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Instant noodles enriched with flours moringa (*Moringa Oleifera Lam*.) and ora-pro-nóbis (*Pereskia aculeata Mill*.)

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Abstract

Non-Conventional Food Plants (PANCs) have been gradually studied and can be included in food in their in natura form and in food production, enriching their nutritional value. Due to its easy cultivation, Ora-pro-nóbis (Pereskia aculeata Mill.) can already be observed in Brazilian states from the Northeast to the South, and the use of these leaves is widespread in folk medicine. Given the above, this study aims to review in the literature the main benefits of Ora-pro-nóbis (Pereskia aculeata Mill.) and Moringa (Moringa Oleifera Lam.). The Ora-pro-nóbis (Pereskia aculeata Mill.) given the nutritional advantages of its leaves, there are studies that evaluate the consumption of leaves in the form of flour or in natura in some specific groups, but there is a need for further studies to analyze the intake of Ora-pro-nóbis leaves in risk groups that need the micronutrients present in large quantities in this part of the species. Moringa (Moringa Oleifera Lam.) is a perennial species of the Moringaceae family, native to northeast India, widely distributed in India, Egypt, Philippines, Ceylon, Thailand, Malaysia, Burma, Pakistan, Singapore, Jamaica and Nigeria (Pio Côrrea, 1984; Duke, 1987). It grows in regions from the dry and humid subtropics, to the dry tropical and humid forests. It is drought tolerant, flowering and producing fruit (Duke, 1978). It adapts to a wide range of soils, but grows best in well-drained terra preta or clayey terra preta, preferring neutral to slightly acidic soil (Dalla Rosa, 1993). It is a multipurpose plant. Almost all parts of moringa are said to be of food value (leaves, unripe fruits, flowers and seeds) and medicinal (all parts of the plant) (Palada, 1996; Makkar & Becker, 1997). In Brazil, Moringa oleífera has been known in the State of Maranhão since 1950 (Amaya *et al*., 1992). Currently, the culture of moringa has been spread throughout the northeastern semi-arid region.

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Introduction

The relationship between diet and health is increasingly evident, with increasing scientific knowledge about the benefits of foods or nutrients for the prevention of diseases and malnutrition (Leoro, 2011) [16]. Enriched or fortified products are all foods to which one or more essential nutrients, whether naturally contained or not in the food, have been added, with the aim of reinforcing its nutritional value and/or preventing or correcting a deficiency in one or more nutrients in human nutrition. (Brazil, 1998).

Brazil is a country with a vast biodiversity of plants where rich nutrients and minerals are found. Non-conventional vegetables are a food alternative and an option for agricultural activity, they are plants with excellent nutritional value, easy to grow and

low cost (Rocha *et al*., 2008) [22]. Among them is Ora-pro-nóbis (Pereskia aculeata Mill.), which from Latin means "pray for us". It belongs to the Plantae kingdom, of the Cactacea family and Pereskia genus (Almeida And Corrêa, 2012) [2].

The ora-pro-nóbis (OPN) is a native plant, originating from the tropics, perennial, with thin stems, generally presented in the form of a climber, can reach ten meters in height, with long branches and thorns and its leaves are fleshy with presence of mucilage (Duarte And Hayashi, 2005) [15]. It is interesting and favorable for cultivation, as it is a rustic and easily propagated plant. In Brazil, it is most commonly found in the State of Bahia and Minas Gerais, but technical information about this culture is still lacking and little explored (Tofanelli And Resende, 2011) [25].

Even though it is little studied scientifically, it is known that the protein content of OPN is of good quality, averaging 20% and presenting 85% digestibility and high values of essential amino acids, especially lysine, leucine and valine, thus being able to demonstrate pharmacological application in the treatment and prevention of pathologies related to protein deficiencies (Mazia, 2012; Rocha, *et al*., 2008) [17, 22].

Another important plant that has been studied is Moringa (*Moringa Oleifera Lam*.), MO, a species of the Moringaceae family, is native to Tropical Africa, presents fast growth, reaching up to 10 meters in height, its propagation can be done through from seeds, seedlings or cuttings, its leaves are bipinnate, its flowers are white and fragrant and its fruits are long and trichinate, with an appearance similar to a brown pod (Alves, *et al*., 2005) [5]. In addition to having several therapeutic properties, it is also cultivated due to the high nutritional value of the leaves, green fruits, flowers and roasted seeds, as they contain high quality calcium, iron, proteins, fiber, minerals and essential amino acids. It can be widely used by the pharmaceutical, chemical and food industries (Silva, *et al*., 2012).

Instant noodles are pre-cooked pasta, prepared by adding boiling water for a few minutes. It cooks quickly due to the fact that it is pre-cooked and in its processing it loses water in the frying process (ABIMA, 2012).

Instant noodles are made up of fat, carbohydrates and sodium and there is currently a general concern about the risk of malnutrition. Therefore, the present work aims to enrich instant noodles with nutrients such as OPN and MO in order to address nutrient deficiencies and prevent future pathologies.

Methods

The present work was based on analytical tests of the physical-chemical properties described in the Manual of Physical-Chemical Analysis Methods of the Adolfo Lutz Institute of instant noodles enriched with Moringa (*Moringa Oleifera Lam*.) and Ora-pro-nóbis (Pereskia aculeata) flours Mill.) formulated, from the evidenced methods of bibliographic review, articles and theses found in databases such as SciELO, LILACS, PubMed.

Results and Discussion

Moringa (Moringa Oleifera Lam.). It is the most widespread species of the Moringaceae family, it is native to Tropical Africa, also known as white lily and okra, it grows quickly, reaching up to 10 meters in height, and can be propagated through seeds, seedlings or cuttings., its leaves are bipinnate, its flowers are white and fragrant and its fruits are long and trichinate, with an appearance similar to a brown pod. It is widely distributed in India, Egypt, Philippines, Nigeria, among others, and in Brazil it has excellent adaptation, especially in the Northeast region, as it is resistant to drought, undemanding to the soil and tolerant to pests. (Alves, *et al*., 2005; Borba, 2001) [5, 7].

Nutritional And Therapeutic Value

Moringa has several therapeutic characteristics, including being a cardiac and circulatory stimulant, being antitumor, antipyretic, antiepileptic, antispasmodic, diuretic, hepatoprotective, combating inflammation and high blood pressure (Barreto *et al*., 2009) [10].

In addition to having several therapeutic properties, it is also cultivated due to the high nutritional value of the leaves, green fruits, flowers and roasted seeds, as they contain high quality calcium, iron, proteins, fiber, minerals and essential amino acids (Silva, *et al*., 2012).

Use of the plant

MO can be used in different ways, its parts have great industrial importance. The seeds produce oil used to lubricate watches and delicate machines, in the manufacture of perfumes and also in the chemical treatment of water. Its leaves, as they have a high protein content, can be considered as an alternative supplement in the preparation of nutrient-poor foods (Silva, *et al*., 2012).

The flowers can be used to make a popular dish in Indonesia and East Timor, called makansufa, in which the flowers are fried in coconut oil and immersed in coconut milk, and can be accompanied by rice or corn. The flowers and leaves can also be added to fruit juices, teas, sauces and broths. Its pods are widely used in Haiti in cooked form, like asparagus and bean pods. Even the bark can be used by artisans in the production of baskets, carpets and in tanning leather for shoes and bags.

Currently, some researchers have proven that OM seeds contain proteins with low molecular weight and when dissolved in water they contract a positive charge that attracts negative particles charged with clay and silt, generating dense flakes that settle. This demonstrates that moringa, as it is of natural origin, is also quite advantageous in water treatment, working even better than chemical coagulants (Amagloh, 2009) [4].

Pereskia Aculeata Mil

Brazil is a country with a vast biodiversity of plants where rich nutrients and minerals are found. Among these species is the Ora-pro-nóbis (*Pereskia aculeata Mill*.), also popularly known as gooseberry-of-America, lobrobo, "carne-de-pobre", lemon creeper (Girão, *et al*. 2003; Duarte And Hayashi, 2005) [13, 15]. Ora-pro-nóbis, which means "pray for us" in Latin, belongs to the kingdom Plantae, family Cactacea and genus Pereskia. The popular names of the species are Pereskiaaculeata Miller and PereskiagrandifoliaHaword (Almeida and Corrêa, 2012) [2]. It is a native plant, originating from the tropics, perennial, with thin stems, generally in the form of a vine, can reach ten meters in height, with long branches and thorns and its leaves are fleshy with the presence of mucilage (Duarte and Hayashi, 2005) [15].

The agronomic characteristics of this Cactea are interesting and favorable for cultivation, as it is a rustic and easily propagated plant.

In Brazil, it is most found in the State of Bahia and Minas

Gerais, but technical information about this crop is still lacking and little explored (Tofanelli and Resende, 2011) [25], it is among the non-conventional vegetables, such as taioba, serralha and mustard, which are a food option and alternative for cultural diversification, for consumption by low-income people and family farming (Rocha *et al*., 2008) [22].

Nutritional Value

In addition to not having any toxic ingredients, the leaves of ora-pro-nóbis and other non-conventional vegetables are considered a nutritional supplement due to their high protein, fiber, iron, calcium content, among others. As a result, this plant has aroused the interest of the pharmaceutical and food industry (Rocha, *et al*., 2008; Almeida E Corrêa, 2012) [2, 22]. OPN has a high content of essential amino acids, being above what is necessary for human consumption recommended by the Food and Agriculture Organization (FAO).

Even though it is little studied scientifically, it is known that the protein content of OPN is of good quality, presenting 85% digestibility and high values of essential amino acids, especially lysine, leucine and valine, thus being able to demonstrate pharmacological application in the treatment and prevention of pathologies related to protein deficiencies and in projects against human and especially child malnutrition (Mazia, 2012; Rocha, *et al*., 2008) [17, 22].

In general, a large part of the population still has a low consumption of vegetables. To help use these in the diet, the use of non-conventional vegetables can be incorporated as an excellent alternative (Dias, *et al*., 2005) [12]. To encourage the consumption of these vegetables, new forms of processing have been studied, one of which is flour, which can be consumed fresh or added to different culinary preparations, increasing the nutritional quality of a variety of products (Zanatta, Schlabitz and Ethur, 2010) [27].

Due to its mucilaginous characteristics, OPN can be used in soups, stir-fries, mixed foods, scrambled eggs, omelettes, pies, breads and pasta in general (BRASIL, 2002). It is also an important ingredient in Minas Gerais cuisine, with the most common dish being Chicken with OPN, with the braised or raw leaf commonly served alongside the dishes. In Sabará/MG, the plant is a symbol of the city and there is even a festival named after it (Site Petit Gastrô, 2012).

In 2012, Nóbrega, Barros and Conceição carried out a sensory evaluation of a bakery product made with OPN flour in different proportions, ranging from 0-15%. With this, they were able to conclude that all formulations were considered viable for human consumption and could be used in various preparations. However, the formulation with flour that presented the best score on the hedonic scale was 5%, since the population is not yet in the habit of consuming products with this vegetable.

Instant Noodles

Instant noodles are understood as pre-cooked noodles, prepared by adding boiling water for a few minutes. It cooks quickly due to the fact that it is pre-cooked and in its processing it loses water in the frying process (ABIMA, 2012).

It was developed in Japan, in 1958, by businessman Momofuku Ando, and Chicken Ramen was the first product launched with good consumer acceptance. In less than a year, daily production of instant noodles grew from 300 to 6 thousand servings (Leoro, 2011) [16].

In the market, this product has a high growth rate, being consumed throughout the world, with China being the largest consumer in the world, followed by Indonesia and Japan. Brazilian industries are also interested in this segment due to the fact that it is a cheap product., easy and quick to prepare, being very relevant questions for today's consumers (Vernaza, Gularte And Chang, 2011; Leoro, 2011) [26, 16].

Food Enrichment

Hidden hunger is the marginal deficiency of one or more nutrients, which is harmful to human health and can cause mental, physical or cognitive damage. The increase in the supply of processed foods is directly influencing the eating patterns of the population who are increasingly looking for products that are easy and quick to consume, rich in fat, refined carbohydrates, with high caloric value and that bring instant satiety, but these are “empty” of essential nutrients to the body, thus generating a series of deficiencies that can be perceived in the short or long term (Rodrigues, 2010).

Otherwise, the increase in the development of new products can have a positive impact when related to enrichment with nutrients with better nutritional value and some bioactive compounds (Aquino and Philippi, 2002) [5].

According to ORDINANCE No. 31, OF JANUARY 13, 1998, fortified/enriched food or simply added nutrients is any food to which one or more essential nutrients contained naturally or not in the food are added, with the aim of reinforcing the its nutritional value and/or prevent or correct demonstrated deficiencies in one or more nutrients, in the diet of the population or in specific groups there of.

This fortification is generally related to specific foods that are commonly used by the population. Thus, the consumer will be consuming a product that they have always consumed, but with an added and differentiated value. These simple foods are generally improved with affordable vegetables that are easy to plant and have excellent nutritional value, as is the case with OPN (Rocha, *et al*., 2008) [22].

Table 1

Sample	Moisture	Ashes	Fat	Protein	Fiber	Carbohydrates	Sodium	Calcium
Instant Noodles	1,84	1,02	22,6	8,6	0,33	66,46	44	23,25
MI	1,65	0,95	22,56	8,54	0,26	66,84	40	22,68
	1,68	0,97	22,87	8,62	0,31	66,17	42	22,21
	1,723333	0,98	22,67667	8,586667	0,3	66,49	42	22,71333
MI + Moringa 1%	2,21	1,09	22,3	9,36	0,48	65,04	48	37,5
	2,06	1,1	22	9,21	0,55	65,63	49	37,8
	2,18	0,9	21,98	9,33	0,5	65,61	48	37,7
	2,15	1,03	22,09333	9,3	0,51	65,42667	48,33333	37,66667
	24,75822	5,102041	-2,57239	8,307453	70	-1,59924	15,07937	65,83505
MI + Moringa 2%	2,62	1,2	21,59	9,6	0,91	64,99	52	51,8
	2,77	1,3	21,78	9,41	1,04	64,74	55	52,4

	2,59	1,24	21,54	9,48	0,98	65,15	54	52,3
	2,66	1,246667	21,63667	9,496667	0,976667	64,96	53,66667	52,16667
	54,35203	27,21088	-4,58621	10,59783	225,5556	-2,3011	27,77778	129,6742
MI + Moringa 3%	2,65	1,34	21,5	10,2	1,39	64,31	59	66,15
	2,6	1,39	21,44	10,3	1,33	64,27	60	66,2
	2,69	1,45	21,51	10,04	1,37	64,31	62	66,3
	2,646667	1,393333	21,48333	10,18	1,363333	64,29667	60,33333	66,21667
	53,57834	42,17687	-5,26238	18,5559	354,4444	-3,29874	43,65079	191,5321
MI + Moringa 4%	2,56	1,45	21,28	10,9	1,48	63,81	65	80,5
	2,44	1,56	21,3	10,97	1,41	63,73	65	81,2
	2,61	1,52	21,34	10,88	1,44	63,65	67	80,8
	2,536667	1,51	21,30667	10,91667	1,443333	63,73	65,66667	80,83333
	47,19536	54,08163	-6,04145	27,13509	381,1111	-4,151	56,34921	255,8849
MI + Ora-pro-nobis 1%	2,34	1,44	21	9,22	0,78	66	45	57,1
	2,27	1,45	20,97	9,15	0,75	66,16	46	57,2
	2,3	1,42	21,02	9,31	0,76	65,95	45	57,1
	2,303333	1,436667	20,99667	9,226667	0,763333	66,03667	45,33333	57,13333
	33,65571	46,59864	-7,4085	7,453416	154,4444	-0,68181	7,936508	151,5409
MI + Ora-pro-nobis 2%	2,26	1,78	20,03	9,78	1,54	66,15	48	90,98
	2,34	1,66	20,31	9,66	1,67	66,03	47	90,55
	2,44	1,82	20,15	9,81	1,64	65,78	47	90,95
	2,346667	1,753333	20,16333	9,75	1,616667	65,98667	47,33333	90,82667
	36,17021	78,91156	-11,0833	13,54814	438,8889	-0,75701	12,69841	299,8826
MI + Ora-pro-nobis 3%	2,17	1,85	20	10,45	2,07	65,53	50	124,85
	2,22	1,91	19,86	10,01	2,16	66	50	125,14
	2,3	1,91	19,9	10,23	2,11	65,66	51	124,88
	2,23	1,89	19,92	10,23	2,113333	65,73	50,33333	124,9567
	29,40039	92,85714	-12,1564	19,1382	604,4444	-1,14303	19,84127	450,1468
MI + Ora-pro-nobis 4%	2,54	1,98	19,5	11,2	2,7	64,78	52	158,66
	2,64	1,95	19,4	11,09	2,66	64,92	53	158,47
	2,55	1,97	19,75	11,17	2,72	64,56	52	158,78
	2,576667	1,966667	19,55	11,15333	2,693333	64,75333	52,33333	158,6367
	49,51644	100,6803	-13,788	29,8913	797,7778	-2,61192	24,60317	598,4297

***Source*:** Authors

In comparison with instant noodles, it was found that the addition of OPN and MO flours showed a significant increase in protein, varying from 10% in MI + F-OPN 1% and F-MO 1% up to a 30% increase in MI + F-OPN 4% and F-MO 4%. Regarding dietary fiber content, the addition of MO and OPN flours showed a significant increase in protein, varying from 100% in MI + F-MO 1% to 400% in MI + F-MO 4%. The addition of F-OPN increased from 200% to 800%.

The additions of flour also represented an increase in calcium content, which varied from 50% to 200% in MI + F-MO 1% to 400% in MI + F-MO 4%. The addition of F-OPN increased from 200% to 800%. Carbohydrate contents reduced with the addition of MO and OPN flours, the decrease reached 4% with 1% F-MO. There was a decrease in total fat content, being slight when adding F-MO and up to 14% less fat when adding 4% F-OPN.

Conclusion

The moringa and ora-pro-nóbis flours analyzed had a high protein content, in addition to contributing significantly to improving the nutritional value of pasta enriched with these flours.

The total dietary fiber content obtained in flour and enriched instant noodles means that they can be considered rich in fiber. In relation to minerals, the high calcium content stands out, however, more studies will be needed to analyze its bioavailability.

Thus, it can be concluded that the use of ora-pro-nóbis and moringa flours acting as inputs in the enrichment of industrialized foods is promising since they present quantity and variety of nutrients that highlight their nutritional value and can help in maintaining health.

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