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Parasitological Analysis of Vegetables in Natura Marketedat the Street Markets in a City inside of Bahia

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Abstract**—** *The quality of human health has direct relation to the condition of food. There is great concern about the hygiene situation of foods intended for human consumption, due to the ability to transmit diseases. The general objective of this study was to evaluate the parasitological contamination of vegetables sold in street markets of Vitória da Conquista-BA. Samples of chives and arugula were analyzed, collected at the main points of commercialization of vegetables in street marketsof Vitória da Conquista, in the State of Bahia. The results showed that 100% of the arugula samples and 80% of the chive samples were contaminated by parasites. The prevalence of contamination by Entamoeba coli cysts, cysts of Endolimax nana, followed by Larvae of Strongyloidesstercoralis. The identification of these parasites hasgreat importance, since theysuggest absence of hygienic and sanitary actions and point out the vegetables analyzed as a source ofemparasitoses transmission.Vegetables are foods commonly eaten by the population. The sanitation of these organic foods, especially those ones consumed in its raw way, is a public health concern, since they, when contaminated, may contain larvae, protozoa and eggs of helminths and serve as a source of transmission of enteroparasitoses to man.*

Keywords— Feeding. Parasitological analysis. Vegetables. Cheers.

I. INTRODUCTION

The quality of human health has significative relationto adequate food condition, that rangs from nutritional values to favorable hygiene conditions. Foods contaminated by microorganisms are responsible for the transmission of diseases to humans. These are called Foodborne Diseases, which may cause problems such as intoxication, intestinal infection, gastroenteritis, amebiasis, giardiasis, cryptosporidiosis, toxoplasmosis, among others (Brasil, 2010).

Vegetables are natural foods widely consumed by the population and are able to be eaten, in most cases, in their raw form. However, numerous microorganisms may be transmitted by these foods, byincluding many protozoa and helminths (Luz et al., 2017; Pezzin et al., 2017). There are, on average, 107 known parasite species that may be from food source, that is, they may be present in food or water, by making possible the contamination of the individual through the ingestion of these ones (Hikal, 2017; Abougrain, 2010).

Intestinal infections caused by helminths and protozoa afflict around 2 billion people all over the world, with significative recordsin Brazil. The main clinical manifestations apparent in infected people are malnutrition, diarrhea, anemia, cognitive delay and irritability (Costa et al., 2019; Ndiaya et al., 2014).

The high incidence and variety of clinical manifestations of intestinal diseases caused by parasites configure as a global public health problem; intestinal parasitic diseases are transmitted by ingestion of larvae, eggs, oocysts or cysts (BRUM et al., 2013). Ezatpour (2013) ratifies that many societies, especially in

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developing countries, regard intestinal parasitic infections as one of the major public health problems.

The main kind of contamination caused by enteroparasites in vegetables by use of water contaminated water byanimal or human fecalmaterials used in irrigation of vegetable gardens, as well asbeyondsanitationperformed in inappropriate places such as standing water tanks, of contamination originated from the fertilizer organic matter with bird feces, flies, rats and the inadequate waythat they are transported (Costa, 2015).

This study selected two vegetables for parasitological analysis: chives and arugula. The chives (*Allium fistulosum*) are usually used as a seasoning very desired by Brazilian population (Silva et al., 2015). The arugula (*Eruca sativa*) is a vegetable that its leaves are very tasted in salads, rich in potassium, sulfur, iron and vitamins A and C (CUNHA et al., 2013). Thus, the general objective of this study is to identify if there is parasitological contamination in the chives and arugula marketed in street markets of Vitória da Conquista - BA.

II. METHODOLOGY

Twenty samples of vegetables of traditional culture were collected and analyzed, by being 10 arugula (Eruca sativa) and 10 chives (Allium fistulosum). The sample units were composedby sheets grouped and lashed by a loop.

The collection was performed in the morning, in five main pointsvegetables commercialization in Vitória da Conquista, in the State of Bahia. Samples were randomly collected at the fair between the months of June and July 2019.Vegetable samples from these referred commercialization points were individually packed in clean and disposable plastic bags and transported to the Laboratory of Clinical Analyzes of the FaculdadeIndependente do Nordeste (FAINOR), where the analyzes were performed.

In the laboratory, the samples were cut and separatelyhomogenized, bydiscarding stalks and roots. Then 200 g of each vegetable was weighed and soaked in 400 ml of distilled water for half an hour. With the help of a small brush with soft bristles, the surface of the leaves was rubbed, thenit was stirred so that the water spread all over the sample and removed the possible parasitic agents present, all procedure was performed by using disposable individual protection materials, in order to avoid possible contamination.

Then the leaves were separated for complete removal of the liquid, and then discarded at appropriate locations. The acquired liquid was filtered through a sieve covered with gauze and collected in a container. This liquid was at rest for sedimentation and then 14.0 ml of it was taken, that was centrifuged by 1,500 revolutions per minute (rpm) for at least five minutes. Discarded the supernatant and by adjusting the final volume of the sit to 0.5 ml with distilled water, and then homogenizing it. 0.05 ml of the sit was pipetted, that was analyzed by direct microscopic examination on a slide stained with lugol solution. The 10x and 40x objectives were adopted in order to identify, confirm and quantify the parasitic structures.

The reading was performed in triplicate, and the calculation of the total number of cysts, eggs and larvae in the samples was analyzed by the light of the studies of Oliveira and Germano (1992).

III. RESULTS AND DISCUSSION

The present study analyzed the presence of parasites in 20 samples of vegetables collected in five street marketsfrom Vitória da Conquista - Ba, with 10 samples of arugula and 10 samples of chives. The results showed that 100% of the arugula samples were positive for the presence of parasites, as well as 80% of the chives were also contaminated.

Contamination levels of the two varieties of vegetables showed that in both samples the prevalence of protozoa contamination predominated, by being 44.82% of Entamoeba Coli cyst in the arugula samples and 58.34% of Endolimax nana cyst in the chive samples. Followed by significant helminth contamination, 31.03% Strongyloidesstercoralis larvae in the arugula samples and 25.00% in the chive samples, according to Table 1

Table 1. Prevalence of parasites found in vegetable samples.

Prevalence		**Arugula n=10**	**Chives n=10**
		%	**%**
Protozoa	*Entamoeba coli cysti*	44,82	0
	Endolimax nana cysti	0	58,34
	Balantidium coli trofozoite	6,90	0
	Larva of Strongyloidesstercoralis	31,03	25,0
	Larva of Hookworm	3,45	0
	Ascaris Egg	6,90	0

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Helminths	*Strongyloidesstercoralis egg*	3,45	0
	Hatching Egg	3,45	0
	Tapeworm	0	8,33
Arthropoda	*Mite*	0	8,33

n = number of samples; % = frequency in percentage
Source: Prepared by the author. 2019.

It is observed that the highest prevalence of arucula contamination was by Entamoeba Coli cyst followed by Strongyloidesstercoralis larvae. (Table 1). E. coli cysts were also found in greater amount in the studies of Carminate et al. (2011), whose objective was to evaluate parasitologically the quality of the raw vegetables consumed from the fair of the municipality of Pedro Canário - ES. The authors identified E. coli as indicative of water contamination, since the producers of this region used waters from rivers that also were used for other dailynecessities.

The contamination of individuals by Entamoeba coli is not uncommon. Its prevalence in clinical exams performed with workers was described in the study by Almeida et al., (2016), also drafting a higher index of contamination by protozoa as compared to helminths, a fact observed in the present study, as it is identified larger quantities of protozoa in the vegetables.

In the works by Costa (2015), Coutinho et al. (2015) and Medeiros (2014)it was verified the presence of vegetables contaminated with Entamoeba. According tothe studies by Santos et al. (2009), although the Entamoeba histolytica species is the only pathogenic species, Entamoeba coli cysts are indicators of fecal infection. Nomura et al., (2015), reaffirms about E. coli and E. nana, which despite being commensal protozoans, their occurrence indicates fecal and oral contamination, that is determinant in the transmission of pathogenic parasites. Therefore, the description of these parasites is important, since they indicate absence of hygienic and sanitary actions.

The presence of Strongyloidesstercoralis larvae found in this research matches with other studies about the contamination of vegetables, such as Rezende et al. (2014) who has verified agreater abundance of this helminth in arugula and lettuce samples. Also in the studyperformed by Silva et al. (2015) the second largest helminth identified in the chives, were larvae of the species Strongyloidesstercoralis. According to Naves and Costa-Cruz (2013) among thenematodes, Strongyloidesstercoralis is the most aggressive because it can cause abdominal pain, vomiting, nausea, diarrhea or loss of appetite, shortness of breath, fever and skin damage.

The results found suggest conditions of cultivation and / or sanitary inadequate handling from the point of view hygienic and sanitary. Although it is not possible to say when the contamination occurred, this study observed a great exposure of the vegetables in the sales areas, by being easily accessible for any passerby, winds, dust and possible insects. No detailed information was obtained about the form of cultivation. However, it is emphasized here that the contamination of vegetables may occur throughthe water or soil, if these ones arecontaminated with human feces, and by being that one of the main waysof human beingsbe affected by these parasites occurs throughthe oral ingestion of foods containing infective forms of parasites. Whenthese ones are contaminated, they may present generic symptoms, and it maylead to death in the eventcase of non-hospital care (Rezende et al., 2014). Amorós et al. (2010) affirms that contaminated water is the main form of contamination of fresh produce.

Other causes of enteroparasite contamination in vegetables are attributed to soil contamination from organic fertilizer with fecal excrement, contact of vegetables with animals such as flies, birds and / or rats, and possible inadequacies in the ways of handling and transport (Robertson Gjerde, 2001).

Chives and arugula are commonly fertilized by poultry or cattle manure, often used as fertilizer for crop soil (Albuquerque et al, 2010). There are kinds of production in which vegetables are grown with swine manure, cattle and poultry and / or irrigated with dammed waters that has contact with these animals. This explains part of the factors that contribute to the contamination of these vegetables. Therefore, the ingestion of these ones, cultivated, preserved or inadequately prepared, affects possible dispersion of parasites (Rezende et al., 2014).

The consumption of contaminated vegetables exposes a large part of the population to possible infections caused by parasites. The control of foodborne diseases, which are the result of the fecal and oral infection cycle, has gained greater care all over the world (Cantos et al., 2004; Blaser, 2006; Käferstein; Käferstein; Abdussalam, 2009).

Graph 1 shows the index of contaminated vegetables in the street markets surveyed in Vitória da

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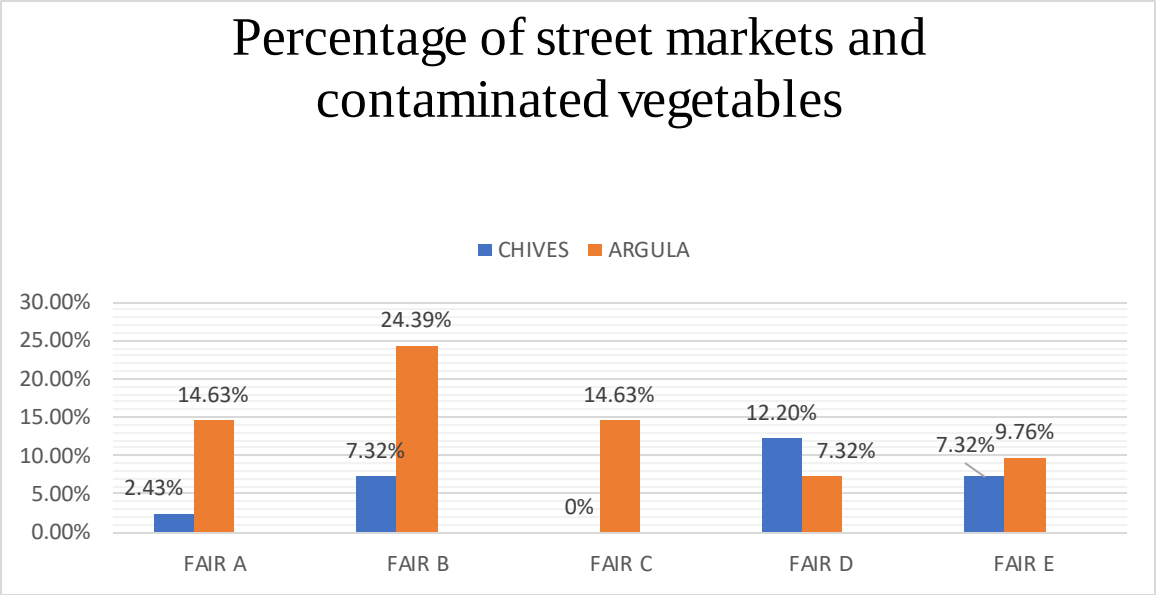
Conquista - BA, by revealing that in all the commercial places, positive samples were collected for parasites.

Coutinho et. al (2015) consider that the street markets present a high degree of contamination risk by being exposed to the open air , that is, they are susceptible to biological alterations due to the actions of the various organisms that act above them, by including microorganisms and insects common in the urban context.

According to Reis (2014),by controlling hygiene and the level of parasitological contamibynation of vegetables is a challenge to be fulfilled. Good hygiene is one of the most effective methods for protecting against diseases transmitted by infected feedlots. Asit is regulated by the Ministry of Health (Brazil, 2006), food safety is an essential factor; this means that food must not contain contaminants of a physical, chemical or biological nature or other hazards that damage the health of the consumer.

Graph 1. Percentage of contamination in street market samples.



Source: Prepared by the author. 2019

According to Campos et al. (2013) arugula is a vegetable that provides several benefits to human health because it is a plant rich in proteins, vitamins A and C, and minerals such as iron and calcium. Besides being associated with a balanced diet, it stimulates the appetite and has anti-inflammatory and antioxidant effects for the living organisms. In relation to the chive, only a scientific work on this vegetable was found, by regarding the physical and chemical characteristics of this food (Silva, 2015). However, it is known that this is a vegetable very used for seasoning and preparation of food.

It is recommended that these foods marketed in street markets have a sanitary safety standard food; that is, these foods must be free of biological, physical or chemical contaminants that compromise the health of the population.

Vegetables and other perishable products with peculiar characteristics are specifically regulated by the General Coordination of Plant Quality - CGQV, a sector of the Ministry of Agriculture, Livestock and Supply, created in order to define the minimum requirements of identity and quality of these organic products and allow the adequate verification of the vegetables offered to the consumer. Thus, inthe Normative Instruction Nº. 69, dated November 6, 2018, Article 2 about the minimum requirements of identity and quality determined are full responsibility of rural producers (BRAZIL, 2018).

However, it is visualized in Article 5 that the minimum quality requirements to be observed in a product are whether they are whole, clean, pestfree, firm, well developed physiologically, without foreign odors and free from rotand insects (BRASIL, 2018) .

By considering the quality standards mentioned above, this study will not establish quality standards for the vegetables analyzed, since, according to a study by Locatelli (2009), the factor that predominates in the evaluation of product quality is subjective, that is, it is up to the consumer. A study performed by Wandel and Bugge (2002) in Europehas verified the most important properties in the evaluation of the quality of fruits and vegetables and it was verified that the attribute of great value were those ones of taste and freshness.

Thus, it is recommended that hygienic and sanitary actions and measures should be continuously

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exploited not only in the vegetableconsuming population, but also in the producing community and merchants of these foods.

IV. FINAL CONSIDERATIONS

Vegetables are foods commonly eaten by the population. The sanitation of these organic foods, especially thoseones consumed in its raw way, is a public health concern, since they, when contaminated, may contain larvae, protozoa and eggs of helminths and serve as a source of transmission of enteroparasitoses to man.

This work aimed to evaluate parasitological contamination in arugula and chives samples marketed in five street marketsfrom Vitória da Conquista-BA. The levels of contamination of the vegetable varieties showed that in both samples the prevalence of protozoacontamination predominated, by being 44.82% of E. coli cyst in the arugula samples and 58.34% of E. nana cyst in the samples of chive. Followed by significative contaminations by helminths, 31.03% of Strongyloidesstercoralis larvae in the arugula samples and 25% in the chive samples.

The presence of protozoa, helminths, was observed in the analysis performed in this work. Therefore, the results of this work point out therequirement for orientation and inspection of cultivating crops and by distributing vegetables for consumption in order to improve the quality of these products, since these ones may be transmitting endoparasites to their final consumers.

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