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SHODH SANCHAR BULLETIN * DR. VINAY KUMAR SHARMA * EDITOR IN CHIEF

Allelopathic influence of *Urtica dioica* L. weed on seed germination and seedling growth of *Glycine max* (L.) Merr. and *Linum usitatissimum* (L.)

Nitesh Kumar, Satish Kumar, Kuldeep Rana[1], Rajeev Bhoria[1], Anita Kumari[1] and Stuti Rawat*

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ABSTRACT

We investigated the allelopathic effects of *Urtica dioica* (stinging nettle) leaf and root aqueous extracts concentrations (1 %, 3 %, 5 % and 7 %) on germination, shoot length and root length of *Glycine max* (soybean) and *Linum usitatissimum* (flax). Findings indicated a concentration-dependent inhibitory response in both crops, with notable interspecies differences. Leaf extract results showed that *G. max* germination was highly sensitive to lower concentrations, exhibiting up to 80 % inhibition at 1 % and 3 %, while *L. usitatissimum* exhibited greater inhibition of 81.79 % at 7 %. The inhibitory effects on shoot and root lengths were more pronounced at higher concentrations, with *L. usitatissimum* root length showing drastic inhibition (95.50 %) at 7 %. Root extract at lower concentrations were less inhibitory in *G. max* but showed severe inhibition at 7 %, while, in *L. usitatissimum* there was mild stimulation at lower concentrations. These concentration-dependent interactions highlight *U. dioica*'s potential as a bio-herbicide, selectively impacting different crop species and growth parameters. The study underscores the necessity of understanding allelopathic interactions in sustainable agriculture and suggests future investigations to incorporate positive controls, evaluate physicochemical parameters (osmotic potential and pH) and explore the specific allelochemicals present in *U. dioica* for eco-friendly weed management strategies.

Keywords: Allelopathy, Extracts, *Glycine max*, Leaves, *Linum usitatissimum*, Linseed, Roots, Seed germination, Seedling growth, Soybean, *Urtica dioica*

INTRODUCTION

Allelopathy, a significant ecological phenomenon, involves the release of chemical compounds by certain plants, affecting the growth and development of neighbouring plant species (23). These allelochemicals, often secondary metabolites, have both inhibitory and stimulatory effects on other plants, shaping the dynamics of plant communities (12). Over the past decades, the study of allelopathy has gained increasing attention due to its implications for plant-plant interactions (11), biodiversity (7,29), and agricultural practices (5,18). Allelochemicals, including phenolics, terpenoids, and alkaloids, are typically low-molecular-weight compounds found in plant leaves, roots, rhizomes and seeds. They are released into the environment through volatilization, leaching, root exudation and the decomposition of plant residues, where they may influence seed germination and seedling growth of nearby plants (15,21).

Urtica dioica L. (stinging nettle, Urticaceae family) grow 1-3 m height and have stinging hairs (0) (Figure 1). This plant releases allelochemicals from its roots, leaves and decaying plant material. These chemicals inhibit the germination and growth of

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AIR POLLUTION AND PUBLIC HEALTH- A REVIEW OF CURRENT RESEARCH AND POLICIES

Dr. Asha Garg*

ABSTRACT

This study shows that air pollution is still a global public health issue as it causes numerous deaths and different diseases. The following review presents a summary of the existing literature on the associations between health outcomes and air pollutants, PM, NO2, and O3, highlighting their associations with respiratory diseases, cardiovascular issues, and adverse birth outcomes. We examine key policies aimed at mitigating air pollution, such as emissions regulations, urban planning initiatives, and public awareness campaigns. The effectiveness of these interventions varies, influenced by factors such as compliance, enforcement, and socioeconomic disparities. Emerging evidence underscores the need for integrated approaches that combine scientific research with community engagement and policy development. Future research should focus on long-term exposure effects, vulnerable populations, and innovative solutions to reduce air pollution's health impact. This review aims to inform policymakers and public health officials about the critical intersection of air quality and health, emphasizing the necessity for continued action to protect public well-being.

Keywords : Air Pollution, Public Health, Health Impact, Climate change

1.1 Introduction

Monitoring environmental value in the 21st century is a tough and intricate endeavor; nevertheless, advancements in technology today enable us to readily ascertain the air quality index of any location. Currently, we can readily get air quality and environmental factors online. Statistical data about air quality is often accessible on the internet. The environmental parameter now affects human health. The air quality index is deteriorating daily, adversely affecting public health. Individuals are encountering many health concerns, including alopecia, asthma, pulmonary disorders, and cardiovascular troubles. Understanding the environmental conditions along our daily travel routes is essential. Recently, air pollution has escalated, with the rise of detrimental airborne particles significantly impacting the air quality index [1]. Exposure to air pollution adversely impacts human health, leading to several hazardous conditions, such as asthma, with significant repercussions on lung function. Air pollution adversely affects public health, resulting in several health-related issues and incurring significant annual medical expenses due to sickness. This research emphasizes the influence of the Air Quality Index on human health, using relevant data to propose a safe path characterized by lower air quality levels, hence mitigating adverse health effects.

Among the most critical environmental health issues of our day is air pollution due to the negative impacts it has on public health and overall wellness. The presence of harmful compounds in the air may be caused by a variety of sources, including human activity, vehicles, and even natural calamities like wildfires. Seven million people lose their lives needlessly each year as a result of air pollution, according to the WHO. Most fatalities are from respiratory and cardiovascular disorders [2]. Air pollutants include PM, NOx, ground-

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Chemical&Engineering Data

Article

Studies on Interactional Behavior of Anticoagulant Drug Aspirin in Aqueous Environments through Physicochemical and Spectroscopic Methods

Parveen Kumar, Inesh Kumar, Shiwali Thakur, and Sunil Kumar*

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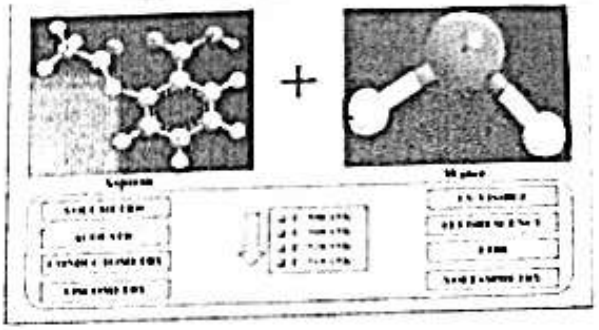
ABSTRACT: A comprehensive analysis of the interactional behavior of aspirin in water is conducted by performing physicochemical, spectroscopic, and cyclic voltammetric studies. The physicochemical properties were evaluated by measuring the densities, sound speeds, conductance, and viscosity values for aqueous solutions of aspirin with varying concentrations (0.001−0.010) mol kg^{-1} at four distinct temperatures (300.15−315.15) K. The experimental data was further used to calculate various physicochemical parameters. On increasing temperature, the values of Φ_v^0 increased from 126.83 to 134.50 and Φ_E^0 increased from −6.77 to −3.45, suggesting strong drug−water interactions. A similar trend prevailed in Φ_J^0, revealing the presence of the caging effect and structure-making behavior of aspirin. Moreover, hyperchromic shift in UV−visible spectrum, quenching in fluorescence spectra, and shift in FTIR spectrum (recorded at T/K = 298.15 and P/MPa = 0.1) strongly validate and strengthen the results of strong intermolecular interactions derived from the physicochemical data. The cyclic voltammetry technique was employed to investigate the electrochemical response of aspirin. The current investigation revealed valuable information on the stability, solubility, electrochemical properties, and intermolecular interactions of aspirin in water. The findings could be helpful, particularly in drug delivery systems, ensuring better therapeutic outcomes and making the research highly relevant for pharmaceutical applications.



1. INTRODUCTION

Research on the interactions of drugs with biological systems has always attracted the attention of scientists. This continual curiosity originates from the vast knowledge gained from several multidisciplinary fields.[1] The drug's effect can be better understood by investigating the temperature-dependent nature of its molecular interactions with water and other solvents. Moreover, the temperature-dependent nature of molecular interactions between the drug and water helps in elucidating the effect of the drug in aqueous environments similar to the human body. In addition to this, the molecular action of a drug can also be understood effectively by examining its physicochemical properties.[2] The interactions of drugs with physiologically relevant molecules found in blood, intra/extracellular fluids, and membranes are crucial in understanding the pharmacokinetics and pharmacodynamics of medicinal treatments. These interactions are significantly affected by various co-solutes like ionic salts, alcohols, proteins, surfactants, carbohydrates, osmolytes, and temperature changes. Thus, it is difficult to directly observe the interactions between drugs and solvents in biological systems.[3−5] However, it is possible to investigate and evaluate how temperature and solvent affect these interactions through a relevant theoretical background.[6−8] The capacity to form and break structures in solutions and the understanding of interactions, including ion-hydrophobic, ion−ion, ion-hydrophilic, and electrostatic, could be gained by studying the thermophysical properties of drugs in aqueous solutions.[9−11]

Nonsteroidal anti-inflammatory drugs (NSAIDs) are a major class of drugs commonly employed as anti-inflammatory, antipyretic, platelet inhibitory, and analgesic.[12] These drugs are predominantly characterized by their amphiphilic nature, possessing both hydrophobic and hydrophilic domains, making them operational.[13] The most common drug of this category is acetylsalicylic acid, commonly known as aspirin. Upon oral ingestion, it undergoes minimal ionization in the stomach due to its weak acidic nature (pK_a = 3.5 at 298.15 K). Approximately 40,000 tons of aspirin are consumed annually, owing to its extensive usage in medication.[14] Aspirin is

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