

Process Optimization for Preparation of an Antibacterial Agent Using a Combined Extract of Tulsi and Marigold Leaves

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Abstract : Medicinal plants and herbs contain substances known to modern and ancient civilizations for their healing properties. India is rich in biodiversity and many of its plants are known to have medicinal properties. This paper highlights two tropical and subtropical important plants -- *Ocimum sanctum* (tulsi) and *Tagetes erecta* (marigold) due to their easy availability and antimicrobial effectiveness. Several studies have been done on the antimicrobial properties of the individual extracts; however, few attempts have been made to study their antimicrobial properties in combination. The present work attempts to prepare an antimicrobial agent possessing the maximum efficiency, with a combination of leaf extracts from tulsi and marigold prepared in the most suitable solvent. Objective of the present work is to optimize the preparation method of the antimicrobial product and to check the properties of the product. Propylene glycol was found to be the most suitable extraction solvent. Process for preparation of the antimicrobial agent was then optimized by Response Surface Methodology using Design Expert Software 10. The extract retained its 72% and 62% of its antibacterial activity after 35 days when preserved at 4 °C against *E.coli* and *S. aureus* respectively.

Keywords: Tulsi, marigold, antimicrobial properties, Response Surface Methodology

I. Introduction

Since ancient times, there has been a continuous effort in finding healing powers in plants. However, for the past few decades, the antimicrobial agents obtained from bacterial and fungal sources have limited the use of the ones obtained from higher plants. The interest in antimicrobial agents from plants has been restored, mainly for two reasons. First, microbes are becoming drug-resistant and traditional methods of antibiotic development failed to keep pace with the development of drug resistance in bacteria. Second, people are becoming more aware of the ill effects of overuse of antibiotics [1].

Food safety is a global problem as many people die from food borne diseases worldwide. According to WHO, at least 2 billion people get ill due to consumption of unsafe food. Thermal processing is a common method to destroy microorganisms present in food but the method can destroy some nutrients. Use of preservatives is another common method to reduce the risk of illness. But increasing regulatory restrictions and negative response from consumers to the use of chemical preservatives have limited their use and developed a need for new antimicrobial agents [2].

It is estimated that plant materials are either present in, or have provided the models for 50% Western drugs [3, 4]. The primary benefits of using plant derived medicines are that they are relatively safer than synthetic alternatives, offering profound therapeutic benefits and more affordable treatment. Though most of the clinically used antibiotics are produced by soil microorganisms or fungi, higher plants have also been a source of antibiotics. Examples of these are the bacteriostatic and anti-fungicidal properties of Lichens, the antibiotic action of allinine in *Allium sativum* (garlic), or the antimicrobial action berberines in goldenseal (*Hydrastis canadensis*) [5].

Medicinal plants and herbs contain substances known to modern and ancient civilizations for their healing properties. Until the development of chemistry and, particularly, the synthesis of organic compounds in the 19th century, medicinal plants and herbs were the sole source of active principles capable of curing man ailments. In more recent history, the use of plants as medicines has involved the isolation of active compounds, beginning with the isolation of morphine from opium in the early 19th century [6, 7]. India is rich in biodiversity and many of its plants are known to have medicinal properties. This paper highlights two tropical and subtropical important plants -- *Ocimum sanctum* (tulsi) and *Tagetes erecta* (marigold). The reasons behind the selection of these plants can be attributed to their easy availability and medicinal effectiveness. Several studies have been done on the antimicrobial properties of the individual extracts; however, few attempts have been made to study their antimicrobial properties in combination. The present work attempts to prepare an antimicrobial product possessing the maximum efficiency, with a combination of extracts from tulsi and marigold prepared in the most suitable solvent. Objective of the present work is to optimize the preparation method of the antimicrobial product and to check the properties of the product.