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THE ENVIRONMENTAL AND HEALTH RISKS OF PESTICIDE USE IN KYRGYZSTAN

КЫРГЫЗСТАНДА ПЕСТИЦИДДЕРДИ КОЛДОНУУНУН ЭКОЛОГИЯЛЫК ЖАНА САЛАМАТТЫК САКТОО ТОБОКЕЛДИКТЕРИ

РИСКИ ДЛЯ ОКРУЖАЮЩЕЙ СРЕДЫ И ЗДОРОВЬЯ, СВЯЗАННЫЕ С ИСПОЛЬЗОВАНИЕМ ПЕСТИЦИДОВ В КЫРГЫЗСТАНЕ

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THE ENVIRONMENTAL AND HEALTH RISKS OF PESTICIDE USE IN KYRGYZSTAN

Abstract

Agriculture plays a vital role in addressing food security worldwide. Many developing countries, including Kyrgyzstan, rely on pesticides to enhance agricultural yields. However, these chemicals pose significant risks to human health and the environment, particularly when used excessively or without regulation. This article explores the types of pesticides commonly used in Kyrgyzstan, their adverse impacts on health and ecosystems, and the efforts of environmentalists to mitigate these risks. The findings emphasize the urgent need for stricter regulations, farmer education, and sustainable alternatives to ensure long-term ecological and public health safety.

Keywords: agricultural production, pesticides, environmental health, toxicology, sustainability

КЫРГЫЗСТАНДА ПЕСТИЦИДДЕРДИ КОЛДОНУУНУН ЭКОЛОГИЯЛЫК ЖАНА САЛАМАТТЫК САКТОО ТОБОКЕЛДИКТЕРИ

Аннотация

Айыл чарбасы дүйнө жүзү боюнча азык-түлүк коопсуздугун камсыз кылууда маанилүү роль ойнойт. Көптөгөн өнүгүп келе жаткан өлкөлөр, анын ичинде Кыргызстан, айыл чарба түшүмдүүлүгүн жогорулатуу үчүн пестициддерди колдонууга таянышат. Бирок бул химиялык заттар адамдын ден соолугуна жана айлана-чөйрөгө олуттуу коркунучтарды жаратууда, айрыкча ашыкча колдонулганда же тиешелүү жөнгө салуусуз пайдаланылганда. Бул макалада Кыргызстанда кеңири колдонулган пестициддердин түрлөрү, алардын ден-соолукка жана экосистемаларга тийгизген терс таасирлери, ошондой эле экологдордун бул тобокелдиктерди азайтуу боюнча аракеттери каралат. Жыйынтыктар экологиялык жана коомдук саламаттыкты узак мөөнөттүү камсыз кылуу үчүн катуураак регулятивдик чараларды, дыйкандардын маалымдуулугун жогорулатууну жана туруктуу альтернативаларды ишке ашыруу зарылдыгын баса белгилейт.

Ачкыч сөздөр: айыл чарба өндүрүшү, пестициддер, экологиялык саламаттык, токсикология, туруктуулук

РИСКИ ДЛЯ ОКРУЖАЮЩЕЙ СРЕДЫ И ЗДОРОВЬЯ, СВЯЗАННЫЕ С ИСПОЛЬЗОВАНИЕМ ПЕСТИЦИДОВ В КЫРГЫЗСТАНЕ

Аннотация

Сельское хозяйство играет ключевую роль в обеспечении продовольственной безопасности в глобальном масштабе. Многие развивающиеся страны, включая Кыргызстан, прибегают к использованию пестицидов для повышения урожайности сельскохозяйственных культур. Однако эти химические вещества представляют серьезную угрозу для здоровья человека и окружающей среды, особенно при их чрезмерном применении или отсутствии должного регулирования. В данной статье рассматриваются виды пестицидов, наиболее распространенные в Кыргызстане, их негативное влияние на здоровье и экосистемы, а также усилия экологов по минимизации этих рисков. Полученные данные подчеркивают необходимость введения более строгих регулятивных мер, просветительской работы среди фермеров и внедрения устойчивых альтернатив, направленных на обеспечение долгосрочной экологической безопасности и охрану здоровья населения.

Ключевые слова: сельскохозяйственное производство, пестициды, гигиена окружающей среды, токсикология, устойчивость

Introduction

Pesticides are chemical substances designed to protect crops and livestock from pests, significantly increasing agricultural yields. However, their excessive and uncontrolled use has severe consequences for both human health and the environment. In Kyrgyzstan, the use of pesticides dates back to the Soviet era, when organochlorine compounds were widely applied to large agricultural areas. Despite international bans on many of these toxic substances, they are still in use today, particularly in remote regions, raising significant concerns among environmentalists.

Pests are organisms that damage crops or livestock, prompting humans to develop solutions such as pesticides. While pesticides effectively reduce pest populations and enhance agricultural productivity, they also pose substantial risks. Historically, the use of pesticides dates back to the 1500s when mercury and arsenic were employed to control pests [1]. These substances remained in use until the 1940s when more advanced chemicals were developed. Notably, pesticides played a role in World War II, being used to destroy enemy food supplies. Over time, efforts were made to improve pesticide application techniques and equipment, such as horse-drawn sprayers and wheeled barrel sprayers, to enhance agricultural efficiency.

In Kyrgyzstan, pesticides such as insecticides, herbicides, and fungicides are commonly used. Although they were initially beneficial, their prolonged and improper use has led to significant adverse effects on human health and the environment. One particularly infamous pesticide is dichlorodiphenyltrichloroethane (DDT), which had a profound impact on agricultural productivity and public health [3]. In 1962, Rachel Carson’s book Silent Spring highlighted the devastating effects of DDT, ultimately leading to its ban in many countries.

Despite these warnings, the misuse of pesticides persists, particularly in developing countries like Kyrgyzstan. Farmers often resort to banned or outdated chemicals to achieve higher yields, exacerbating the risks. Environmentalists continue to advocate for reduced pesticide use, but the cycle of overuse and dependence on new formulations persists. This overreliance has led to serious health crises, as exceeding safe pesticide limits can result in acute and long-term consequences for both individuals and ecosystems.

Dangers of pesticides in Kyrgyzstan

Pesticides pose significant risks to human health due to their toxic chemical composition. In Kyrgyzstan, where agriculture is a cornerstone of the economy and sustains a large portion of the population, farmers heavily rely on pesticides to boost yields. During the Soviet era, organochlorine pesticides (OCPs), which are now banned internationally, were extensively used. Their residues persist in the soil and water, posing long-term ecological and health risks.

A study led by Rakhmanbek Toichuev, founder and former director of the Institute of Medical Problems in Osh, Kyrgyzstan, revealed that 60% of the pesticides used during the Soviet era were highly toxic OCPs. Despite the international ban, many farmers in Kyrgyzstan continue to purchase and use pesticides from local markets without proper regulation, leading to serious health consequences. For instance, research has shown that traces of organochlorine compounds have been detected in mothers' breast milk, increasing the risk of developmental pathologies in newborns [4].

Kyrgyzstan's agricultural sector is primarily driven by small-scale farmers, who often operate on limited budgets and prioritize cost-effective methods to maximize production. Major crops include cotton, tobacco, various vegetables, and stone fruits which require significant pesticide application to meet production demands. The extensive use of pesticides in the Soviet Union played a crucial role in cultivating industrial crops, including cotton, across more than 14 million hectares [3]. These crops were treated with multiple pesticide applications, often delivered by aircraft. Even today, regions in Central Asia, including Kyrgyzstan, show high levels of soil and water toxicity due to these historical practices.

The legacy of Soviet-era pesticide practices has left a lasting impact not only on Kyrgyzstan but across Central Asia. The continued use of outdated and hazardous pesticides, combined with insufficient regulatory frameworks, exacerbates the environmental and health challenges faced by these regions. Addressing these issues requires coordinated efforts, including stricter pesticide regulations, public awareness campaigns, and the promotion of sustainable agricultural alternatives.

Impact of pesticides on public health in Kyrgyzstan

In Kyrgyzstan, pesticides pose a significant threat to public health, particularly affecting vulnerable groups such as children and pregnant women. Environmental studies have revealed alarming statistics: 89.4% of children in certain regions suffer from tooth decay, while enlarged thyroid glands are commonly observed in girls [3]. The toxic substances from pesticides contaminate water, soil, and food, leading to severe health conditions, including nervous system disorders and cardiovascular pathologies [4].

In the 1960s, the global perception was that chemical solutions were indispensable for agricultural productivity. This belief led to the widespread and excessive use of pesticides, resulting in devastating consequences, especially in countries like Kyrgyzstan. Many farmers in the region are unaware of the harmful chemicals they apply to their crops. Their primary concern remains maximizing production, often at the expense of safety, inadvertently creating significant health and environmental hazards [4].

A major contributor to these issues is the use of banned pesticides obtained from local markets. These chemicals, unapproved by the Environmental Protection Agency (EPA) and prohibited in many countries, continue to be sold and applied in Kyrgyzstan. Reports from local environmentalists highlight that the use of these substances causes severe health problems, disproportionately affecting children, infants, and breastfeeding women [4].

A study led by Rakhmanbek Toichuev and others found that breast milk from mothers in affected regions contains eight types of organochlorine pesticides (OCPs). When compared to uncontaminated samples, the study revealed that breast milk containing OCPs is seven times more likely to be associated with pathologies. These findings underline the serious health risks posed to children, many of whom suffer from physical impairments and developmental challenges linked to pesticide exposure [4].

The persistent use of banned and highly toxic pesticides in Kyrgyzstan necessitates urgent interventions. Comprehensive educational programs for farmers, stricter regulatory measures, and the promotion of sustainable agricultural practices are critical to mitigating these health and environmental risks [4].

Role of environmentalists in mitigating the impact of pesticides

Environmentalists play an essential role in identifying and addressing the harmful consequences of pesticide use. Through research, advocacy, and public awareness campaigns, they aim to reduce environmental damage and promote sustainable agricultural practices. However, their efforts are frequently obstructed by political and corporate interests, highlighting the need for stronger collaboration between environmentalists, government institutions, and international organizations.

Pesticides have far-reaching impacts, affecting all forms of life, including soil, water, air, and non-target organisms such as plants, birds, fish, and wildlife. The German research community raised alarms after a 27-year study showed a 75% decline in insect biomass, attributed to pesticide use [5]. Additionally, environmentalists worldwide annually file over 2,000 cases concerning pesticide misuse. For example, a 1979 report in an American journal detailed how the Environmental Protection Agency approved a potentially carcinogenic pesticide despite opposition from its own scientists, allegedly due to political pressure [6].

In Kyrgyzstan, pesticide misuse has severe health implications, particularly in vulnerable communities. In Batken, a rural southwestern region, Ogulkan Seitova, a 46-year-old woman, and her family suffer from various health issues. Her children experience severe tooth decay, her husband struggles with a heart condition, and she endures constant headaches. The region is home to waste sites from lead and zinc mining, with pesticide-contaminated dust polluting soil and water sources. According to the WHO, these pollutants are directly linked to the community's health problems. Environmentalists in Kyrgyzstan reported that 89.4% of children in the area suffer from tooth decay, 6.8% of sexually mature girls have enlarged thyroid glands, and cases of mental disabilities have been recorded in areas near pesticide and fertilizer storage sites.

Despite the evidence and persistent efforts of environmentalists to address pesticide-related issues, progress is often thwarted by corporate and political interference. This reality underscores the urgent need for robust partnerships among all stakeholders to curb pesticide use, prioritize public health, and adopt environmentally sustainable practices.

Pesticide classification and environmental impact in Kyrgyzstan

Pesticides are categorized based on various criteria, including chemical composition, target organisms, mode of action, and toxicity. They are also classified by their intended targets, such as fungicides, herbicides, and rodenticides. From a chemical perspective, pesticides are broadly divided into organic and inorganic types.

In Kyrgyzstan, farmers primarily rely on locally available pesticides rather than importing large quantities. Many pesticides and fertilizers imported between 2008 and 2019 were subsequently re-exported, leading to a condition known as the "balance of fertilizer residues [5]." Historically, Kyrgyzstan served as a storage and dumping site for obsolete pesticides and chemical waste. This legacy has significantly contributed to the environmental hazards observed today. Recent findings indicate the existence of approximately 50 pesticide storage sites, which continue to elevate contamination levels in the environment.

The most commonly found pesticides in these dumps include organochlorines, organophosphates, organometallic compounds, and carbamates. Among these, organochlorine

pesticides are particularly notorious. A study using gas chromatography detected organochlorine residues in 241 placentas from cotton-growing regions, 121 placentas from urban areas, and 146 placentas from unpolluted mountain regions of Kyrgyzstan [2]. These findings strongly correlate with adverse health outcomes, including unhealthy childbirth and infant mortality.

The impact of these pesticides is most evident in mothers during pregnancy and childbirth, as well as in their newborns. The presence of such toxic substances in placental tissue underscores the urgent need for effective measures to manage pesticide residues, prevent environmental contamination, and safeguard public health.

Conclusion

Pesticides remain one of the major threats to public health and the environment in Kyrgyzstan. Their uncontrolled use, coupled with a lack of awareness among farmers, exacerbates health risks and environmental degradation. To mitigate these impacts, a multifaceted approach is essential. Measures such as educating farmers, strengthening environmental legislation, ensuring compliance with EPA standards, and introducing safer, sustainable alternatives must be prioritized.

The issue of pesticide misuse is not unique to Kyrgyzstan but reflects a global challenge faced by farmers who often lack adequate knowledge about the chemicals they use. The absence of proper guidance and regulatory enforcement amplifies the risks. Annual research by medical authorities in Kyrgyzstan consistently highlights that pesticide-contaminated soil is a significant factor contributing to poor health outcomes among farmers and their families.

To safeguard future generations, decisive action must be taken. This includes providing farmers with comprehensive training on pesticide use, implementing stricter regulations on pesticide sales and applications, and promoting agricultural practices that reduce reliance on harmful chemicals. Only through collective efforts involving government authorities, environmental organizations, and the farming community can the harmful effects of pesticides on human health and the environment be addressed effectively.

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