

**AN ASSESSING THE HEALTH IMPLICATIONS OF PESTICIDE USE
AMONG ORCHID WORKERS IN KASHMIR****Ishfaq Majeed Malik***Department of Environmental Science**Jammu and Kashmir, India***Corresponding Author: Ishfaq Majeed Malik****DOI - 10.5281/zenodo.10662856****ABSTRACT:**

Pesticides have been shown to have a negative impact on people, just like they do on other species of animals, according to research and reports from a variety of regions throughout the world. Monocrops that provide large yields have become increasingly popular among farmers as a result of the exponentially growing human population and the food requirements that it has. Farmers have been able to compensate for the financial loss that was caused by pests by using chemical pesticides; however, this has resulted in a long-lasting negative impact on a variety of life forms and the natural environment. With its enormous floral and faunal richness, Kashmir is an ecologically sensitive and biologically diverse region that will be significantly impacted by the use of chemical pesticides. This is because Kashmir is a place that is both ecologically sensitive and biologically diverse. The vast majority of Kashmir's arable land is being put to use in a variety of horticultural and agricultural operations, which are providing a means of subsistence for the region's rapidly expanding population. There has been a significant impact on human health as a result of the widespread use of chemical pesticides, which has developed into a significant problem all over the world. The purpose of this study is to conduct an analysis of the possible effects that chemical pesticides have on the health of people living in the Kashmir valley. These findings will be employed for the purpose of promoting awareness among farmers and the general public, as well as for the purpose of recommending the utilization of biological control and biopesticides for the purpose of protecting human life and preserving biodiversity.

Keywords: Pesticides, Human Health, Environmental Impact, Kashmir, Chemical Pesticides

INTRODUCTION:

All around the world, pesticides are heavily used. The term "pesticide" has several definitions. According to the Food and Agriculture Organization of the United Nations (FAO), a pesticide is any substance or combination of substances meant to prevent, destroy, or control any pest, including vectors of

human or animal disease, undesired plant or animal species that harm or otherwise interfere with agricultural commodities, food production, processing, storage, or marketing, wood and wood products, or animal food items[1]. It can also be given to animals to control insects, arachnids, or other pests in or on their bodies. In order to

meet the growing population's demands for food, cotton fiber, and tobacco as well as to manage vector-borne diseases, pesticides are essential [2]. Unfortunately, the majority of pesticides that are used end up in the environment and have an impact on the health of unprotected industrial and agricultural personnel [3].

The skin, lungs, and digestive tract are the three main entrance points for pesticides [4]. Despite having a superficial surface area of only 1.73 m², an adult human's skin is unquestionably the primary target of unintentional acute exposure [5]. Similarly, whether a material is in the form of particles, droplets, or vapours, the respiratory system offers an extremely effective surface for absorption [6]. Pesticides provide several advantages for crops, but they also come with a host of hazards and issues [7]. Pesticide exposure is a public health concern that is made more difficult by impurities found in so-called inert substances including emulsifiers, wetting agents, and solvents [8].

Due to these compounds' structural resemblance to known toxicants, negative health effects are suspected [9]. Our battle against insect pests is severely hampered by the excessive and uncontrolled use of insecticides [10]. One of the biggest occupational hazards for farmers in developing nations is pesticide exposure [11]. In order to determine the risks

associated with pesticide usage and to establish safe handling practices, occupational exposure to pesticides is of great importance [12]. This is due to the fact that the overuse of pesticides in a variety of agricultural sectors has been linked globally to environmental degradation and health issues. One of the main causes of the high rate of pesticide poisoning in developing nations is the misuse of extremely toxic pesticides combined with a lax or non-existent legal framework for pesticide use.

The poisoning situation has been linked to a number of factors, including low levels of education among rural populations, a lack of knowledge and training regarding pesticide safety, subpar spraying equipment, and insufficient personal protection when using pesticides [13]. Generally speaking, little is known about the primary factors that determine pesticide exposure in developing nations, and exposure circumstances might vary from nation to nation. The improper or dangerous use of pesticides is a major contributing factor to pesticide poisoning or contamination in developing nations. Past research has identified several components of unsafe pesticide use, such as farmers' incorrect beliefs about the toxicity of pesticides, their disregard for safety precautions, environmental hazards, and labelled information about first aid and antidotes, their use of malfunctioning

spraying equipment or poor maintenance, and their failure to wear appropriate clothing and protective gear when handling pesticides [14]. Because farmers in developing nations cannot afford well-maintained equipment, they frequently continue to dispense and measure pesticides using a large amount of broken household items [15].

It is necessary to inform farmers about the potential risks associated with using unsafe pesticides, given the negative health effects of using them, the latency of those effects, the reported ignorance of some farmers regarding the negative health effects of pesticides, and the mistaken belief of invincibility held by others. Thankfully, a large number of farmers have indicated that they require education and training on safe use of pesticides, and as a result, they are probably open to receiving such offerings [16]. Research has frequently underlined the necessity of educating farmers about the dangers of using pesticides improperly as well as the significance of risk-reduction communication and educational initiatives.

Farmers may be less able to defend themselves against these risks if they have false views about pesticides and the risks that are frequently connected to their use. However, determining the scope of the issue by looking into farmers' knowledge, attitudes, and perceptions of pesticide handling and safety is the first step in

creating programs to reduce the hazards associated with pesticide use [17]. From many angles, agricultural extension can enhance crop productivity by acting as a vital conduit for information between farmers and research institutes, where a variety of agricultural technologies, including pesticides and related technologies, are developed, tested, and adjusted as needed.

Training programs can be extremely important in helping farmers make decisions about pest control because they give them the technical know-how needed to choose the best pest management strategies and use pesticides in a safe and efficient manner [18]. Small farmers frequently have distinct production strategies, requirements, and limits despite the impression of homogeneity.

METHODOLOGY:

The purpose of this study was to compile all of the long-term health reports that have been undertaken over the course of the past years and are accessible through global literature databases that have been subjected to peer review. As a result of this impact, we conducted a search on the online database of Web of Science using the terms "health hazards" and "pesticide exposure" as well as "farmers" and "agriculture," which led to the discovery of a total of 150 papers. For this study, we chose surveys that took into account all of the health-related problems that

are experienced by farmers and farm workers all over the world as a result of the extensive use of chemical pesticides and the impacts that are produced by exposure to these pesticides when they are being employed in crop fields. We were able to acquire additional articles by consulting the references in the literature. In conclusion, the only surveys that were taken into consideration were those that indicated changes in quantitative data over time. In light of this, this review contains forty publications on the health risks that are associated with exposure to pesticides in the rural districts of the Kashmir valley in India.

AGRICULTURAL AND HORTICULTURAL SECTORS OF KASHMIR:

Kashmir is a region that is known for its diverse beauty, which includes snow-capped mountains, forests, rivers, natural springs, and vast lakes. Its name comes from the incomprehensible abundance of these natural features. At a height of around 6000 feet, the valley is situated in the heart of the western Himalayas and is surrounded by a chain of towering mountains that have not been damaged in any way [19]. The Valley Floor, the Karewas, the Side Valleys, and the Mountain Ranges are the different locations that are included in the paradigm of land planning. This morphology is quite interesting to see. The valley of Kashmir is home to a

sufficient quantity of natural resources, and the agricultural sector of Kashmir has always been an essential component of the lives of its inhabitants [20].

This sector continues to be an integral element of the lives of people in Kashmir, spanning from the highlands to the lowlands, enormous forests, and wastelands. Kashmir's economy began to integrate with the rest of the Indian economy in the sixteenth century, which provided Kashmiris with the opportunity to get familiar with a variety of agricultural implements that were deployed during the period of Mughal control [21]. Nearly eighty percent of the population in Kashmir is either directly or indirectly employed in the agricultural and allied sectors, making the agricultural industry the most important contributor to the economy of the region. Agricultural and horticultural fields provide a constant source of activity for people living in rural areas throughout the entire year [22].

The wealth of land in Kashmir is not indicated by its monetary value, but rather by the quantity of proportions of rice that it is able to deliver. Rice is the main meal of Kashmir and the necessary nutrition of its population. It is also an incredible piece of income. For the most part, it was the fruits of the Valley that attracted the attention of people from other places. The production of walnuts, mulberries, peaches, apples, almonds, pears, plums, cherries, grapes, and other

fruits and vegetables was facilitated by an extremely rich and fertile alluvium that was created with the assistance of a favourable atmosphere. Rice was gradually replaced by cash crops such as apples, pears, plums, peaches, apricots, and so on over the course of several years. This was due to the fact that cash crops generated a greater amount of profit and generate a large amount of money. The exceptional and delectable flavor of the Apples of Kashmir has earned them a great deal of notoriety. The exportation of apples to practically all of India's states is carried out annually by thousands of trucks. The output of both fresh and dry fruits in the Kashmir valley has seen a significant increase from the year 2019 to the year 2022 (Table 1), as shown in the data presented here.

Table 1: Agricultural Production Data

Year	Area (Hectares)	Production (MT Tones)
2019	154212	562314
2020	132545	758914
2021	114578	45214
2022	189549	156321

In the table that has been displayed, an illustration of agricultural statistics for a specific location is provided during the course of a period of four years, commencing in 2019 and ending in 2022. All of the information is provided in terms of the cultivated area, which is measured in hectares, and the production, which is measured in metric

tons. Both of these measurements are used to describe the information [23]. During the year 2019, the total area of agricultural land comprised 154,212 hectares, which led to a total production of 562,314 metric tonnes. A perceptible shift, on the other hand, has been observed over the course of the years that have followed. In spite of the fact that the overall production reached 758,914 metric tonnes in the year 2020, the cultivated area decreased to 132,545 hectares. This is significant because the total production climbed significantly [24].

In the year 2021, there was a further drop in both the area and the output, with the latter totalling to 114,578 hectares and the former amounting to 45,214 metric tons. Both of these aspects were noted to have decreased. On the other hand, the trend started to change in 2022, when the cultivated area reached 189,549 hectares and the production reached 156,321 metric tonnes. This marked the beginning of the reversal trend [25]. These fluctuations in agricultural area and production are illustrative of the dynamic nature of the farming operations that take place in the specific location. These variations are caused by a number of different factors, including as the methods of land management, the environmental conditions, and the legislation that govern agriculture. It is possible that conducting an analysis of these trends will not only provide

valuable insights into the agricultural productivity of the region, but it may also provide ideas for the creation of farming practices that are both sustainable and efficient in the future.

PESTICIDES UTILIZATION IN KASHMIR:

It is important to note that the application of pesticides in Kashmir is a substantial component of agricultural practices in the region. In order to protect their crops from a wide variety of illnesses and pests, farmers in Kashmir use pesticides [26]. This helps to ensure that their harvest is successful. The expansion of agriculture and the requirement to satisfy the ever-increasing demands of the people have both contributed to an increase in the prevalence of the use of pesticides [27]. The significance of this tendency becomes especially apparent when considering monocrops, which have become increasingly popular due to the high yields they produce [28]. The widespread use of pesticides raises concerns about the potential adverse effects that they may have on human health as well as the environment, despite the fact that pesticides play an essential part in ensuring the productivity of agricultural production. As a result of Kashmir's complex ecological sensitivity and biological diversity, the region is vulnerable to the effects that chemical pesticides can have [29]. In Kashmir, the vast majority of the

land that is suitable for cultivation is put to use for agricultural and horticultural purposes. This is an essential method of providing sustenance for the region's fast-growing population.

The application of chemical pesticides has been shown to have negative impacts on human health, according to research and reports originating from a variety of places across the globe [30]. It is possible to be exposed to pesticides through the contamination of the skin, by inhalation, or through digestive processes. The health dangers that are linked with pesticide exposure, in addition to the environmental concerns, highlight the necessity of conducting a thorough investigation of the practices that are engaged in regarding the utilization of pesticides in Kashmir [31]. The raising of awareness among farmers and the general public is an important part of the efforts being made to solve these concerns. For the purpose of reducing the negative effects that chemical pesticides have on human health and preserving biodiversity, it is essential to promote the use of alternative methods, such as biological control and biopesticides [32]. In order to strike a balance between agricultural output and the well-being of both the people and the environment in Kashmir, it is vital to implement education and training programs, as well as sustainable farming techniques and the prudent application of pesticides.

MANCOZEB FUNGICIDE PESTICIDE:

Mancozeb is a fungicide that has a broad spectrum of activity and is utilized to protect a wide range of plant species from developing fungal infections. It is a contact fungicide, which means that in order for it to be effective, it must come into direct touch with the growth of the fungus[33]. Because mancozeb is not a systemic drug, it does not travel around the plant in any meaningful way. Fruits, vegetables, nuts, and field crops are some of the most typical places to apply it. Mancozeb is effective in preventing and treating a variety of diseases, including scab, anthracnose, late blight of potato, and early blight of tomato, among others. The fungicide known as Mancozeb is classified as a dithiocarbamate, which indicates that it is composed of the element manganese[34]. There is a need for manganese in plants, and Mancozeb has the ability to supply the plant with some manganese that is not already present in the soil. On the other hand, it is not a suitable replacement for fertilizer. As a fungicide, mancozeb is considered to be relatively safe for both humans and animals. According to the FRAC (Fungicide Resistance Action Committee), it is classified as a Group M fungicide, which indicates that it has a mode of action that is distributed across many sites. Because of this, the

likelihood of fungus developing resistance to mancozeb is reduced.



Figure 1 Mancozeb Fungicide Pesticide

BITERTANOL:

There is a potent fungicide known as bitertanol, which is a member of the triazole family. Stone fruits are protected from illnesses such as scab and *Monilia laxa* thanks to this product, which eliminates fungal enemies that are hiding in orchards and fields[35]. As a seed treatment, it can also be used to protect against potential dangers such as *Fusarium* and *Septoria*, which are now concealed. This multi-talented instrument functions in two different ways: it destroys the fungal membrane, which leaves the fungi exposed, and it limits the creation of their crucial sterol, which hinders their growth and spread capabilities. Bitertanol, which was first developed in 1979, has a long history of safeguarding vegetables and plants. Generally speaking, it is utilized either as a preventative measure or as a prompt response to early indicators of fungal infection[36]. However, it is

absolutely necessary to make responsible use of it by adhering to the criteria that have been advised in order to prevent any potential harm to the environment or to human health. Although it is generally regarded harmless, it is important to be aware of the possibility of skin irritation and to take the appropriate measures when handling it.

HORTICULTURAL MINERAL OILS:

When it comes to your plants, horticultural mineral oils, sometimes known as HMOs for short, are like having a knight in shining armor[37]. These highly refined oils, which are derived from petroleum, are natural pesticides that are utilized to efficiently treat a wide variety of pests and mites that are hazardous to the environment. In order to accomplish their goals, they employ a multi-pronged assault. To begin, they suffocate pests like as aphids and mealybugs by obstructing their respiration and creating a situation in which they are unable to breathe. Second, they cause the waxy covering that is found on insect bodies to disintegrate, which ultimately results in the insect's death due to dehydration. Third, they have the ability to form a protective barrier on the surfaces of plants, which makes it more difficult for new pests to establish themselves.

HMOs are attractive because of their adaptability and their low impact on the environment. It is during the

dormant season that they are most effective since they are able to target pests that are overwintering[38]. However, certain formulations that are lighter can be used safely even on foliage during the growing season. It is important to note that HMOs are not hazardous to humans, pets, or beneficial insects like ladybugs, which makes them an excellent option for organic farming.

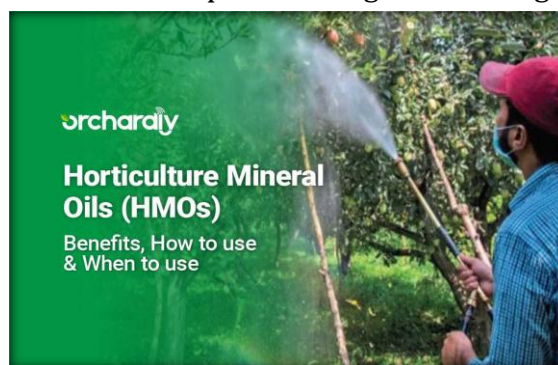


Figure 2 Horticultural mineral oils

CHLORPYRIPHOS:

Chlorpyrifos, which is classified as an organophosphate insecticide, is a powerful killer when it comes to attacking insects. Because it inhibits the activity of an enzyme known as acetylcholinesterase, this chemical, which is odourless, causes disruptions in their neurological system[39]. Imagine this enzyme as the person who maintains the flow of a neurotransmitter at a nightclub under control. It is responsible for ensuring that neurons continue to function normally. Chlorpyrifos behaves on the dance floor in a manner similar to that of a renegade VIP, causing the bouncer to be overpowered and leaving the nerves

locked in a hyperactive frenzy. As a result of the insect's inability to move, it suffocates and ultimately dies.

Concerns have been raised over the potency of chlorpyrifos, despite the fact that it is efficient against a wide variety of pests, including termites and mosquitoes[40]. It is also capable of inflicting harm to animals and people, with exposure resulting in symptoms such as nausea, headaches, and even trouble breathing. Because of its ability to stay in the environment, there is cause for concern over the health of the ecosystem over the long run. Its usage has been restricted and even banned in many countries as a result of this, which has prompted a discussion between the benefits of using it to manage pests and the possible problems that it may pose.



Figure 3 Chlorpyrifos

CARBOFURAN:

A member of the carbamate family, carbofuran is a highly effective pesticide, nematicide, and acaricide[41]. Because it acts as both a systemic poison that is absorbed by plants and a contact killer that directly affects insects, it provides broad-spectrum protection for crops such as potatoes, corn, and

soybeans so that they can be grown successfully. Carbofuran's legacy is fraught with controversy, despite the fact that it is effective. Because of its tremendous toxicity, it poses enormous dangers to both people and animals, as well as to the environment[42]. Those who are exposed to it may experience severe poisoning symptoms, and the fact that it remains in water and soil raises worries about the possibility of sustained exposure. Furthermore, it is categorized as an endocrine disruptor and that it has the potential to be a reproductive toxin, which means that it poses additional health risks. Even though these issues have been raised, carbofuran is still being used in certain locations. However, because to the harmful nature of the substance, rigorous laws and bans are being implemented more and more over the world. When it comes to pest management tactics, alternatives that are less hazardous and have a smaller impact on the environment are being aggressively searched out to replace carbofuran.

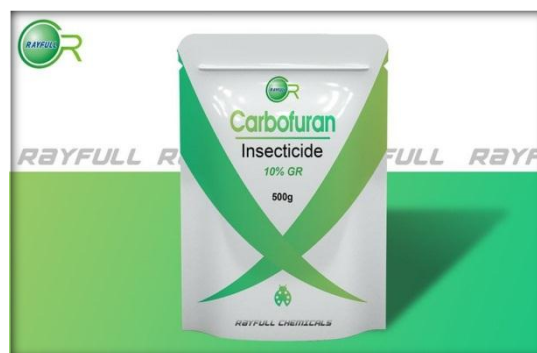


Figure 4 Carbofuran

HEXYTHIAZOX:

When it comes to mites, which are minuscule pests, hexythiazox is a potent weapon that can be used in the arsenal. The pesticide in question is referred to as a "acaricide," and it is designed to particularly target certain organisms that cause problems[44]. Hexythiazox, in contrast to other insecticides, does not move through plants; rather, it remains on the surface of the plant, waiting for its prey. When a mite comes into contact with this invisible barrier, its neurological system is thrown off, which ultimately results in the mite becoming paralyzed and dying.

Hexythiazox, on the other hand, is not a one-trick pony. Not only does it eliminate adult mites, but it also interferes with the development cycle of such mites. It does this by preventing future generations of mites from causing havoc by interfering with their capacity to lay eggs and by preventing the growth of young mites. As a result of its multi-pronged strategy, hexythiazox is a very useful tool for both farmers and gardeners, as it protects crops and ornamental plants from mite infestations

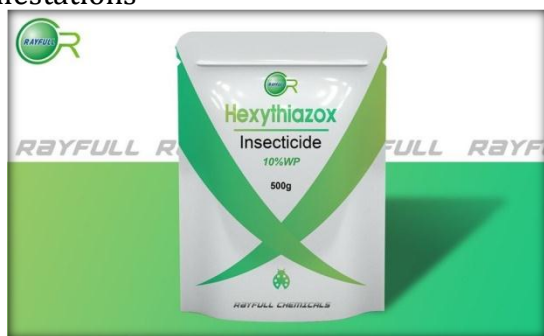


Figure 5 Hexythiazox

PESTICIDES AND HUMAN HEALTH IN KASHMIR:

The excessive use of pesticides has led to catastrophic consequences on human health, with many being non-degradable and causing severe damage to the environment. Pesticides can orbit the globe for over 12 days, causing acute and chronic poisoning, leading to various health issues from mild effects to death. Exposure to pesticides occurs during spray preparation and spraying on crops, resulting in unending health-related problems[45]. Pesticide use is linked to chronic diseases and disorders such as cancer, diabetes, respiratory failures, and fertility issues. Studies have found a connection between pesticide use and sarcomas, numerous myelomas, malignant growth in various organs, including the prostate, pancreas, lungs, ovaries, breast, gonads, liver, kidneys, alimentary tracts, and brain. Around 250,000-370,000 people die annually due to poisonous agricultural pesticides, making it a disastrous health problem in the developing world.

The European Food Safety Authority report revealed that 44% of conventionally produced food samples contained one or more significant residues, while 6.5% of organic samples contained quantifiable pesticide residues[46]. Farmers are routinely exposed to elevated amounts of pesticides, as exposure mostly happens during the preparation and spray of solutions. An investigation found that

90.04% of patients were farmers or orchard inhabitants in Kashmir exposed to high levels of neurotoxic and carcinogenic chemicals for over 10-20 years. Many neurological dysfunctions in farmers are caused by residual concentrations of toxic chemicals, while the entire community is also affected by defiled sustenance, consumer products, or pesticide float from fields. Chemical pesticides affecting the brain include organophosphates, carbamates, and ethylenebisdithiocarbamates [47].

In Kashmir, the problem of pesticides and the influence they have on human health is a complicated and worrisome one [48]. The rising reliance on chemical pesticides in Kashmiri agriculture, notably in the apple business, has been the subject of a number of studies and papers that have brought to light serious concerns about the effects of this trend.

Use of Pesticides in High Amounts:

Over the course of the last few decades, Kashmir has witnessed a considerable increase in the usage of pesticides. This increase has been driven by factors such as intensive horticultural practices and inadequate awareness of alternate means of disease prevention and control. The reliance on chemicals presents significant dangers to the health of both people and the environment on both fronts.

Threats of Exposure: The most direct exposure to pesticides occurs through a variety of ways, including inhalation,

skin contact, and the consumption of polluted water and food. Farmers, farmworkers, and citizens who live in close proximity to agricultural grounds are the most immediately affected. Inadequate safety procedures and a lack of appropriate protective gear both contribute to an increase in the existing dangers.

Consequences for Health: There are a variety of acute and chronic health problems that can be caused by exposure to pesticides. Some of these concerns include skin irritation, headaches, nausea, vomiting, and respiratory disorders. Neurological diseases, malignancies, birth deformities, and disruptions in the endocrine system are some of the most serious long-term repercussions this can have. Studies have explicitly established a connection between exposure to pesticides and the development of high-grade malignant brain tumors in Kashmiri orchard producers.

Effect on the Environment: The discharge of pesticides contaminates bodies of water, which has a negative impact on aquatic life as well as the quality of drinking water. It also causes ecosystems in the soil to be disrupted and lowers biodiversity.

Change Is Needed: In Kashmir, and in light of the gravity of the situation, there is an increasing demand for the promotion of environmentally responsible agriculture management practices. This entails the following:

- **Increasing consciousness:** In addition to promoting alternate techniques of pest management such as Integrated Pest Management (IPM), educating farmers about the dangers of using pesticides is becoming increasingly important.
- **Offering assistance:** To provide farmers with the information and resources necessary to properly execute integrated pest management approaches.
- **Interventions in public policy:** Increasing the number of controls that are placed on the usage of pesticides and encouraging organic farming efforts.
- **Investigation and observation:** It is essential to do ongoing study and monitoring in order to determine the long-term effects that pesticides have on both human health and the overall environment.

The application of pesticides in Kashmir poses a difficult problem that has extremely negative repercussions for both the local population and the natural environment. Education, awareness, support, regulatory changes, and ongoing research are all necessary components of an approach that must be multifaceted in order to effectively address this issue. Kashmir has the ability to maintain the health of its people and preserve its valuable ecosystem for future generations if it adopts methods that are sustainable and promotes alternatives.



Figure 5 Pictograms for Explaining Safety Instructions and Pesticide Hazards

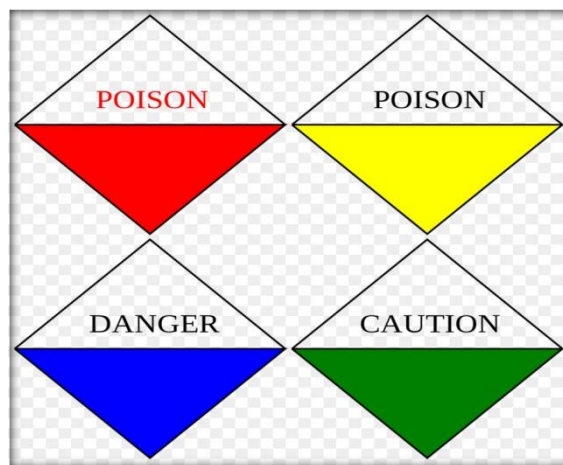


Figure 6 Pesticides' toxicity labels

MONITORING OF PESTICIDE

EXPOSURE:

It is challenging to keep track of the health impacts of pesticide exposure in farmers, particularly when a mixture of pesticides is applied over an extended period of time [49]. Almost any measurement that shows the interaction between a biological system and an environmental agent—which could be chemical, physical, or biological—is referred to as a biomarker. Biomarkers can be utilized to determine causative relationships and improve quantitative

estimates of such relationships at pertinent exposure levels [50]. They might also make it easier to pinpoint vulnerable populations or people who run the danger of coming into contact with particular kinds of environmental and occupational toxins. The majority of susceptibility factors are now more trusted due to advancements in molecular genetics, and it is now easy to identify enzyme polymorphisms. Biomarkers include genetic material alterations, cell death, and the detection of the environmental agent itself or its metabolites in blood or urine [51].

The biological events that have been identified may indicate changes in the quantity, composition, or mode of operation of cellular or biochemical constituents. The assessment of biological processes or chemicals that may offer markers of exposure, effect, or susceptibility in humans is made possible by recent developments in molecular and cellular biology [52]. Enzyme activity and pesticide residue in the blood are two types of measurements that have been used to evaluate pesticide exposure. When assessing the danger of exposure to harmful organophosphates, inhibition of plasma cholinesterase is a useful diagnostic technique. It has been common practice to evaluate OPs exposure through inhibition of Ache activity. A study found that agricultural producers were most likely to be poisoned by pesticides, including OPs

and carbamates, when their Ache levels decreased. Employees at greenhouse farms displayed the same outcomes [53].

Numerous researchers have similarly documented low levels of serum cholinesterase following moderate and prolonged pesticide exposure. Ache levels were reported to have significantly decreased in pesticide applicators [54]. During the peak period of pesticide exposure, acetyl cholinesterase activities dramatically drop, indicating a possible inhibitory action of pesticides on this esterase. Workers who had longer exposures than those who had shorter exposures showed a greater decrease in serum cholinesterase levels. Inhibiting plasma cholinesterase is a diagnostic technique used to evaluate the risk of exposure to harmful organic pollutants [55]. Days or weeks after being exposed to OPs, ache activity levels recover to normal. As such, it functions as a gauge for relatively recent exposure. Biological samples, serum, fat, urine, blood, or breast milk can all have pesticides and their metabolites analyzed using standard analytical methods or biological approaches [56-58]. There are several reports that assess the levels of pesticides and/or their metabolites in bodily fluids following occupational exposure. Exposure will be shown by a favourable outcome [59-60]. The two primary methods used for pesticide residue analysis are gas

chromatography (GC) and high-performance liquid chromatography (HPLC).

CONCLUSION:

According to the findings of the current study, the Kashmir valley is forecast to face a perilous future. The use of chemical pesticides has been demonstrated on numerous occasions all over the world, demonstrating that it has the potential to cause harmful consequences on human beings, other forms of life, and the natural environment. In the event that the use of chemical pesticides continues at such a rapid pace, there would be a concerning increase in the number of people in Kashmir Valley who are diagnosed with cancer and other health conditions. The research endeavors to bring to the notice of the general public the significance of alternative approaches to the problem that is facing both the current generation and the generations to come. It has been demonstrated by a great number of people that the solution to the issue is the utilization of alternative technologies such as biological control and biopesticides. The region of Kashmir, which is rich in biodiversity, possesses its own natural diversity, which can be leveraged for the purpose of this endeavor. The agents of biological control, in addition to the substances that can be used as biopesticides, are going to be thoroughly investigated and exploited. The first step

toward taking this movement forward is to raise awareness among the local community, particularly among the farmers. In order to make biological insecticides and biological control methods more accessible to the general population, it is necessary to do research on the subject and make them available to the public through both government and non-governmental organizations. Consequently, the current study occupies a significant position within the framework of human health management, conservation, and protection of nature, all with the goal of enhancing Kashmir's development and ensuring its continued success in the years to come.

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