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Revalorization Of Prosopanche Americana (Hydnoraceae), Used In Argentine Original Communities

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Abstract – The present work included the study of *Prosopanche americana* (Hydnoraceae), a medicinal plant native to the province of San Luis. According to the World Health Organization, many populations in the world still use the plants for food and health problems. Prosopanche americana is popularly known as "guaycurú", "mil hombres", "flor de tierra", "flor de hierro","huachar". It is a parasitic, subway perennial plant that lacks leaves, which only emerges whenit blooms in summer season, develops a subway root system and is found in dry or dune areas.*Prosopanche americana* was used in folk medicine and as edible fruit.

The objective of this study was determined the preliminary characterization of *Prosopanche americana* (Hydnoraceae), performing the proximal analysis and potential toxicity to validatethe popular use as food. Its characterization has not been published to date. Using the AOAC methods, the composition was: moisture: 73.2 ± 0.04%; protein: 7,81 ± 0.05; fat: 2.50 ± 0.06;
fiber: 10,00 ± 0.13; ash: 0.77 ± 0.05; carbohydrates: 5,72. ± 0.19; moisture: 15.2 ± 0.04%;
protein: 4.76,00 ± 0.05; fat: 2.90 ± 0.06; fiber: 27,00 ± 0.13; ash: 0.97 ± 0.05; carbohydrates: 40.17±0.98; energy: 78.54± 0.34 calories for fruits and rhizome respectively.

***Prosopanche americana* toxicity was carried out by of acute toxicity test (OECD guidelines 423). Prosopanche americana aqueous extract was administered orally and the tested doses did not produce visible symptoms or mortality of acute toxicity in the two rodent species used.*Prosopanche americana* was not classified, since there was no evidence of toxicity at doses higher than 2000 mg/kg, as well as no toxicity at a dose of 5000 mg/kg.**

Besides, the importance of study new vegetal source, this underutilized native plant analyzed indicate that have a good nutritional value and non-toxic properties that suggest they can be animportant alternative for Argentinian food and nutraceutical industry. Preserving and revaluingtheir consumption in either the traditional way and also as potential new ingredients.

Keywords – *Prosopanche Americana*, Native Fruits, Proximal Analysis, Acute Toxicity.

I. INTRODUCTION

Edible native plants are a local, regional and global food source, due to the presence of micronutrients, complementing food based on agricultural production, contributing to regionaland global malnutrition problems (1).

The consumption of native plants, although it is inherent to most civilizations, has been maintained with different intensity in different cultures. The quantity and quality of traditionalknowledge varies between the various areas of study and is closely related to the traditions, environment and cultural heritage of each country. Thus, native plants play an important role in the lives of indigenous peoples around the world (2), and have been particularly important in times of famine or conflict when normal food supply mechanisms are disrupted. and local or displaced populations have seen limited access to other types of food (3). However, under normal conditions, autochthonous plants have played an important role in supplementing staplefoods to provide a balanced diet in many populations, as they may do again in the future (4, 5).Native plants appeared to represent important components of the diet of many aboriginal groups; that is, these resources likely functioned as dietary supplements and sustenance buffersin periods of seasonal scarcity.

Around 12,000 edible native plants are known and it has even been proposed that approximately between 10-30% of the plant

species on the planet (280,000 are vascular plants)have edible parts or parts that are assumed to be able to be eaten, be palatable and edible (3). This could contribute to human nutrition. The use of wild plants is one of the many aspects thatshape the traditional ecological knowledge that characterizes each local, indigenous and/or peasant community, and reflects the particular way in which each society interacts with its environment (6). Therefore, the study of its different cultural and social dimensions over time,its visibility and its valorization are of fundamental importance for the maintenance ofbiocultural diversity in the world (7).

In Argentina, Huarpe, Calchaquí, Ranquel and Tehuelche communities, use of autochthonousedible plants with many traditional uses still preserved today. They used various species such as: carob tree (*Prosopis flexuosa* DC), molle (*Schinus johnstonii* Barkley) and chañar (*Geoffroea decorticans* (Gillies ex Hook. & Arn.) Burkart), flower of the earth (*Prosopanche bonacinae* Speg) to prepare drinks and food (8) among others. Several authors have pointed out the great cultural and nutritional importance of these plants (9; 10).

In America the Prosopanche species is found in Paraguay, Peru and Argentina. In Argentina habits several provinces (Buenos Aires, Catamarca, Córdoba, La Pampa, La Rioja, Mendoza, Salta, Santiago del Estero, San Juan, San Luis and Tucumán) (11).

In San Luis is localized in the biogeographical area called monte espinal, aborigin local community used *Prosopanche americana* in many ways. This native people consumed the fruit(raw fully ripe or fried) and rhizomes for medicinal purpose (wash sores or ulcers, as an expectorant, antiasthmatic, diuretic, antidiabetic) these authors considering the entire plant formedicinal, edible, and dyeing purposes. (12, 13, 14, 15, 16, 10 17, 18, 19, 20, 21, 22, 23, 24) refers to *Prosopanche americana* that is used in preparations such as cool drinks (decoction ofthe roots to purify the blood, for the kidneys).

Prosopanche americana is known by the following popular names: “guaycurú”, “mil hombres”, “flor de tierra”, “flor de hierro”, “huachar, used in popular medicine and as edible fruit (26; 27; 15). This fruit is collected ripe and remains on the ground where it can be used for consumption. The ripe fruit has a banana aroma, it is eaten raw or cooked (10, 13,16). Theplant morphology of *Prosopanche americana* is as follows: flower, body and rhizome (Figure2). (23, 27, 28).

Prosopanche americana is a perennial plant. The rhizome has a fleshy, reddish, very viscous resinous content that dries quickly in the air, vitrifying and becoming brittle. The content is soluble in water, staining deep red. It contains resins, waxes and catechic tannins and does nothave alkaloids or heterosides (28). According to Cocucci, 1965(13) the flowers are large, 24- 40 cm tall, but depending on the depth of the rhizome, the length of the pedicels can vary. It has solitary inflorescence. The flower is born anywhere from the rhizome on the edges of the upper face, it is sessile or pedunculated, this character depending on the depth at which the rhizomatous that originates it is found.

Exist an important nutritional interest of edible native fruits, in the general chemical composition of the fruits, it is worth noting the high-water content and the fat content is almostnegligible, as well as the fact that they are good sources of vitamins and mineral elements. Theprotein content is low and within the hydrocarbon fraction it is necessary to point out the contribution of dietary fiber. All this makes consumption essential to achieve a healthy and balanced diet. It is extremely important to highlight that at the regional level, native fruits are of great value for the biodiversity of native flora and stand out as a resource with potential for technological and economic exploitation, contributing to sustainable forest management, making a rational use of an underutilized resource. It is necessary to recover the knowledge ofbiodiversity, revaluing native plants, nutrition and culture, preserving traditional consumption and also as potential new ingredients, promoting food uses, allowing their inclusion in the FoodComposition Tables.

In our country the National Administration of Medicines, Food and Medical Technology (ANMAT), a decentralized organization of the National Public Administration, collaborates inthe protection of human health, ensuring the quality of the products of its competition, that is,of medicines, foods, medical products, diagnostic reagents, cosmetics, dietary supplements andproducts for household use, in its provisions, provides the guidelines on the qualification and validation of medicinal specialties (35).

Besides, the Argentine Alimentary Code (AAC) establishes guidelines on the use of herbs as potential foods incorporating new native species vegetables to be used as food at the request ofthe organizations current provincial and national regulations (36).

The selection of the different toxicological tests to be used, species, time and route of exposure,as well as the dose levels to be used in them, will depend on the characteristics of the substanceto be tested, as well as the objectives of its possible use in humans (37).

With respect to acute toxicity tests, they evaluate the biological effects of the administration ofa single dose. The observations must be qualitative and quantitative, depending on its nature, and is a more in-depth evaluation method of the effect of the product on biological activity thanthe LD50 assay. (40, 41).

The objective proposed in this work was to determine the chemical composition and safety of*Prosopanche americana* (Hydnoraceae) be use as food. All this results together will be the basis for preparing a preliminary monograph to include legally the fruit of *Prosopanche americana* to the Argentinian Alimentary code AAC and incorporated this product to the diet.This study also will mean a scientific contribution that supports its traditional consumption ofby San Luis native communities, allowing the conservation and revalorization of the cultural and gastronomic identity of our region.

II. MATERIALS AND METHODS

Plant material

Rhizomes and fruits of *Prosopanche americana* were collected in the San Luis province, JuanMartín Pueyrredón Department, between localities Beazley and Mosmota. The botanicalidentification of specie was made through the application of classical taxonomic methods andcertified by Dr. Luis Del Vitto. The voucher specimen was deposited in the Herbarium of the Universidad Nacional de San Luis, San Luis, Argentina, under the registry No. 560. The vegetal material of *Prosopanche americana* collected were desiccated and mechanically milledto powder and uses in the following analyses.

Proximate chemical composition

Determinations were made using Official AOAC methods for food analysis in triplicate (39).When another method was used, the reference source is indicated.

Total fat

Fat determination was performed by extraction with toluene using the Soxhlet method.

5 g of sample were weighed and placed in a closed filter paper cartridge and inserted into theextraction chamber. The extraction was carried out using at 95 °C petroleum ether as solventfor 6 to 8h. Once the extraction was complete, the solvent was recovered by distillation undervacuum. Finally, the fat content of the sample was determined by weight difference. Total fat percentage determination, equation 1 was used. (Eq. 1) (39)

$$\text{(Eq. 1) \% Crude fat} = ((m2 - m1)/m) \times 100$$

m= sample weight m1=matrix tare weight only m2=weight of flask with fat

Ash determination

The sample was weighed in tared dry porcelain crucibles. It was carbonized with a lighter andplaced in a muffle at 540 °C

for 4 hours. The ash content was obtained by weight difference (39).

$$\text{(Ec 2) \% ash} = ((P - p) \times 100) / M$$

P = crucible mass with ashes in grams. p = Empty crucible mass in grams. M = Mass of thesample in grams.

Moisture

The samples were weighed in previously tared and dried porcelain crucibles. They were heatedin an oven at 105 ºC every 2 hours, taken to a desiccator and weighed in this way until constantweight. Moisture was determined by weight difference (39).

$$\text{(Ec 3) \% Moisture} = (\text{gr. Residue} \times 100)/M$$

Fiber

The fiber determination was carried out by the method based on the acid and alkaline digestionof the sample, obtaining a residue of crude fiber and salts. A subsequent calcination was carried out in a muffle, which allowed the removal of organic matter (39). 2.0 g of fat-free sample wasweighed, placed in a flask and 200 ml of boiling 0.255 N sulfuric acid was added. It was boiledfor 30 minutes, the sample was filtered, washed with boiling distilled water several times (with50 ml portions each time).

The residue retained on the filter was carefully returned to the original container, then 200 mlof boiling 0.313 N sodium hydroxide was placed and boiled for 30 minutes.

Immediately removed from the heating mantle and filtered through a crucible, the residue waswashed with boiling water until the sodium hydroxide was removed. The residue was placed in an oven at 130 ºC for two hours and weighed. Finally, the residue was placed in the muffle for one hour at 500-600 ºC until white ash was obtained and the weight was recorded again. The percentage of fibers was obtained by weight difference. (Ec 4).

(Ec 4) 100 ((A -B) /C) = %

A= weight of the crucible with the dry residue (gr) B= weight of the crucible with the ash (gr)C= weight of the sample (gr).

Total protein

The protein percentage was obtained by the Kjeldahl method, using 5.85 as a conversion factorfrom nitrogen to protein.

The sample was weighed and placed in a Kjeldahl digestion flask. 10 g of Na2SO4 and 1 g ofCuSO4 (catalysts) and 25 ml of concentrated H2SO4 were added. Everything was digested forseveral hours, until the liquid took on a translucent green color. It was allowed to cool and wasneutralized with 35% NaOH. Then it was distilled by bubbling the distillate in 50 ml of 0.1 Nsulfuric acid, previously titrated, with drops of methyl red as indicator. Finally, it was titrated by return with 0.1 N NaOH titrated.

The percentage of total proteins is expressed, taking into account the conversion factor (FC) ofnitrogen to protein nitrogen (Eq5) (39).

(Eq 5) Ng%=(VxN)(SO4H2) x meq Nx100/(Gm)meq N=(P(at)N/1000Protein N%=N% x 5.85

Carbohydrates

The carbohydrate content was determined by difference the values obtained (in g/100 g) ofmoisture, ash, protein, total fat, by the following equation: (Ec 6) (39).

(Ec 6) Ct=100%- (moisture + proteins + fats + fiber)

Total caloric value

The energy value will be based on its proximal composition (percentage of proteins, fats and carbohydrates) using the Atwater factors (Proteins: 4 Kcal/g – Fats: 9 Kcal/g – Carbohydrates:4 Kcal/g).

Animals

Adult albino Wistar rats (150–220 g) and mice (20–25 g) were used. They were housed in standard environmental conditions and fed with rodent diet and water ad libitum. The animalswere housed at a room temperature of 24 ± 1°C with 12 h light/dark cycle. The animals were randomly assigned to different groups and a period of 4 days was allowed to adapt to each experiment. All experiments were in compliance with the ANMAT animal care guidelines. Experimental protocols were approved by Animal of Laboratory Care and Use Institutional Committe (CICUAL) of Facultad de Química, Bioquímica y Farmacia, Universidad Nacionalde San Luis (35, 43).

Acute toxicity test

The *Prosopanche americana* lyophilized extract (PALE) was studied for acute oral toxicity asper revised OECD guidelines (42). Thirty albino mice (20 - 25 g) of both sexes were randomlydivided into five groups of six animals each. The mice were fed on mice pellets and water ad libitum. The animals were starved for 4 h prior to testing. The PALE was re-dissolved in distilled water and administered intragastrically (5, 50, 300 and 2000 mg/kg). The fifth group,served as control, was treated only the vehicle (distilled water). The volume of the PALE wereadministered to each animal in the test group was calculated based on the body weight (0.2 ml/mice). Animals were observed daily, for 14 days. These were euthanized due to dislocationcervical (40). The parameters studied were body weight and macroscopic analysis of the vital organs: heart, lungs, liver, spleen and kidneys.

Acute toxicity test in rat procedure was the same as the mouse test. Wistar rats were used of 8weeks of age (150-220 g), fasted for 4 h who received increasing doses (5, 50, 300 and 2000 mg/kg, v.o) of the lyophilized aqueous extract of *Prosopanche*

americana (PALE), which Theywere euthanized with CO2 inhalation.

Sample

A 10% *Prosopanche americana* dry ground rhizomes infusion was prepared (ArgentinePharmacopeia, VI edition). Obtaining a reddish liquid. Finally, it was lyophilized for conservation.

III. Results

Proximate chemical composition

Table 1 presents the results of the component determinations proximal values of the nutritionalcontent of *Prosopanche americana* fruit and rhizome samples.

A proximal analysis study has been carried out on the *Prosonache americana* (name vulgar: “flor de tierra”, “guaycurú”, etc.), widely used in native communities.

The studies carried out on the plant are fundamental in that they guide the research towards a specific type of activity, with the objective of a later identification of the main nutrients.

The analyzes carried out on *Prosopnache americana* demonstrated the existence of several metabolites of nutritional and biological interest, such as: carbohydrates, proteins, fats and fibers.

However, as in the rest of the foods approved and regulated by the official entities, it is expectedin the future to carry out more detailed studies to evaluate the quality nutritional value of it. The studies carried out on *Prosopanche americana* showed that the species has nutritional value.

Acute toxicity test

Acute toxicological study showed that an oral administration of 2000 mg/Kg of PALE did notproduce any sign of acute toxicity in the mice and rat (male and female). The Irwin, 1968 (44)observation test was used to evaluate the effects of PALE on behavior and physiological function. Over the 14 days following the oral administration of PALE, none of the animals diedand no significant changes in daily body weight (Grafico 1 and 2) or organ relative weight (Table 4 and 7), and neither were changes in the spontaneous activity recorded in the actographin mice and rats (data not shown). No gross lesions were noted in any mice and rat on necropsy.There were no signs on symptoms of ataxia, catalepsy, excess curiosity, scratching, restlessness, respiratory distress, urination, diarrhea, convulsions and coma.

IV. Discussion

The identification, rescue and analysis of native plants is a integration process between knowledge holders and researchers. It is essential to prioritize research that maintains the cultural identity of the traditional use and management of plants in ethnic communities and rural areas of the region. In particular, ethnobotanical studies provide information diverse andbroad on the cultural uses of plants as food, medicine, fibers, dyes, firewood, construction, decoration, crafts and toxicity (47). At the same time, it provides research possibilities for newbiological uses, pharmacological, food safety or ecological industry (48).

Edible plants contribute to the food security of the population, and this way the production of foods with high nutritional value is strengthened and encouraged using native plants (49).

Despite the important advances registered in Argentine ethnobotany during the last decades, there is still much to know, in particular, the plants nutritional and medicinal practices of several indigenous and Creole peoples of our country (20).

Numerous authors have highlighted that the conservation of resources plant genetics isessential and the cultural rescue associated with these resources, as well as the improvement ofthe quality of life of people who, despite their high levels of poverty, they selflessly offer us this knowledge. When the resources considered include food plants, these types of studies allow us to contribute also with valuable elements to reverse the global trend towards simplification of the diet that has negative consequences for health, nutritional balance and safety food (50).

Food culture is a reflection of the identity of people and, as such, experiences changes and continuities through time and space. Therefore, the same resource can be selected, processed and consumed in different ways among different societies, which dilutes

the apparent homogeneity implied by their common use (51).

Currently, historical practices of use of biodiversity are resignified in market contexts, in whichwild resources, once anchored in cultural practices of collection, exchange and domestic consumption, they begin to be part of collection, sale and consumption circuits outside the collection territories.

These transformations generate new pressures on resources, for example, over exploitation, butthey also represent opportunities for the local revaluation of the biodiversity and the development of new knowledge and cultural practices around said resources (52).

The importance of finding new foods or expanding the range of them, not It only opens the opportunity to complement the nutrients obtained from foods already known, but also increasesthe possibility of food sovereignty. (53).

Prosopanche is a genus of parasitic plants from Central and South America, which It is little known. It grows almost entirely buried and without leaves. The species of Prosopanche are more similar to fungi than to most plants (54).

Ochoa and Ladio, 2015 (7), reports a native species of the genus Prosopanche (*Prosopanche bonacine* Speg.) as plants with storage organs underground edibles registered for Patagonia, inwhich it is cited as edible. Considering the multiplicity of uses is relevant, along with other variables of use, to understand the cultural importance that these species may have at a local and regional level.

Prosopanche americana is a native food of the Argentine flora and it has not been studied untilnow in terms of its nutritional and biological properties to be used as food and incorporated, not only to normal diet and also in the entities that regulate the implementation of new foods such as the ANMAT (National Administration of Medicines, Foods and Medical Technology)and the AAC (Argentine Food Code) (36).

The chemical composition of *Prosopnache americana*, although it has not been studied with previously and there is no other similar study of the closest relatives, such as the *Prosopanchebocinae* or *Prosopanche costaricensis*, it is possible to compare it nutritionally with other similar foods or those that are from the family of tubers and roots, such as potato (*Solanum tuberosum*) and sweet potato (*Ipomoea batata L*).

The studies carried out on the plant are fundamental in that they guide the research towards a specific type of activity, with the objective of a later identification of the main nutrients.

The analyzes carried out on the fruit of *Prosopanche americana* demonstrated the existence ofcomponents of nutritional interest, such as: carbohydrates, proteins, fats and fibers.

These results will be the basis for preparing a preliminary monograph in the future. to includethe fruit of *Prosopanche americana* to the AAC; also, offer it as a healthy alternative for itsincorporation into the usual diet, which would contribute to revaluing it as a food traditional. Based on the results of the nutritional composition of proteins obtained from fruit of *Prosopanche americana* (7.81 g per 100 g), this has a higher content than S. tuberosum (2.7 gevery 100g) and that I. batata L (1.1 g every 100g), covering 14.87% of the Acceptable DailyRecommendations (RDA), (55). In the rhizome of our material vegetable, the calculated valuewas 4.76 g per 100 g, therefore, it is also greater than *S. tuberosum* and *I. batata L*, covering 9.06% of the RDA.

Lipids in foods are often designated as fats or oils, depending on their physical state, solid or liquid at room temperature, although both terms are frequently interchangeable. A diet withoutexcess fat and with a predominance of fats of plant origin is considered a positive factor in thefight against diseases coronaries; This being one of the reasons why it is recommended to include fruits and vegetables in the diet (56, 57, 58, 59).

According to these mentions, most fruits could use the low-fat and fat-free designation since many do not exceed 3 g per 100 g of food and in some cases, they do not exceed 0.5 g of fat per 100 g.

Regarding the fat content of the fruit (2.5 g per 100 g), it is higher than that observed in S. tuberosum (0.1 g per 100 g) and I. batata L (0.1 g per 100 g). In the rhizome the content was

2.9 g per 100 g, higher than *S. tuberosum* and *I. batata* L. Taking into account that the fat content of fruits that contain small

edible seeds, may be more elevated by lipids that accumulatein the embryo (60).

Lastly, it could justify the higher fat content of the fruit and rhizome detailed in Table 1 (63- chapter XVII, Art 1385) (61).

According to the United Nations United Nations Food and Agriculture Organization (62), it isrecommended consume 5 servings of fruits and vegetables (400 g) per day to meet the recommendation of 20 – 30 g of fiber daily (National Cancer Institute). Based to the fiber results evidenced in (Table 1), the content in the fruit of *Prosopanche americana* was 10 g per100 g, with a higher content than *S. tuberosum* (2.4 g per 100 g) and then *I. batata* L (3 g per 100 g), covering 33% of the RDA. In the rhizome the content of this component was 27 g per 100 g, higher than S. tuberosum and *I. batata* L, covering with 90% of the RDA, what could be estimated, as a food source of fiber food.

Regarding the carbohydrate content of the fruit of *Prosopanche americana* (5.72 g per 100 g),this has a lower content than *S. tuberosum* (19.3 g per 100 g) and *I. batata L* (19.8 g per 100 g), while in the rhizome the value found was 49.17 g per 100 g.

It is observed that the content is higher than *S. tuberosum* and *I. batata L*.

Moisture content is a quality factor in the conservation of some products, since it affects the stability of fruits, vegetables and dehydrated milks; egg in powder, dehydrated potatoes and spices (63). The determination of humidity is used as a quality factor for food products. The moisture content is often specified in identity standards for each product. All value calculationsNutritional requirements require prior knowledge of moisture content. The data about moisturecontent is used to express the results of other determinations analysis on a uniform basis (39).Regarding the moisture content of the fruit of *Prosopnache americana* was estimated at 73.2%, somewhat lower than that of *S. tuberosum* and *I. batata* L. (78% for both). For rhizome content,it was 15.2%, also being lower than *S. tuberosum* and *I. batata* L

The ashes represent the mineral content of the food; in general, the ashes They represent less than 5% of the dry matter of foods (64). The determination the ash content may be important for several reasons; are a part of the analysis proximal for nutritional evaluation, are the first step in preparing a sample of foods for specific elemental analysis, serves to obtain the purity of some ingredients used in the preparation of foods such as: sugar, pectins, starches and gelatin, etc. From the nutritional point of view, the registration of the content of the ashes has little value; However, from an analytical point of view, estimating the value of total inorganicmaterial is useful when it is required to calculate carbohydrates by difference, it gives us information about the nature of the sample, as well as about some adulterations present in the food, and is also useful in quantitative research of some trace elements (65).

Analyzing the ash of the fruit of *Prosopanche americana* (0.77%), it presents greater content than *S. tuberosum* (0.5%) and lower than *I. batata* L (1.1%). In the rhizome the value found was (0.97%), also higher than *S. tuberosum* and lower than *I. batata* L.

A few preliminary phytochemical studies have been carried out on the *Prosopanche bonacinae*speg. (66), which provided useful data as a first approach to the knowledge of this species founded in the Buenos Aires south dunes coastal areas and has important agronomic advantagesrelated to the implementation of culture, which improves the rational use of natural resources in Argentina as a means of regional and national development. It has been reported that some plants contain not only secondary metabolites toxic but are also contaminated with air pollutants, especially heavy metals, which could cause serious health problems. Therefore, it is necessary evaluate the safety of plant extracts for human consumption before considering itspossible use.

One of the effective ways to achieve this is by performing acute oral toxicity tests in vivo Acutetoxicity is characterized by unfavorable effects that occur immediately or within a specified period of time after administration of a single or multiple doses of a substance. Any effect thatcauses alterations in the organs and/or biochemical injuries, which in turn disrupt the functioning of the body in general or individual organs, is called unwanted (or adverse) effect.This test of Acute toxicity is the first step in determining the effects of vegetal extracts on investigation within 14 days after administration of a single dose or multiple (67). Acute toxicity is a basic study and is performed for classification and information initial informationon the toxic mode of action of a substance (68).

In this study, acute toxicity tests of *Prosopanche americana* were carried out at through an in vivo experimental model and the objective of this test was to determine the toxic potential of this vegetal material after administration to a single dose of *Prosopanche americana* infusion Observation effects were carried out over a period of 14 days and includes the analysis of survival, weight changes and spontaneous mobility.

The acute toxicity model chosen in rodents (mouse and rat) has the advantage use a smaller number of animals to classify the material in study and determine those ranges of doses at which the substance should be considered lethal.

The toxic effects of plant extracts on the vital organs of the body are evidenced by clinical signsand symptoms, being one of the indicators of toxicity (69).

In our trials, the toxicological studies carried out with the aqueous extract of *Prosopanche americana* did not demonstrate significant toxicological effects in both mice as in rats at the highest concentration (2000 mg/kg) administered orally in the acute toxicity study. It also did not produce toxicity at higher doses, as observed in the trials with the dose of 5000 mg/kg. Theevaluation carried out shows that a simple oral dose of the infusion in the concentrations of 5,50, 300, 2000 mg/kg did not produce mortality or visible symptoms of toxicity in both mice and rats. No signs or symptoms of concern were observed, depression of breathing, seizures orcoma.

There were no significant differences in the body weight of mice and rats of both sexes (Graph1 and 2) between the treated and control batches during the study. *Prosopanche americana* infusion did not induce changes in spontaneous activity of mice and rats recorded in the actograph (Table 2 and 5).

The liver, kidneys, heart, lungs and spleen are the vital organs of our body and constitute the main metabolic target of any toxic substance (69).

The liver and kidneys are the main organs affected by the reactions metabolic effects of toxicants and are useful for predicting the toxicity effects of products. or phytotherapeutic drugs. The liver is the main target of toxic compounds due to its previous exposure to foreign substances absorbed in the intestine before reaching blood circulation. Although toxins can damage the liver, it detoxifies the toxins (70).

At the time of euthanasia of the animals, the macroscopic appearance of some organs (Table 3and 6). There were no statistically significant differences in the organ weight/body weight ratiobetween the flocks treated with *Prosopanche americana* and the control batch. Tables 4 and 7show the means ± S.E.M. of the relative weight of the organs in percentages, where no significant differences were found between the batches informed.

It is concluded that the aqueous extract of *Prosopanche americana* is not toxic at doses testedand within the exposure period.

In this sense, it is necessary focus efforts on nutritional and toxicological studies that allow consider the species with the highest nutritional value and innocuous.

On the other hand, the edible attributes culturally interpreted by the different societies, dependon various elements of a biological nature, such as the parts of the plant that offer a greater amount of food in relation to others of the same plants (71),its aroma and flavor (72), its nutritional and functional contents, the number of substances that cause indigestion or are toxic,and therefore, the forms with that must be treated post-harvest (washing, cooking, etc.), for ingestion (73; 7).

Is extremely important to highlight that at the regional level, native fruits are of great value forthe biodiversity of native flora and stand out as a resource with potential for technological andeconomic exploitation, contributing to sustainable forest management, making a rational use of an underutilized resource. It is necessary to recover the knowledge of biodiversity, revaluingnative plants, nutrition and culture, preserving traditional consumption and also as potential new ingredients, promoting food uses, allowing their inclusion in the Tables of Food Composition.

All of the above justifies the consumption of the specimen in the native communities. However, as in the rest of the foods approved and regulated by official entities It is expectedin the future to carry out more detailed studies to evaluate the nutritional quality of the same. Continuing along this same line, *Prosopanche americana* has been included among the main Spermatophyte species of economic and social interest in the book “Plants of interest economicin Argentina”, Appendix I. (21).

V. Conclusion

The results obtained from the proximal analysis content provide data to the scarce informationavailable for *Prosopanche americana* as a fruit like a good nutrients source with potential usesin the food industry.

Finally, the infusion of *Prosopanche americana* orally administered in the tested doses did notproduce visible symptoms or

mortality from acute toxicity in the two rodent species used. *Prosopanche americana* was not classified, since it did not There was evidence of toxicity at doses greater than 2000 mg/kg, nor was there evidence toxicity at doses of 5000 mg/kg.

This work completes the existing information about underultized Argentinian regional fruits, allowing their inclusion in food composition tables, as well how to offer them as a dietary alternative for incorporation into the usual diet, contributing to revaluing *Prosopanche americana* fruit.

This study shows that there is still much to be done in depth in the preliminary nutritional characterization and toxicity of this plant, a scientific dimension that can contribute to the valorization of old and new dietary patterns.

Figure 1. Collection area

Figure 2. *Prosopanche americana* fruit

Table 1: Proximate chemical composition of *Prosopanche americana*

	Fruit (%)	**Rhizomes (%)**
Caloric value	76.62 ± 0.34	241.82 ± 1.07
Moisture	73.2 ± 0.04	15.2 ± 0.04
Protein	7.81 ± 0.05	4.76 ± 0.05
Fat	2.50 ± 0.06	2.90 ± 0.06
Carbohydrates	5.72 ± 0.19	49.17 ± 0.98
Fiber	10.00 ± 0.13	27.00 ± 0.13
Ash	0.77 ± 0.05	0.97 ± 0.05

Table 2: Spontaneous activity recorded in actograph of mice (male and female) exposed to different concentrations of the aqueous extract of *Prosopanche americana* (PAEL, v.o).

Groups	**Spontaneous activity recorded in actograph of male and female mice Counts/10 minutes**
Control	144.25 ± 16.25
PALE 5 mg/kg	86.00 ± 28.88
PALE 50 mg/kg	62.25 ± 14.25
PALE 300 mg/kg	133.00 ± 61.94
PALE 2000 mg/kg	71.50 ± 20.04
PALE 5000 mg/kg	52.25 ± 7.51

The results are expressed as the mean ± S.E.M. 6 animals for each lot. ANOVA.

Table 3: Macroscopic appearance of some organs of mice (male and female) exposed to aqueous extract of *Prosopanche americana* (PALE, v.o).

Macroscopy aspect	Vehicle	*Prosopanche americna* treatment
Heart	normal	normal
Liver	normal	normal
Stomach	normal	normal
Intestine	normal	normal
Lung	normal	normal
Kidney	normal	normal
Spleen	normal	normal
Testicle	normal	normal
Ovary	normal	normal

Table 4: Effect of *Prosopanche americana* lyophilized extract (PALE, *p.o.*) on the organs relative weight (%) of males and females mice in the acute toxicity test.

Group	Organs relative weight (%) of males and females mice				
	Heart	**Lung**	**Liver**	**Kidney**	**Spleen**
Vehicle	0.69 ± 0.06	0.84 ± 0.07	6.00 ± 0.50	2.02 ± 0.24	0.59 ± 0.09
PALE 5 mg/kg	0.75 ± 0.10	0.82 ± 0.07	5.65 ± 0.50	1.93 ± 0.18	0.65 ± 0.18
PALE 50 mg/kg	0.60 ± 0.03	0.72 ± 0.01	5.24 ± 0.19	1.80 ± 0.08	0.41 ± 0.03
PALE 300 mg/kg	0.69 ± 0.05	0.73 ± 0.03	5.68 ± 0.40	1.92 ± 0.09	0.39 ± 0.04
PALE 2000 mg/kg	0.60 ± 0.03	0.73 ± 0.02	5.36 ± 0.30	1.79 ± 0.13	0.36 ± 0.02
PALE 5000 mg/kg	0.59 ± 0.05	0.88 ± 0.04	5.79 ± 0.31	1.95 ± 0.13	0.46 ± 0.11

Data are expressed as mean ± S.E.M (ANOVA). Six animals were used in each group.

Table 5 Spontaneous activity recorded in actograph of rats (males and females) exposed to different concentrations of the aqueous extract of *Prosopanche Americana* (PALE, v.o

Batch	Spontaneous activity recorded in male and female rat actograph Counts/10 minutes
Control	51.25 ± 5.17
PALE 5 mg/kg	64.00 ± 23.21
PALE 50 mg/kg	76.50 ± 12.01
PALE 300 mg/kg	75.75 ± 6.26
PALE 2000 mg/kg	57.75 ± 8.92

The results are expressed as the mean ± S.E.M. 6 animals for each lot. ANOVA.

Table 6 Macroscopic appearance of some organs of rats (male and female) exposed to aqueous extract of *Prosopanche americana* (PALE, v.o).

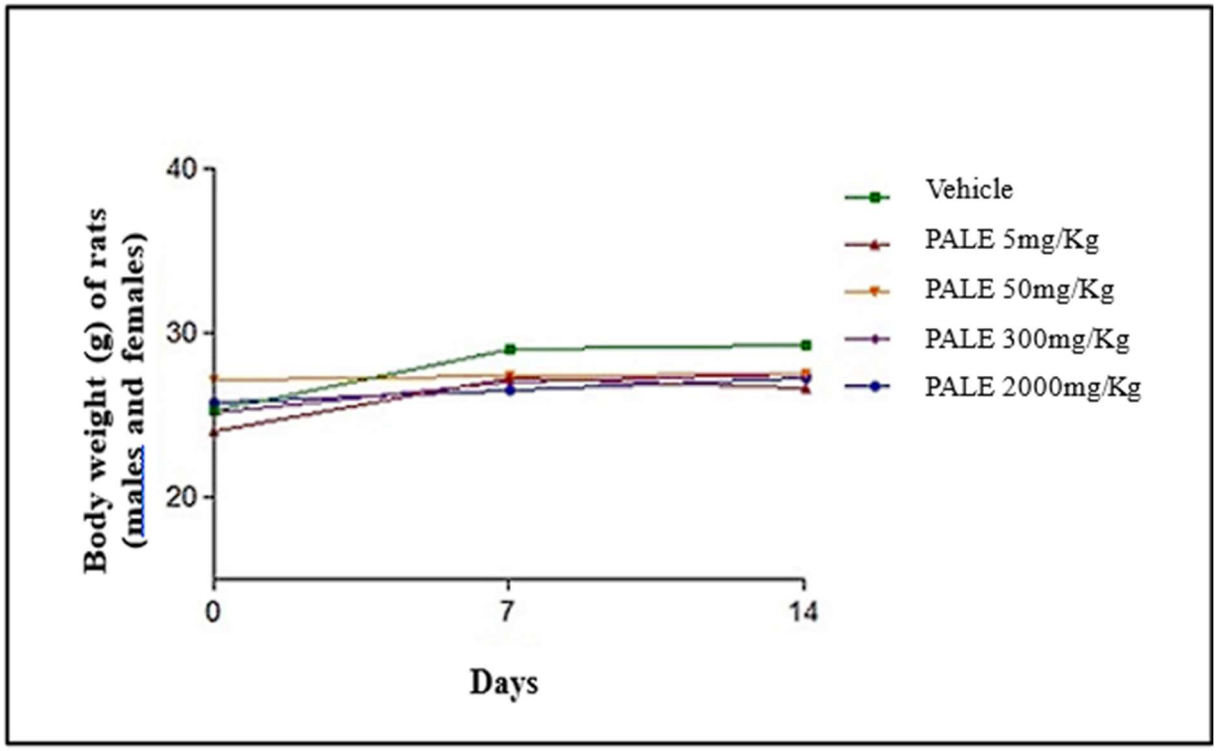
Macroscopy aspect	Vehicle	*Prosopanche americana* treatment
Heart	normal	normal
Liver	normal	normal
Stomach	normal	normal
Intestine	normal	normal
Lung	normal	normal
Kidney	normal	normal
Spleen	normal	normal
Testicle	normal	normal
Ovary	normal	normal

Table 7. Effect of *Prosopanche americana* lyophilized extract (PALE, *p.o.*) on the organs relative weight (%) of males and females rats in the acute toxicity test.

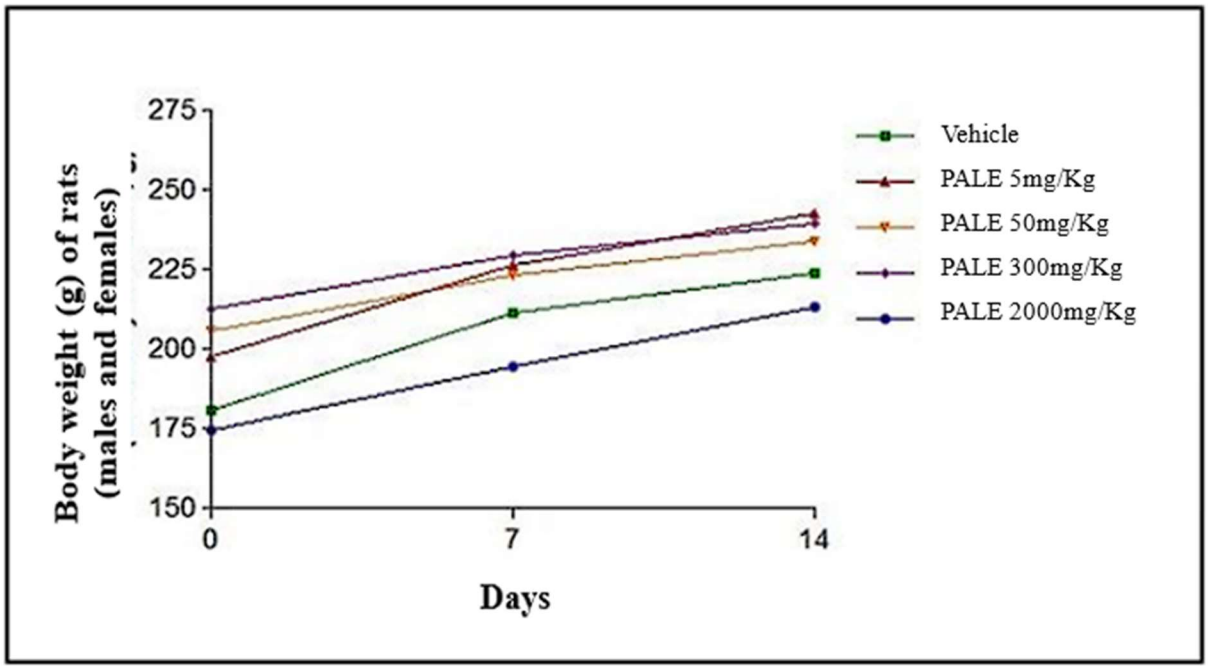
Group	Organs relative weight (%) of males and females rats				
	Heart	**Lung**	**Liver**	**Kidney**	**Spleen**
Vehicle	0.35 ± 0.01	0.48 ± 0.03	4.17 ± 0.12	1.05 ± 0.02	0.17 ± 0.005
PALE 5 mg/kg	0.35 ± 0.01	0.40 ± 0.02	4.38 ± 0.20	1.04 ± 0.02	0.16 ± 0.005
PALE 50 mg/kg	0.34 ± 0.01	0.49 ± 0.02	3.80 ± 0.13	0.97 ± 0.01	0.15 ± 0.007
PALE 300 mg/kg	0.34 ± 0.005	0.58 ± 0.03	4.09 ± 0.09	0.96 ± 0.03	0.17 ± 0.007
PALE 2000 mg/kg	0.37 ± 0.02	0.60 ± 0.02	4.46 ± 0.40	1.19 ± 0.03	0.19 ± 0.008

Data are expressed as mean ± S.E.M (ANOVA). Six animals were used in each group.

Graphic 1. Mean body weight (g) of males and females **mice** in the acute toxicity test treated with *Prosopanche americana* lyophilized extract (PALE, *p.o.*). Data are expressed as mean ± S.E.M (ANOVA). Six animals were used in each group.



Graphic 2 Body weight (g) of rats (males and females) exposed to different concentrations of the aqueous extract of *Prosopanche americana* (PAEL, v.o). The Results are expressed as the mean ± S.E.M. 6 animals for each lot. (ANOVA).



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