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Research Article

Bromatological Composition and Nutritional Assessment for *In Vitro* Digestibility of Peel and Pulp of Mature Mango Fruits (*Mangifera indica* L)

Criscioni P[1]*, Álvarez R[2], Castellani G[1], Valiente OL[1] and Palacios L[1]

[1]*Department of Bromatology, Nutrition and Animal Feeding, University of Veterinary Sciences, U.N.A, Asunción, Paraguay*

[2]*Department of Animal Production, University of Veterinary Sciences, U.N.A, Asunción, Paraguay*

***Corresponding Author**: Criscioni P, Department of Bromatology, Nutrition and Animal Feeding, University of Veterinary Sciences, U.N.A, Asunción, Paraguay.

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Abstract

In order to determine the bromatological composition and the *in vitro* digestibility coefficients from different parts of *Mangifera indica*, L (peel and pulp of ripe fruits) was carried out the present researcher. Mango samples were taken from the San Lorenzo Campus of the National University of Asunción. The samples were dried in a forced air stove at 65°C and subsequently subjected to analysis to determine their chemical composition (AOAC, 2000) and *in vitro* digestibility coefficients of the Dry Matter (IVDDM) and Organic Matter (IVDOM) according to Tilley and Terry (1963).

The results obtained for the chemical composition were: Dry matter 105ºC (MS 105ºC) 87.01% Crude Protein (PB): 3.87%; Ethereal Extract (EE) 1.14%; Acid Detergent Fiber (FAD) 9.12%; Detergent Neutral Fiber (FND) 13.03%; 1.85% ash and Gross Energy (EB) 3,652 Kcal/Kg. The IVDDM and IVDOM were 89.5 and 90.2%, respectively.

Keywords: *Chemical Composition; In Vitro Digestibility; Mangifera indica L*

Introduction

Feeding accounts for more than 60% of total production cost [1]. Searching for feeding alternatives considering the use of locally available resources is an important element to create proper production ways for the tropical environment [2].

In general, mango fruit is rich in carbohydrates and organic acids, which are important energy and flavor providers, with volatile compounds as the factors responsible for the flavor [3].

Knowledge of the digestibility and chemical composition of any food will be necessary to establish its nutritional value and the formulation of rations for animals. In this order, one of the methods to predict its value is the *in vitro* digestibility technique [3].

Mango is a native plant from India, that is grown in all countries with a tropical climate, with high growths and production of many fruits rich in fiber, originally were introduced in Paraguay by grafting.

The lack of information on its potential digestive use in ruminants can be one of the reasons why fruits are not used regularly and in many cases they are wasted, being able to be used regularly in the feeding of the animal [4].

Currently, there is not much information available on the chemical composition and digestibility of this fruit at the local level, so its evaluation is necessary to be able to use it as an alternative in animal feed.

Materials and Methods

For the study, mango fruits from the FCV-Campus UNA were randomly selected at harvest time (November). The seeds were extracted manually and the remaining husks and pulp (to complete 1 kg of the sample) were dried in a forced air oven at 60°C for 48 hours.

The bromatological analyzes were carried out in the Bromatology, Nutrition and Animal Feeding laboratory of the FCV-UNA. For partial dry matter by drying in a forced-air oven at 60°C for 48 hours, then they were milled in a 1 mm sieve diameter. The analysis of total MS, PB and FB were performed using the method of AOAC 2000 [5] and the FND and FAD by Van Soest [6].

Non-fibrous carbohydrates (CNF) were calculated by applying the equation based on individual chemical analyzes according to NRC (2001) CNF = 100- (NDF-ash-CP-EE) [7] and Gross Energy by total burning of samples in adiabatic calorimetric bomb.

For the *in vitro* digestibility (IVD) of the DM and OM, the technique described by Tilley and Terry (1963) was applied [8], a 2-year-old sheep cannulated in rumen was used as ruminal fluid and five repetitions were incubated (n = 5) for 48 hours in ruminal fluid (extracted after 12 hours of fasting) with a Buffer medium corresponding to the first phase and a second phase was digestion in HCL-pepsin for 48 hours, the amounts of MS and MO that disappear after incubations were considered "digested". The digestibility results of MS and MO were statistically processed by calculating average with their standard deviation

Results and Discussion

In table 1, the chemical composition of the peel and pulp of ripe mango fruits is presented, as can be seen, it is a food with high humidity, low crude protein content, the components of the cell wall shed values of 9.12% for ADF and 13% for NDF and energy value of 15290 KJ.

Chemical Composition[1]	Values
TDM	21.47
DM 105ºC	87.01
OM	98.15
CP	3.87
EE	1.14
ADF	9.12
NDF	13.0
Ash	1.85
Gross Energy (Kcal/Kg)	15290 KJ
NFC	40.45

Table 1: *Chemical composition expressed in% of dry matter of the mixture of peel and pulp of ripe fruits of mango (Mangifera indica, L). [1]DTDM= Total Dry Matter; DM= Dry Matter 105ºC; OM= Organic Matter; CP= Crude Protein, EE = Ether Extract; ADF= Acid Detergent Fiber; NDF= Neutral Detergent Fiber; NFC=Non-Fibrous Carbohydrates.*

Silva J de L., *et al.* [9] with mango flour, they found slightly higher values of DM and Crude Protein (91.5% and 5.6% respectively) and three times higher of EE, the differences could be due to the variety of mango used and the harvest time.

Regarding the fibers, the same authors mention NDF values of 28.4% more than double that obtained in this research, the values of ADF, NFC and ash were also higher (15.2; 59; and 3,8% for each) these results would be due to the use of the integral mango including the seed.

Guzmán., *et al.* [10], mention that the chemical composition of mango fruits at the end of harvest time was 25.2; 1.3; 56; 5 and 25.7% for the DM, CP, NDF, and ADF, respectively, these differences may mainly in the values of ADF and NDF could be due to the fact that in this work we do not use the seed that contains the largest amount of these fibers. Regarding the crude protein, Palma [11] also in whole fruits reports a similar value (2.74% of PB). The results presented by both authors demonstrate the influence of the harvest time and the variety in the formation of the compounds Fruit chemicals [12].

Emshaw Y., *et al.* [13] with juice extraction mango waste, including seeds obtained higher protein values, 8.8% and Hincapie G., *et al*. [14] with Mango shells, mention that the content of protein and ethereal extract, despite being low, does not reach 5% in B.S. each one, although these results are superior to those reported by Ajila [15] in her research, which could indicate that the CMH variety contains a higher nutritional value than the peels from other mango varieties.

Items	Average	SD	CV
IVDDM	89.5	2.48	0.028
IVDOM	90.2	2.37	0.026

Table 2: *[1]IVDDM (In vitro Digestibility coefficients of the Dry Matter); IVDOM (In vitro Digestibility coefficients of the Organic Matter)*

The average values of *in vitro* digestibility of dry matter (DIVMS) and organic matter (DIVMO) are presented in table 2.

The percentage of IVDDM was 89.5% and IVDOM of 90.2% high coefficients, also taking into account its chemical composition with a low percentage of FND and ADF.

Silva J de L., *et al.* [9] replacing corn, with whole-grain mango flour at different levels of inclusion in goat feed with a forage/concentrate ratio of 60:40 found no differences in the levels of dry matter intake, However, the intake of NFC and Total digestible nutrients (TDN) decreased linearly around according to increased inclusion of mango flour.

Conclusion

The mixture of peel and pulp of ripe mango fruits (*Mangifera indica L*), presents chemical composition and *in vitro* digestibility values of both DM and OM highest, suggesting good potential for use as food in ruminants suggests testing consumption and productive response in the animal, taking into account the high availability and the important production of this fruit.

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