Derivatives of Coumarin With Distinct Functions

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Abstract- *Coumarin has received a lot of attention because of its numerous pharmacological effects. Including Anti-bacterial, Anti-inflammatory, Anti-tumor, Anti-coagulant, Antioxidant, Anti-leishmanial. Due to its many pharmacological characteristics, Coumarin is an invaluable tool in the fields of chemistry and drug development. It is a crucial part of the research process for novel therapeutic medications. This paper aims to provide research findings on the chemistry and pharmacological properties of Coumarin derivatives.*

Keywords- Coumarin, Anti- bacterial, Anti-coagulant, Antioxidant, Anti-tumor.

I. INTRODUCTION

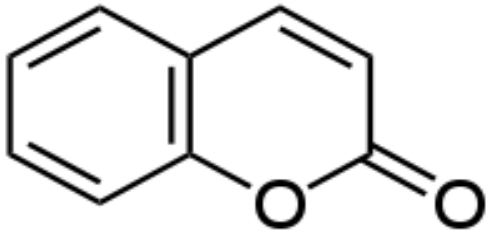
The aromatic organic chemical compound Coumarin, also known as 2H-chromen-2-one, has the formula $C_9H_6O_2$.Tonka beans, sweet clover, woodruff, cassia oil, and lavender are just a few of the plants and essential oils that naturally contain Coumarin.

The plant Coumarounaodorata is the source of its name. In 1822, Voleg separated and refined Coumarin from the Dipreryxodoratatonka bean. Later, Perkin synthesized itin1868.

Since coumarins have both nucleophilic and electrophilic characteristics, they can go through a variety of reactions that produce new coumarin derivatives or hybrid molecules. As a result, it could be regarded as a flexible synthon in medicinal and organic chemistry for creating new compounds.

The synthesis of new molecules that combine two or more pharmacophores and have the capacity to act on the same target at different sites or on two or more targets in order to provide better biological action has been made possible by molecular hybridization during the last several decades

Coumarin belongs to the class of substances known as Benzopyrones. A benzene ring fused to an alpha-pyrone ring makes up the chemical structure of coumarins. Six carbon atoms joined together to form a ring is known as a benzene ring. A ring with six members is also called an alpha-pyrone ring, but it has an additional oxygen atom and a double bond between one of its carbons and another oxygen.By combining with other heterocyclics, coumarins are useful tools for molecular hybridization, which produces more potent hybrids with favorable pharmacokinetic parameters, high selectivity, and fewer or no side effects.



Coumarin

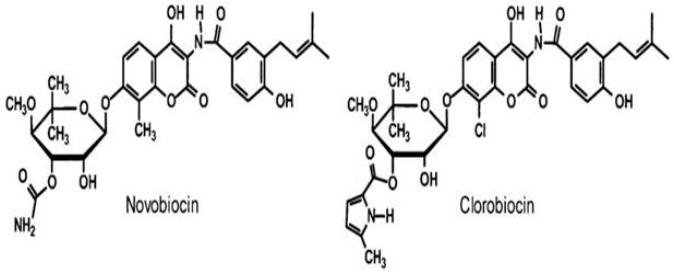
BIOLOGICAL ACTIVITY OF COUMARIN:

ANTI-BACTERIAL ACTIVITY:

The emergence of multidrug-resistant strains (MDRs) in recent years has focused the research community's attention on the design and development of new antimicrobial drugs in the modern drug discovery era. Multi-drug resistant infections (MDRs) represent a significant health risk to the world's population and are often linked to higher medical expenses and longer hospital stays. Scientists are concentrating more on finding new, safer, and more effective drug candidates to combat multidrug resistance (MDRs), even though recent developments have enhanced our understanding of the pathophysiology of antimicrobial infection. Our research lab has been actively involved in the design and development of novel bioactive molecules to combat multidrug resistant strains in the past few years.

Due to its drug-like qualities and, more importantly, its correlation with numerous pharmacological activities, coumarin pharmacophore has been regarded as the best small-molecule scaffold for the creation of new drugs. There are numerous clinically used drug candidates that contain coumarin pharmacophore, some of which are well-known antibiotics. As strong inhibitors of bacterial DNA gyrase, clorobiocin and novobiocin are available. In clorobiocin and

novobiocin, their distinctive aminocoumarin moiety is substituted at C-8with a chlorine atom and a methyl group, respectively.

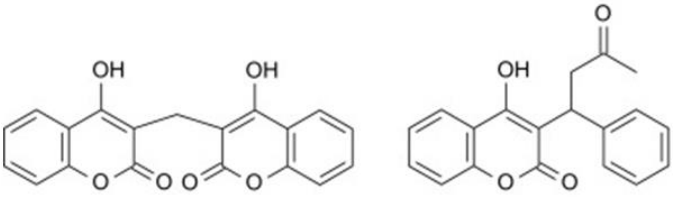


ANTI-COAGULANT ACTIVITY:

Many patients with thromboembolic diseases or those at risk for them are treated with oral coumarin anticoagulants. Due to their high rates of morbidity and mortality, intracerebral hemorrhages are one of the most feared complications of oral anticoagulants, as bleeding is a serious side effect of all of them.

Numerous natural products with potential medical applications contain the 4-hydroxy-3-substituted coumarin moiety, a commonly fused heterocyclic nucleus. Unique biological and pharmacological properties, including antibacterial, antiviral, anti-HIV, and anticoagulant properties, are exhibited by a number of these natural products.

Warfarin and Dicoumarol are strong Coumarin anticoagulants that prevent vitamin K from acting as a cofactor. Vitamin K is necessary for the liver to synthesize factors II, VII, IX, and X as well as proteins C and S. Vitamin K epoxide reductase, an enzyme necessary to keep vitamin K in the reduced state required for functional coagulation protein synthesis, is inhibited by Coumadin treatment.

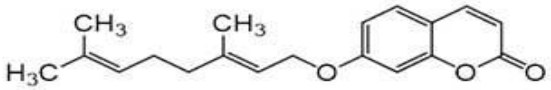


ANTI-CANCER ACTIVITY:

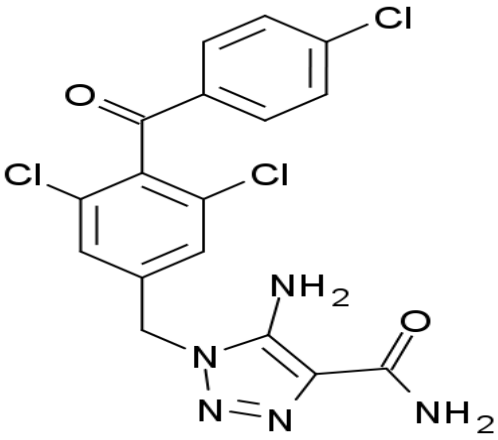
It is now extremely popular, highly active, and quickly developing to discuss coumarin compounds as possible anticancer agents. Numerous investigations have documented the creation of new anticancer compounds and their thorough structure-activity relationship (SAR) analyses in recent years.

The current review, however, attempts to offer up-to-date details on various coumarin-based anticancer scaffolds that have been documented during the previous five years. A compilation of different research studies on synthetic and natural coumarin derivatives with anticancer properties is also included.

Azoles are a significant class of nitrogen heterocycles that are found in fragment form in several anticancer medications. The hybrids of coumarin and azole show great promise as biological agents that improve pharmacological activity. These hybrids have therefore been selected for the creation of anticancer medications. A few Coumarin based on triazoles and their anticancer properties.



Auraptene



Carboxyamidotriazole

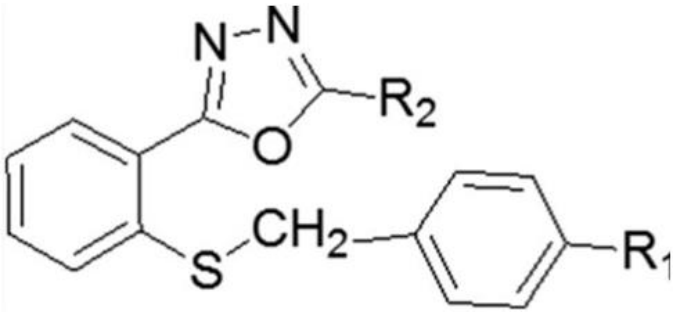
ANTI-CONVULSANT ACTIVITY:

The development of anti-convulsant agents will be interested in Coumarin and their related compounds. Abnormal behavior, seizures, and occasionally unconsciousness are symptoms of epilepsy, a disorder of the central nervous system.

Anti-epileptic (anticonvulsant) medications, vagus nerve stimulants, brain surgery, and a high-fat, low-carb ketogenic diet are all viable forms of treatment. We report

some recent developments in the use of Coumarin as anticonvulsant compounds here.Recently, Abd-Allahand and associates investigated the anticonvulsant activity of a number of coumarin derivatives, which was accomplished by combining two or more pharmacophore scaffolds to form novel chemical entities with enhanced biological activity.

To act as anticonvulsants, a number of novels 2-substituted-5-(2-benzylthiophenyl)-1,3,4-oxadiazoles were created. The optimal anticonvulsant activity was obtained by introducing an amino group at position two of the 1,3,4-oxadiazole ring and a fluoro substituent at the para position of the benzylthio moiety



ANTI-LESIHMANIAL ACTIVITY:

The parasite "Leishmania" is the cause of the neglected tropical disease leishmaniasis. Approximately 12 million individuals globally are impacted by this illness. There are three different types of leishmaniasis: visceral, mucocutaneous, and cutaneous. The most common and widespread of these is cutaneous leishmaniasis (CL), which is more common than the visceral form. In certain regions of Central Asia, the Middle East, and Latin America, CL is more common. The appearance of unsightly scars and skin sores are common signs of CL.

Numerous naturally occurring substances possess anti-leishmanial characteristics, including phenolic compounds, saponins, alkaloids, and terpenes. Additionally, anti-leishmanial activity of coumarins has been discovered by recent studies. Using NMR and MS spectroscopy, the structures of newly discovered coumarin or 5-methylcoumarins, that were extracted from Vernonia brachycalyx roots were determined. In vitro and in vivo, compound3-(1,3-benzodioxol-5-yl)-2-oxo-2H-chromen-6yl acetate exhibited the strongest anti-leishmanial characteristics.

II. CONCLUTION

The wide range of biological and pharmacological activities of coumarin derivatives has drawn increasing attention. For both naturally occurring and synthetic coumarins, we compiled information on their antimicrobial, anti-coagulant, anti-convulsive, Anti-cancer properties. The coumarin scaffold is a very attractive starting point and has proven to be a valuable source of inspiration in the design of new biologically active compounds. Many pharmaceuticals on the market today that are used to treat a variety of illnesses contain this natural core. As an example, the treatment and prevention of thromboembolic diseases are now well established with the use of warfarin and Dicoumarol. With this review, we hope to further advance the exploration and utilization of the potential of coumarins.

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