Indonesian Food Science and Technology Journal
IFSTJ : Vol 4 no 1 December 2020
ISSN : 2615-367X

Antibacterial Activities Of *Capsicum Frutescens* Extracts On Bacteria Isolated From Domestic Food Wastes In Akure

Ayodele Isaac[#], Ajibulu, O. Oluyomi*

[#]*Federal University of Technology Akure, Ondo State, Nigeria 340*
E-mail: ayodeleissac@gmail.com

**Environmental Biotechnology and Bio-Conservation Department, National Biotechnology Development Agency, Abuja, Nigeria 900107*
Corresponding author: yoamide@gmail.com

Submission date : 20 November 2020 Published date : 31 December 2020

Abstract* - The aim of this experiment was to determine the antibacterial actions of the extracts of *Capsicum frutescens* on Forty four (44) bacteria associated with domestic food wastes in Akure metropolis, Ondo State, Nigeria. The bacteria were subjected to antibacterial test using unfiltered extract (UFE) and filtered extract (FE) of *Capsicum frutescens* prepared by grinding and filtering long pepper fruits in sterile distilled water in a ratio 1:2 (w/v) in mortal, pestle and Whatman paper by Agar Well Diffusion Methods. The aqueous extracts of *C. frutescens* showed strong appreciable antibacterial activity against the entire test bacteria. The unfiltered extract demonstrated better antibacterial action over the filtered extract. The zones of inhibition exhibited by UFE and FE were 3.33±0.33 mm to 6.00±0.58 mm and 1.33±0.58 mm to 3.33±0.33 mm. Hence, widest and least inhibitions were observed against *Proteus mirabilis*, *Bacillus licheniformis*, *Myroids odoratimimus* and *Proteus vulgaris.

Keywords - *Capsicum frutescens*; Domestic food waste; antibacterial effect

I. INTRODUCTION

Domestic food wastes (DFW) are unwanted raw or cooked foods discarded during or after food preparation at homes, they are no longer fit for consumption or desirable. In other words, they are wastes generated during the preparation of meals and any food, that is not consumed [10]. The components of domestic food wastes include spoilt vegetables, peelings and trimmings, fruit skins, spoilt fruit, cooked and uncooked meat, bones, fats, eggshells, used teabags, coffee grounds, bread and pastries, cooked food waste, tissue papers, packing materials, plastics, glass and water [8].

Long pepper, the plant used in this research is also called African bird's Chili. It belongs to the genus *Capsicum,* species *frutescens,* variety baccatum and the family Solanaceae (Night shade). Members of the Solanaceae family are mostly herbs or under herbs while some others are climbers. The family contains about 90 genera and nearly 3000 species [12]. The pepper is a spice grown in both tropical and sub-tropical regions [13]. *Capsicum frutescens* is one of the sources of chili pepper that grows wild and domesticated. It grows in Angola, Nigeria, and Uganda [12]. The long pepper (*Capsicum frutescens* L.) is among the three major hot peppers grown in the Nigeria. It is moderate moisture loving perennial tropical crop often grown as annual [6].

The long pepper is one of the five most important vegetable crops used in Nigeria as condiment and food flavour. It contains phenolic compounds, flavonoids and carotenoids, besides being a source of vitamin C [2]. It is low in sodium, cholesterol free, rich in vitamins A and C, and is a good source of potassium, folic acid and vitamin E [13]. It is used to prepare sauces, soups, stews and generally as a flavouring agent [3]. It is also known to have antimicrobial property. Previous work carried out in the Department of Microbiology of this institution showed that C. *frutescens* var. baccatum can inhibit an array of microorganisms [4].

II. MATERIALS AND METHODS

A. Materials

Fruits of the long pepper (*Capsicum frutescens* var. Baccatum) used in this project were collected from Teaching and Research Farm of The Federal University of Technology, Akure (FUTA). Authentication of the fruits was carried out in the Department of Crop Science and Pest Management, FUTA, Nigeria and reference was made to the handbook of West African weeds [1]. The bacterial species were provided by the Microbiology Department, Federal University of Technology, Akure. They were previously isolated from domestic food wastes (DFW) in the Department of Microbiology, Federal University of Technology, Akure. The domestic food wastes were collected from different locations in the Federal University of Technology, Akure (FUTA) namely School of Agriculture and Agricultural Technology, FUTA South Gate and Ogooluwa" Restaurant in Obakekere, FUTA. Other sampling locations were 'Oba's' market, Leo's Hospital junction in Akure metropolis.

B. Methods

B.1. Preparation of the Long Pepper's Extracts

The pepper extracts were prepared using the method of [5] with slight modification. Two different methods were used for the preparation of the extracts of the pepper fruits. For the first method, 3.0 g of the pepper fruits was weighed and rinsed thoroughly with distilled water to remove dirt. The pepper fruits were properly crushed with sterilized mortar and pestle. The crushed pepper was then mixed with 6.0 mL sterile distilled water to make a paste of concentration ratio of 1:2 (w/v). The paste obtained was termed the unfiltered extract (UFE). The second method followed the same steps till the UFE was obtained. The extract was then filtered through Whatman Filter Paper Number 1 (Whatman Limited, England) with pore size of 2 µm into sterile test tubes, plugged with cotton wool and wrapped with foil paper. The filtrate was termed the filtered extract (FE).

B.2. In vitro Test

The *in vitro* antibacterial activity of the crude extracts was determined by the agar well diffusion method as described by [11]. A volume of 1 mL from 18 hour broth culture of each of the test bacterium that have been adjusted to turbidity equivalent of 0.5 McFarland standard was dispensed into a sterile Petri dish. Cooled molten sterilized Muller-Hinton agar (MHA) was aseptically poured into the plates and gently swirled to distribute the bacterial cells evenly in the medium. The agar was allowed to solidify. A sterile cork borer of 6 mm in diameter was used to bore uniform wells in the agar. Each pepper extract (0.5 mL) was afterwards introduced into each of the wells. Sterile distilled water was used as a control.

III. RESULTS AND DISCUSSIONS

A. Comparative Inhibition of Unfiltered and Filtered Pepper Extract

The inhibitory effects of unfiltered and filtered extracts of *C. frutescens* are presented in **fig. 1.** Comparative inhibitive effects of unfiltered and filtered extracts of *C. frutescens* on selected isolates revealed that unfiltered extract had widest zones of inhibition ranging from 1.67±0.33 mm to 6.00±0.58 mm. The zones of inhibition formed by the extract ranged between 1.00±0.00 mm and 4.00±0.58 mm. The widest zone of inhibition formed by the unfiltered extract was recorded against *Proteus mirabilis* strain VITSBSTV02 (6.00±0.58 mm) followed by *Bacillus subtilis* strain CIFT MFB 4158A, *Proteus mirabilis* strain PPB3 and *Alcaligenes faecalis* strain MSC63 each with the inhibition zone of 5.67± 0.33 mm. On the other hand, highest inhibition (4.00±0.58 mm) achieved by filtered extract was marked against *Bacillus licheniformis* strain BIBT_VC_A and *Myroides odoratimimus* strain MTB-1-1. Moreover, unfiltered pepper extract had 1.67±0.33 mm as the lowest zone of inhibition against *Proteus vulgaris* strain AST11 while filtered extract recorded 1.00±0.00 mm against *Proteus vulgaris* strain CYPV1.

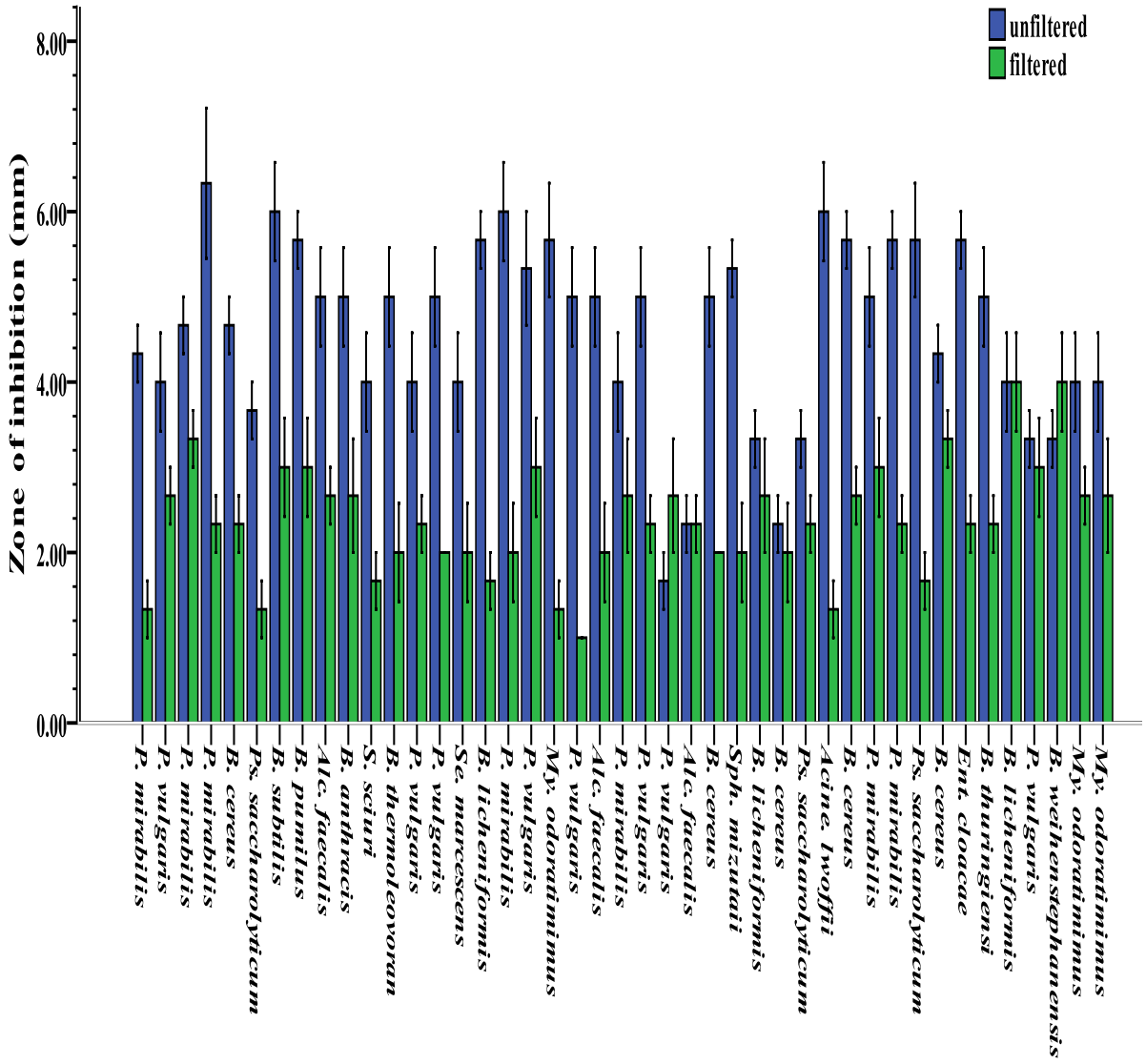

Fig. 1 Comparative inhibition of unfiltered and filtered pepper extract

The aqueous extracts of *C. frutescens* showed strong appreciable antibacterial activity against the entire test bacteria, an indication of its effectiveness. These indicate that the extract contained some active ingredients which endowed it with its antibacterial potential. These bioactive could be secondary metabolites such as capsaicin and dihydrocapsaicin as documented by [7] who reported on phytochemical analysis of *C. frutescens* attributing its antibacterial property to the presence of these substances in the extracts then. The results obtained in this work also agrees with the data obtained by that of [4] *Capsicum frutescens* extracts made with different extract solvents exhibited strong antibacterial activity against all the test bacterial isolates from human source. The data obtained in this work are also supported by those of [9] who observed antibacterial activity of *Capsicum* species against some human pathogens namely *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas* species and *Bacillus subtilis*. They testified that *Capsicum* have antibacterial property. From the results of the comparative inhibitory activity of unfiltered and filtered crude extracts of *C. frutescens*, the unfiltered extract demonstrated better antibacterial action over the filtered extract. This implies that filtration might cause loss of the active bioactive component in the long pepper extract. [5] documented similar results.

IV. CONCLUSION

The antibacterial property displayed by *C. frutescens* extract established their usefulness in the treatment of infections. The extract could however be used to treat infections caused by multi-drug antibiotic resistant test bacteria in preference to the antibiotics. Based on the antibacterial effectiveness of pepper extract obtained with this aqueous extract of *C. frutescens*, it is therefore suggested that *C. frutescens* should be developed into drug to treat infections caused by bacteria of domestic waste source.

REFERENCES

[1]. Akobundu, O. I. (1998). A handbook of West African weeds. *International Institute Tropical Agriculture*, 2 pp. 564-571

[2]. Alvarez-Parrilla, E., la Rosa, L. A., Amarowicz, R. and Shahidi, F. (2011). Antioxidant activity of fresh and processed Jalapeño and Serrano peppers. *Journal of Agricultural Food Chemistry,* 59 pp. 163–173.

[3]. Amusa, N. A., Kehinde, I. A. and Adegbite, A. A. (2004). Pepper fruit anthracnose in the humid forest of south-western Nigeria. *Nutrition and Food Science*, 34(3) pp. 130-134.

[4]. Bello, I., Boboye, B. E. and Akinyosoye, F. A. (2015). Phytochemical screening and antibacterial properties of selected Nigerian long pepper (*Capsicum frutescens*) fruits. *African Journal of Microbiology Research*, 9(38) pp. 2067-2078.

[5]. Boboye, B., Babatunde, T. and Onoriode, A. (2007). Antibacterial activities of some plants used as condiments and spices in Nigeria. *Current World Enviroment,* 2(2) pp. 171-174.

[6]. Ferrara, A., Lovelli, S., Di Tommaso, T. and Perniola, M. (2011). Flowering, growth and fruit setting in greenhouse bell pepper under water stress. *Journal of Agronomy*, 10 pp. 12-19.

[7]. Gayathri, N., Sekar, T. and *Gopalakrishnan, M. (2016).* Phytochemical screening and antimicrobial activity of Capsicum chinense Jacq. *International Journal of Advances in Pharmaceutics*, 3(1) pp. 2330-1923.

[8]. Hodges, R. J., Buzby, J. C. and Bennett, B. (2010). Postharvest losses and waste in developed and less developed countries: opportunities to improve resource use. *Journal of Agricultural Science*, 149 pp. 37- 45.

[9]. Koffi-Nevry, R., Kouassi, K. C. Nanga, Z. Y. Koussémon, M. and Yao Loukou, Y. (2012). Antibacterial Activity of Two Bell Pepper Extracts: *Capsicum annuum* L. and *Capsicum frutescens. International Journal of Food Properties*, 15(5) pp. 961-967.

[10]. Lamb, G. and Fountain, L. (2010). Waste in action. pp. 6

[11]. Monali P, Mishra R, Shasank S, Goutam G, Debajyoti Das and Rabindra N (2015). In vitro antibacterial activity of crude extracts of nine selected medicinal plants against UTI causing multidrug resistance (MDR) bacteria. J King S U 4 pp. 36-44.

[12]. Sterm, K. R. (2000). Introductory plant biology, Mac Graw Hill Company Inc. United States of America. pp. 630.

[13]. Than, P., Prihastuti, H., Phoulivong, S., Paul, W., Taylor, J. and Hyde, K. D. (2008). Chilli anthracnose disease caused by *Colletotrichum* species. *International Symposium on Fungal Diversity*. pp. 16-19.