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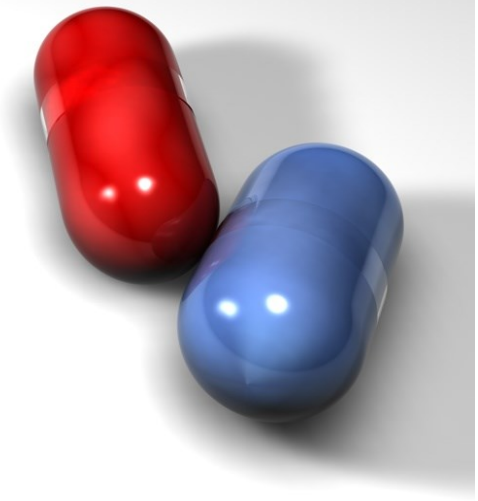

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Letter to the Editor

Antibacterial activity of phenolic compounds from *Terminalia arjuna* against multidrug resistant *E. coli* isolated from meat shop

Sir,

Escherichia coli is an emerging foodborne pathogen which is Gram negative rod, mostly motile and some of its serogroups have the public health impact on human. The most severe *E. coli* serotype associated with hemolytic uremic syndrome and hemorrhagic colitis have been the cause of several large outbreaks in various parts of the world during the past three decades (Reilly, 1998). In Germany outbreak, the stool sample analysis revealed that the *E coli* (O104:H4) strain virulence potentials are the combination of two different pathogens (Bielaszewska et al., 2011): Shiga-toxin-producing and entero-aggregative *E coli*. The emergence of antibiotic resistance in the commensal *E. coli* came from a clinical study from the Peru and Bolivia, with 3174 healthy children where *E. coli* showed resistance towards the different commonly used antibiotics (Bartoloni et al., 2006). The major risk factors for the acquisition of a multidrug resistant *E. coli* were found to be resident in a nursing home and in-hospital against the prescription of antimicrobials (Ikram et al., 2015). Therefore, the emergence of antibiotic resistance becomes a challenging area of research for the effective management of the common entero-pathogens.

A total of 100 samples were collected from the local meat shops from May 2008 to November 2009. The samples were collected, storage and transport according to the standard protocol (WHO, 2000). Eighteen samples were identified as *E. coli* with various serogroups and also reported to possess multidrug resistant (Pavithra and Ghosh, 2013). Out of which five strains (PV3, PV8, PV31, PV32 and PV34) were selected for this study based on multidrug resistant to the maximum drugs tested.

In recent years, a diverse variety of medicinal properties of the natural resources have been investigated worldwide. Thus, identifying new sources of natural products with antimicrobial properties from the medicinal plants are always the area of thrust (Valle et al., 2015). The current study aimed to screen the antimicrobial potential of phenolic compounds from the *Terminalia arjuna* against the multidrug resistant *E. coli,* which could not only useful for therapeutic applications but also will expand the antibiotic chemical diversity which is aimed to provide chemical leads for new drug.

The commercially available bark powder of *T. arjuna* (Sri Vinayaga Herbals, India) was subjected to extrac-

Table I

Antibiotic susceptibility test against multidrug resistant *E. coli* strains

Drug	Zone of Inhibition (mm)				
	PV3	PV8	PV31	PV32	PV34
Ampicillin (10 µg)	(S) 22	(S) 23	(R) –	(R) –	(R) –
Ciprofloxacin (5 µg)	(R) 25	(R) 22	(R) 12	(R) –	(R) 20
Chloramphenicol (30 µg)	(S) 23	(S) 23	(R) 19	(R) 11	(S) 24
Lomefloxacin (10 µg)	(R) 21	(R) 19	(R) 7	(R) –	(R) 16
Norfloxacin (10 µg)	(R) 21	(R) 21	(R) 9	(R) –	(R) 17
Nalidixic acid (30 µg)	(R) 19	(R) 20	(R) –	(R) –	(R) 19
Nitrofuranton (300 µg)	(R) 19	(R) 19	(R) 15	(R) 16	(R) 18
Ofloxcin (5 µg)	(R) 21	(R) 23	(R) 8	(R) –	(R) 16
Streptomycin (300 µg)	(S) 17	(S) 18	(S) 15	(R) 7	(S) 11
Tetracycline (10 µg)	(R) 11	(R) 14	(R) –	(R) –	(R) –

R: Resistant, S: Sensitive, –: No Zone.

Table II

Antibiotic potential of phenolic compounds against multidrug resistant *E. coli* strains

Concentration (µg/well)	Zone of Inhibition (mm)				
	PV3	PV8	PV31	PV32	PV34
62.5	14	13	15	12	14
125	15	15	16	14	15
250	17	17	19	19	18
500	18	18	20	20	19

tion through the soxhlet's method by using methanol solvent (Redfern et al., 2014). The dried methanolic crude extract was subsequently subjected to acid-base method for the isolation of phenolic compounds (Agrawal and Paridhavi, 2012). The phytochemical screening and GC-MS analysis showed the presence of phenolic characteristic of the isolated compounds which was identified as 5,7,dihydroxy-3',4',5'–trimethoxyflavone, ethyl-3-phenyl-1-((1-phenylethyl)carbomoyl) cyclobutane carboxylate and 2-(benzylsulfanyl)-4-(4-chlorophenyl)-6-(4-methyphenyl) nicotinitrile and their expected molecular weight was found to be 344.37, 351.04 and 425.00 dalton respectively.

The antibiotic susceptibility test for the *E. coli* against the various commonly used antibiotics and their resistance patterns were depicted in Table I. The phenolic compounds from the *T. arjuna* was screened for the antibacterial potential against the five *E. coli* multidrug resistant strain using well diffusion method (Rahman et al., 2016) and the results were tabulated in Table II. Interestingly, the synergistic effect of phenolic compounds showed significant inhibition against the multidrug resistant strain of *E. coli* evident from inhibition zones ranging from 12 to 20 mm and this effect was found concentration-dependent. Phenolic compounds have been reported to possess strong antioxidant and antimicrobial activities. The potential action of polyphenols acts on the bacterial cell membranes in a dose-dependent manner, thus disturbing membrane function and leads to cell leaking, therefore, inhibition of cell growth (Cardona et al., 2013).

Considering a great challenge towards the treatment of bacterial infections caused by multidrug resistant *E. coli*, the isolated phenolic compounds from the *T. arjuna* could be useful for its therapeutic application besides providing a novel lead compound.

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Kandasamy Sasikumar, M. Pavithra and Asit Ranjan Ghosh

School of Biosciences and Technology, VIT University, Vellore 632014, Tamil Nadu, India.

Corresponding author:
email: cidcvit@gmail.com

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