] to detect the presence or absence of certain bioactive compounds.

IV. RESULTS AND DISCUSSION

Results

Antiplasmodial evaluations

The results of the *in vitro* antiplasmodial activity of crude extracts are presented in table I.

Table I: Results of the antiplasmodial tests of the crude extracts of the studied plants

Selected Plants	Extracts	IC ₅₀ of <i>P. falciparum</i> strains (µg/mL)	
		NF54	K1
<i>Jatropha curcas</i>	Aq	24,4±3,48	>50
	eth	8,76±0,75	12,51±1,54
<i>Parkia bicolor</i>	Aq	4±1,09	7,67±0,69
	eth	45±1,26	>50
<i>Vernoniaamygdalina</i>	Aq	>50	>50
	eth	10±1,39	22±1,81
Chloroquine (nM)		11.03±0.23	124.74±4.96

Aq :aqueous ; eth : ethanol

In vitro antiplasmodial activity of our crude extracts is classified as high (IC₅₀ < 5 µg/mL), promising (5 < IC₅₀ < 15 µg/mL), and moderate (15 < IC₅₀ < 50 µg/mL) according to the classification scale of some authors^[17-18]. It is the ethanolic extracts of *Jatropha curcas* and *Vernoniaamygdalina* which has a good antimalarial activity on the NF54 and K1 strains. Also, the aqueous extract of *Parkia bicolor* to show a good antimalarial activity.

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Phytochemical screening

Phytochemical screening performed showed the presence of several secondary metabolites summarized in Table 2. Tables II : Results of the phytochemical screening of the aqueous and ethanolic crude extracts

Plants	Extracts	Polyterpenes and sterols	Polyphenols	flavonoids	Catechism tannins	Quinones	alkaloids	saponins
<i>Jatropha curcas</i>	Aq	+	-	-	-	+	++	+
	eth	++	-	-	-	-	++	
<i>Parkia bicolor</i>	Aq	+	++	+	-	-	+	++
	eth	++	++	++	-	-	+	
<i>Vernonia amygdalina</i>	Aq	+	+	+	+	-	++	++
	eth	++	++	+	-	-	+	

Aq :aqueous ; eth : ethanol +: present ++: Abundantly present - : Absent

In general, the various extracts are rich in alkaloid, sterols and polyterpenes, saponin and polyphenols and flavonoid. On the other hand, they are poor in catechetical tannins and quinones.

Discussion

An ethnobotanical survey have done in Department of Agboville (South-Eastern of the Ivory Coast). It allowed us to know that *Jatropha curcas*, *Parkia bicolor*, *Vernonia amygdalina* are three plants used by the traditional health practitioners of the Department of Agboville for the treatment of malaria. We therefore tested crude extracts on reference strains of chloroquine-sensitive *P. falciparum* (NF54) and chloroquine-resistant (K1). All plants tested have different antimalarial effects.

The aqueous extract of *Parkia bicolor* have promising activity on NF54 (NF54 : 4 µg/mL) and K1 strain (7,67 µg/mL). The aqueous ethanolic *Jatropha curcas* also showed a promising activity (NF54: 8.76 µg / mL and K1: 12.51 µg / mL). Our study confirms that of [19] who showed that the methanolic extract of *Jatropha curcas* leaves on the chloroquine-resistant K1 strain of *Plasmodium falciparum* has an IC₅₀ of 11.53 µg / mL.

For *Vernonia amygdalina* (NF54: 10 ± 1.39, K1: 22 ± 1.81), the ethanolic extract showed good antimalarial activity. The extract has a moderate activity on strain K1 and a promising activity on strain NF54.

These results confirm the work of [20] on the cloned chloroquinosensitive strain 3D7 of NF54 where the IC₅₀ is 9.83 µg / mL.

These three plants used in Department of Agboville for the treatment of malaria are indeed plants with antimalarial activity. The results obtained also find a justification in the composition of these plants which have several secondary metabolites involved in the treatment of malaria. These natural products have antioxidant, antimicrobial, anti-inflammatory, anti-cancer pharmaceutical properties, antiparasitics^[21-22]. More particularly alkaloids, phenols, saponins, triterpenoids, flavonoids, present in our extracts have antiplasmodial properties^[23-20-6]. Also flavonoids, tannins and alkaloids have anti-inflammatory properties [24]. They thus participate in the cure of malaria as well as saponins which are known to improve feeding in animals, which is necessary in the condition of loss of appetite that occurs with malaria [25].

V. CONCLUSION

In this study we have shown that *Jatropha curcas*, *Parkia bicolor*, *Vernonia amygdalina* are plants with antiplasmodial activity. Also certain secondary metabolites (alkaloids, phenols, saponins, triterpenoid, flavonoid) with antiplasmodial property present in our plants confirm our results. The results therefore justify the traditional use of the plant in the treatment of malaria in the Department of Agboville (Ivory Coast).

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We plan to do toxicological studies on these medicinal plants to determine their safety.

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