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THE IMPACT OF SOIL POLLUTION ON HUMAN HEALTH : LITERATURE REVIEW

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KEY W O R D S

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A B S T R A C T

Soil is the earth's layer that is crucial for the life of all living creatures. Chemicals, like pesticides, can introduce pollutants that contaminate the soil and negatively impact human health. Direct exposure to pesticides can lead to acute or chronic poisoning risks. This study aims to investigate the effect of soil pollution from pesticide pollutants on human health issues. The method employed is a literature review, sourcing materials that discuss the impact of soil pollution due to pesticides. Literature sources were retrieved from Google Scholar, ResearchGate, and other journal platforms. The review included 18 national journals and 12 international journals, with 6 journals on relevant topics summarized in an analysis table. The study's findings indicate that soil pollution from chemicals, including pesticides, significantly affects human health.

1. INTRODUCTION

In the context of literature addressing the effects of soil pollution on human health, soil pollution is defined as the introduction of hazardous materials into the soil, disrupting its role as a medium for plant growth and a habitat for microorganisms. The addition of heavy metals, organic pollutants, pesticides, and other chemicals can adversely affect soil health and its ecosystem. Soil pollution not only reduces agricultural productivity but

potential health risks for humans and animals through the contamination of food and drinking water. Furthermore, polluted soil conditions can facilitate the development and spread of parasites, highlighting the importance of monitoring and managing soil environments to prevent the spread of zoonotic diseases.
Soil contamination by lead, mercury, and pesticides can have extensive negative effects on both soil ecosystems and the health

of humans and animals. Lead is particularlydissolution and uptake by plants. This can harmful to children, causing kidney and brainlead to elevated lead concentrations in plants, damage. Mercury and cyclodiene also causewhich, when consumed by humans, can kidney damage. Additionally, variouscause health problems. Additionally, lead can

pesticides and herbicides can act as carcinogens for all populations. Chronic exposure to these substances increases

The risk of developing cancers, such as pancreatic, bowel, skin, and breast cancer, as well as leukemia. Neurological and hormonal disorders can also result from consuming foods exposed to toxic substances from soil pollution, leading to abnormalities in hormones like estrogen and progesterone. Therefore, important measures in prevention and proper environmental management are necessary to reduce the negative impacts of soil pollution.
The process of soil contamination by lead (Pb) involves several mechanisms that increase heavy metal concentrations in the soil. One major source is industrial waste, such as exhaust gases and dust from burning used batteries, which contain lead. Lead also enters the soil through fertilizers, pesticides, and inappropriate agricultural practices, like using lead-contaminated soil to grow crops susceptible to heavy metals. Lead in the soil can be absorbed by plants, especially when the soil's pH is high, facilitating lead

be deposited in the soil, particularly in high pH conditions, hindering plant access to nutrients and water and disrupting soil microorganisms crucial for nutrient cycling and soil structure. Therefore, effective soil management and monitoring are essential to prevent and reduce pollution by hazardous chemicals.

2. METHOD

The method employed is a literature review that examines and synthesizes various selected sources to draw conclusions and generate new ideas. The reference literature consists of primary data from national and international journals published in the last 10 years. The journals cover topics based on keywords such as "soil, pollution, pesticides, humans, health." A total of 18 national journals and 12 international journals were obtained through searches on Google Scholar, ResearchGate, and journal sites like NCBI, PubMed, and ProQuest.

3. RESULT AND DISCUSSION

State of Polluted Soil

Soil fertility can be compromised by pollution, particularly through the loss of mycorrhizae, a beneficial type of fungus. Polluted soil decreases the soil's capacity to support plant growth, as pollution disrupts the nitrogen and oxygen bonds essential for fertility. Consequently, soil pollution represents an environmental alteration of natural soil, driven by the introduction of man-made chemicals.

Pesticides (Chemical Structure and How They Work to Damage Crops)

Farmers use various pesticides, including those with the active ingredient carbofuran, such as Furadan 3G and Dithane. Overuse of these pesticides can negatively impact soil fertility by making the soil more alkaline and lowering its pH. For humans, pesticides that settle in the soil can pose serious health risks, as these deposits can be carcinogenic.

Contaminated sediments not only threaten human health but also disrupt ecosystems by causing the extinction of natural pest enemies and fostering pest and disease resistance. Misuse of pesticides such as incorrect type, dosage, and frequency
leads to residues that adversely affect water, soil, plants, and humans. High pollution levels are often a result of such non
compliance by farmers.
Pesticides enter the soil through subsurface and surface layers, undergoing biotransformation and bioaccumulation in plants, reabsorption by roots, and direct

infiltration through soil flow. These processes affect groundwater content and influence the leaching of substances during biological and chemical decomposition stages.

Earthworm Presence as an Indicator of Soil Pollution

In fertile soil rich in organic matter, various types of worms, such as Pheretima, Pontoscolex, and Megascolex, can be found. These worms help adjust the soil density, contributing to soil fertility and reducing the risk of pesticide pollution. Three main factors cause earthworms to leave their habitat: problematic soil conditions, high soil density, and soil disturbance or damage.

The diversity of worm species can be influenced by environmental conditions and leachate. Leachate, a liquid from the decomposition of manure, contains organic and inorganic materials. Proper

decomposition of this water can enhance soil chemical levels, such as pH, total nitrogen (N), total organic carbon (TOC), and organic carbon (C-organic), thereby promoting worm diversity and soil health..

Effects of Plants Consumed and Soil Trodden on Humans

of pesticides and the harmful effects of excessive use. Many farmers believe that using more pesticides will lead to quicker and pest-free yields. However, this misconception poses significant health risks

to both farmers and consumers. Long-term exposure can result in severe illnesses, including cancer, while short-term exposure can cause symptoms like nausea and dizziness.

Signs of pesticide poisoning after spraying include stomach pain, nausea, dizziness, blurred vision, diarrhea, muscle aches, and skin irritation. A person is considered poisoned by pesticides if they were previously healthy but exhibit these symptoms after spraying pesticides.

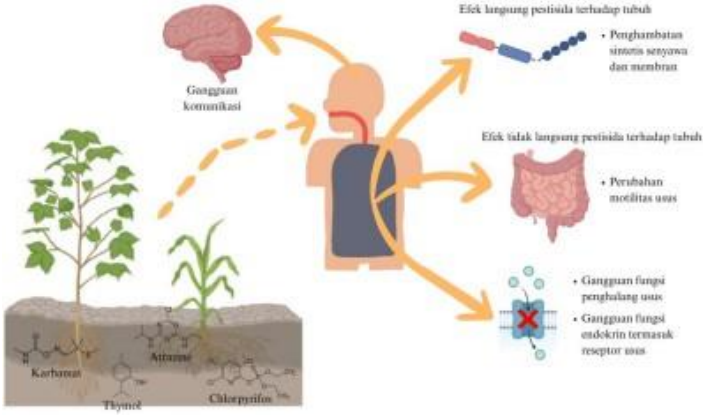

Figure 1:

Mechanism of Pesticide Effect on Human Health. Pesticide residues in the

environment—such as in the air, soil, water, and food—can enter the bodies of living beings, disrupting the gut-brain connection. Although the exact mechanisms remain unclear, several potential pathways could explain these communication disorders. These pathways include direct effects on microbial metabolism, indirect effects on the microbial community in the gut, and indirect effects on host-microbe interactions, all of which may contribute to behavioral disorders.

Mechanisms of Effect of Pesticides on Human Health

Although limited in number, studies have shown that pesticide exposure can impact the behavior of living beings, leading to anxiety, memory loss, and reduced social interaction. The mechanisms behind these behavioral changes due to pesticide

exposure are still under investigation, (e.g., the HPA axis, neural pathways, and immunity). The HPA axis is a complex interaction pathway between three body systems that regulate responses to stress and various bodily processes, including digestion, the immune system, mood and emotional levels, sexual arousal, and energy storage and utilization.

Although still hypothetical, it is

although various studies have evaluated necessary to explore whether pesticide

potential pathways. Alterations in brain induced activation of the HPA axis can development and function are clear effects of trigger the immune system, resulting in

signal disruption along the microbiota-gut brain axis, potentially caused by changes in gut microbiota composition and function.

It has been previously described that changes in gut microbes can cause behavioral disturbances through several

modifications to microbial diversity that may harm gut function. Changes in gut microbial composition and structure could alter the production of various metabolic products, which may stimulate the enteric nervous

system and vagal afferent nerves, leading to further activation of the HPA axis.

4. CONCLUSION

Soil pollution significantly compromises soil fertility, primarily through the disruption of essential biological processes like the functioning of mycorrhizae. Pesticides, especially those with active ingredients like carbofuran, exacerbate soil degradation by altering pH levels and contributing to the loss of beneficial organisms such as earthworms. These pollutants enter the soil through various pathways, leading to bioaccumulation and adverse effects on groundwater, plant health, and ultimately human health. Pesticides' residues not only disrupt ecosystems but also pose severe health risks to humans, causing both short-term and long-term health issues. The presence of earthworms serves as a crucial indicator of soil health, and their decline signals significant ecological imbalance. Moreover, pesticide exposure has been linked to behavioral disturbances in humans, possibly due to disruptions in the gut-brain axis. Thus, the widespread use of pesticides not only threatens environmental health but also endangers human well-being, underscoring the need for more sustainable agricultural practices.

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