

Original Research Article

**PHYTHOPHANE PARASITES ON COMMON EDIBLE PLANTS OF EASTERN
NIGERIA: EASY LINK TO INTESTINAL PARASITES TRANSMISSION.**

ABSTRACT:

Aims: In recent years, particularly in developing countries, there has been an unprecedented number of reported cases of parasitic illnesses linked to the high demand for fast foods, majority of which may be contaminated, improperly cooked or washed. This study was carried out to determine the parasitic load on some selected plant leaves, identify the possible parasites which could be found on these leaves, and determine which particular plant leaves harbour more parasites.

Study Design: The study was laboratory-based observational investigation.

Place and Duration of the Study: The research was done in the laboratory of Biological Sciences Department of Ebonyi State University, Abakaliki, Ebonyi State, Nigeria between June 2014 and January 2015.

Methodology: The leaves of *Thaumatococcus daniellii*, *Alchornea cordifolia* and *Musa sapientum* were screened for parasites using standard microscopy methods.

Results: Out of the 30 samples of the plant leaves screened, 22(73.3%) were positive for intestinal parasites. The parasites encountered include some species of protozoa (*Entamoeba coli*), cestode (*Hymenolepis nana*), nematodes (*Ascaris lumbricoides*, *Trichuris trichiura*, hookworm and *Strongyloides stercularis*). *T. daniellii* leaves had the highest parasitic contamination of five species of parasites while *M. sapientum*, and *A. cordifolia* showed the less parasitic contamination of three and two parasites respectively.

Conclusion: From the findings of this study, it is obvious that plant leaves consumed by people are quite often contaminated with intestinal parasites. This is an indication that

humans are at risk of infection especially as some plant leaves are naturally present in diet of people of all classes. Hence, the findings underscore the public health implication of using improperly washed or undercooked leaves of these plants with vegetable farmers, sellers and consumers, being at high risk of infection with strongyloidiasis, ascariasis, amoebiasis and others. The need to soak plant leaves for 10 minutes in saturated salt solution or to steam adequately before using them to prepare or wrap food is recommended. There is also need for government and non-governmental organizations to provide portable water and toilet facilities in order to discourage indiscriminate defecation in the environment.

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Keywords: Phylloplane, parasites, contamination, *Thaumatococcus daniellii*, *Alchornea cordifolia*, *Musa sapientum*

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38 INTRODUCTION

In recent years, there has been an increase in the number of reported cases of food borne illness linked to consumption of fresh plant leaves. The consumption of raw plant leaves or their use in wrapping food items plays a major epidemiological role in the transmission of parasitic food-borne diseases (Al-megrm, 2010). Intestinal parasites such as *Cryptosporidium* spp., *Giardia lamblia*, *Entamoeba histolytica*, *Ascaris lumbricoides*, hookworms, *Enterobius vermicularis*, *Trichuris trichura*, *Toxocara* spp., *Hymenolepis* spp., *Taenia* spp., *Fasciola* spp., and members of the family *Trichostrongylidae* could infect humans as a result of consumption of contaminated, uncooked or improperly washed plant leaves or vegetables. Lack of efficacious sanitizers that can remove or kill pathogens on raw plant leaves has contributed to their ability to gain access to locations within structures and tissues that may harbour these pathogens (Beuchat, 2002). Epidemiological studies have also indicated that parasitic diseases are endemic in areas where waste water is used to irrigate plants and

51 vegetables (Damen *et al.*, 2007). In developing countries, due to inadequate and lack of
 52 systems for routine diagnosis, monitoring and reporting for many of the food borne
 53 pathogens, most outbreaks caused by contaminated plant leaves go undetected and the
 54 incidence of this occurrence in food is under-estimated. In recent years, in developing
 55 countries, there has been an increase in the number of reported cases of parasitic illnesses
 56 linked to a high demand for food wrapped in some plants' leaves. It therefore becomes
 57 imperative to investigate the phylloplane parasites assemblage of some of these leaves used
 58 in wrapping food in order to contribute to information required for the control of parasitic
 59 infections, especially those that make up part of the neglected tropical diseases.

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61 **2. MATERIALS AND METHOD**

62 **2.1 Study Area**

63 The study was carried out in Ebonyi State in South-east Nigeria, with vegetation of the
 64 mosaic of the savanna and semi-tropical forest that is dense and remains evergreen
 65 throughout the rainy season. Majority of the inhabitants of this area are peasant farmers and
 66 petty traders of low economic status. It is a common practice that majority of the farmers use
 67 human and animal faeces as manure to augment and reduce the cost effective commercially
 68 processed fertilizer.

69 **2.2 Sample Collection**

70 Leaves of different species of plants were collected in three major zones of Ebonyi State,
 71 South-east of Nigeria. The plants screened were *Thaumatococcus daniellii*, *Alchonea*
 72 *cordifolia* and *Musa sapientum*. They were randomly collected in batches of 10 per every
 73 location. A total of 30 leaves were investigated. The leaves were identified by the plant

74 taxonomist in the Department of Applied Biology, Faculty of Biological Sciences, Ebonyi
75 State University, Abakaliki, Nigeria and the voucher specimen are deposited in the Ebonyi
76 State University Herbarium.

77

78 **2.3 Analysis of the Sample**

79 Thirty leaves of the plant species were examined for intestinal parasite profile as described by
80 Nyarango *et al.*, (2008). Samples were washed with distilled water and the suspension was
81 strained through a sterile sieve to remove undesirable materials. The filtrates were
82 centrifuged at 3000 rpm for five minutes and the supernatant discarded while the deposits
83 were placed on clean glass slides and covered with cover slips. This was followed by
84 examination under a light microscope using 10x and 40x objectives fixed with digital camera
85 to identify the cysts and eggs of these organisms as described by Suzuki, (1981). Different
86 parasite eggs, larvae or cysts present in the samples were counted and results documented as
87 described by (Alade *et al.*, 2014).

88 **Statistical Analysis**

89 Data collected were analyzed in simple percentage prevalence.

90 **3. RESULTS**

91 Out of the 30 samples of the three plant leaves analyzed, 22(73.3%) were positive for
92 intestinal parasites. The incidental parasites are some species of protozoa (*Entamoeba coli*),
93 cestode (*Hymenolepis nana*) and nematodes (*Ascaris lumbricoides*, *Trichuris trichiura*,
94 hookworm and *Strongyloides stercularis*).

95 Among the different locations surveyed, nine (90%) contamination rate occurred in plants
96 from Izzi, 7(70%) in those from Ezza North while the least 6(60%) occurred in plants
97 collected from Ebonyi (Table1). *Thaumatococcus daniellii* had highest parasitic
98 contamination with five species of parasites followed by *Alchonea cordifolia* which had three

99 species, while *Musa sapientum* showed the least parasitic contamination with two parasite
 100 species (Table 2). The rates of contamination of the three plants were 80%, 60% and 50%
 101 respectively (Table 2).

102 **Table 1. The intensity of parasitic contamination of plants at different locations.**

Area of collection (LGA)	Number vegetables screened	of Number contaminated	Percentage contamination
Ebonyi	10	6	60.0%
Ezza North	10	7	70.0%
Izzi	10	9	90.0%
Total	30	22	73.3%

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104 **Table 2. The contamination and infection rate of different plants' leaves**

	Parasites	TH	MS	AL
1	Hookworm	-	+	+
2	<i>Ascaris lumbricoides</i>	+	-	+
3	<i>Strongyloides stercoralis</i>	+	+	+
4	<i>Trichuris trichiura</i>	+	-	-
5	<i>Hymenolepis nana</i>	+	-	-
6	<i>Entamoeba coli</i>	+	-	-
Types of plant leaves		NE	NP	PS (%)

<i>Thaumatococcus daniellii</i>	10	8	80
<i>Musa sapientum</i>	10	5	60
<i>Alchornea cordifolia</i>	10	6	60
Total	30	19	190

TH=*Thaumatococcus daniellii*, MS= *Musa sapientum*, AL= *Alchornea cordifolia*, NE =

Number examined, NP = Number positive, PS = positive specificity

4 Discussion

The presence of intestinal parasites in plant leaves sampled is suggestive of faecal contamination of those leaves within their habitats. Routine diagnosis has implicated plant leaves as source of transmission of parasites. This result is in conformity with the reports by Rajeswari *et al.*, 1994; Meremikwu *et al.*, 1995; Al-Agha and Teodorescu, 2000; Adamu *et al.*, 2006; Noor-Azian *et al.*, 2007, Ani and Urom, 2015) who noted that factors such as hygiene of consumers and farmers, plant leaf anatomy cum nature of infective forms of the parasites, the behavioural attitude of farmers in application of untreated human and animal dung as manure, and the use of irrigation source which receives raw affluent from human or animal wastes have contributed to the prevalence of parasitic infection. These are also in tandem with the report of Hedberg *et al.*, (1994).

High levels of environmental sanitation, proper sewage disposal and personal hygiene tend to be more observed in Ebonyi Local Government area due to its proximity to the capital city of Ebonyi State compared to Ezza North and Ezzi that are far away. The prevalence of parasites according to different plant leaves showed that *T. daniellii* had the highest number of contamination of parasite of different species. This is due to the fact that *T. daniellii* are majorly found in humid areas where most of the contaminated faecal materials are dumped through erosion current Cheesbrough (1998). It might also be due to its popular use as sweetener since its aril contains a non-toxic, intensely sweet protein, thaumatin, which is at

126 least 3000 times as sweet as sucrose (Stivala *et al.*, 2011).The low prevalence of parasite on
127 banana leaves might be due to the reason that plantation site are not majorly found in water
128 logged areas.

129 **5 Conclusion**

130 Plant leaves consumed by people or used for wrapping foods are quite often contaminated
131 with intestinal parasites. *Thaumatococcus daniellii* which is usually used in wrapping
132 uncooked foods had the highest rate of contamination. This is an indication that humans are
133 always at risk of infection especially as some plant leaves are naturally present in diet of
134 people of all classes. These findings underscore the public health implication of vegetable
135 famers, sellers and consumers, being at high risk of infection with strongyloidiasis, ascariasis,
136 amoebiasis and others.

137 **Recommendations**

138 Plant leaves cannot be removed from human diet but can be excluded from the cycle of
139 transmission and dispersion of parasites. This can be achieved by maintenance of simple
140 personal and environmental hygiene by sellers and consumers. There is need to avoid the use
141 of untreated human and animal wastes as fertilizer. There is also need to soak plant leaves for
142 10 minutes in vinegar or saturated salt solution for plasmolysis of parasites. Steaming leaves
143 adequately before using them to prepare food (such as African salads) or wrapping of food
144 should be practised. There is need to avoid indiscriminate defecation in the environment. The
145 campaign to eradicate parasitic infection must be intensified.

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