ABSTRACT

The increasing global health emergency due to the frightfully fast development of microbial resistance towards man-made antibiotics has generated an immediate and extreme requirement for the identification, development, and application of safe and efficacious substitutes. The current research tackles this critical challenge by concentrating on the preparation and rigorous assessment of a new polyherbal tablet.

This special combination uses a synergistic mixture of four widely recognized and commonly utilized medicinal plants: Neem (*Azadirachta indica*), Tulsi (*Ocimum sanctum*), Ginger (*Zingiber officinale*), and Turmeric (*Curcuma longa*), which are all traditionally employed and historically used for their strong antimicrobial action in traditional systems of medicine. The overall objective of this study was to formulate a stable, efficient, and completely natural oral dosage form that has wide-spectrum antimicrobial activity, able to fight a wide variety of microbial pathogens.

The polyherbal tablets were carefully prepared by the wet granulation process, a widely practiced pharmaceutical method renowned for improving the flowability and compressibility of powders, essential in tablet production. After preparation, tablets were subjected to exhaustive and rigorous testing, with emphasis on numerous important physicochemical parameters to authenticate quality and stability. These parameters involved hardness testing to ascertain tablet crushing resistance, friability testing to quantify its tendency to crumble, weight variation testing to confirm dosage uniformity, and drug content uniformity testing to ensure uniform distribution of active herbal ingredients throughout the tablet. In addition, an initial antimicrobial screening was done to determine the inhibitory action of the developed tablets on a well-chosen panel of microbial strains that reflect both typical and clinically significant pathogens.

The findings from these tests were very impressive. The developed tablets not only fulfilled the rigorous standard evaluation requirements for pharmaceutical dosage forms, but were also found to have excellent and impressive antimicrobial activity. This activity was most evident against Gram-positive ($Gram^+$) and Gram-negative ($Gram^-$) bacterial species. In particular, the tablets exhibited strong inhibitory activities against model Gram-positive bacteria such as *Bacillus subtilis*, and Gram-negative bacteria such as *Escherichia coli*, revealing the broad-spectrum antimicrobial efficacy of the polyherbal medicine.

This research has serious implications for the future of antimicrobial chemotherapy. It advocates and recommends the application of natural herbal products that are in most cases linked to having a lower risk of causing negative side effects over their synthetic equivalents. The effective design of these polyherbal tablets highly affirms the vast potential for harmonizing traditional herbs into contemporary pharmaceutical uses.

This offers a highly promising and appealing alternative route for the efficient control and cure of a broad variety of microbial infections. The conclusions of this study are a major contribution to the increasingly global interest in herbal medicine and can act as a stimulus, further motivating the formation of novel plant-based antimicrobial drugs in the pharmaceutical sector. This can eventually result in more sustainable and affordable healthcare options for the prevention of the increasingly present threat of antibiotic resistance.