

Review



Narrative Review of Pesticide Use in India: Current Evidence, Impacts, and Future Outlook from an Ayurvedic Perspective

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ABSTRACT:

Background: Pesticide poisoning is an important public health concern in India, a country with an agriculture-based economy. Mainly agrarian economy with heavy dependence on agricultural practices. The widespread overuse of pesticides to increase crop yields and minimize losses to agricultural produce has unintended consequences, including accidental poisoning and adverse health effects among farmers, agricultural workers, and rural communities. **Objectives:** The Present review explores the socioeconomic implications of pesticide poisoning including healthcare costs, lost productivity, and long-term health complications. **Materials and methods:** The available literature on the topic under consideration was reviewed in classical Ayurvedic texts. A literature search was also conducted in PubMed, Scopus, the AYUSH Portal, and Government databases related to the concerned topic. Information gathered was analyzed, summarized, and presented. The Boolean operator 'AND' and 'OR' were used with the key words such as 'Pesticide poisoning', 'India', 'Ayurveda', 'Public health', 'morbidity and mortality'. **Results:** Challenges of pesticide regulation, monitoring, and enforcement are discussed in light of the need for stricter laws, an effective system of pesticide residue monitoring, and better education of farmers. Above all, intervention strategies to reduce pesticide poisoning should consider promoting integrated pest management, increasing access to safer alternatives, and increasing awareness about proper use and safety precautions for pesticides. **Conclusion:** Poisoning with pesticides remains a critical issue in India, involving multidisciplinary efforts by government bodies, agricultural institutions, healthcare providers, and local communities. The issue of pesticide poisoning calls for an integrated approach to its solution, encompassing regulatory reforms, improved training, better availability of protective equipment, and the use of sustainable agricultural practices. These initiatives may help to minimize poisoning incidents among farmers, safeguard public health, and provide long-term sustainability to agriculture in India.

KEYWORDS: Ayurveda, India, Intervention strategies, Narrative Review, Pesticide Poisoning, Public health.

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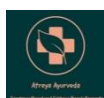
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1. INTRODUCTION

Pesticides poisoning is a major public health concern in India, and it has important consequences both for rural and urban communities. Pesticides, especially the organophosphates, are the commonest cause of poisoning in India, due substantially to agrarian profitable practices, poverty, and unsafe practices, ignorance, lack of defensive apparel, and the easy vacuity of largely poisonous pesticides. [1] These factors contribute to the frequentness of pesticides poisoning, which are common in agrarian workers. The wide vacuity of pesticides has aggravated the problem, as they're a veritably common means for purposeful suicidal- poisoning. Organophosphorus composites have been intertwined in the poisoning deaths in southern and central India. [2] In South India, the maximum cases of poisoning is caused by organophosphate pesticides, which differs from the results of studies, which was conducted in North India where utmost poisonings had been due to aluminum phosphide. [3] This Epidemiological data reveals that there is indigenous variation in pesticides poisoning cases throughout India. [4] Organophosphates are cheap, easy to get and used a lot for pesticide purposes. It also adds to the number of pesticides poisoning in India. The number of pesticides poisoning in India is high among working people. The case fatality rate for its poisoning ranges from four to thirty percent. The patterns of pesticides poisoning in India differ across regions. The differences, in pesticides poisoning suggest the need of targeted actions and plans to address its poisoning. Understanding the study of pesticides poisoning, in India is important. Pesticides poisoning knowledge helps us make plans to stop and treat pesticides poisoning. Accurate data can highlight how big pesticides poisoning is and helps to design actions. The high use of pesticides in farming in places like Andhra Pradesh leads to some of the numbers of pesticides poisoning, in India. [5] This review enumerates the

status, trends, challenges, and interventions connected with the issue of pesticides poisoning particularly in India.

2. METHODOLOGY:

The present study is a narrative review of the current status of pesticide use in India and its impact. A structured hunt of accessible databases, such as PubMed, Scopus, Google Scholar, Ayush portal, Research Gate and Web of Science was conducted to collect studies related to the content grounded on different sections like journal papers (peer- reviewed) or classical textbooks (Ayurvedic Samhitas). The Boolean operator 'AND' and 'OR' were used with the key words such as 'Pesticide poisoning', 'India', 'Ayurveda', 'Public health', 'morbidity and mortality'. [Table 1](#) shows the search criteria details. In addition, other data sources were delved similar as bane information centres, hospitals, government reports and other applicable databases. This information comprised types of pesticides, inflexibility of poisoning, issues & mortalities, terrain and other demographic and socio- profifgle factors.

Table 1: Search Criteria.

Sl.No.	Topic	Check list item
1	Database name	PubMed, Scopus, Google Scholar, Ayush portal, Research Gate and Web of Science
2	Mesh Terms	Pesticides, Pesticide poisoning, Public health, Morbidity, Mortality, Ayurveda
3	Search strategies	Mesh terms, Key words, phrases are used as search strategies to collaborate the data
4	Selection Process	Articles focusing on the general health impact of pesticides, Articles including its management, ayurveda interventions
5	Boolean operators	'AND', 'OR'
6	Year Range	2005 to 2025
7	Language Restriction	English
8	Total	Total 40 articles including classical literature included

Inclusion Criteria

- Peer-reviewed original research articles, review articles, and government or international agency reports on pesticide.
- Studies focusing on pesticide use its exposure, health effects, toxicology, or environmental impacts.
- Studies allowing co-relation and interpretation about pesticides from an Ayurvedic perspective.

Exclusion Criteria

- Studies which are not directly related to pesticide use, toxicity, or associated health and environmental outcomes.
- Blog articles, conference abstracts without full data, and non-peer-reviewed sources.
- Duplicate publications or studies with insufficient methodological information or unavailable full text.

3. DISCUSSION

Threat Factors and Exposure to Pesticides in India:

It has seen that a mix of risk factors and ways people get exposed causes the number of pesticide poisoning cases, in India. The risk factors include lots of use of pesticides in farming, easy access to pesticides for poisoning and different ways of pesticide use in parts of the country. Farm workers and growers have risk of pesticide exposure because their job puts them in contact, with it. Factors such, as poverty, unsafe practices, ignorance and lack of awareness and protective gears make people more vulnerable to pesticides poisoning. In India the use of pesticides began in 1952. Since then, it has become widely available and are often used. [6] It has seen the impact of pesticides poisoning in many communities. The lack of data, on how acute pesticide poisoning occurs in India makes it hard to understand how large the problem is. This data gap underscores the need for comprehensive surveillance systems and exploration to gather accurate information on the epidemiology of pesticides poisoning in India. The wide use of pesticide in agrarian practices and their easy vacuity contribute to the high prevalence of its

poisoning in India. These pesticides are largely poisonous, and their wide availability makes them a standard system for purposeful suicidal- poisoning.

Scenario of pesticide poisoning in different regions:

Several case studies have been conducted in different regions of India to exfoliate light on the epidemiology of pesticide poisoning. A study conducted by Thomas et al in 2000 concentrated on southern and central India and set up that pesticides poisoning was the leading cause of suicidal-poisoning deaths in these areas. Another study conducted by Gautami et al stressed the high pesticide use in Andhra Pradesh, particularly for agrarian purposes. This study set up that Andhra Pradesh has one of the loftiest reported rates of pesticides poisoning in India.

The increased use of the germicides and the pesticides, in India has caused the rise in poisoning cases. [9] Overall the problem of pesticide poisoning has gotten worse. Three hundred thousand deaths happen worldwide each year because of pesticide poisoning and many of the poisoning deaths come from the exposure to the germicides and the pesticides. It is observed that these case studies and other studies, from the Asia Pacific Region including China show that a large share of pesticide poisoning cases happen because people deliberately swallow the pesticides for suicidal purposes. Also, it has been noted that youthful grown-ups are more likely to engage in suicidal poisoning using pesticides. Likewise, while numerous suicidal poisoning cases may not have a want to die, the case casualty rate of acute pesticide poisoning, especially with certain pesticides, is very high. This is due to the largely poisonous nature of the pesticides ingested and the difficulty in furnishing effective treatment. The global public health problem of acute, deliberate suicidal poisoning with agrarian pesticides affects India significantly. The easy availability and wide use of pesticides in agrarian practices contribute to the high prevalence of its poisoning in India. Also, the pastoral areas of

India are particularly affected by this issue due to the addition of vacuity of germicides and pesticides.

Fig.1- Consumption of Chemical Pesticides in Different States of India

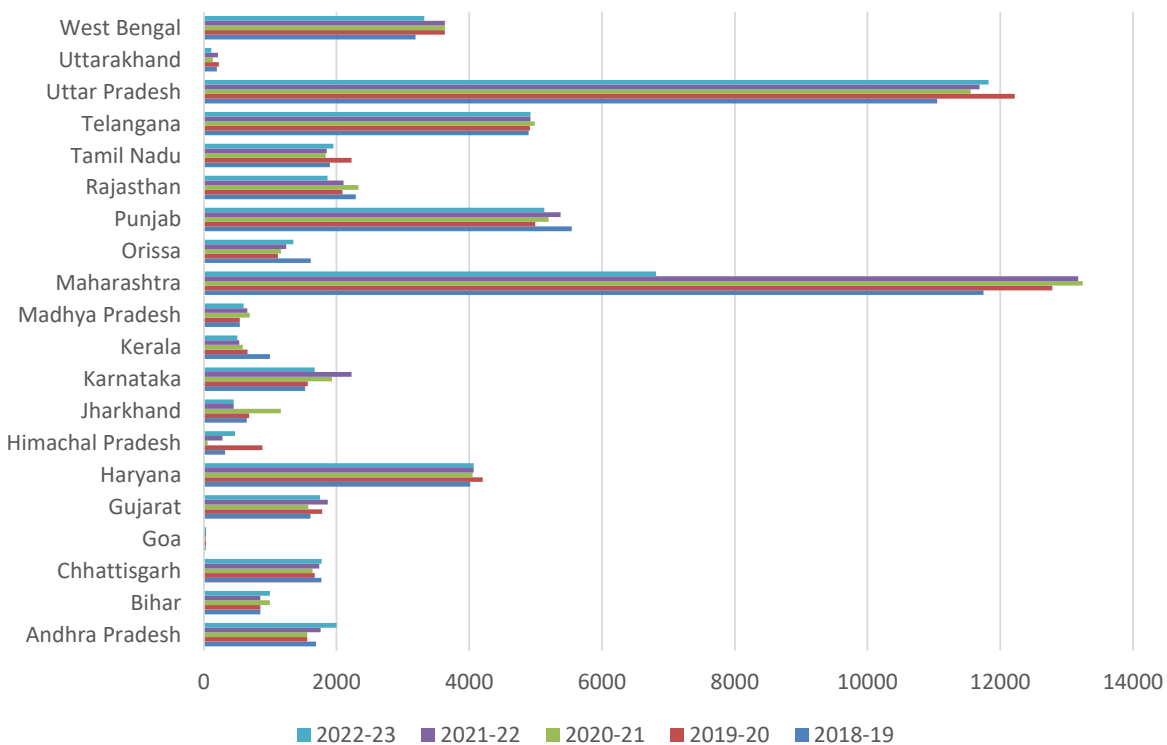


Fig. 1 Provides information on the consumption of chemical pesticides in different states and union territories of India from 2018-19 to 2022-23. [7] The consumption of chemical pesticides in metric tons (MT) for each year.

The use of these substances, in India started in 1952. Since then, the problem of pesticides poisoning has become a pressing issue. [10]. Reliable estimates of the prevalence of pesticides poisoning does not exist. The best estimates come from hospital admission data. Hospital admission data only show a part of the prevalence because hospital admission data records only the most serious cases of acute pesticide poisoning. The study of pesticide poisoning in India shows a link, between farming practices, storage of pesticides and deliberate harm. Thomas et al. Say that pesticide poisoning is the cause of poisoning deaths, in central India. [11]. In another study, it is observed that most of the patients in the ICU with poisoning were men who had taken poison on purpose and pesticides were the most common poison used. The death rate, for all poisonings was low. Aluminum

phosphide caused a death rate of 35 percent. [12] Also, studies from neighbouring counties set up that some of the most common pesticides remaining in agrarian use in Sri Lanka, similar as profenofos, carbosulfan, fenobucarb, quinalphos, and propanil, have higher than average mortal toxin. The study also linked several pesticides that could be banned to reduce morbidity and mortality from pesticides poisoning in Sri Lanka. [13]

Another meta- analysis study showed that the frequency of pesticides poisoning was more in grown-ups (around 65) than in children (22). The proportion of pesticides poisoning varied by region, with North India having the loftiest proportion (79) and East and North East India having the smallest (lower than 50). [14]

Acute purposeful and non-intentional poisoning with germicides can bring ruinous goods on mortal health, including respiratory insufficiency, cardiac arrest, sepsis, hypovolemic shock, and others, which is generally the most frequent cause of death in similar cases. [15]

Also, the high rates of pesticides poisoning in Andhra Pradesh, which is known for its expansive use in agrarian conditioning. [16] The epidemiological data emphasizes the need for comprehensive and targeted interventions to address the issue of pesticides poisoning in India. The addition of germicides and pesticides in pastoral India has contributed to a steep rise in cases of suicidal poisoning. [9]

Regulatory Framework:

The regulation of pesticides in India falls under the dimension of several legislations and authorities. The crucial nonsupervisory bodies include

1. Central Insecticides Board and Registration Committee (CIBRC) This central authority is responsible for the enrolment of pesticides, setting residue limits, and advising the government on pesticides- related matters.
2. The Germicides Act, 1968 This legislation forms the backbone of pesticides regulation in India. It regulates the import, manufacture, trade, transport, distribution, and use of pesticides.
3. Food Safety and Standards Authority of India (FSSAI) FSSAI plays a pivotal part in regulating maximum residue limits (MRLs) of pesticides in food particulars, icing food safety for consumers.
4. State Agriculture Departments States have their own nonsupervisory authorities to cover and apply pesticides regulations.

Health Impact of Pesticide Poisoning:

The health impact of pesticides poisoning is a concern, in India. Research and studies show that pesticides poisoning has effects on the health of the people. Pesticides poisoning, especially when a person drinks it on purpose is a leading

cause of poisoning deaths in India. The death rate, from pesticides poisoning is high because the pesticides are very poisonous and because treatment is hard. Also, it is important to note that the extent of pesticides poisoning is probably undervalued in India. Probably, the problem is bigger than the numbers show. Underreporting, limited access, to health care facilities and weak surveillance systems keep the extent of pesticides poisoning undervalued. Likewise, the health impact of pesticides poisoning goes beyond death. Pesticides poisoning can affect a range of chronic health outcomes, such as disease, respiratory problems, reproductive issues and cancer. The interventions to address pesticides poisoning in India are needed because pesticides poisoning, in India damages the health and the society. Pesticides poisoning must be fixed by strengthening pesticides regulations and control measures. The actions will ensure the responsible use of pesticides. It is required to promote pest control practices that focus on reducing the use of pesticides. It is also required to encourage the use of the methods, for pest control. It is also essential to increase the awareness and education about the dangers of uncontrolled use of pesticides and by promoting the handling and its storage of it is also important to improve access to the appropriate care for pesticides poisoning cases. Research should be conducted to better understand the study of disease patterns and the risk factors linked to pesticides poisoning, in India. Issues should also be made to address the underpinning factors that contribute to suicidal- poisoning, similar as internal health issues, socioeconomic difference, and limited access to support services. Also, collaboration between different sectors including husbandry, healthcare, education, and government agencies is essential to apply a comprehensive and coordinated approach to addressing pesticides poisoning. Interventions to address pesticides poisoning in India are key. It will reduce the deaths and disabilities caused by the poison there by help to improve the health and the productivity of

the people. It will also lower the health and social impact of this problem. Interventions are needed to ease the burden, on families and communities. Enforcing these interventions will not only help to reduce deaths and disabilities but also contribute to the overall well-being and productivity of the population.

Strategies for Prevention and Control of Pesticide Poisoning:

To help control pesticides poisoning, in India, strategies need to be implemented. . First it is a need for enforcement of the Pesticide Act. The Pesticide Act controls the import, manufacture, trade, transport, distribution and use of pesticides. [17] Strict enforcement of the Pesticide Act will make sure that proper guidelines and regulations are followed. That will lower the risk of pesticides poisoning. Also promote methods for pest control as an alternative, to using pesticides. Lowering exposure, to chemicals would also promote the eco-friendly agrarian practices. Enforcing relief packages and internal health programs at the position can give needed support and advice to populations. The relief packages and internal health programs can lower poisoning cases, in the future. [18]. Increasing the use of outfit and safety guidelines in the running and operation of pesticides can lower occupational poisoning. The use of outfit and safety guidelines can protect workers who spot the pesticide result. Proper training, in pest operation reduces poisoning cases among workers. Proper training in pest operation makes a difference in the health and safety of workers. To address pesticides poisoning in India clear rules about its use must be carried out. [19] Farmers must follow the regulations to cut down pesticides poisoning incidents. Also, better medical care for pesticides poisoning and support services for people can improve the response, to pesticides poisoning. [13] Incipiently, defined access to pesticides can serve as a preventative measure by limiting the vulnerability of these dangerous substances.

A study, in Srilanka raises questions about pesticides regulation and self-harm prevention. The study says the current WHO bracket system uses animal dose values. The study says those values may not show the danger of some pesticides. The study says a broader approach, to pesticides regulation is needed. The study says the broader approach must look at the toxin of each pesticide and the overall risk of poisoning. The study shows why it is required to look at how we handle pesticides. The study provides substantiation that banning largely dangerous pesticides can reduce morbidity and mortality from pesticides poisoning, without significantly affecting agrarian affair. These findings could inform policy opinions in other countries facing analogous challenges with pesticide's suicidal- poisoning. [13]

Future of Pesticide Use and Safety in India:

Pesticides poisoning hurt families, in India. The government must address the future of pesticides use and its safety. Strong regulations and strict enforcement of pesticides laws are needed to control pesticides poisoning. The regulations must cover every part of pesticides use, such, as import, manufacture, trade, transport, distribution and operation. Enforcing the regulations and ensuring adherence will reduce the risk of pesticides poisoning. In addition to regulations, promoting indispensable styles for pest control should be precedence. Integrated pest operation uses a mix of artistic and chemical control styles. Integrated pest operation can lower the need, for pesticides operation. Cut the risks that come with pesticides operation. Likewise raising awareness among growers and authorities about the use of outfit and proper running practices when using pesticides is essential. Achieving the goal requires training programs and educational juggernauts that stress the importance of defensive outfit and safe operation practices. Farmers follow training programs and educational juggernauts and notice problems. By prioritizing these preventative measures and promoting safe practices, the number of pesticides poisoning

cases among ranch workers and other vulnerable populations can be significantly reduced. Likewise, it's essential to apply relief packages and internal health programs at the indigenous position to give support and comforting to vulnerable populations who may be affected by pesticides poisoning incidents. [19] By offering support and comforting services, individualities can admit the necessary backing to manage with the internal and emotional impacts of pesticides poisoning. It is A need, for targeted interventions to cut the number of pesticides poisoning cases is also important in the regions that have a frequency of pesticides poisoning. There is also a need for data on the frequency of poisoning and on how the frequency of poisoning changes with age and, with region. That data would help us design measures, restorative measures and recuperation measures. It is also required to bring together promotive health services. The integration of promotive health services would help lower the morbidity and mortality that come from poisoning. It's veritably important to address the social and profitable factors that contribute to the high frequency of pesticides poisoning in India, similar as poverty, agrarian husbandry, and patriarchal societal morals.

Administration of Herbal chelating agents:

It is detected that the Herbal chelating agents, in the pesticides poisoning have gained a lot of attention lately. The Herbal chelating agents can offer safer and further natural druthers for detoxification. [20-22] Chelation remedy is a medical procedure used to remove heavy essence and poisonous substances from the body, and traditional chelating agents frequently come with adverse effects and pitfalls. Herbal chelators, on the other hand, are deduced from natural sources and are believed to be gentler and less harmful. Several herbs and natural composites have shown *promices* as herbal chelating agents for pesticides poisoning. Notable sources include Cilantro (*Coriandrum sativum*). Cilantro has garnered attention for its capability to bind to

heavy essence and facilitate their excretion from the body. Studies suggest that cilantro may effectively reduce the poisonous burden of pesticides similar as organophosphates and glyphosate. Chlorella (*Chlorella vulgaris*), a green alga, contains chlorophyll and peptides that may prop in heavy essence detoxification. It's implicit as a chelator for pesticides like paraquat and atrazine is under disquisition. Garlic (*Allium sativum*) contains sulfur composites, including allicin, which may retain chelating parcels. Exploration indicates that garlic may help in the junking of heavy essence and organophosphates from the body. The fluid excerpt cure deduced from *Dendrobium officinale*, Kimura et Migo is employed in the treatment of organophosphorus pesticides poisoning. One advantage of these agents is that herbal chelating agents can reduce the side effects that come with chelation treatment. It is still important to note that scientific research, on the effectiveness and safety of chelating agents is ongoing and one should use chelating agents with caution and, under the guidance of a healthcare professional. Herbal chelating agents hold promise as choices for addressing pesticides poisoning and detoxification. Further exploration is demanded to understand their effectiveness and safety completely, but they offer a potentially precious avenue for reducing the detriment caused by pesticides exposure. Herbs play roles in managing pesticides poisoning on farms that rely heavily on chemicals that pollute plants and food. Using herbs that have been used as medicine can help the body detoxify from pesticides exposure. Research shows that some herbs contain plant chemicals that can offset the effects of pesticides poisoning and improve the body's detox process. For case, studies have stressed the implicit use of phrasings herbs like *Andrographis paniculata* and *Commiphora mukul* to manage symptoms associated with acute pesticides poisoning. [23- 25] In developing regions of India, people rely on herbal remedies, for health care. The Ayurvedic practice uses *Albizzia lebbek* to treat injuries caused by poisons and

chemicals. This shows how traditional knowledge meets toxicology. The Ayurvedic practice uses *Aristolochia indica*, which also has benefits in the management of poisoning. [26] Likewise, toxicological studies indicate that Ayurvedic processing styles can significantly reduce pesticides remainders in foods, enhancing safety [25] still, the threat of impurity with pesticides remainders in herbal products necessitates alert. Woolf and Woolf proved the significant threat of lead poisoning associated with spices, emphasizing a broader issue of heavy essence traces in herbs that might inadvertently lead to health complications. [27] The presence of remainders from pesticides remains a critical concern, especially since numerous plants can absorb these poisons from their terrain. [28-30] Addressing this requires robust testing methods and sanctification processes to remove dangerous pollutants from these herbal products. A study in India illustrates that while *Gloriosa superba* is traditionally used, it poses poisoning pitfalls due to its poisonous parcels when misused or sourced from defiled surroundings. [31] Also, other exploration suggests that herbs used in folk practices may harbor dangerous pesticides remainders, complicating their perceived safety. [28-29, 31] Therefore, integrating ultramodern logical ways, similar as mass spectrometry, to test for pesticides remainders in herbal phrasings are essential for consumer safety. [33, 34]

While herbs hold efficacy in managing pesticides poisoning through colorful mechanisms, confirming that these remedies are free from dangerous pollutants is imperative. Methodical evaluations of herbal products, adherence to agrarian stylish practices, and compliance with nonsupervisory norms are pivotal for employing the full mending eventuality of sauces while icing public health safety.

Role of Herbo-mineral compounds:

i. ***Dooshivishari Agada*** is an Ayurvedic herbo- mineral compound traditionally used for *Dooshivisha* (latent or accretive poisoning), which contemporary interpreters

associate with habitual exposure to pesticides and other environmental poisons. Exploration suggests that the expression may offer remedial benefits in this environment, but it should not be used as a cover for standard medical treatment.

- **Detoxifying action:** It's considered to have detoxifying parcels that can help exclude accumulated poisons.
- **Antioxidant properties:** Some exploration suggests it possesses antioxidant parcels, which can help offset the oxidative stress caused by poisons.
- **Organ protection:** Some constituents may have a defensive effect on colorful organ systems. A study involving albino mice showed that *Dooshivishari Agada* helped to reduce the teratogenic property of the pesticides cyfluthrin. [35]

ii. ***Dhavashvakarnadi Yoga*** described by Acharya Sushruta offers an easy system to clean water. *Dhavashvakarnadi Yoga* holds importance now because the ultramodern sanctification technologies may be, expensive and out of reach, for the people from low socioeconomic populations. *Dhavashvakarnadi Yoga* serves as a cheap and proven choice. It gives a way to lower the health risks that come from the drinking water especially when the water is polluted with pesticides. [36,37] From this, multitudinous classical Ayurvedic sources interpret the generalities of *Jala*, *Dushita Jala*, and their styles of *Shodhana* with remarkable clarity and oneness. [38]

iii. ***Ananta- Sarvagandhadi Yoga*** is one further remedy provided by Acharya Sushruta for vindicating the soil pollution. The contents of this yoga can be mixed in the water and sprinkled over the weakened ground face due to various chemicals and pesticides and may help to purify it. [39]

iv. ***Laksha- Haridradi Yog*** is also given by Acharya Sushruta especially for the sanctification of the atmosphere. The contents of the medicines mentioned in this yoga would

help to detoxify the presence of pesticides in the atmosphere. [40]

Challenges in controlling Pesticide use and poisoning:

One of the primary challenges in India is the inadequate monitoring and enforcement of pesticides regulations at the ground position. The vast agrarian geography and limited coffers make it challenging to ensure compliance with pesticides laws.

- i. Lack of Farmer Awareness: India warrants mindfulness about proper pesticides use, safety preventives, and druthers to chemicals and pesticides. This leads to overuse and abuse of pesticides, posing health hazards and environmental pollution.
- ii. Pesticides Residue Management: Ensuring that food particulars do not exceed MRLs for pesticides remainders remain a challenge, as multiple crops are cultivated in close propinquity, making cross-contamination a common circumstance. The enrolment of pesticides, in India can be a strict registration process. The registration process stops the introduction of more effective options.

Strengths:

- i. Evolving Regulations: India has been continuously streamlining its pesticides regulations to align with global norms, Emendations to the Germicides Act have aimed at enhancing safety and efficacy.
- ii. Research and Development: The country has made strides in exploration and development for bio-pesticides and integrated pest operation systems, offering sustainable preferences to chemical pesticides.

International Cooperation: India laboriously participates in transnational agreements and conventions related to pesticides operation, promoting stylish practices and information sharing.

Areas for enhancement:

- i. Capacity Building: Investment in training and capacity structure for growers, pesticides retailers, and

nonsupervisory officers is essential to enhance mindfulness and enforcement.

- ii. Monitoring Technology: The relinquishment of advanced technologies, similar as remote seeing and Civilians, can ameliorate the monitoring of pesticides use and residue situations in crops.
- iii. Streamlined Registration: Process Simplifying and expediting the pesticides enrollment process can encourage the preface of safer and further effective products.
- iv. Promotion of Integrated Pest Management: Encouraging the relinquishment of integrated pest operation practices can reduce over-reliance on chemicals and pesticides.
- v. Biopesticides Herbal pesticides: Also known as botanical pesticides or bio pesticides represent a compelling and eco-friendly approach to pest control in husbandry, gardening, and public health. Unlike conventional synthetic pesticides, which frequently rise environmental and health enterprises, herbal pesticides harness the power of naturally being factory composites to control pests and conditions. [32]

Limitations:

- a. Since the article uses a narrative review approach, there is a possibility of selection bias in choosing studies, as methodical and transparent hunt and selection criteria (e.g., PRISMA) was not be rigorously applied.
- b. Available studies on pesticide exposure and health impacts in India are mostly cross-sectional, experimental, or region-specific, with many large- scale longitudinal or randomized studies.
- c. The Ayurvedic perspective in the literature on pesticide and fungicide toxin, habitual exposure, and environmental pathogenesis (e.g., *Dushi Vishha*) is limited.
- d. Evidence on pesticide use and impacts is often highlighted about certain states and or crops and may not reflect the diversity of agricultural practices across India.

4. CONCLUSION:

It is a matter of hours to address pesticides poisoning, in India with a plan. The plan must enforce the rules and build the combined pest control methods with support and counseling services. To control pesticides poisoning one must apply the rules that cover every step of pesticides use. Those steps include the import, the manufacture, the trade, the transport, the distribution and the operation. One must follow the rules to keep growers safe and to protect the land and the nearby people. Farmers can also use pest management to cut the use of pesticides and to lower the problems that come with it's over use. Effective regulation and control of pesticides, in India are key to protecting the health to saving the land and to ensuring food safety. Steps can be taken forward in pesticides regulation, problems with enforcement and, with farmer awareness. Continued sweat, collaboration between stakeholders, and the creation of sustainable pest operation practices are essential to address these challenges and produce a safer and further sustainable agrarian geography in India.

Abbreviations

AYUSH – Ayurveda, Yoga, Unani, Siddha and Homeopathy

CIBRC - Central Insecticides Board and Registration Committee

FSSAI - Food Safety and Standards Authority of India

ICU – Intensive Care Unit

MRLs - Maximum Residue Limits

MT – Metric Tons

UTs – Union Territories

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Declaration of Generative AI

The authors declare this manuscript was written without the use of generative artificial intelligence tools. All the content, including text generation, data analysis and references was developed and reviewed by the author without assistance from AI technologies.

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