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Synthesis of Novel Michael Adducts and Study of their Antioxidant and Antimicrobial Activities

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ABSTRACT

In the current study, the Michael addition reaction of nitromethane to chalcones was considered. 4-benzeloxy benzaldehyde was synthesized from 4-hydroxybenzaldehyde and benzyl bromide, which was then converted to chalcone derivatives by reaction with substituted acetophenones, and finally nitromethane was added to give Michael adducts. The structures of the synthesized compounds were characterized by FT-IR, ^{1}H NMR, and ^{13}C NMR spectroscopy. All the products were screened for antioxidant, antimicrobial against *Staphylococcus aureus* G (+*ve*) and *Escherichia coli* G (-*ve*) microorganisms and antifungal activities against *Candida albicans*.

1. Introduction

Ketones with two aromatic groups connected via an enone (Ar–COCH=CH–Ar) are called (Chalcones) [1]. Additionally, there are widespread chalcones, particularly (trans-1,3-diaryl-2-propen-1-ones) in natural products, that are an intermediate in the biosynthesis of flavonoids. Chalcones possess α,β-unsaturated ketone moiety, which leads to several biological activities. Several productive compounds, such as flavonoids and iso-flavonoids, which are usually human diet constituents, are synthesized from chalcones as precursors [2]. The condensation reaction between aryl aldehydes and acetophenone in the presence of a catalyst readily gives chalcones as the product [3]. Aldehydes, substituted aryl, including 5- and 6-membered ring heteroaryl, and acetophenones were selected as constituents for the chaconne array [4]. There is a wide spreading attention toward chalcones due to the simplicity in their structure vital pharmacological influence, and biological activities such as anti-inflammatory [3, 5, 6], antibacterial and antifungal [7], antimalarial [8, 9], antioxidant [10], antitubercular [11], antitumor [12], antiviral [13], antimicrobial [14], antihypertensive [15], antileishmanial [16], antimitotic [10], and anticancer activities [17]. Several protocols and procedures have been documented for the preparation of chalcones. Among them, Aldol condensation and Claisen-Schmidt condensation are considered high-quality and powerful methods still in use.

Claisen-Schmidt condensation reaction is reported to be the best method to synthesize chalcones in the presence of alkaline bases [18] such as $Ba(OH)_2$ [19], LiOH, with ultrasonic irradiation and microwave irradiation [20].

The nitro group ($–NO_2$) is considered one of the most useful functional groups in organic synthesis, biochemistry, and other relevant fields. The crucial point to be noticed regarding this manner is the association of powerful electron attraction (E.A.) character, significantly depending on the moiety type that nitro group is attached. Moreover, the ($–NO_2$) group possess high electronegativity which resulting in the strong inductive electron-accepting property, which influences the electronic and energetic properties of the compounds [21]

The definition of Michael addition reaction stated upon the 1,4- nucleophilic addition (Michael donor) to an unsaturated carbonyl group having an electron-withdrawing group (Michael acceptor) [22]. Generally, it is utilized for the chemical bond formation and synthesizing building block in organic chemistry [23]. This type of reaction is a flexible procedure for the addition of those compounds having conjugated nucleophilic group with an unsaturated electron-withdrawing substituent. The common Michael donor

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