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Research Article

Ethnobotanical studies of the genus *Crotalaria* L. (Crotalarieae, Fabaceae) in Katsina State, Nigeria

Samaila Samaila Yaradua[1*] and Muzammil Shah[2]
1. Centre for Biodiversity and Conservation, Department of Biology, Umaru Musa Yaradua University, P.M.B 2218 Katsina-Nigeria
2. Department of Biological Sciences, Faculty of Life Science, King Abdulaziz University, 21589 Jeddah-Saudi Arabia
**Corresponding author's email: dryaradua@gmail.com*

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Abstract
Ethnobotanical study was conducted to document the ethnobotanical information of some of the members of the genus *Crotalaria* in Katsina. Field work was conducted to collect the data using semi structured questionnaire and oral interview. Seven species of the genus were found to have medicinal value and are used in treatment of various ailments. Among the species are *Crotalaria pallida, Crotalaria senegalensis and Crotalaria retusa.* Relative Frequency of Citation (RFC) was employed to get the most used species. *Crotalaria pallida* was found to be the most used plant RFC 0.41 followed by *Crotalaria retusa* RFC 0.29. The results of the ethnobotanical data obtained showed that the species have good medicinal value in the treatment of various common ailments such as skin infection, fever and ulcer. The result of the study showed that members of the genus *Crotalaria* in the study area are widely used in treatment of various ailments.

Keywords: *Crotalaria*; Ethnobotany; Katsina; Medicinal plant

Introduction

Crotalaria L. (Fabaceae) is one of the largest genera of Papilionoideae consisting of ca. 700 species **[1]**. It is the largest genera of vascular plants in tropical Africa **[2]**. The genus common name is "Rattlepod'orrattlebox and is derived from the fact that the seeds become loose in the pod as they mature, and make a rattling sound when the pod is shaken. The name derives from the Ancient Greek κρόταλον, (Crotalon) meaning "castanet", and is the same root as the name for the rattlesnakes (*Crotalus*).

The genus is almost cosmopolitan in distribution across tropical and subtropical regions of the world **[3]**, with it centre of diversity in Africa and Madagascar (ca. 543 species) **[1, 2, 4]** and a secondary center in India (ca. 92 species) **[5, 6]**. The genus is also widely distributed across the southern hemisphere, extending into Asia and North America.Some of the species within the genus are widely used in agriculture, production of commercial products while some have medicinal and nutritional value **[2, 7, 8]**.

Crotalaria species are widely used in veterinary pharmacy in preventing liver disease [9, 10]. In Tanzania *Crotalaria comosa* Bak provides nitrogen to the crops intercropped with and assist in the control of weeds and nematodes [11]. The species within the genus like *Crotalaria recta* L. are used as food source by larvae of Lepidoptera species, the insect also used the plant as defense against their predators [12].

[13] revealed that *C. retusa* L. seeds are used as source of fibres, silage and green manure when removed from pods by pounding. According to [14] oils derived from *Crotalaria bongensis* Bak, *C. naragutensis*Hutch and *C. lachnophora* Desu are used for medicinal purposes Seeds of some of the species such as *C. atrorubens* are not suitable for use as edible oil and soap production but many however, are useful for the production of paint and shampoos. *Crotalaria* is also used in the treatment of diabetics [15], skin infection, snake bite and stomach ache prevention[16]. Plants in the genus *Crotalaria* are very important in bioremediation, ethnomedicine and agriculture globally. Ethnobotanical uses of the species of *Crotalaria* have never been documented in the study area. Since several species were found to be medicinal in other parts of the world e.g. *Crotalaria pallida*is used in the treatment of diabetics [15], skin infection, snake bite and stomach ache prevention [16], and there is tendency that species in the study area might be having some medicinal applications. The need to ascertain the species of *Crotalaria* that may serve these and many other purposes cannot be overemphasized .Evaluation of the ethnobotanical uses of the species of this genus will also help in understanding there medicinal potentials to enable the people in the study area to make use of the plant in treating various ailments. The objective of the study is to identify and document *Crotalaria* species with ethnobotanical applications in order to bring out their potential health benefit.

Materials and methods

Study Area

The study was conducted in Katsina state, northern Nigeria. Katsina state is located between latitudes 11°08′N and 13°22′N and longitudes 6°52′E and 9°20′E. The state covers an area of 23,938 sqkm. The state is bordered by Niger Republic to the North, Jigawa and Kano States to the East, Kaduna State to the South and Zamfara State to the West. The state has 34 Local Government Areas.

Data collection

The field methodological framework chosen for this study was that used in ethnobotany [17, 18] and based on method given by[19], semi-structured interviewees; observation and guided field walk with informants were employed to obtain ethnobotanical data. Field research was conducted by collecting ethnobotanical information during structured and semi-structured interviews with knowledgeable people native in each site territory. For each species recorded one questionnaire was filled. Even though, a structured questionnaire had to be filled direct questions were avoided. The basic information needed was taken during the conversation

No special selection criteria were used in the choice of the informants because one of the aims of this work was to assess the breadth of popular heritage in the field of wild edible plants, knowledge which is widespread among locals. However, most of the interviewees were men and women between 40-60 years old. Data obtained were collated and arranged to give the botanical names, and the local names as well as their uses and the part(s) used.

Collection and identification of plant specimen

Plant materials were collected through field survey of the genus *Crotalaria* across the

study area. The plants were identified based on morphological features seen in relevant literatures. Specimens from Herbarium of the department of Biological sciences, Ahmadu Bello University Zaria were also used as a guide in indentifying the plants. Plants were collected following the procedure for collection of plants specimen for standard herbarium **[20]**.

Data analysis

The results obtained during the survey were analyzed using the Relative Frequency of Citation (RFC) **[21]**.

Relative Frequency of Citation (RFC)

This was used to calculate the importance of a particular species in treating ailments. It was determined using RFC = F_c/N where F_c is the number of respondents who cited a particular species and N is the total number of the respondents.

Results and discussion

The species within the genus were found to be used in treating various ailments in the study area and they are very effective in the treatment. The name of each species, part used, ailment treated are given in (Table 1). Majority of the respondent having the knowledge of the medicinal uses of the plant are usually old age people and they are herbalist. *Crotalaria pallida* and *Crotalaria retusa*have the highest Relative Frequency of Citation RFC 0.41 and 0.29 respectively, this revealed that they are most used species in treating various ailments,whereas the rest of the species have RFC 0.07 respectively.

Mode of preparation of the medicine is mainly by decoction followed by maceration with 40% and 28% respectively (Figure 1), whereas mode of preparation by poultice 4% (Figure 2) is not frequently used, Many of the people used decoction because they believed that the method extract the compounds that cure the diseases. With regard to parts used, the whole plant is themost part used followed by leaves, seeds, roots and flower (Figure 3). Route of administration is mainly through oral followed by dermal and body bath (Figure 4).

The species were reported to be effective in treating various ailments. **[22]** reported the effective use of the species within the genus *Crotalaria* in treating various ailments in northern Nigeria. The used of *Crotalaria pallida* in treating skin infection such eczema is also reported by **[23, 24]**. Our findings that *Crotalaria retusa*is used to treat chicken pox is also reported by **[25-27]** also reported the use of the plant to heal scorpion sting which was also reported here. *Crotalaria pallida* is reported to have high medicinal value with RFC= 4.1, while *Crotalaria retusa*have RFC = 0.29. *Crotalaria macrocalyx, Crotalaria senegalensis* and one of the unidentified species have RFC = 0.07 respectively and this is the first time of reporting their medicinal uses.

Table 1. List of medicinally utilised species

Name of species	Local name	Disease	Part used	Preparation	Route	RFC
Crotalaria Pallida	Farar Biya rana	Skin infection	Whole plant	Decoction	Body bath	0.41
		Eczma	Whole plant	Decoction	Dermal	
		Urinary problems	Leaves	Decoction	Oral	
		Fever	Whole plant	Decoction	Body bath	
		Swelling of joint	Root	Poultice	Dermal	
		Tumor	Seed	Maceration	Oral	
		Stomachache/indigestion	Root	Maceration	Oral	
		Ulcer	Leaves	Powder	Oral	
		Orchitis	Whole plant	Maceration	Oral	
		Hypertension	Whole plant	Maceration	Oral	
		Epileptic	Whole plant	Decoction	Body bath	
Crotalaria retusa		Hemoptysis	Roots	Maceration	Oral	0.29
		Lung diseases	Leaves	Maceration	Oral	
		Scabies	Leaves	Maceration	Oral	
		Fever	Leaves	Decoction	Body bath	
		Impetigo	Leaves	Decoction	Body bath	
		Cold	Flower/leaves	Decoction	Oral	
		Scorpion sting	Seeds	Direct	Oral	
		Chicken pox	Leaves	Ointment	Dermal	
Crotalaria goreensis	Gyadar awaki	Wound	Leaves/seeds	Ointment	Dermal	0.07
		Ulcer	Seeds	Direct with honey	Oral	
Crotalaria macrocalyx	Katsemi	Dendruf	Whole plant	Powder	Dermal	0.07
		Back pain	Whole plant	Powder	Dermal	
Crotalaria senegalensis	Kahwartankarki	Fever	Whole plant	Decoction	Oral	0.07
		Gonorrhea	Whole plant	Powder	Dermal	
Crotalaria Pallida var. *obovata*	Bakar biya rana	Dizziness	Leaves	Powder/Decoction	Dermal/Oral	0.07
		Orchitis	Whole plant	Maceration	Oral	

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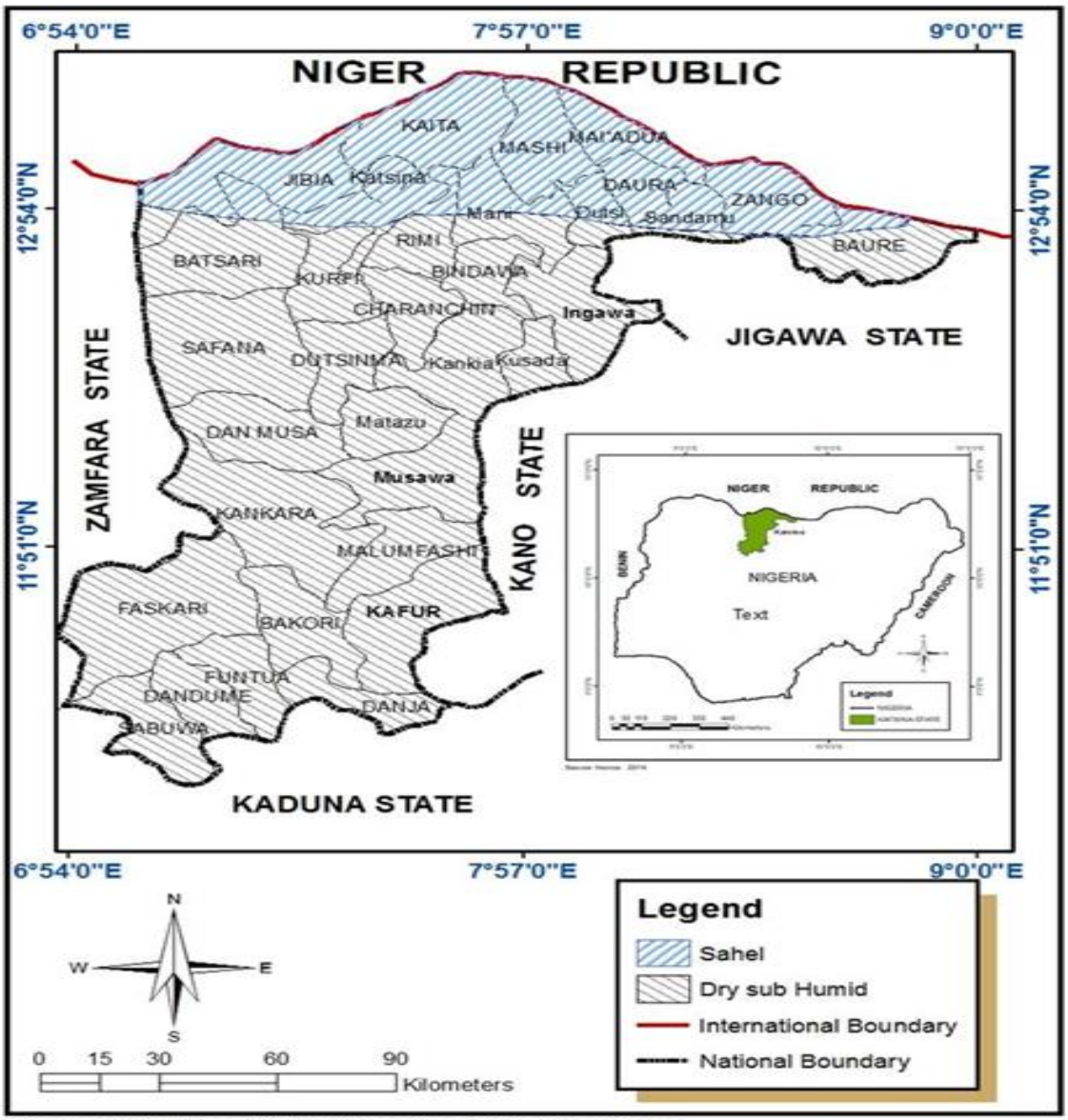

Map of Katsina State Showing Sahelian Zone
Source: NIMET

Figure 1. Map of Katsina State showing the study area

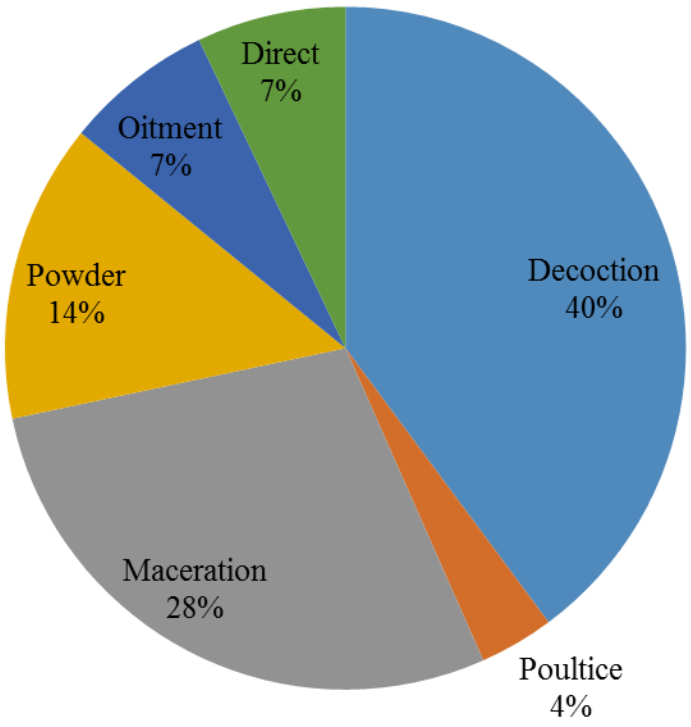

Figure 2. Mode of preparation used for treating various ailments

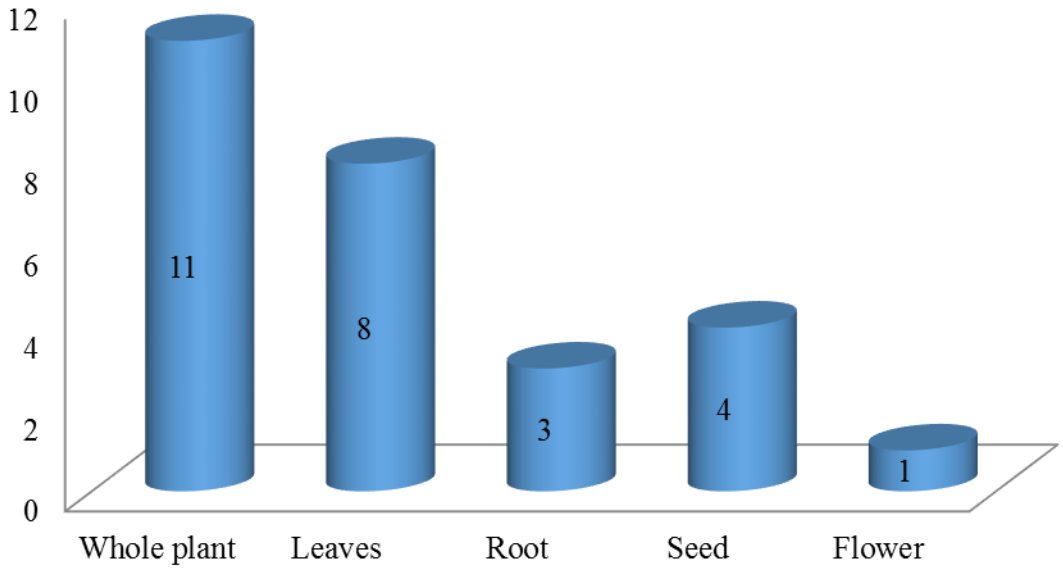

Figure 3. Parts of the plant used for treating various ailments

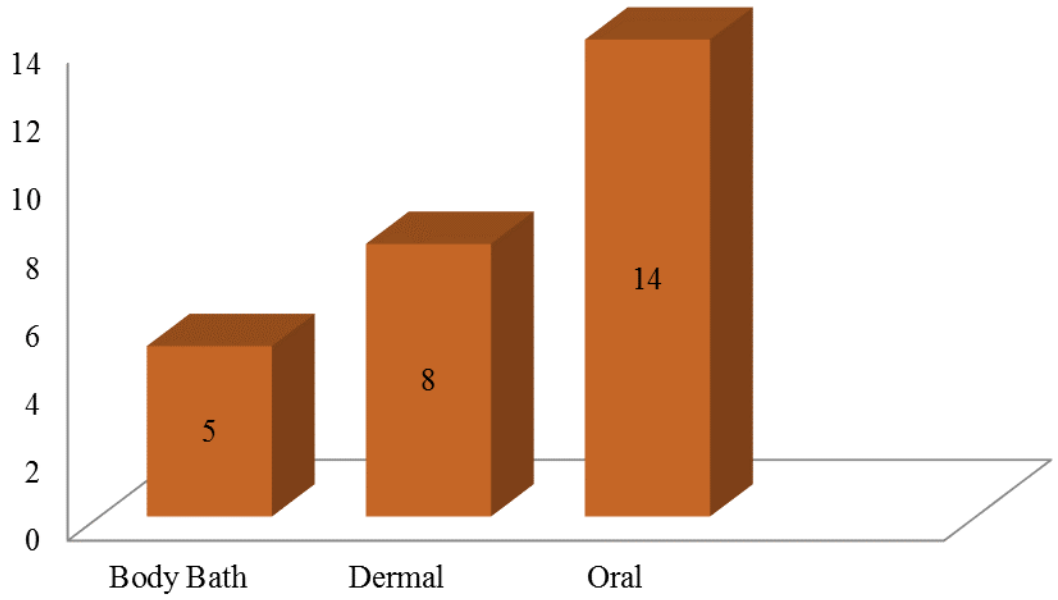

Figure 4. Route of administration used for treating various ailments

Conclusion

This study reported the first documentation of medicinal uses of members of the genus *Crotalaria* in Nigeria. The results demonstrated that some of the species are widely used in treatment of various ailments.

Authors' contributions

Conceived and designed the experiments: SS Yaradua, Performed the experiments: SS Yaradua, Analyzed the data: SS Yaradua & M Shah, Contributed materials/ analysis/ tools: SS Yaradua & M Shah, Wrote the paper: SS Yaradua & M Shah.

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