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Study of the Prevalence of Helminths and Protozoa in Fruits marketed in Street Markets in a City insideof Bahia

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***Abstract*—** *Parasitoses in Brazil represents a serious public health problem, by affecting mainly the poorest population, with little access to education and basic sanitation. It is estimated that millions of people around the world are afflicted with parasitic infections from eating contaminated food. The present study had as objective to evaluate the presence of helminths and protozoa in fruits marketed in open fairs in Vitória da Conquista-Ba. Forty samples were analyzed, by including guava, lemon, apple and grape, by the method of spontaneous sedimentation Hoffman, Pons and Janer (1934). The results showed that 70% of the fruits presented positivity for some type (kind) of parasite, with guava being the most contaminated fruit (90%). The highest prevalence was of helminths (Ascaris lumbicoides (n = 92), Ancylostomideo (n = 18), Taenia sp (n = 8) and Enterobius vermiculaes (n = 2), followed by protozoa (Balantidium coli, Entamoeba coli (n = 11) .The high frequency is associated to the inadequate handling of these fruits, as well as to the inefficiency of the sanitary conditions of the commercialization place, by recommending measures of sanitary education from the merchants and the population consumers.*

***Keywords*— Parasites. Basic sanitation. Infections. Contamination.**

I. INTRODUCTION

Parasitoses are infections presents all over the world, by representing a serious public health problem, with higher incidence in poorer communities and unfavorable financial conditions. By contaminating human beings, parasites can cause several health hazards, which can cause significant complications such as malnutrition, severe anemia, intestinal problems, delayed growth, lack of some vitamins, and other ones (Bastien M, Vaniscotte A. et al.). Data from the World Health Organization (WHO) show that more than 1.5 million people have somekindof intestinal parasite, which represents 24% of the world population, with some kind of intestinal parasite (Sales; Nichi, et al. 2017)

Several factors are associated with enteroparasites contamination by including socioeconomic and sociocultural factors, with emphasis in deficient sanitary conditions, bad hygiene habits, improper handling of foods (fruits, vegetables and veggies), which rang from the lack of sanitation of these ones beforeconsumption such as the lack of accessingby potable and / or treated water. The presence of these pathogens may also be associated with the food production process and / or the care of the food handler (Moreira; Cruz; et al, 2017). Education is also another important factor, since people with less knowledge are the ones most affected by parasitic diseases (Hengami M, Hamed Y et al 2018).

Fruits and vegetables are among the foods listed by the Ministry of Health as responsible for the transmission of foodborne diseases, which cause innumerable outbreakscaused by the consumption of fruits, seeds and nuts and vegetables (Ministério Da Saúde, 2010).This way, the WHO (World Health Organization) has listed fruits and vegetables, among other foods as possible sources of disease transmission,

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caused by fungi, viruses, bacterium and parasites (BrasiL, 2010b).

Foodborne diseases occur through the ingestion of foods or liquids that have been contaminated with some kind of pathogenic microorganism, which mostly leads to enteric problems for those ones who consume these kind of foods (Allende, Bolton, D. et al.). About 250 kinds of foodborne diseases are responsible for generating public health problems, by causing frequent outbreaks in the population. In this way, the importance of the care with the manipulation of food is underlying, in order to warranty food security (Melo, 2018).

Fruits are foods rich in vitamins and minerals, which provide innumerable health benefits to those ones who consume them. Due to the increasing incentive to a healthy and balanced diet, fruit consumption has been increasing every day (Punsawad, C, Phasuk, N et al, 2018). The facilityon the preparation of these foods whichare consumed in most of time in their raw form is another factor that contributes to the appearance of enteroparasite infections (Andrade; Teodoro et al., 2017). However, despite this, studies directed to the investigation of fruits as vehicles for transmission of parasites are still limited. Thus, it is necessaryto investigate the presence of enteroparasites in these foods, in order to contribute to the scientific knowledge about enteroparasitoses, as well as to collaborate for the adoption of sanitary education measures about the possible risks and the appropriate ways of preventing transmission of these agents.

By considering the importance of this problem, this study aims to identify the prevalence of eggs and larvae of helminths and protozoa cistys present in fruits marketed in street markets of Vitória da Conquista-BA, by presenting the impact that their presence may cause to health of the population.

II. METHODOLOGY

The study has been conducted in the city of Vitória da Conquista-BA from October 2018 to December 2018, where samples of the following species were collected: guava (Psidium guajava), lemon (Citrus limon), apple (Malussilvestres) and grape Vitisvinifera). The samples were obtained through the purchase in two street markets located in this city, where in each street market five samples of each species of fruit were collected, thus totaling 40 samples evaluated. The choice for analysis of these ones was due to the facility of finding them in the street markets and because they are fruits very marketed in this region.

The samples were evaluated by means through the spontaneous sedimentation method Hoffman, Pons and Janer (1934), in charge of identifying eggs and larvae of helminths, cysts and protozoa cysts (Rey, 2001),which besides good effectiveness also presents a good relation cost benefit.

The fruits were collected and stored in clean and new plastic bagsfor avoiding contamination, then they were sent to the parasitology laboratory of the Faculdade Independente do Nordeste (FAINOR), where the analyzes were performed.

The beakers and conical chalices used in the process of analysis were washed by using detergent and running water, then it was done alcohol asepsis 70%, and they were washed with distilled water and dried by room temperature. Each fruit was individually placed in 100 ml glass beakers and washed with 30 ml of distilled water.

By adding a soft bristle brush, a careful washing of each fruit was done, bypassing the brush over its surface for five minutes in circular movements. After that the fruits were submerged in the distilled water for 10 minutes and soon after the washing liquid was distributed in conical chalices.

The calyces were capped for avoiding contamination and left for 24 hours for spontaneous sedimentation of the material to be analyzed from the liquid. After this time, the supernatant was discarded and an aliquot of the sediment was placed on the sheetstained with lugol for visualization by a microscope.

The optical microscopy was used to read the sediment, that was done in triplicate with 10x and 40x objective, by allowing the identification of parasitic structures. All the results obtained through the optical reading were annotated and later used for the production of tables, thus facilitating their demonstration and understandingof these ones. Emphasizing that the confidentiality of the sampling places has been preserved.

III. RESULTS AND DISCUSSION

The present study has analyzed the presence of parasites in fruits: guava (Psidium guajava), lemon (Citrus limon), apple (Malussilvestres) and grape (Vitisvinifera) obtained through random purchase in two distinct fairs at the city of Vitória da Conquista -Ba, by totaling 40 samples evaluated. The results showed that 70% (n = 28) presented positivity for some kind of parasite, byrevealing a high percentage of contamination as compared to the study by Bozzetti et al. (2013), that also evaluated the presence of parasites in fruits collected at fairs , supermarkets and slaughterhouses and it has identified 14.5% of positivity on the samples analyzed.

The prevalence of parasites in foods from plant origin and they are consumed, most often in theirin natura form, it makes an object of study withgreat relevance, since the ingestion of contaminated food by helminths and

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protozoa is one of the main forms of transmission of enteroparasitoses (Neres, 2011). Pebsworth, and colaborators (2012), reaffirm that this kind of contamination brings a warning that these foods(natural) as contaminated with eggs, larvae and / or cyst of parasites, and once consumed by humans, characterize a source of risk for the transmission of intestinal parasitoses.

The occurrence of foodborne diseaseshas been increasing considerably all over the world (Saleh, F, Gad, M, et al., 2018). Data from the Ministry of Health, foods are one of the main means of contamination by microorganisms in humans. This occurrence is justified by the increase in the demand for food of easily prepare, such as fruits and vegetables, by the inadequate sanitation of these ones or by the lack of sanitary structure of the sale places and by the lack of care of the handlers of these foods (Brasil, 2010).

The diseases caused byingestion of parasites are called enteroparasitoses, with a high incidence in developing countries, thus constituting a global relevance problem in the tangent to the public health sphere. The consumption of foods in natura increases the risk of enteroparasites, since eggs, cysts and larvae of parasites may remain viable on their surface for long periods, even in adverse conditions(Barros, 2018).

Although the interest about the presence of parasites in foods, there are few studies about parasitic contamination in fruits, with most publications have been directed to vegetables. A possible explanation for this observation may be related to the fact that most of leafy trees are cultivated in direct contact with the soil, a fact that represents a potential source of contamination, since the soil may contain parasites that as they enter in contactwith the vegetable, these ones use it as a shelter (Chijioke; U. Onyemelukwe et al., 2018). Unlikefrom most fruits that are grown in the aerial parts of plants, without direct contact with the soil (Dueholm B, Bruce.D, et al, 2016).

A study by Brauer et al., (2016) in which samples of lettuce and salsas collected at street markets and supermarkets in São Mateus-ES were analyzed, it was foundthat 86.8% of the vegetables were positive for some kind of parasite. Pinto (2018) has analyzed 26 samples of lettuce collected at a street market in the city of Jardim-CE and he has found that 80% of these lettuces were contaminated by parasites, by reaffirming the high levels of contamination in vegetables in Brazil.

The results of the present study have showed that guava (Psidium guajava) presented the highest incidence of parasitological contamination in relation to the other species of fruits analyzed, by totaling 90% (n = 9) of positive samples. The positivity of the apple (Malussilvestres) and lemon (Citrus limon) was similar, by representing 70% (n = 7) of the analyzed samples, followed by grape (Vitisvinifera) with 50% (n = 5) of contaminated samples Table 1).

Table.1: Positivity of contamination of the samples obtained.

Local	**Fruits**			
	Apple	Grape	Guava	Lemon
Fair A	30%	30%	40%	40%
Fair B	40%	20%	50%	30%
Total	**70%**	**50%**	**90%**	**70%**

Source: Research, 2019.

The amount of parasites found in each kind of fruit was also evaluated and it is shown in Table 2, in which shows that Ascaris lumbricoides was the specie located in all positive samples (n = 92/28). byconcentrating its largest distribution in guava (Psidium guajava) (n = 27) and in lemon (Citrus limon) (n = 24).

The prevalence of A. lumbricoides in the present study may be related to the fact that this nematode is considered of wide distribution. The female of this parasite hasthe capacity of producing about 200,000 eggs daily in the intestine of the human being that eliminates it through the feces. As in contact with the external environment, these eggs can contaminate the soil, water and foods (Yang, Wang, Y et al, 2018). According to Costa (2012), the outer membrane of the A. lumbricoides eggs presents good adhesion, that may justify the large number of eggs found in the fruits analyzed by this study, as well as the fact that guava and lemon, fruits that have irregular shell show a bigger quantity, since the presence of these parasites may also occur due to the morphology of the plant, which even in the washing process, the complete removal of all the infective agents may not occur efficiently (Ferreira, 2016).

Besides the high number of Ascaris eggs in fruits, the presence of Ascaris lumbricoides larvae (n = 16) was also identified. Although the presentation of these larvae

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does not represent a form of transmission of the disease, its presence in the samples confirms the prevalence of contamination by these species.

The disease caused in humans by A. lumbricoides is called ascaridiasis and it includes the symptoms such as diarrhea, vomiting, abdominal distension and pain, reduced absorption of vitamins, etc (Costa, 2012). According to(WHO, 2019), the Áscaris lumbricoides represents one of the main soil contaminant parasites in areas in which sanitation is poor and / or deficient. All over the world, approximately 1.5 billion people are infected with soiltransmitted helminths, by including A.lumbricoides and more than 267 million of preschool children and 568 million of schoolaged children live in areas with intense transmission of this parasite.

Another helminth prevalent in the analyzed fruits was confirmed bythe presence of Ancylostomides eggs (n = 18). Silva et al. (2018) as they analyze lettuces in supermarkets in Betim-MG, they have verified that the Ancylostomidae was the most common parasite in the samples (33.3%), that characterizes the fact that these parasites are frequently contaminating in natura foods.

Protozoa were also found in theanalyzed fruitsby this study, with the presence of cysts of Balantidium coli (n = 31) and Entamoeba coli (n = 11). Santos et al. (2017) in their study, as they evaluate vegetables marketed in supermarkets in Maceió-AL, have observed that 61.98% of the samples had presented Balantidium coli cysts. Another study performed by Vidgal. T; Landivar. E. et al. (2018) as he analyzes lettuce samples in restaurants in São Miguel do Oeste - SC, they have found with a higher incidence of Balantidium presence coli present in 81.5% of the samples.

Table.2: Quantity of Helminths and Protozoa found.

Hoffman's Method (Spontaneous Sedimentation)

Helminths					
	Apple	**Grape**	**Guava**	**Lemon**	**Total**
Eggs of Ascaris lumbricoides	19	22	27	24	92
Hatching eggs	4	3	7	4	18
Eggs of Taenia sp.	0	8	0	0	8
Eggs of Enterobius vermicularis	0	0	2	0	2
Larva of *Ascaris lumbricoides*	5	1	6	4	16
Protozoa					
	Apple	**Grape**	**Guava**	**Lemon**	**Total**
Balantidium coli cyst	10	7	9	5	31
Entamoeba colicyst	5	0	0	6	11

Source: Research, 2019.

From 40 fruit samples collected at the two street markets, 70% hadsome kind of parasite, by characterizing a contamination of more than half of the fruits under analysis. The study has observed little discrepancy among the kind of parasites found in the two fairs surveyed. In this way, both ones presented the significant occurrence of six kinds of parasitological agents.

Although it is not possible to affirm the way of contamination of the samples analyzed by the present study, it was observed during the research poor conditions of basic sanitation by vicinity of the sale place of these foods and with little hygienic control. It is known that these factors can favor the contamination of the fruits andbecome them possible vehicles of parasitoses transmission p, whichmay entail risks to the health of those who consume these fruits (Alhabba, T. 2014).

According to Ferreira (2012) the contamination can occur both in the cultivation process, as well as the transport and / or storage, that is, from planting to the commercialization of the fruits. Several factors are directly related to this fact, and may be due to the contamination of the water, used for irrigation of the plants, with animal or human feces containing eggs or cysts of parasites; contaminated soil; or even fertilizers containing fecal matter, as well as the incorrect handling

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of the sameones and the transport made by a wrong way that exposes these foods to the risk of contamination.

Besides that, it is knownthat the food handler, that individual who is directly or indirectly in contact with foods (Wingert And Araújo, 2009), may be represent a source of risk for the contamination by parasites in these ones, especially for the fresh food. This contamination occurs due to the improper handling of these foods, which may occur from the time of harvest to its commercialization (Silva et al., 2005). A study performed by Capuano et al. (2008) show that the lack of hand sanitationand improper handling with the foods by handlers, as well as inefficient sanitation conditions, are directly related to the increase in cases of contamination of the. foods.

Another relevant factor is that fruits that are infected by parasites do not present altered taste or color, which makes it difficult their visualization, thusgoing unnoticedby the eyes of consumers, especially those ones that have little clarification about this subject (Bozzetti; Alves; *et al*. 2013).

The relevance of health education is stressed here. Theinformation about the severity that enteroparasites can cause in humans should be constantly practiced and explored. The lack ofknowledge by part of the population contributes to the increasing incidence of these infections, which could be reduced with necessary prevention andcare information.

IV. CONCLUSION

The prevalence of 70% of positivity, besides the diversity of the parasites found in the present study, indicates low sanitary conditions of the fruits marketed in the street markets. It was also observed that the morphology of some fruits favors the presence of some parasites in the outer part (shell), which requires attention on the sanitation process of theseones. The results suggest that at some time, from cultivation to commercialization, there was contamination by human and / or animal feces, since the helminths and protozoa found in the fruits come from these intestinal sediments.

Although parasites can be transmitted by foods for people everyday, it is still a great challenge to promote actions and measures that control the occurrence of intestinal parasite infections. Despite the great incidence and the impact of this problem nowadays, the prevalence of these enteroparasites in fruits has not been described yet. Thus, it is necessary to promote educational campaigns to raise awareness among both food handlers as consumers, thus contributing to the prevention and reduction of parasitic contamination.

REFERENCES

[1] Associação Portuguesa de Nutrição. Colher saber. E-book nº 45. Porto: Associação Portuguesa de Nutrição; 2017. Disponível em: http://www.apn.org.pt/documentos/ebooks/AW_EBook_ColherSaber.pdf. Acesso em: Novembro. 2018.

[2] BRASIL FOOD TRENDS 2020. São Paulo: Fiesp/Ital, 2010. 176 p. Disponível em: http://www.brasilfoodtrends.com.br/Brasil_Food_Trends/index.html. Acesso em: NOVEMBRO. 2018.

[3] Manual Integrado de Vigilância, Prevenção e Controle de Doenças Transmitidas por Alimentos. MINISTÉRIO DA SAÚDE Brasília – DF 2010 Alimentos. Disponível em: http://bvsms.saude.gov.br/bvs/publicacoes/manual_integrado_prevencao_doencas_alimentos.pdf. Acesso em: Novembro. 2018.

[4] MOREIRA; CRUZ; et al, 2017. Atualização do Manual de Controle Higiênico-sanitário de uma Instituição de longa Permanência para Idosos. Disponível em: http://portaldeperiodicos.unibrasil.com.br/index.php/cadernossaude/article/view/2346/1918. Aceso em: Novembro. 2018.

[5] NOLLA e CANTOS, 2005. Relação entre a ocorrência de enteroparasitoses em manipuladores de alimentos e aspectos epidemiológicos em Florianópolis, Santa catarina, Brasil. Disponível em: https://www.scielosp.org/scielo.php?pid=S0102311X2005000200033&script=sci_arttext&tlng=en#back10. Acesso em: Novembro. 2018.

[6] SALES; NICHI, et al. 2017. Avaliação parasitológica de notas de dinheiro e moedas provenientes de três cidades da região sul do estado do Paraná. Acesso em: http://revista.uninga.br/index.php/uningareviews/article/view/1967. Disponível em: Novembro. 2018.

[7] ANDRADE; TEODORO; et al. 2017. Intestinal parasites in publictransportbusesfromthecityof Diamantina, Minas Gerais, Brazil. Disponível em: https://www.dovepress.com/intestinal-parasites-in-public-transport-buses-from-the-city-of-diaman-peer-reviewed-article-RRTM. Acesso em: Novembro. 2018.

[8] GRILLO. L. P; CARVALHO.L .R, et al. Influência das condições socioeconômicas nas alterações nutricionais e na taxa de metabolismo de repouso em crianças escolares moradoras em favelas no município de São Paulo. Disponível em: https://repositorio.unesp.br/handle/11449/29854?locale-attribute=es. Acesso em: Dezembro. 2018.

https://dx.doi.org/10.22161/ijaers.6.5.34 *ISSN: 2349-6495(P) | 2456-1908(O)*

[9] COSTA. J. R. B. Ocorrência De Enteroparasitos Em Amostras De Alface (Lactuca Sativa L.) Comercializadas Na Feira Livre De Pocinhos. 2012. Disponível em: http://dspace.bc.uepb.edu.br/jspui/bitstream/123456789/568/1/PDF%20-%20Jo%C3%A3o%20Rafael%20Bernardo%20Costa.pdf. Acesso em: Dezembro. 2018.

[10] STEFFEN. B. P. R; SOARES. D. K, et al. 2011. Prevalência do Balantidium coli nas fezes de suínos na fase de terminação em abatedouro. Disponível em: http://ojs.ufgd.edu.br/index.php/agrarian/article/view/1115/668. Acesso em: Dezembro. 2018.

[11] BRAUER. A. M. N.W; SILVA. J. C, et al. 2016. Enteroparasitesdistribution in vegetablesof São Mateus food trade, Espírito Santo, Brazil. Disponível em: https://www.researchgate.net/profile/Marco_De_Souza2/publication/304990225_Distribuicao_de_enteroparasitos_em_verduras_do_comercio_alimenticio_do_municipio_de_Sao_Mateus_Espirito_Santo_Brasil/links/577e420008aed39f59945f2a.pdf. Acesso em: Março. 2019.

[12] CAPUANO; LAZZARIN, et al. 2008. Enteroparasitoses em manipuladores de alimentos do município de Ribeirão Preto - SP, Brasil, 2000. Disponível em: https://www.scielosp.org/article/ssm/content/raw/?resource_ssm_path=/media/assets/rbepid/v11n4/14.pdf . Disponível em: março. 2019.

[13] PEBSWORTH. 2012. Parasite Transmission Risk From Geophagic and Foraging Behavior in Chacma Baboons. **American JournalofPrimatology**. Disponível em: https://translate.googleusercontent.com/translate_f. Acesso em: Abril. 2019.

[14] BRASIL. Ministério da Saúde. Manual Integrado de Vigilância, Prevenção e Controle de Doenças Transmitidas por alimentos. Brasília – DF, 2010. Disponível em: http://bvsms.saude.gov.br/bvs/publicacoes/manual_integrado_vigilancia_doencas_alimentos.pdf. Acesso em: Maio. 2019.

[15] BARROS; et al. 2018. Alimentos Contaminados por Enteroparasitas: Uma Questão de Saúde Pública. **Brazilian Journal of health Review.** Disponível em:http://www.brjd.com.br/index.php/BJHR/article/view/931/810. Acesso em: Abril. 2019.

[16] HWO. 2019. Helmintiasis Transmitidas por elSuelo. Disponível em: https://www.who.int/es/news-room/fact-sheets/detail/soil-transmitted-helminth-infections. Acesso em: Abril. 2019.

[17] FERREIRA. 2016. Higiene e Segura Alimentar em Vegetais para Consumo Humano: Comparação entre Produtos de Agricultura Biológica e Convencional. Disponível em: http://repositorio.ul.pt/bitstream/10451/27254/1/ulfc120917_tm_Simone_Ferreira.pdf. Acesso em: Abril. 2019.

[18] MELO; AMORIM, et al. 2018. Doenças transmitidas por alimentos e principais agentes bacterianos envolvidos em surtos no Brasil: revisão. Disponível em: http://www.pubvet.com.br/artigo/5232/doenccedilas-transmitidas-por-alimentos-e-principais-agentes-bacterianos-envolvidos-em-surtos-no-brasil. Acesso em: Abril. 2019.

[19] PINTO; Gonçalves et al. 2018. Estruturas Parasitárias em Alface (Lactuca Sativa L.), Comercializadas Na Feira Livre do Município de Jardim, Ceará. Disponível em: https://www.researchgate.net/profile/Renato_Ferreira12/publication/330811938_estruturas_parasitarias_em_alface_lactuca_sativa_l_comercializadas_na_feira_livre_do_municipio_de_jardim_ceara_parasite_structures_in_lettuce_lactuca_sativa_l_sold_in_the_open_market_of_the_city_of_ja/links/5c54c4cd458515a4c7506358/.pdf. Acesso em: Abril. 2019.

[20] SANTOS; SOARES et al. 2017. Isolamento e Identificação de Parasitas Encontrados nas Verduras dos Principais Supermercados de Maceió/ Al. Disponível em: https://periodicos.set.edu.br/index.php/fitsbiosaude/article/view/4035/2603. Acesso em: Abril. 2019.

[21] SILVA; ALVARENGA. 2018. Avaliação da Contaminação Enteroparasitária em Alfaces (Lactuca Sativa) in Natura, Comercializadas em Supermercados da Cidade de Betim – MG. Disponível em: http://periodicos.pucminas.br/index.php/sinapsemultipla/article/viewFile/18884/14008. Acesso em: Abril. 2019.

[22] FERREIRA; CHAFAUZER et al. 2012. Estudo da Contaminação por Parasitas em Hortaliças da Região Leste de São Paulo. **Science in Health**. Volume 3, página 96. Disponível em: http://arquivos.cruzeirodosuleducacional.edu.br/principal/new/revista_scienceinhealth/08_maio_ago_2012/science_02_2012.pdf#page=40. Acesso em: Abril. 2019.

[23] ALHABBA. T. The Prevalence of Parasitic Contamination on Common Sold Vegetables in

Alqalamoun Region. **International Journal of Pharmaceutical Sciences Review and Research**. 2014. Disponível em: https://pdfs.semanticscholar.org/1ac0/a1b4a13f81c5ac4725fa18e83adf2d8216ae.pdf. Acesso em: Abril. 2019.

[24] NASCIMENTO; LEMOS et al. Enteroparasitos em amostras de Alface (*Lactuca sativa* var.crispa), no município de Anápolis, Goiás, Brasil. **BioscJournal**, 2011. Disponível em: http://www.seer.ufu.br/index.php/biosciencejournal/article/view/7613. Acesso em: Abril. 2019.

[25] HENGAMI. M; HAMED.Y. et al. Prevalence of Intestinal Parasites in Food Handlers of Bandar Abbas, Southern Iran. **Iran J Public Health**. 2018. Disponível em: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5756585/. Acesso em: Abril. 2019.

[26] ALLENDE. A; BOLTON. D. et al. Public health risks associated with food-borne parasites. **EFSA Journal**. 2018. Disponíevl em: https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2018.5495. Acesso em: Abril. 2019.

[27] PUNSAWAD. C; PHASUK. N. et al. Prevalence of parasitic contamination of raw vegetables in Nakhon Si Thammarat province, southern Thailand. **BMC Public Health**. 2019. Disponível em: https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-018-6358-9. Acesso em: Abril. 2019.

[28] SALEH. F; GAD. M; et al. Molecular detection of Entamoeba histolytica in fresh vegetables and irrigation. **Egyptian Journal of Aquatic Biology & Fisheries**. 2018. Disponível em : https://www.researchgate.net/publication/330507815_Molecular_detection_of_Entamoeba_histolytica_in_fresh_vegetables_and_irrigation_waterf. Acesso em: Abril. 2019.

[29] CHIJIOKE ; U. ONYEMELUKWE et al. Factors Affecting the Parasitic Contamination of Edible Locally Produced Dry Season Leafy Vegetables Cultivated in South East Enugu, Nigeria. **AfricanJournalofClinicaland Experimental Microbiology**. 2018. Disponível em: https://www.ajol.info/index.php/ajcem/article/view/169903/159343. Acesso em: Abril. 2019.

[30] YANG. D; WANG. Y. et al. Prevalence and Risk Factors of Ascaris lumbricoides, Trichuris trichiura and Cryptosporidium Infections in Elementary School Children in Southwestern China: A School-Based Cross-Sectional Study. **Res. Public Health 2018.** Disponível em: https://www.mdpi.com/1660-4601/15/9/1809. Acesso em: Abril. 2019.

[31] BOZZETTI; ALVES; et al. 2013. Detecção de Estruturas Parasitárias em Frutas Comercializadas no Município de Ilhéus, Bahia. Disponível em: https://www.researchgate.net/publication/280599604_deteccao_de_estruturas_parasitarias_em_frutas_comercializadas_no_municipio_de_ilheus_bahia. Acesso em: Abril. 2019.

[32] MASTIEN. M. VANISCOTTE. A. et al. Identifying drivers of fox and cat faecal deposits in kitchen gardens in order to evaluate measures for reducing contamination of fresh fruit and vegetables. **Food and Waterborne Parasitology 2018.** Disponível em: https://reader.elsevier.com/reader/sd/pii/s2405676618300246?token=d7c79c0bd46ed453cd74d5beec31abbe3c8bf9df3779879895992fd584ada3d41f8b19b3c166ef6e0817b4dbe0899c17. Acesso em: Abril. 2019.

[33] VIDIGAL. T; LANDIVAR.E. Presence of parasitic structures in lettuces served in self-servicerestaurants of São Miguel do Oeste, Santa Catarina State, **Brazil. Acta Scientiarum. BiologicalSciences, v. 40.** 2018. Disponível em: https://search.proquest.com/openview/6d670bcfdbe342fcddc19d231818871a/1?pq-origsite=gscholar&cbl=2037657. Acesso em: Abril. 2019.

[34] DUEHOLM. B; BRUCE.D. et al. Spatial analysis of root hemiparasitic shrubs and their hosts: a search for spatial signatures of above- and below-ground interactions. 2016. Disponível em: https://link.springer.com/article/10.1007/s11258-016-0676-8. Acesso em: Abril. 2019.