



**PHARMACOLOGICAL USES OF CUCURBITS AND POPULATION PERCEPTIONS IN  
THE MOST POPULATED REGION OF NIGER: ZINDER**

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**ABSTRACT**

In Niger, the use of medicinal plants by the population is very common. However, few studies have examined plant perception and pharmacological knowledge of the population. To this end, a descriptive ethnobotanical survey, with a convenience sampling, which provides information on the identity of the respondents, the use of plants in general and cucurbits in particular and toxicity, was conducted in the most populated city in Niger. A total of 8 species have been identified. The predominant pharmaceutical form is maceration (42%) and the most commonly used part is pulp (46.90%). The oral route is the most widely used and only 20% of respondents have knowledge of plant-related toxicity. It should also be noted that the use of plants is cultural ( $p = 0.003$ ) and the supply is in the bush ( $p = 0.002$ ). 78% of respondents believe that phytomedicines improve their health and 54% believe their effectiveness is very high. The results of this study not only expand the repertoire of medicinal plants in Niger but also and mainly show the need to raise public awareness of the toxic effects of plants.

**KEYWORDS:** Niger, cucurbits, phytotherapy, Perceptions, populations.

**INTRODUCTION**

Niger, a landlocked country with a high population growth rate, has a fragile economy. The Nigerian population, which is highly poor, is 83.8% rural.<sup>[1]</sup> In addition, the drugs produced by modern medicine are very expensive. In addition, there are the ever-increasing health needs of this rapidly growing population. Indeed, the population of Niger is estimated at 17,129,076 in 2012, the growth rate has increased from 3.3% during the period 1998-2001 to 3.9% for the period 2001-2012.<sup>[2]</sup> Pushing most of the population to use medicinal plants in primary health care.

Traditional medicine is widely used in Africa. According to Aké-Assi,<sup>[3]</sup> in Black Africa, 70 to 80% of health coverage is provided by traditional medicine and pharmacopoeia. Thus, numerous ethnobotanical surveys conducted among traditional health practitioners have confirmed the use of medicinal plants in Niger.<sup>[4,5]</sup> It is important to note that few studies have looked at the know-how of populations. Based on this observation, it is important to investigate the populations and finally to expand the repertoire of medicinal plants and the number of recipes with interesting therapeutic properties. It is within this framework that this ethnobotanical study, on the pharmacological uses and perception of plant species of the cucurbitaceae family, is being conducted among

the population of Zinder. The aim is to identify the species used, the diseases treated, the methods of preparation and administration of the phytomedicament and the idea that the peoples have of the plants.

**MATERIAL**

**Material**

The material used is an ethnobotanical survey card. The latter includes 14 questions focused on the informant's identity, the pharmacological uses (methods of preparation, modes of administration of the phytomedicine, place of supply) and the perception on the uses of these plants by the respondents (effects after taking, toxicity and efficacy of phytomedicament).

**METHOD**

**Study area**

The study was conducted in the most populous region of the eight regions that Niger has, namely Zinder. It covered five (5) districts (Garin malam, Hilin tanbari, Birni, Ounwala and Karkada) of the city of Zinder (Fig. 1). This region is located in the center-east of Niger. It covers an area of 155778 Km<sup>2</sup> and extends in latitude between the parallel 12 ° 48 'and 17 ° 30' north and in longitude between 7 ° 20 'and 12 ° 0' East. It is limited by the region of Agadez in the North, Diffa in the East,

Maradi in the West, and by the Federal Republic of Nigeria in the South.<sup>[6]</sup>

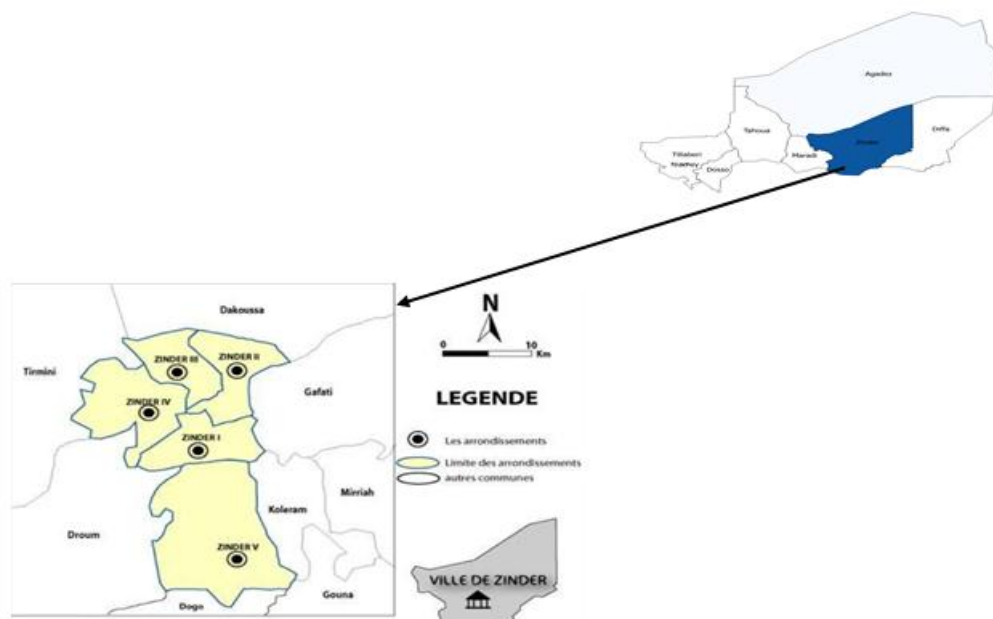


Figure 1: area of study.

**Methodology of the survey**

Two groups of the Zinder population were targeted by this survey. These are sick people in treatment and saint who have undergone treatment with plants. It concerned five (5) districts of this city. The choice of the respondents is for convenience and the interview is directed, in national language. A total of 49 elderly people who underwent treatment with the plants were surveyed.

The choice of the Zinder region is based on the high concentration of the population and the cucurbits are cultivated by the population. The respondents are chosen on the basis of their acceptances.

**Data analysis**

**Fidelity index**

The Fidelity level (FL) index tells us about the degree of consensus around the use of a species to treat a disease. It is the percentage of informants citing the use of a given species in the treatment of a disease. It is calculated according to the method described by Fredman *et al.*,<sup>[7]</sup>

$$FL (\%) = \frac{I_p}{I_u} \times 100$$

-  $I_p$ : is the number of informants who have stated the use of the plant for the treatment of the condition.

-  $I_u$ : is the total number of informants interviewed.

**Analysis statistical results**

The raw data was analyzed using the SPSS software. The mean and the significance level between the different variables were determined.

**RESULTS AND DISCUSSION**

**Distribution of respondents according to neighborhoods**

The survey covered five (5) neighborhoods in the city of Zinder and the results are reported in *Table 1*. The area Karkada is most represented with a percentage of 26.50% followed Hilin tabari with 22.45%. However, neighborhoods in a small proportion are Garin malam and Hilin gada with a respective percentage of 12.45% and 18.40%. This difference in representativeness of respondents is due to the refusal to be investigated observed in certain neighborhood.

**Table 1: Distribution of respondents interviewed in the five (5) neighborhoods in Zinder.**

Neighborhoods	Number of respondents	Proportion of respondents (%)
Ounwala	10	20.41
Hilin tabari	11	22,45
Garin malam	6	12.24
Karkada	13	26.50
Birni	9	18,40
Total in Zinder	49	100

**Profile of respondents and reasons for using medicinal plants**

The Table 2 shows gender, reasons for use and the storehouses. The analysis in this table shows that 73.5% of the respondents are male. The age of the respondents varies from 20 to 50 years and to 69.4% between 31 and 50 years of age. All our respondents use medicinal plants. This table shows that the difference in use

between neighborhoods by sex is significant with a probability of  $p = 0.008$ . Regarding the age of the respondents, the use is not significant. This result also informs us that the reasons for use are cultural ( $p = 0.003$ ) and these respondents obtain supplies of phytomedicine in the bush and at the level of pharmacists with respective probabilities of  $p = 0.002$  and  $p = 0.017$ .

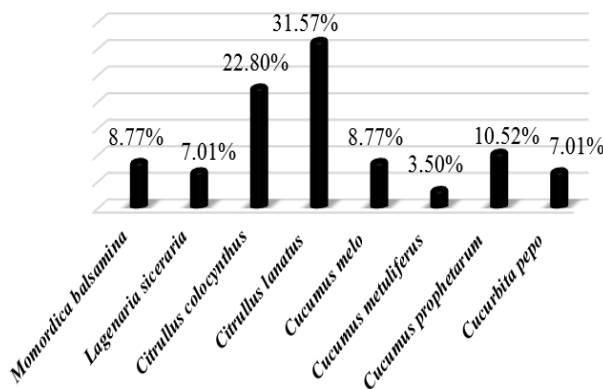
**Table 2: Characteristics of the respondents in Zinder, reason for use and place of supply of the plants.**

Characteristics		Ounwala N = 10	Tabari Hilin N = 11	Market N = 6	Karkada N = 13	Birni N = 9	SS
Sexes (%)	Women	70.0	9.1	0.0	23.1	22.2	P = 0.008
	Man	30.0	90.9	100.0	76.9	77.8	P = 0.008
Ages (%)	<20	-	-	-	-	-	-
	21 to 30	20.0	18.2	0.0	0.0	0.0	P = 0.212
	31 to 50	40.0	81.8	83.3	69.2	77.8	P = 0.222
	> 50	40.0	0.0	16.7	30.8	22.2	P = 0.232
SHI (%)	In good health	100	100	100	100	100	-
UMP (%)	Yes	100	100	100	92.3	100	P = 0.587
RU (%)	Cultural	90.0	90.9	50.0	23.1	66.7	P = 0.003
	Cheaper	10.0	0.0	16.7	38.5	11.1	P = 0.112
	Effective	0.0	0.0	16.7	30.8	22.2	P = 0.143
	Self-medication	0.0	9.1	16.7	0.0	0.0	P = 0.343
AS (%)	Bush	90.0	72.7	33.3	23.1	88.9	P = 0.002
	Pharmacist	10.0	27.3	66.7	61.5	11.1	P = 0.017
	traditional healer	0.0	0.0	0.0	7.7	0.0	P = 0.587

*Meaning of abbreviations : SHI : state health of investigated ; UMP : use of medicinal plants ; RU : reason of use ; AS : place of supply ; SL : significance level*

**Cucurbitaceae species encountered during our study**

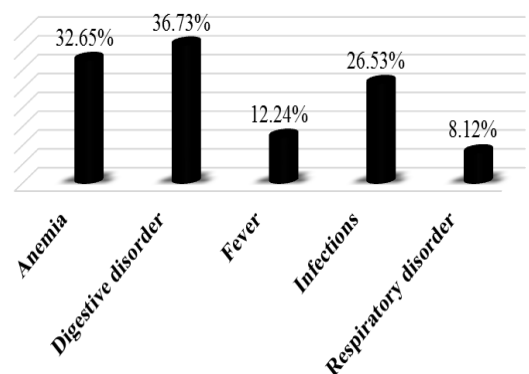
A total of 8 Cucurbitaceae species were identified among the population of the study area. The most popular species is *Citrullus lanatus* (31.57%). It is followed by the species *Citrullus colocynthus* (22.80%). On the other hand, the species *Cucumis metuliferus* is the least quoted (3.50%) (Fig.2). This result allows to confirm that the population of Zinder known to use medicinal family cucurbits. As elsewhere, the fact that the species *Citrullus lanatus* itself does mainly used could be linked to its culture in the region.



**Figure 2: Plants used by respondents in Zinder.**

**The diseases treated by the species of cucurbitace according to the respondents**

According to our respondents, the species of the family cucurbitace s are indicated primarily to treat digestive disorders at 36.73% followed by anemia (32.65%). By against the respiratory disease and fever are less represented with respectively 8.16% and 12.24% (Fig. 3). The therapeutic effect of this family may be due to its chemical composition as secondary metabolites.<sup>[8,9]</sup>



**Figure 3: Percentage of diseases treated with Zinder.**

### The different parts of the species of the family Cucurbitaceae used in recipes

Various parts of the plant are used for medicinal preparations. It is: pulp, seeds, whole plant and fruit. Pulp (46.90%) are mainly used while fruits and seeds are the least used with 14.30% each (Fig. 4). This preference given to pulps could be justified by the study carried out by Sabiou,<sup>[5]</sup> Indeed, the latter has shown that the pulps are very rich in secondary metabolites which are responsible for the therapeutic effects of the plants. These results are also reported by Nacoulma-Ouedraogo<sup>[10]</sup> Thus, the antibacterial effect of tannins was reported by Okouda,<sup>[11]</sup> the pest control effect of flavonoids by Sparg *et al.*,<sup>[12]</sup> and antifungal saponosides by Shan *et al.*,<sup>[13]</sup>

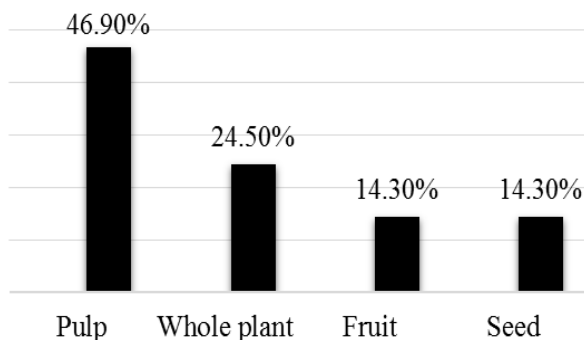


Figure 4: Parts of plant s used according to the respondents in Zinder.

### The different modes of preparation used by the respondents

During our investigation, three (3) modes of preparation were identified. The method is most commonly used (42%) followed e of the powder (30.60%) and the decoction (26.40%) (Fig.5). According to Guessan *et al.*,<sup>[14]</sup> the choice of a method of preparation by a people is also related to the differences of localities, the habits of the peoples concerned, their traditions and their preferences.

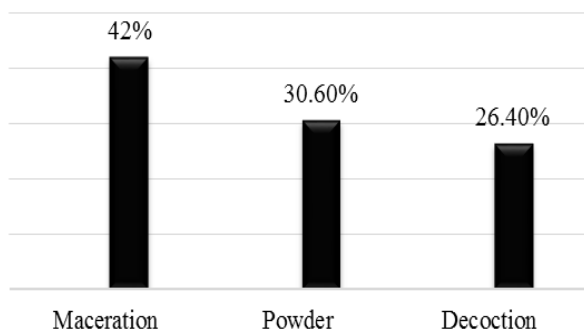


Figure 5: the different modes of preparation.

### The main routes of administration of cucurbitaceae products

Several routes of administration are used for taking phytomedicines. During this survey, three (3) routes of administration were identified. This is the oral route, the rectal route and the dermal route. It is noted in Figure 6, below, that the oral route is the most used with 75.55%, followed by the dermal route 16.32%. The nasal route is the least used with 4.08% (Fig. 6). This result is similar to that of Dibong *et al.*,<sup>[15]</sup> Cameroon , who reported a predominance of the oral route of 94%.

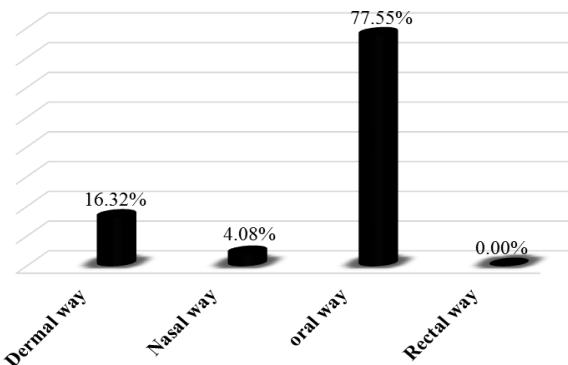


Figure 6: the different ways of administration of the phytomedicine used in Zinder.

### Perception of the cucurbitaceous medication by the respondents

The pharmacopoeia of cucurbits is well known to the population of the study area. Thus, all our respondents use herbal medicines to base this family. 78% of respondents believe that these herbal medicines improve their health. The efficacy of these phytomedicines is judged strong by 54% of the surveyed population and only 14% answered yes as to the toxicity of these drugs. They claim that this toxicity is manifested by diarrhea (8%) and vomiting (4%). However, this table shows the uniformity of characteristics studied at the level of the neighborhoods surveyed with non-significant thresholds (Table 3). This result confirms the lack of mastery of the toxicity of medicinal plants because a bad mixture can make them dangerous. According to Guessan *et al.*,<sup>[14]</sup> in Africa about 30% of fatal accidents are due to the use of mixtures.

Table 3: Pharmacognosy and Use of Cucurbitaceae in Zinder.

Characteristics		Kanya (N = 10)	Hilin tabari (N = 11)	Market (N = 6)	Karkada (N = 13)	Hilin gada (N = 9)	MOY	SS
UC (%)	Yes	100.0	100.0	100.0	84.6	77.8	91.8	P = 0.225
ET (%)	H	30.0	0.0	33.3	0.0	11.1	12.0	P = 0.106
	Imp	70.0	100.0	66.7	84.6	66.7	78.0	P = 0.132
	None	0.0	0.0	0.0	15.4	22.2	8.0	P = 0.319
PE (%)	St	60.0	45.5	83.3	61.5	33.3	54.0	P = 0.351
	Moy	20.0	45.5	16.7	15.4	44.4	28.0	P = 0.418
	W	20.0	9.0	0.0	7.7	0.0	8.0	P = 0.644
Toxic (%)	None	0.0	0.0	0.0	15.4	22.2	8.0	P = 0.319
	Yes	20.0	18.2	16.7	0.0	22.2	14.0	P = 0.657
	D	20.0	9.1	16.7	0.0	0.0	8.0	P = 0.468
MT (%)	V	0.0	0.0	0.0	0.0	22.2	4.0	P = 0.091
	None	80.0	90.9	83.3	100.0	77.8	86.0	P = 0.097

UC : use of cucurbits ; ET : effect of treatment ; PE : product efficacy ; MT : manifestation of toxicity ; MOY : average ; H : healing ; Imp : improvement ; St : strong ; W : weak ; D : diarrhea ; V : vomiting ; SL : significance level

#### Analysis of the fidelity index for treated diseases and routes of administration according to species

The same species can treat several pathologies or be administered by several routes. Therefore, we method to calculate the fidelity indices (FL) species based diseases treated and species depending on the route of administration. Thus, the species *Citrullus lanatus* comes out with a highest fidelity index in the treatment of anemia (24.48%). There are also fidelity indices of 10.20% for the species *Citrullus colocynthus*, *Citrullus*

*lanatus* and 14.14% for the species *Citrullus colocynthus* respectively in the treatment of digestive diseases and infections (Table 4). The observation in Table 5 shows that the oral route is used for administering recipes based on listed species with indices ranging from 4.08 to 24.48 %. The nasal route is used with the species *Citrullus colocynthus* and *Cucumis prophetarum*. This result could serve as the choice of route of administration and the disease treated according to the species.

Table 4: Fidelity index for the different diseases treated with these species in the Zinder population.

Diseases treated	cash							
	Number of quotes (N = 49)							
	Mb	LS	CL	CM	DC	CMe	CP	C pepo
Aff. digestive	n = 2 IF = 4.08	----	n = 5 IF = 10.20	n = 1 IF = 2.04	n = 5 IF = 10.20	n = 1 IF = 2.04	n = 3 IF = 6.12	n = 1 IF = 2.04
Aff. respiratory	n = 1 IF = 2.04	n = 1 IF = 2.04	---	n = 1 IF = 2.04	---	----	----	n = 1 IF = 2.04
Anemia	----	---	n = 12 IF = 24.48	n = 3 IF = 6.12	----	----	----	n = 1 IF = 2.04
infections	n = 1 IF = 2.04	n = 1 IF = 2.04	n = 1 IF = 2.04	----	n = 7 IF = 14.14	----	n = 2 IF = 4.08	n = 1 IF = 2.04
Fever	n = 1 IF = 2.04	n = 2 IF = 4.08	----	----	n = 1 IF = 2.04	n = 1 IF = 2.04	n = 1 IF = 2.04	----

Mb : *Momordica balsamina* ; LS : *Lagenaria siceraria* ; CL : *Citrullus lanatus* ; Cucumis melo ; CC : *Citrullus colocynthis* ; CMe : *Cucumis metuliferus* ; CP : *Cucumis prophetarum* ; Cpepo : *Cucurbita pepo* ; Fidelity index (IF%) =

$$FL (\%) = \frac{I_P}{I_U} \times 100$$

**Table 5: Fidelity index for the different routes of administration according to the species in the population of Zinder.**

Routes of administration	cash							
	Number of quotes (N = 49)							
	Mb	LS	CL	CM	DC	CMe	CP	C pepo
Oral way	n = 2 IF = 4.08	---- IF = 0	n = 12 IF = 24.48	n = 6 IF = 12.24	n = 9 IF = 18.36	---- IF = 0	n = 6 IF = 12.24	n = 3 IF = 6.12
Dermal way	n = 1 IF = 2.04	n = 2 IF = 4.08	n = 1 IF = 2.04	---- IF = 0	n = 1 IF = 2.04	n = 3 IF = 6.12	---- IF = 0	---- IF = 0
Rectal way	---- IF = 0	---- IF = 0	---- IF = 0	---- IF = 0	---- IF = 0	---- IF = 0	---- IF = 0	---- IF = 0
Nasal way	---- IF = 0	---- IF = 0	---- IF = 0	---- IF = 0	n = 1 IF = 2.04	---- IF = 0	n = 1 IF = 2.04	---- IF = 0

*Mb* : *Momordica balsamina* ; *LS* : *Lagenaria siceraria* ; *CL* : *Citrullus lanatus* ; *Cucumis melo* ; *CC* : *Citrullus colocynthis* ; *CMe* : *Cucumis metuliferus* ; *CP* : *Cucumis prophetarum* ; *Cpepo* : *Cucurbita pepo* ; **Fidelity index (IF%)** =

$$FL (\%) = \frac{I_P}{I_U} \times 100$$

## CONCLUSION

At the end of our study, it was found that this population surveyed has knowledge of the pharmacopoeia of cucurbits. A total of 8 species (*Citrullus lanatus*, *Cucumis melo*, *itrullus colocynthus*, *Cucumis metuliferus*, *Cucumis prophetarum*, *Cucurbita pepo*, *Lagenaria siceraria*, *Momordica balsamina*) are listed, used, in various pharmaceutical forms (maceration, powder, decoction), in the treatment of several diseases. The use of these plants is cultural and the supply is in the bush. The oral route is the most used and the same species treats several pathologies. Thus, the species *Citrullus lanatus*, *Citrullus colocynthus* and *Cucumis prophetarum* are respectively more used in the treatment of anemia (IF = 24.48%), infections (IF = 14.14%) and digestive diseases (IF = 6.12%). These results make it possible not only to expand the repertoire of medicinal plants in Niger, but also to show the need to sensitize this population on the problems related to the toxic effects of plants. It would be interesting to carry out an ethnobotanical survey with probabilistic sampling to make inferences about the population of Niger.

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