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Research Article

TRADITIONAL TECHNIQUES OF FRUIT DEAMERIZATION OF A WELDING *FOOD WORK* (*BOSCIA SENGALENSIS*) IN TWO DEPARTMENTS IN NIGER

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ABSTRACT

Spontaneous plants contribute greatly to food and nutrition security of the population in Niger, especially during the lean season. This study aims to identify local best practices / technologies for processing immature seeds of *Bosciasenegalensis* (anza in local language). Thus, a questionnaire was sent to 128 women in Bambèye and 114 in Banibangou. 16 methods, including 8 in Banibangou and 8 in Bambèye are listed. The different methods are implemented by women, the quantities of seeds, water, inputs are measured and a tasting session is organized in each commune with 32 people, to see the pre-treated seeds that respond better, to the specifications of the consumers. The results show that many methods consume water, time and energy, often up to three days of work. With the taste test, based on the organoleptic characteristics, the seeds from the washing method with water ashes, was best appreciated in both municipalities.
This unpublished study, of valorization of the local knowledge reported different methods of treatment of the seeds to make them edible. Beyond the ideas, according to which, it is necessary to make several days of désamérisation, the study has just highlighted that, the seeds can be consumed after a half-day of treatment.

INTRODUCTION

In Niger, despite the social mobilization around agricultural activity, it rarely meets the food needs of the population. Food insecurity is an almost permanent feature and the exodus is an alternative to many of the area bodied (Famines of 1973, 1984, 2001, 2005, 2010 and 2012) (Alpha Gado, 1989, Anonymous, 2017). Those who do not migrate include women and children who exploit natural resources (firewood and service, straw, leaves and fruit for food) to earn income or food. Natural resources contribute significantly to the food and nutrition security of communities.

Bosciasenegalensis is a shrub of the family Caparaceae (capparidaceae) widely distributed in Africa (Arbonnier, 2000). In Niger, it is found practically throughout the country (Saadou, 1996). *Bosciasenegalensis* find many uses, both in food and pharmacopoeia (Kari *et al*., 2004; Khadra, 2006; Ermias *et al*., 2008; Doka and Yagi, 2009; Ould Mohamed, 2009; Victoria and Musa *et al*., 2011; Mirutse and Tilahun, 2013; Adam *et al*, 2017).

Women are pioneers in seed processing for food uses. Indeed, Boscia seeds are extremely bitter and women have developed several technologies to remove bitterness. For this study, the choice is focused on two communes of Niger, Banibangou and Bambèye, where Boscia is widely distributed and used in food. Our goal is to i dentifier, best practices / local processing technologies immatures seeds. The strategy of the study is to make the plant better known, its different uses and the best techniques for exploiting and valorizing its products and by-products, impacts are expected on the improvement of the living conditions of the plants. households.

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This study, the first of its kind that combines local know-how and measurements of parameters throughout the process will allow the transfer of the best technologies. In addition, this food, which is used mainly during periods of food crises, is an accompanying food that can be used at any time. It would therefore be a significant source of income for rural communities, as experience has shown that urban populations consume these types of products well. Also such a food exploitation and regenerative income will add value to the species, which will encourage the reflexes of its conservation and its maintenance in the systems of land use.

MATERIALS AND METHODS

Presentation of the study area

The study was conducted in two common s, Banibangou (Tillaberi) and Bamboo è ye (Tahoua region) (Figure 1).

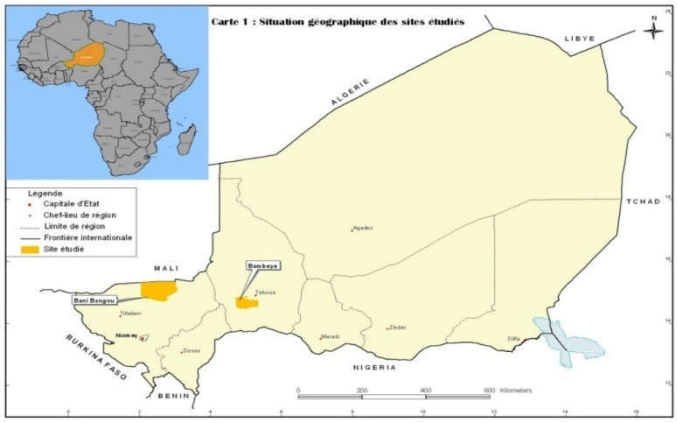

Figure 1 Location of the two communes Banibangou (Tillabéri region) and Bamb è ye (Tahoua region)

Plant material

It consists of immature seeds of *Bosciasenegalensis* purchased on the local market, as well as all inputs which come from the year s different treatment methods.

METHOD

After the selection of villages, a survey has to make an inventory of traditional practices pretreatments immature seeds. A questionnaire on the different seed treatment methods of *Bosciasenegalensis* was administered to 128 women in Bambèye and 114 in Banibangou for convenience. Then, women are chosen to carry out the identified pretreatments. The interviewers are in place for monitoring women pilots to Banibangou to Bambèye. Finally, a tasting test is organized in the two municipalities with 32 people in each municipality.

Statistical analysis

The results obtained are processed with the SPSS software, version 20.

RESULTS AND COMMENTS

The different methods of treating *Bosciasenseeds* in both communes are reported in Table I.

Table I Methods for treating *Bosciasenegalensis* seeds in Bambèye and Banibangou

BAMBEYE	Banibangou
I. Soaking for 2 nights	I. Soaking for one night
II. Soaking with curd + water change	II. Direct cooking + water change
III. Soakingwith water overnight	III. Method of soaking with hot water
IV. Water washing of wood ash	IV. Washing with water of ashes
V. Soaking for 1 night at the pond	V. Soaking for 2 days
VI. kalgo wash (*Piliostigmentreticulatum*)	VII. Method that combines washing plus boiling
VII. Soaking with washing water of millet grains	III. Soaking in the pond
VIII. Wash with simple water	IX. Wash with simple water before cooking

Table II Method I for treatment of *Bosciasenegalensis* seeds in Banibangou

Soaking for one night	
Quantity of raw product = 2 tias[1]	baking
Hulling (crushing with stone then with pestle)	Cooking washed seeds + 4 tias of simple water
Tidying up	Boiling 2 : 4 tias of simple water
Sorting (to remove teguments, pebbles, stems, broken and moldy seeds)	Boiling 3 : 4 tias of simple water
Quantity obtained = ½ Tia	Boiling 4 : 4 tias of simple water
Soaking one night	Boiling 5 : 4 tias of simple water + natron
Wash with 4 s each 1Tia [2] Cold water then kneading	Filtration
	Soaking
	Remove treated seeds from water

Both methods use water washes. Unlike the 1st method of soaking for a night, the 2nd aligns baking and change of water directly on the fire and takes place in one day

Table III Method II for treating *Bosciasenegalensis* seeds in Banibangou

Direct cooking + water change	
Quantity of raw product = 2 Tias	baking
Hulling (pestle crushing)	Cooking seeds + 3 tias of simple water
Tidying up	4 boiling with each 3 tias and ½ tia of simple water and the last
Sorting on a mat (to remove teguments, pebbles, stems, broken and moldy seeds)	More natron (for 25 F CFA)
Quantityobtained = ½ Tia + one hand	Duration = 5 hours
	With each change of water it is necessary to filter
	Filtration
	Soaking
	Remove treated seeds from water

Table IV Method III treatment of *Bosciasenegalensis* seeds in Banibangou

Method of soaking with hot water	
Quantity of raw product = 2 Tias	T rush 1 (3 Tias hot water)Then the anza that is cooking directly on the fire more
Hulling (pestle crushing)	Water change
Tidying up	baking
Sorting (to remove teguments, pebbles, stems, broken and moldy seeds)	Cooking washed seeds + 2 tias of simple water
Quantity obtained = ½ Tia	Boiling 2 : 4 tias of simple water
Soaking one night	Boiling 3 : 4 tias of simple water + natron
	Filtration
	Soaking
	Remove treated seeds from water

Like the previous method, the seeds of anza are soaked inhotwater (method III).In the 4th method, the seeds are first treated with ashes water and then boiled with water change.

Table V Method IV treatment of *Bosciasenegalensis* seeds in Banibangou

Washing with water of ashes	baking
Quantity of raw product = 2 Tias	
Hulling (pestle crushing)	Cooking washed seeds + 4 liters of simple water
Tidying up	Boiling 2 : 8 liters of simple water
Sorting (to remove teguments, pebbles, stems, broken and moldy seeds)	Boiling 3 : 8 liters of simple water
Quantity obtained = ½ Tia + one hand	Boiling 4 : 8 liters of simple water
4 Washes including one with 2 Tias of water + ashes then mixing and 3 others 2 Tias of cold water then mixing	Boiling 5 : 1 tia of simple water + natron
Wash time: 30 min	Filtration
	Soaking
	Remove treated seeds from water

Table VI Method V Treatment of *Bosciasenegalensis* Seeds in Banibangou

Soaking for 2 days	
Quantity of raw product = 2 Tias	2 Wash s with 2 Tias cold water and mix .
Hulling (pestle crushing)	
Tidying up	baking
Sorting on a mat (to remove teguments, pebbles, stems, broken and moldy seeds)	Cooking washed seeds + 4 tias of simple water
Quantity obtained = ½ Tia	Boiling 2 : 2 tias of simple water
Soaking two (2) nights with each time 2 tias of simple water in a pot.	Boiling 3 : 2 tias of simple water
Day 1 :	Boiling 4 : 1 tias of simple water
5 Washes with 1 Tia cold water then mix	Boiling 5 : 1 tia of simple water + natron
Day 2:	Duration of cooking : 3 hours
	Filtration
	Soaking
	Removetreatedseeds from water

It took 2 days, to make the bitterness leave with method V and half a day for method VI, which combines boiling and water change, but with a slight difference with method II

Table VII Method VI Treatment of *Bosciasenegalensis* Seeds in Banibangou

Method that combines washing plus boiling	baking
	Cooking seeds + 10 liters of simple water
Quantity of raw product = 2 Tias	Boiling 2 : 10 liters of simple water
Hulling (pestle crushing)	5 Washes each with 5 liters of cold water and mix
Tidying up	Cooking pot + 10 liters of simple water
Sorting on a mat (to remove teguments, pebbles, stems, broken and moldy seeds)	Boiling 3 : 10 liters of simple water
Quantityobtained = ½ Tia	Boiling 4 : 1 tia of simple water + natron
	Filtration
	Soaking (1 tia of water)
	Remove treated seeds from water

Table VIII Method VII Treatment of *Bosciasenegalensis* Seeds in Banibangou

Soaking in the pond:	baking
Quantity of raw product = 2 Tias	Cooking washed seeds + 2 tias of simple water
Hulling (pestle crushing)	Boiling 2 : 2 tias of simple water
Tidying up	Boiling 3 : 2 tias of simple water
Sorting on a plate (to remove teguments, pebbles, stems, broken and moldy seeds)	Boiling 4 : 1 tias of simple water + natron
Quantity obtained = ½ Tia	Filtration
Soaking a day and a night the shelled seeds are put into the bag and then immersed in the pond.	Soaking
	Remove treated seeds from water
Washing 1 (with the water of the pond then mixing)	
Washing 2 (2 Tias cold water then mixing)	

For method VII, the seeds are put in a bag and immersed in a pond. The current of water of the pond will allow to désaméliser, the seeds. Method VIII combines several washes with water before and during cooking

Table IX Method VIII for treating *Bosciasenegalensis* seeds in Banibangou

Wash with simple water before cooking	baking
Quantity of raw product = 2 Tias	Cooking washed seeds + 2 tias of simple water
Hulling (crushing with stone then with pestle)	Boiling 2 : 4 tias of simple water
Tidying up	Boiling 3 : 4 tias of simple water
Sorting on a mat (to remove teguments, pebbles, stems, broken and moldy seeds)	Boiling 4 : 4 tias of simple water
Quantity obtained = ½ Tia	Boiling 5 : 1/2 tia of simple water + natron
3 Wash each with 7 liters of cold water and mix	Filtration
	Soaking
	Remove treated seeds from water



Photo 1 Cooking steps seeds *Bosciasenegalensis* pre-processed

Tasting Test Inbanibangou


Photo 2 tasting session of the seeds coming from the different treatments of the fruits of *Bosciasenegalensis*

Table X Results of the tasting in Banibangou

Characteristics	**1 st**	**2**	**3**
Taste	IV	VIII	III
Consistency	IV	VIII	III
Color	IV	VIII and III	III

With the organoleptic characteristics, the seeds resulting from method IV are the best. It is the washing with water of the ashes then cooking one day. In 2nd position the tasters chose method VIII, which uses several washes with simple water followed by cooking in one day. Method III, for one night, comes in 3rd position.

Methodes of Treatment of Anza Recognized In the Area of Bambeye

Board XI Method I for the treatment of *Bosciasenegalensis* seeds in Bambèye.

Soaking for 2 nights	**2 days :**
Quantity of raw product = 3 Tias and 1/2	4 Washes with 1 Tia cold water for mixing
Hulling (pestle crushing)	**Three days :**
Drying (in the sun on a mat)	Washing 1 (1 Tia cold water then mixing)
[1] Winnowing (ventilation in the open air)	baking

Hulling (pestle crushing) Sorting (to remove teguments, pebbles, stems, broken and moldy seeds) Quantity obtained = 1/2 Tias + a handshake Soaking 2 nights **Day[1] :** 6 Wash each with 1 T ia cold water and mix	Cooking washed seeds + 1 and ½ tias of simple water Addition of ½ tianatron filtrate after boiling Washing Washing 1 (1 Tia cold water) Washing 2 (1 Tia + ½ tia cold water) Remove treated seeds from water

For two nights, the seeds are soaked and washed at are gularfrequency. The women proceed to the water change. With Method II, the seeds are treated for 3 days, with the addition of curdled milk in hot water

Board IXI Method II of treatment of *Bosciasenegalensis* seeds at Bambèye.

Soaking with curd + water change	
[1] Triage (to remove debris) Quantity of raw product = 3 Tias and 1/2 [1] Peeling (crushing the stone) 2nd dehulling (crushing with pestle) [1] Winnowing (ventilation in the open air) 2nd Sorting on a mat (to remove teguments, pebbles, stems, broken and moldy seeds) Quantity obtained = ½ Tia + ½ tiarase **Day[1] :** **Soaking** (2 Tia cold water) **2 days :** 2 Wash s with 2 T ia of cold water then mix each Soaking + 1 ladle of curd (1 Tia of cold water) Washing (1 t of cold water then mixing)	**Three days :** Washing 1 (1 Tia cold water then mixing) Washing 1 (1 Tia cold water then mixing) baking Cooking washed seeds + 1 tia of simple water Addition of natron filtrate 1Tia after boiling Washing Wash 1 (1 Tia cold water) Removetreatedseedsfrom water

Board IXII Method III of treatment of *Bosciasenegalensis* seeds in Bambèye.

Method of soaking with water overnight	
Quantity of raw product = 3 Tias and ½ Dehulling (stone crushing 45 minutes) [1] Winnowing (Ventilation in the open air for removing debris) 2nd shelling (at the stone) Sorting (to remove teguments, pebbles, stems, broken and moldy seeds) Quantity obtained = 1 Tia Drying in the sun (to obtain completely dry seeds ready for soaking) **Day[1] :** **Soaking** (2 Tia of cold water) for 4 hours. **Day[1] :** 6 Washing s each with 2 Tia s of cold water and kneading	**2 days :** Washing 1 (1/3 Tia cold water then mixing) Washing 2 (1 Tia cold water then mixing) Soaking (3/4 tia for 6 hours) Washing (3/4 tia cold water) **Three days :** Washing (3/4 tia of water foide) baking Cooking washed seeds + 1 tia of simple water Addition of natron filtrate after boiling Washing Washing 1 (1/2 Tia of cold water) Soaking (1/2 tia of cold water) Remove treated seeds from water

For methods III and IV, several successive washes are used to remove the bitterness for 3 days and with the use of ashes for method IV.

Board XIV Method IV of *Bosciasenegalensis* seed treatment in Bambèye

Water washing of wood ash	
Quantity of raw product = 3 Tias and ½ Drying in the sun (during 2h) Hulling (mortar crushing) Vanning (Ventilation) Sorting (to remove teguments, pebbles, stems, broken and moldy seeds) Quantity obtained = ½ Tia + ¼ **Day[1]:** Wash 1 (2 Tia cold water then mix) Soaking (2 Tias of water of ashes) **2 days:** 8 Washes each with 2 Tias of cold water then mix	**Three days :** Washing 1 (1 Tia cold water then mixing) baking Cooking washed seeds + 1 tia of simple water Addition of the ash filtrate from millet stems (3/4 tia) after boiling Boiling Washing Wash 1 (1 Tia cold water) Removetreatedseedsfrom water

Table XV Method V for the treatment of *Bosciasenegalensis* seeds in Bambèye.

Soaking for 1 night at the pond	**Three days :**
Quantity of raw product = 3 Tias and 1/2 Hulling (pestle crushing) Tidying up Sorting on a mat (to remove teguments, pebbles, stems, broken and moldy seeds) Quantity obtained = ½ Tia + a handshake **Day[1] :** Soaking one (1) night at the pond in a bag (the seeds are put in a bag, the bag is attached to a tree branch) **2 days :** Washing 1 (1 Tia cold water then mixing) Washing 2 (1 Tia cold water then mixing) Soaking (1 Tia of cold water then mixing)	Washing 1 (1 Tia cold water then mixing) Washing 2 (1 Tia cold water then mixing) baking Cooking washed seeds + 1 tia of simple water Addition of the filtrate from the ashes of millet stems (1/2 tia) after boiling Boiling Washing Wash 1 (1 Tia cold water) Soaking (1 tia cold water) Remove treated seeds from water

Both methods are observed for 3 days with soaking with ashes for method IV. For 3 days V and VI methods the 1 st observed a soaking overnight in the pond and 2 used the branches Kalgo *(Piliostigmentreticulatum)* for two days.

Board XVI Method VI treatment of *Bosciasenegalensis* seeds in B ambèye.

Kalgo washing method (*Piliostigmentreticulatum*)	**2 days :**
Quantity of raw product = 3 Tias and 1/2 [1] Peeling (crushing the stone) Valve (Ventilation in the open air) 2nd drying in the sun 2nd dehulling (pestle crushing) Sorting on a mat (to remove teguments, pebbles, stems, broken and moldy seeds) Quantity obtained = 1 Tia + ¼ **Day[1] :** 5 l Avage s with 1 Ti cold water and then mixing each	5 Washes each with 2 Tia cold water + Kalgo racks followed by mixing and soaking after 3 washes **Three days :** 5 l Avage s with 1 Tia cold water and then mixing, whenever baking Cooking washed seeds + 1 tia of simple water Addition of the ash filtrate from millet stems (3/4 tia) after boiling Boiling Washing 3 Washes with 1 Tia of cold water at each step Remove treated seeds from water

Board IXVI. Method VII of treatment of *Bosciasenegalensis* seeds in Bambèye.

Soaking with washing water of millet grains	
Quantity of raw product = 3 Tias and 1/2 [1] Peeling (crushing the stone) Drying Valve (Ventilation in the open air) 2nd dehulling (pestle crushing) Sorting on a mat (to remove teguments, pebbles, stems, broken and moldy seeds) Quantity obtained = 1/2 Tia + a handful **Day[1] :** 5 Washed with 1 T ia cold water then kneaded each Soaking 1 tia of water + ¼ tia of millet grain washing water	**2 days :** 5 l Avage s with 1 Tia of cold water and kneading 1 Washing plus millet wash water **Three days :** 5 Washes with 1 Tia cold water then mix baking Cooking washed seeds + 1 tia of simple water Addition of the filtrate from the ashes of millet stems (1/2 tia) after boiling Boiling Washing 3 lbs s with each 1 Tia of cold water) Removetreatedseedsfrom water

Board IXVII Method VIII for treating *Bosciasenegalensis* seeds in Bambèye

Simple water wash	**Three days :**
Quantity of raw product = 3 Tias and 1/2 Hulling (stone crushing) Drying in the sun (on a bag) Hulling (mortar crushing) Sorting (by hand to remove teguments, pebbles, stems, broken and moldy seeds) Product obtained : ½ tia + ½ tiarase **Day[1] :** 3 l 2 T iaAvage with cold water and then mixing **2 days :** 6 swaddling with 2 Tia cold water then mixing Soaking (1 tia cold water)	Wash 1 (2 Tia cold water then mix) Wash 2 (2Ta cold water then mix) baking Cooking washed seeds + 1 tia of simple water Addition of the filtrate from the ashes of millet stems (1/2 tia) after boiling Boiling Washing 4l Avage s with 1 Tia cold water Remove treated seeds from water

In three days, the seeds undergo several water washes with a trempage overnight at the millet wash water for the method VIII and the ashes of millet stalks, 3 °day during cooking.

Tasting Test in Bambeye

Board XIX Results of tasting at Bambèye

Feature	1 st	2	3
Taste	VIII	IV	III
Consistency	VIII	IV	III
Color	VIII	IV	III

This table shows the following facts: that globally it is the experience VIII, washing with water of wood ash for three days which gives the best results, followed by IV experiments soaking in simple water for one night and in 3rd position, method III, t in the simple water for one night.

DISCUSSION

In this study, women's know-how was followed for the desameralization of *Bosciasenegalensis* seeds. The answers to the questions asked are summarized in the table It also showed the results of the investigation fo r treatment methods in both communes (Bambeye, Banibangou), 16 different m ethods that have been set are implemented by women. Simple water-based methods, with tap water, with washing water of millet, ashes, millet stalks, Kalgo branches (*Piliostigmentreticulatum*), curdled milk, are encountered. The tasting test allowed people to express their opinion on the results of the seed treatment methods. In both towns the seeds from the ash methods are chosen. Treatments of 2 to 3 days are met and consume. As regards, the qua n 53.4% water tity use from 20 to 100 liters; 39.9% from 110 to 200 liters; 4.1% from 210 to 300 liters and 2.7 % from 300 liters to more. Cooking time 7.4% observed 10 h ours; 64.2% 24 h ours and the rest does not rule. These are significant amounts of water that are used mostly in an area where water is a scarce commodity. Duration of treatment is an additional burden for women in rural areas.

To our knowledge, only one study has been found in the literature. It is Kim *et al*., 1997, who worked for five days on seeds from Zinder in Niger to get rid of bitterness.

CONCLUSION

For debitter, seeds *Bosciasenegalensis,* women have developed various strategies. It is a starvation food, but is also sought after in markets and is even donated. One of the factors limiting the consumption of these seeds is the deambitination. D inputs are often added, which have an acid taste (the curd has, Kalgo (*Piliostigmentreticulatum*) or basic (cresres) to accelerate or give a better taste to the treated seeds.

Table IX NCOME s comments and inquiries,

	Banibangou	**Bambèye**
Consumption of anza	The respondents almost unanimously consumed at least twice the Boscia , the majority 76% have consumed it several times. The consumption of ANZA dates back a very long time to 80% of respondents even if they do not remember exactly the year, for others it started from 1999 and until 2001.	The majority of respondents (63%) harvested 1 to 3 times the Anza, about 33% harvested it several times. The harvest of anza for some date of 1956 for others it is recent 2005. But we can see that the surveyed are more likely to harvest during the years 84 and 2004 these years correspond to periods of famine and food crisis in Niger.
Period of consumption of Boscia	Most respondents say that Boscia is consumed in times of famine.	The factors that limit the consumption of ANZA are mainly the scarcity of the product for 40% of the respondents, for another 30% this is related to the difficulties of the ANZA treatment, and for others still the abundance of the crops or the absence of starvation limits the consumption of anza because it has been found that ANZA is consumed only in times of food crises;
Provenance of Boscia	88.3% of the respondents say they have collected the ANZA, some 52.6% have bought it and some 62.3% claim to have received it as a donation.	More than 47% of respondents acknowledge having bought ANZA in the markets of their villages or markets in the surrounding villages. Purchase prices range from 150 to 400 F per cup ; Only 25% claim to have received a donation from ANZA between 1974 and 2005 and the amount received varies from one to 20 cups ;
Criteria for the evaluation of cooked Boscia seeds	The opinions are very divided as regards the criteria of appreciation of the well prepared anza, but by grouping the answers it appears that the main criteria are : The taste, well prepared anza loses its bitter taste and is edible like beans • The smell anza that is not well prepared for a bad smell • the consistency of the seeds, that is to say their shape, the more the seeds are firm and consistent the better they resist the different treatments and promote the good preparation ; • color also plays a big role for some of the best seeds are greenish and for others they are reddish or yellowish when they are well treated and well prepared. Regarding the harvest period of many respondents 39% believe that the best period is the milky phase 61% are of opposite opinion, The good treatment of ANZA is to wash the seeds several times, some think it should be washed 7 times but others believe it should be washed 10 to 20 times. The majority of respondents believe the bad treatment of anza is not washing at all or washing it once. To have a good taste the anza must be washed several for some.	

However it should be noted that many s method consume water, time and energy. It is therefore necessary to deepen these methods in the laboratory to make the economy of women on these parameters and to increase the contribution of Boscia to the food security of the populations.

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