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Review on chemical-Biological Fields of Chalcone Compounds

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Abstract

Chalcones as a chemical compound became an object of sustained interest in each fields (academia besides and industry). Currently, numerous chalcones derivatives are applied to the treatment of viral disorders, cardiovascular infections, parasitic toxicities, pain, gastritis, besides a stomach tumor, as well as like food flavors with cosmetic formulation ingredients. However, abundant of the medicinal potential of chalcones is remain not utilized. The aim of this survey is to refer to chalcone importance, applications, preparations, reactions besides to scientists in pharmacological screening of formatted chalcones, studying the importance of chalcone, with preparation of pharmacologically active chalcones with their biological activities. Certainly occurring chalcones have been applied in traditional medicine for numerous years; however, topical scientific advances have appeared that these compound shave a capacious range of biological activities in a multiplicity of organisms. A survey on the main sources of chalcones besides the main compound sevents convoluted in the modes of exploit of these natural compounds is achieved. Chalcones are chemical compounds with a broad spectrum of biological activities, that are of great concentration in agriculture to control weeds besides unwanted pests.

Key words: Chalcone, Aldol, Application, Carbanion, Reaction

Introduction

Chalcone is a ketone and an aldehyde (enone) that produces the central core to a variation of important biological molecules that are known communally as chalcones. Different names of chalcone involve benzylidene-acetophenone, phenyl styryl ketone, benzal acetophenone, β-phenyla crylophenone, γ-oxo-α, γ-diphenyl-α-propylene, and α-phenyl-β-benzoyle thylene [34],[75],[91]. They include the ketoethylenic group (–CO–CH=CH-) Figure 1.

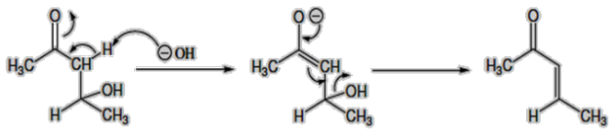

Figure 1. Mechanism of Aldol reaction -Chalcone

Names of Chalcone

Other names

- AldolProduct
- Benzylidene acetophenone
- Phenyl styryl ketone
- Chalconiode.
- One- alphaH-ene

Properties of Chalcone

This reaction (aldole) can be carried out without any solvent as a solid-state reaction. The reaction between substituted aldehydes and ketones can be reached from the same starting materials in high-temperature water (200 to 350 °C). Substituted chalcones were besides synthesize dviapipe ridine-mediated reaction to avoid side reactions like multiple condensations, polymerizations, besides rearrangements. A variety of approaches are available to the

preparation of chalcones[15]. Usually, chalcones could be found via Claisen–Schmidt condensation carried out in (base or acid)-medium under homogeneous conditions [46],[32],[73],[13]. The heterogeneous catalysts have been applied to Claisen–Schmidt reaction, involving Lewis acids, Bronsted acidsor solid bases with moderate success. Greatest of them depend on the occurrence of specific catalysts. The reaction of Claisen-Schmidt to obtain chalcones has similarly been previously reported via the applying of specific catalysts, KF-Al2O3, or 2-2-bipyridine complex to Co(OAc)2 were applied as basic medium [3],[16],[23],[4],[25],[49],[63],[17], Figure 2.

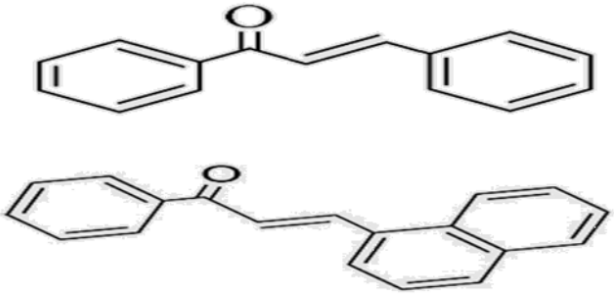

Figure 2. Formula of Chalcone

Preparation Methods of Chalcone

The catalysts are either strong (bases or acids). In Basic medium (base catalysis), the chalcone is produced from the aldol product via dehydration in (an enolate) - mechanism, while in acidic medium acid catalysis, it is produced via (an enol)-mechanism. The major drawback of this process is the slow reaction; the reaction naturally needs some days [22],[81],[64],[53],[74] to completion, Figure 3.

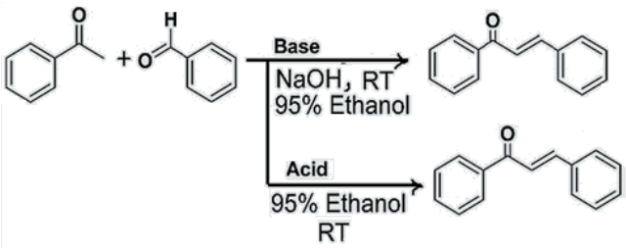

Figure 3. Preparation of Chalcone in Base or Acid

General Procedure for Chalcone

Place (1 mol-asa weight) of the any aldehyde into a conical flask ona magnetic spin plate, add (1 mole) of the ketone then(1 mL of absolute ethanolor 95% ethanol) to the mixture then start stirring, then add (0.10 mL of a 15 Molar of NaOH solution) to the flask, with stir at room temperature till it solidifies. Most of the formatted chalcone will precipitate out of solution after. Break up the solid with a spatula and dilute with (3 mL) of ice water. Transfer the mixture into another (3 mL) of ice water in a small beaker. Stir thoroughly, then suction filter, wash with cold water, and dry the yield. Chalcone-(aldol) condensation products should be purified with recrystallization from 95% ethanol.

Cyclization of Chalcone

Cyclization of chalcon by reaction of chalcone compounds with diamineor amino-alkyl thiol, etc…, Figures 4, 5.

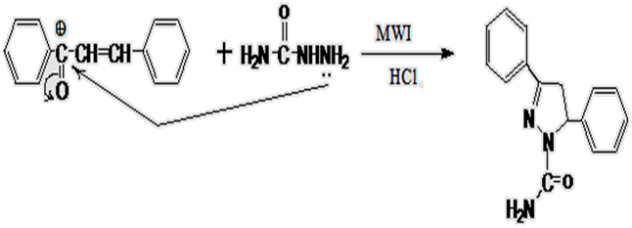

Figure 4. Preparation of Heterocyclic Compound from Chalcone

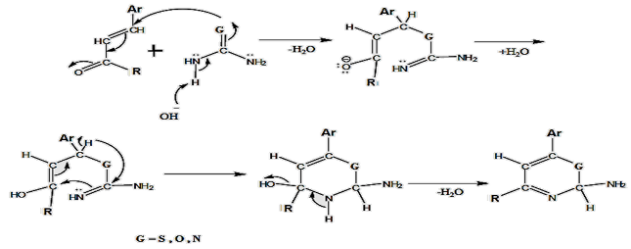

Figure 5. Mechanism of Cyclization for Chalcone

Applications of Chalcone

In Coordination Chemistry as a Ligandor Complexes Numerous studies described that various schalcone compounds tested as a ligands coordinate with many ionsin production of complexes in coordination [58],[15],[1],[28],[21],[30] fields, Figure 6.

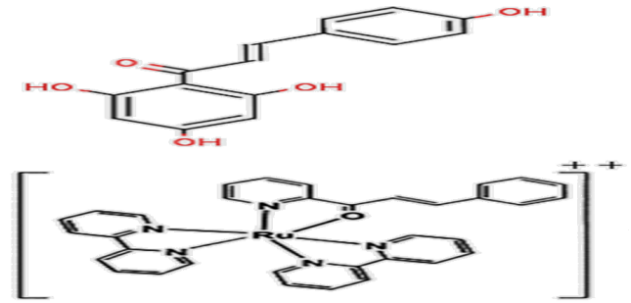

Figure 6. Chalcone as a Ligand and Complex

Applications in Medical and Pharmaceutical Fields

Chalcones is type of flavonoids and phenolic derivatives show an important natural role as signaling compounds in plant-microbe symbioses, being important to plant survival. Chalcones of leguminous plants are showed into the rhizosphere strongly persuading nod genes in Rhizobium meliloti. These biocompounds might similarly play a role in normal systems as pharma-chemical regulators of plant dispersal in Pityrogramma calomelanos ferns. In addition, some chalcones screened as antitumor [31],[35],[36],[37],[39],[54],[55],[56],[57],[60],[61],[42],[65] or anticancer, Figure 7, 8.

Applications in Biological Fields

Chalcones besides their derivatives are increasing attention because of various pharmacological applications. Chalcones are the major fore runners for the bio-preparation of flavonoids with iso-flavonoids besides exhibit many biological activities like antituberculosis agents, antiviral, anti-Inflammatory [73], anti platelet [67],[70],[72],[80],[82],[83],[41],[85],[2], antimicrobial like compounds in Figure 9. On the other hand, quinolinyl chalcones have appeared a wide range of pharmaceutical activities like Antibacterial, antimalarial, anti-inflammatory, anti-infective, antitumor

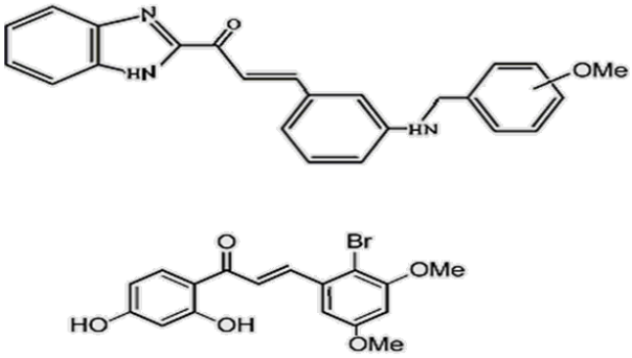

Figure 7. Chalcone derivatives as Anticancer

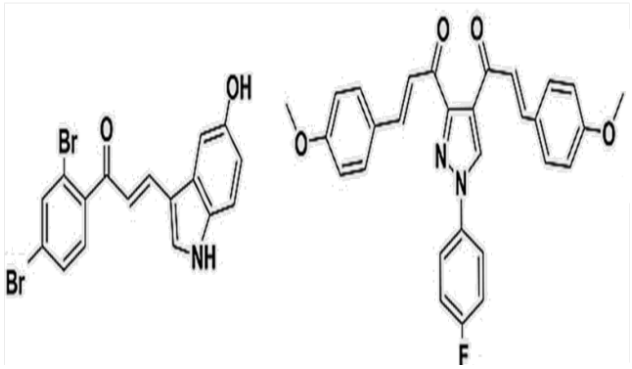

Figure 8. Chalcone Derivatives as Antitumor

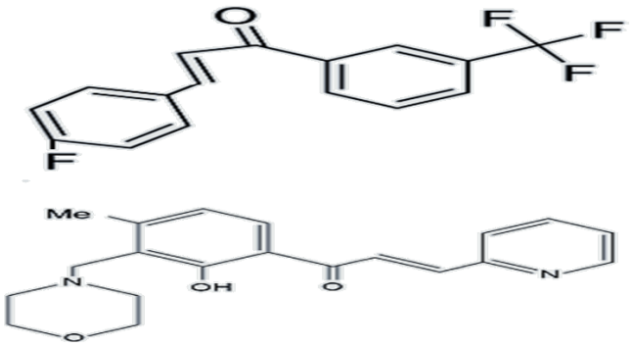

Figure 9. Chalcone as Antimicrobial

[5],[6],[50],[7],[8],[43], antimycotic, reverse-transcriptase inhibitor, and antiulcer [9],[11],[47],[59],[10]. A number of naturally occurring chalcones are toxic against a wide variety of plant pathogens which cause pests besides important agronomic and economic losses worldwide [52],[51],[12],[48],[14],[45],[62],[27],[86],[33].

Chalcone in Phyto-toxicity Field

The phytotoxic properties of chalcones inextracted plants have been extensively identified to deeply estimate the effects of these secondary metabolites as plant growth [19],[20],[26],[29],[38],[69],[77],[44] controllers with/or new potential bio-herbicides., Figure 10. Chalcones are phytotoxic molecules which affect a diversity of plant species prepossessing the germination process [78],[79],[87],[24],[18],[40],[66]. As well; different screened concentrations of chalcones molecules may induce different phytotoxic effects [68],[71],[76],[84],[88],[89],[90],[92].
For example some compounds in Figure 11.

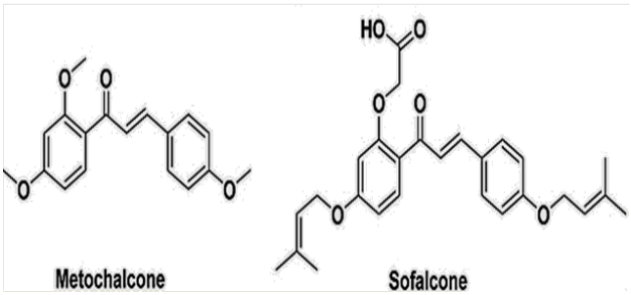

Figure 10. Chalcone in Extracted Plants

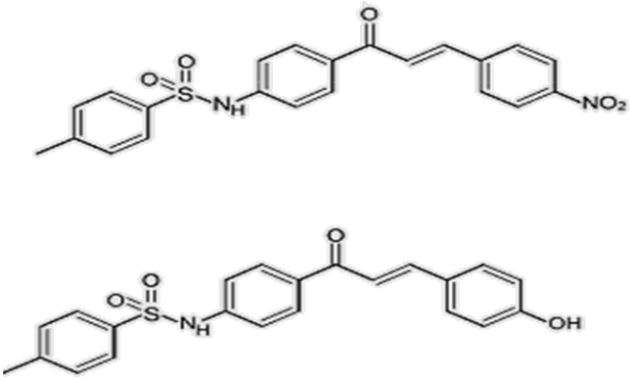

Figure 11. Chalcone Derivatives in Plant

Conclusions

Overall, chalcones derivatives are highly phytotoxic compounds besides the works completed resulted in exact promising effects, although further literatures on the mode of action with the pharmaceutical effects of chalcones derivatives in the field are essential to create real the application of these secondary metabolites in pest control and weed management. Abstracting, chalcones derivatives are versatile molecules with a abundant range of medicinal activities besides a great variety of application areas. The structure of chalcones, in terms of numeral and position of the hydroxyl groups and the á,â-double bond, is a key factor in the estimation of their biological activity.

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