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Pesticidal Pollution Due to Soybean Farming in Sehore District of Madhya Pradesh

Kishor Kumar Pal[1,*], Asha Verma[2], L.K. Tiwary[3]

Abstract

Worldwide, agricultural areas, including the Sehore district of Madhya Pradesh, India, are growing concerned about pesticide pollution. This research aims to determine the extent and effect of pesticide pollution around the region's soybean Farming. In the Sehore district, soybean is an important agricultural product and a revenue generator for the Government. Pesticides are used extensively to control pests and illnesses which could harm the soybean farm. The study used various of methods to determine the presence and quantity of pesticides in the agricultural environment, including field surveys, the collecting of water and soil samples, laboratory analysis, and statistical modeling. The study further looked at potential places of contamination and their impacts on soil health, water bodies, and human health. Initial research shows that soybean agricultural operations frequently use pesticides, such as herbicides, insecticides, and fungicides. In other instances, food products were also found to have these pesticide residues. This contamination puts human health and the ecological balance at risk. The study highlights several risk factors that contribute to pesticide contamination, such as improper handling and application procedures, a need for more information among farmers regarding appropriate dosage and time, and a lack of awareness of safer substitutes. The results also highlight the importance of adopting integrated pest control and sustainable agriculture methods to reduce the adverse consequences of pesticides on the environment and human health. In conclusion, this study reflects the most critical problem of pesticide pollution brought on by soybean cultivation throughout area Sehore in Madhya Pradesh, India. The study emphasized the need for immediate action to implement entire methods, including regulatory bodies interventions, encouragement of sustainable farming practices, and training and education initiatives to reduce pesticide related environmental concerns while preserving the area's ecological integrity.

Keywords: Pesticides, soybean farming, pesticide pollution, environmental contamination, Sehore District, Madhya Pradesh

***Author for Correspondence**
Kishor Kumar Pal
E-mail: kishorkumar_pal@yahoo.com

[1]PhD Student, Department of Chemistry, Dr. Shyama Prasad Mukherjee College, Bhopal, Madhya Pradesh, India
[2]Professor, Department of Chemistry, Dr. Shyama Prasad Mukherjee College, Bhopal, Madhya Pradesh, India
[3]Professor, Department of Chemistry, Regional Institute of Education, Bhopal, Madhya Pradesh, India

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INTRODUCTION

The soybean farming sector in the state of Madhya Pradesh plays a crucial part in India's agricultural landscape, contributing considerably to both the nation's overall food production and its economy. The Indian state of Madhya Pradesh is home to this business. The extensive usage of pesticides is a caution that must be considered with great agricultural production it is a cause for worry. While pesticides are unavoidable for achieving effective pest management and optimizing agricultural yields, they do pose a serious threat to human and environmental health. The purpose of this research is to evaluate the

possible health concerns that are connected with pesticide exposure among farmers and people in the area [1]. The study digs into the important topic of the influence of pesticides on the human body as a direct result of soybean cultivation in Madhya Pradesh. This study explores the numerous facts of the pesticide usage in soybean farming, from the kinds and amounts used to the health consequences experienced by persons, in order to give a thorough knowledge of the issues provided by this topic. Agricultural practices in the area should also be considered in this study with an eye on sustainability and health.

Importance of Soybean Cultivation in Madhya Pradesh

The "Soybean Bowl of India" moniker comes from Madhya Pradesh's status as India's leading soybean provider. The state's prominence in the soybean industry is the source of this title [2]. This crop is vital to the state's agriculture ecosystem and rural residents' quality of life. First, Madhya Pradesh farmers make a lot of money growing soybeans. Farmers choose the crop because to its great production potential, good weather, and adequate soil. In addition to providing cash, soybeans improve soil fertility and reduce insect infestations in future seasons. [3]. Soybean farming supports hundreds of rural households throughout the state. Second, Madhya Pradesh soybeans increase India's edible oil. In this country, culinary oil manufacturing region soybean oil extraction. Madhya Pradesh soybean out produces India's edible oil imports, ensuring food security and reducing foreign currency outflows [4]. Finally, the local ecosystem in Madhya Pradesh is significantly impacted by soybean farming. Plants that produce soybeans are able to fix nitrogen, which increases soil fertility and decreases the demand for synthetic fertilizer. Thus, less pollution is released into the environment, and the region's agricultural sector is able to endure for the long term [5].

Agriculture and the Use of Pesticides

To avoid insect, weed, and disease losses in agriculture and animals, pesticides are widely employed. One million pounds—1% of Madhya Pradesh 900 million pounds of conventional pesticide—is sprayed annually. The EPA estimates that 76% of MP pesticide usage is in agricultural output, with 24% in urban, industrial, forests, as well as public sectors [6]. These chemicals increased agricultural output and reduced labor costs. However, improper pesticide usage has caused human sickness, non-target animal damage, and water quality loss. Insecticides, herbicides, & fungicides are pesticides. Most pesticides found in surface and groundwater are herbicides. The most common pesticides in agriculture and cities are herbicides. [7]. Our ability to detect chemicals in their native habitats has improved dramatically throughout the past few years. Conventional management approaches may introduce trace amounts of pesticides into surface and groundwater sources, according to results from the development of very sensitive detection technology. The development of more sensitive detection methods has made this a certainty. These water sources are a source of our drinking water, so it is imperative that individuals applying pesticides be very careful and implement good pesticide management practices to avoid contamination [8].

Pesticides Behavior in the Environment

Through application to a target plant or disposal, pesticides possess the capacity to infiltrate the environment. Pesticides can endure various processes upon infiltrating the environment, including transfer (or migration) and degradation. Environmental pesticide breakdown produces new chemical compounds [9]. Transfer mechanisms such as adsorption, leaching, volatilization, aerosol dispersal, and discharge facilitate the movement of pesticides from the intended site to non-target environmental media or plants. The variations in chemical categories are indicative of their distinct environmental behaviors. As an illustration, organochlorine compounds, including DDT, possess a notable capacity to accumulate in tissues and inflict enduring harm despite their minimal acute toxicity [10]. Although their sale has been prohibited in the majority of nations, the persistence of their residues in the environment is attributed to their inherent characteristics (Figure 1).

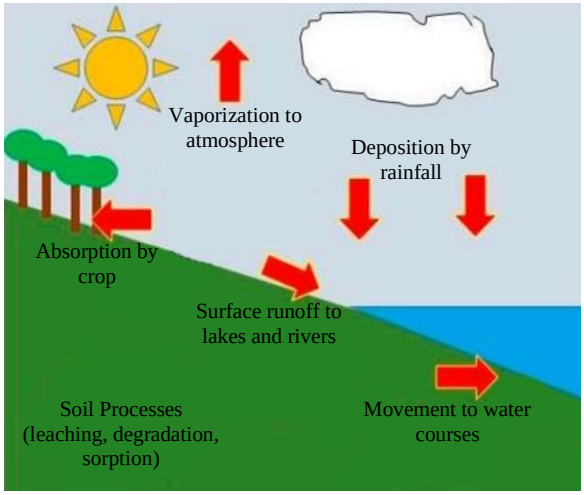

Figure 1. The operation of pesticides in the natural habitat.

LITERATURE REVIEW

[11] This study aims to evaluate the boundaries of soybean cultivation in the Madhya Pradesh, India's sehore district, as well as the expenses and benefits of soybean production on farms of varying sizes. [12] Pest and disease outbreaks, soil fertility, water shortages, and climate change keep India's agricultural productivity low. The food and agriculture industry's production, markets, and unemployment suffer. Awareness of plant diseases is needed to avoid them. Plant pathology brings unique solutions to sustainability issues and advances Indian agriculture. [13] The current study will add to the body of knowledge on the advantages of organic farming and food production, which will aid in future studies. Even though organic farming may provide high-quality food with minimal effects on soil, human health, and the environment, sufficient food for India's whole population still has to be produced by large-scale organic farms [14] With a yield of12.19 q/ha and anareaof11.32 M/ha, the soybean production in India amounts to 13.79 Mt. Evidence-based practices are demonstrably preferable to local practices, as demonstrated by the results. Incontrast to the local control interventions, benefit-to-cost ratios were observed to be higher throughout the entire year for the demonstrations. [15] This research examines technical interventions on soybean crops by three KVKs from 2008-09 to 2010-11. The yield increased 16.72–34.70 percent above farmer practice. The plots yielded 21.42 qha-1, 27.0percent greater than the farmer's practice(16.83qha-1).

METHODOLOGY

The methodology used in this study is essential for figuring out how pesticide exposure affects human health in the context of Madhya Pradesh soybean farming. This section explains the study's focus on a particular region, participant selection, data collection techniques, and other crucial factors that ensure the reliability and validity of the findings. Using a comprehensive approach, this research aims to provide a systematic & evidence-based examination of the health dangers related to pesticide exposure in the area.

Study Area

The current research focused on agricultural spray farmers in Sehore Madhya Pradesh, which is recognized for its large soybean output. Wheat, sugarcane, and other vegetables are also farmed in the region.

The three villages of Sehore district, which are well-known for growing soybeans in Sehore, were chosen at random for the study, ArniyaRam village has a population of 1109 people and 278.18 hectares of agriculture land, Amipur village has a population of 316 people and 440.66 hectares of agriculture land, and Badkhola village has a population of 1298 people and 666.98 hectare agriculture land. This study was conducted from June to September of 2009 to 2011, during the period when

soybean crops were sprayed with organophosphate insecticides. The typical spraying schedule was from 8:00a.m.to11:00a.m., followed by3:00p.m. to 6:00p.m., six days a week. Following pesticide spraying, the farmers were investigated during working days. Three organophosphate pesticides manufactured by Cheminova India Ltd.—chlorpyrifos (20%), quinalphos (25%) and triazophos (40%)—are used to soybean crops on a large scale. The current research included participants who were exposed from 3 months to 12 months.

Interview Questionnaire

The questionnaire included information on property ownership, the farmer's plantation, organophosphate pesticide exposure, pesticide usage, precautions, indications and symptoms, and more. Pesticide sprayers were asked whether they encountered these symptoms during or after spraying. We found poor eyesight, tremors, skin patches, heavy sweating, itching, and more throughout the interview. The cross-sectional research required farmers to self-report symptoms and indicators. Data was collected on pesticide timing. Farmers utilized hand compression, backpack, and tractor-mounted sprayers, according to the questionnaire. None of the investigators utilized plastic waterproof clothing, masks, gloves, or boots for spraying.

Data Collection

The research included 151 individuals ranging in age from 18 to 45 years old and from the same socioeconomic background as the male subjects. The categories were chosen based on surveys completed by Sehoresprayers.107 individuals were chosen at random from diverse farms based on their full-time active engagement in pesticide preparation, storage, and crop spraying for at least six months. The analysis was performed on four groups depending on the period of organophosphate exposure (38 patients exposed for 3 months, 31 subjects exposed for 6 months, and 38 participants exposed for 12 months). The research was compared to 38 healthy men from nearby locations with the same socioeconomic position who had no past or present occupational exposure to pesticides. Questionnaires were sent to each group's members. Each respondent's socioeconomic background, family history, and habits were meticulously recorded in the questionnaire. The academic study's goal was disclosed to all participants, and their permission was secured.

RESULT AND DISCUSSION

Results

This section summarize major results on the effects of pesticide exposure on human health. It examines symptom prevalence among pesticide-exposed individuals for various durations and compares the results to control groups, offering insight into the health impacts of differing exposure periods.

This Table 1 and graphs (Figure 2) represent the prevalence of various symptoms among different groups of human subjects, each with its respective sample size (n), likely exposed to varying conditions or environments. Notably, Group-3, consisting of 38 individuals, experienced the highest

Table 1. Prevalence of symptoms by duration of exposure and control groups.

Exposure Duration	Symptom s→ Groups of Hum an Subjects (n)↓	Burning / Stinging / itching eyes	Blurred vision	Skin redness/ white patches on skin/skin scaling	Excessive sweating	Dry/ Sore throat	Runny/ Burning nose	Shortness of breath /cough
3 Months	Group- 1(38)	1(1.42)	2(4.70)	2(4.11)	3(6.41)	2	0	2 (3.41)
	Control-1 (16)	0	0	0	1(20)	0	0	1(1.24)
6 Months	Group- 2(31)	6(20.1)	4(7.71)	7(19.4)	8(28)	6(11.27)	5(25.7)	3(12.7)
	Control-2 (12)	3(10)	0	0	0	0	0	2 (5)
12 Months	Group-3(38)	10(25.4)	12(28.69)	20(58.3)	16 (38.5)	8(21.06)	15 (34.9)	13(31.6)
	Control-3(16)	0	3(14.4)	0	2 (7.7)	0	0	2(6.7)

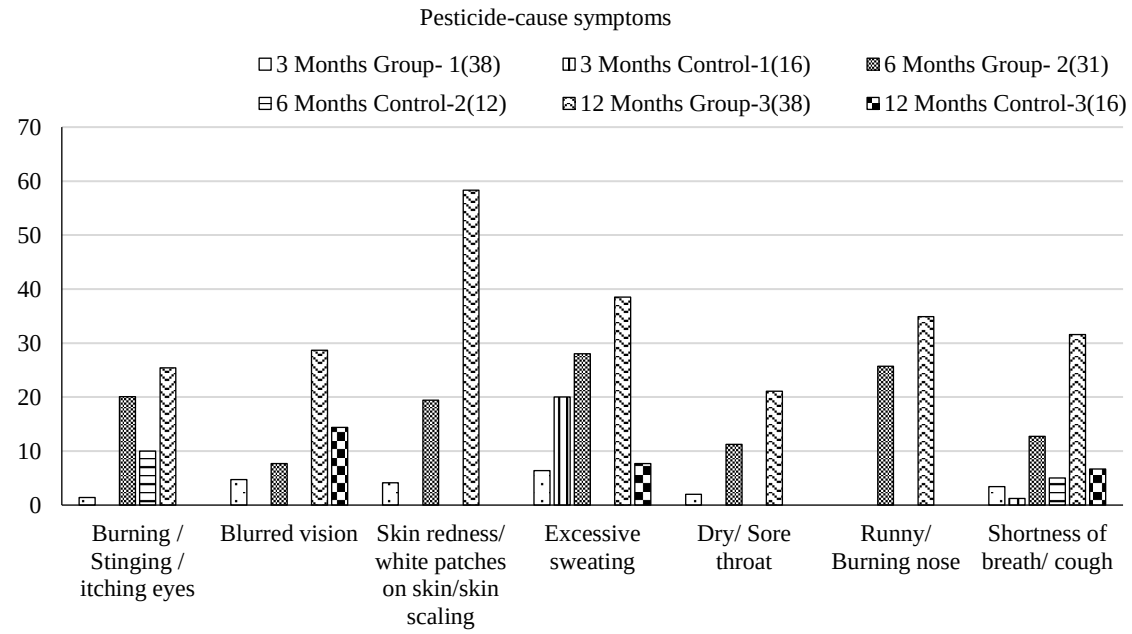

Figure 2. Prevalence of various symptoms among different groups of human subjects.

symptom rates, with skin redness/white patches on the skin/skin scaling (58.3%) and blurred vision (28.69%) being the most pronounced, followed by shortness of breath/cough (31.6%). In contrast, Control-1, Control-2, and Control-3 groups had minimal or no symptoms overall, except for Control-1, where excessive sweating was notably high (20%). These data suggest a potential correlation between exposure and symptom severity, underscoring the importance of further investigation to understand the factors contributing to these health outcomes in each group.

DISCUSSION

The study's results have major consequences for the health of Madhya Pradesh soybean farmers. The found association between pesticide exposure length and the incidence of health complaints emphasizes the critical need for proactive efforts to address this problem. Prolonged exposure, especially exposure lasting 3 to 12 months, tends to significantly raise the chance of undesirable health consequences such as vision loss, skin problems, profuse sweating, and respiratory disorders. To reduce these hazards, it is critical to enforce strict pesticide handling safety regulations, give extensive training to agricultural employees, and encourage the use of personal safety gear. Regular health checks and monitoring must be common practice in the agricultural industry in order to identify and treat illnesses as soon as possible. Furthermore, this research highlights the greater need for environmentally friendly pest control solutions that minimize dependency on chemical pesticides. It advocates for a comprehensive strategy to protecting farmers' and the environment's health while assuring the continuing prosperity of Madhya Pradesh soybean growing.

CONCLUSION

In conclusion, this research reveals the severe health consequences of pesticide exposure among the soybean farming population in Madhya Pradesh. There is a definite correlation between extended exposure duration and increasing health symptoms, which was shown in the study. It is vital to implement stringent safety measures, offer extensive training, and promote sustainable pest control options in order to safeguard the health and well-being of agricultural workers as well as the environment. In addition, it is necessary to do routine health checks in order to detect symptoms and take appropriate action as soon as possible. This study highlights the critical need for a comprehensive and proactive strategy to pesticide control, highlighting the relevance of sustainable agriculture practices that priorities both human health and environmental sustainability.

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