

ACTIVITY OF 'TRIPHALA' AGAINST DRUG-RESISTANT *ESCHERICHIA COLI*

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'Triphala' is a herbal product used in traditional medicine to treat wounds, coughs, heart disease, and others. It comprises fruits of *Terminalia chebula*, *Terminalia bellirica*, and *Phyllanthus emblica*. The objective of the present study was to assess the inhibitory effect of the combination and constituent dried fruit extracts of 'Triphala' on antibiotic-resistant *Escherichia coli*. The antimicrobial activity was assessed using the agar dilution assay, with an aqueous extract of 100% (boiled down to 1/8th of the initial volume) and 50% strengths of 'Triphala'. The combined extract and individual fruit extracts were assessed using one Multidrug Resistant (MDR- resistant to at least one agent in three or more antibiotic classes) and nine Drug-Resistant (DR-resistant to one antibiotic) isolates (all resistant to Ciprofloxacin), previously isolated from river water. Ciprofloxacin (8 µg/ml) was used as the positive control and sterile distilled water as the negative control. Further, aqueous extracts of the three fruits were assessed using X-Ray Fluorescence (XRF) to determine the elemental composition of the three extracts. The results revealed that the aqueous extract (100%) of 'Triphala' and individual extracts (100%) of *T. chebula* and *P. emblica* exhibited strong antibacterial activity against the MDR *E. coli* isolate resistant to antibiotics Ciprofloxacin [Fluoroquinolone], Amikacin [Aminoglycoside] and Augmentin [β-lactam] and all nine DR *E. coli* isolates. The extract of *T. bellirica* did not exhibit inhibition against the isolates tested. The XRF analysis revealed differences in elemental composition between the three extracts, which could not be attributed to the differences in the activity of the extracts. In conclusion, the combined extract of 'Triphala' and two of its constituents (*T. chebula* and *P. emblica*) showed activity against drug-resistant *E. coli*, exhibiting their potential to be used as antibacterial agents, particularly in the treatment of infections that are untreatable by synthetic antibiotics.

Keywords: Antibiotics, Ciprofloxacin, Drug-resistant *E. coli*, MDR *E. coli*, *Triphala*