Fatima Elashry

Fatima Perez

Mohamed Elashry

Professor Joseph R Boisvere

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Research paper

**The adverse effects of Pesticides on humans and the environment.**

**Introduction:**

Pesticides have been used for decades within the agricultural industry and they play an important role in protecting crops from pests, weeds and any fungal diseases while growing. It is a chemical compound that is used to deter, incapacitate and destroy pests such as a virus, bacterium, antimicrobial, or used as a disinfectant. Pesticides allow for the yield of crops to increase and help increase farm revenue as well. Due to less crops being affected while using pesticides, it also benefits consumers by supplying them with high-quality food for an affordable price. Pesticides have three different forms: solid (powder or crystal), liquid, and aerosols. All different forms do the exact job for plants which is to protect them from pests. For farmers, pesticides are helpful because they shield their crops from these pests, but pesticides are harmful on the environment and the human body. An excessive use of pesticides could lead to a loss of biodiversity and many birds and aquatic animals can be negatively affected by the runoff from it. Two sides of the argument however are whether pesticides are beneficial or harmful, it is beneficial for plants, but they include harmful chemicals that are not only affecting the pests, but also lead to an adverse effect on humans and the environment.

**Method:**

Bugs and insects tend to target crops that are grown in farms more often than your regular house garden due to the abundance of food. Some insects harming your garden will not have the same effect as pests who harm the harvesting fields because the agricultural industry will experience a loss of revenue and will have to spend more money on growing and cultivating crops that could’ve brought these farmers money. That’s why the use of pesticides is so important within this industry and it is used to repel these insects. Pesticides can also avoid the spread of illness, so the use of pesticides decreases the chance of losing the seasonal crop. To ensure the food is not contaminated there are more than 1000 pesticides used throughout the world. Every pesticide has distinct toxicological effects and properties. It is possible to group pesticides according to the types of pests that they kill. There are seven group fist one insecticides which kill insects, herbicides which kill weeds, rodenticides kill rodents (rats and mice), bactericides which kill bacteria, fungicides which kill fungi, larvicides which kill larvae and avicides kill birds. However, there could possibly be an alternative to this whole pesticide crisis. In the Journal of Asia- Pacific Entomology, “Toxicity of basil and orange essential oils and their components against two coleopteran stored products insect pests,” investigated how these two essential oils could be used as fumigants for two grain storage insects. It states, “The contact activity of basil oil was more toxic than the oil… thus, basil oil, orange oil, and their components could be potential candidates as new fumigants for the control of S. zeamais and T. castaneum adults” (Kim, 2017). In order to test this, basil oil and orange oil and their components displayed both contact and fumigant toxicities through fumigant actions via vapor, which is also one of the main ways that pesticides are used within the agricultural industry.

Another alternative to pesticide use is the use of bio-pesticides. Bio-pesticides are considered as low risk compounds because they are derived from natural materials such as animals, plants, bacteria and certain types of minerals. This is a safer alternative because they generally affect only targeted organisms, as where regular pesticides can harm organisms such as different insects, birds or mammals (Rousidou, 2013). They are also effective in smaller quantities and often decompose quickly resulting in lower pollution and avoiding the pollution that is caused by conventional pesticides. It’s a safer alternative for the people harvesting as well and works the same way as regular pesticides because they help crop yields remain high which is one of the main uses for a pesticide.

It is very important to use pesticides only in compliance with the label instructions found on the bottle of the pesticide. Pesticides can enter the human body in three ways: oral entry, respiratory entry and dermal entry. Oral entry through the mouth through the food we consume or the liquids we drink. While ingestion is a less frequent way to be exposed, the most serious poisonings may occur this way. Respiratory entry is through the mouth or nose. It is possible to breathe in pesticide sprays, vapors or powders through the mouth and nose. Applying a high-pressure, ultra-low-volume pesticide or fogging system will increase the risk since the droplets are smaller and can be transported over considerable distances in the air. In order to use a respirator, pesticides with a high inhalation risk would be labeled with guidance. Dermal entry is another way pesticide enter the body, which is through exposed skin and eyes, pesticide spray that falls on the body may be absorbed. The most popular route of pesticide exposure is absorption through the skin in most working circumstances. When blending, loading or applying the pesticide, individuals may be exposed to a splash or spray. When you touch a piece of equipment, protective clothing, or surface that has pesticide residue on it, skin contact will also happen. Pesticides are typically absorbed through the skin, forehead and forearms very easily. According to Akash Sabarwal in the article of Hazardous Effects Of Chemical Pesticides on Human Health- Cancer and other Associated Disorders, “Poisoning from pesticides is a global and public health problem and accounts for nearly 300,000 deaths worldwide every year.” However, most of these ways that people get linked to pesticide poisoning is due to the fact that they may work with them often, such as the workers who are involved in these pesticide industries and the farmers who use them for their fruits and vegetables, regular consumers like us get exposed to different concentrations of pesticides. Therefore, the use of pesticides will always be harmful to humans due to the fact that whether we work on a farm or not, there will always be a way for us as a group to be exposed to pesticides when it is extremely dangerous.

**Results and discussion:**

In the United States, the use of pesticides started in the 1930s and became popular after World War II (Miller, 2014). As a country, we lag behind other countries who have banned the use of pesticides that are harmful to the environment. Four of the largest agricultural producers in the world are the USA, EU, China, and Brazil - together accounting for more than half of all global agricultural production value. In addition to numerous incidents of acute poisonings, multiple states have determined that current US EPA regulations are not protective enough for some of these pesticides and have opted to place greater restrictions on use than the US EPA requires (Donley, 2019). After the use of pesticides, it was found that it increased farm yield and today it became the most commonly used method in controlling pests. Pesticides are sprayed on land many times but still they can find their way to a source of water, like a river, ocean, or pond, several times. If the chemical contaminates a body of water, many fish and other animals can run the risk of dying, which throws off balance to the entire ecosystem. Pesticides not only affect the body water but also it might affect the groundwater by the process of leeching. Leeching is the method of separating or removing a solute from its carrier content by means of a solvent. There are individuals who depend on groundwater for their drinking supply so this could be unsanitary for people to consume.

Pesticides contain harmful chemicals and are dangerous which can cause the soil, water and the air to be polluted. Leeching is not the only way that pesticides can spread but also by volatilization is another way that pesticides can spread and cause potential damage. Volatilization is the conversion of a liquid chemical into a vapor which escapes into the atmosphere. This is the mechanism by which a dissolved sample is vaporized. When a pesticide turns into a gas or vapor after it has been applied, volatilization occurs, causing it to pass through the air and disperse to various pieces of ground. Samantha Jakuboski in her blog talks about how, “Some scientists also claim that atrazine (the pesticide), causes reproductive problems in frogs that impair the biological purpose of the frog, which is to live to reproduce. The herbicide of atrazine causes problems for future generations of frogs because it emasculates them and turns them into females which is not natural. An experiment was conducted by Robert Sanders, a manager in science communications at UC Berkeley and a science writer. “The findings come at a time when the EPA is re-evaluating allowable levels of atrazine in drinking water, which stands today at 3pbb, and has drafted new criteria for the protection of aquatic life, limiting four-day average exposures to 12 pbb.” In a laboratory experiment that was conducted using various concentrations of atrazine, they used two different populations of frogs raised in three separate tanks. Each experiment was replicated 51 times and he observed that atrazine was found to influence the sexual growth of frogs as low as concentrations of 0.1 ppb (Sanders, 2002). This goes to show that even the tiniest amount of atrazine can impact a whole species, and this isn’t including all the other surrounding animals that could potentially be impacted by the use of pesticides.

Pesticides are not only harmful to the environment but are also detrimental to the health of an individual. In your colon, pesticides are processed, where they slowly but surely poison the body. You might not notice it but when you eat any type of non-organic vegetable or fruit such as apple, strawberries, carrots, celery you could also be possibly consuming over 30 different chemicals that have been sprayed on the fruit or vegetable. The reason for this is that pesticides could filter through the skin of the fruit and as much as you wash it, it won’t come off. As Alice Park, a writer at Time magazine, confirms in her article that The Environmental Working Group states in the latest report on pesticide residues that 70 percent of conventionally grown fruits and vegetables contain up to 230 different pesticides or their breakdown products (Park, 2018). Strawberries alone have accounted for testing positive for 20 different pesticides. After countless studies Jakuboski emphasizes that Cancer, Alzheimer's Disease, ADHD (Attention deficit hyperactivity disorder) and even birth defects have been related to pesticides. The nervous system, the reproductive system and the endocrine system also get affected by pesticides. Pesticides can also be very dangerous to fetuses because during pregnancy or if a woman feeds her infant, the chemicals can move away from the mother through the milk and be ingested by the baby. Although you would not be killed by one piece of fruit with pesticides, if they build up in your body, they can be potentially harmful to your health and should be avoided as much possible during pregnancy or nursing (Jakuboski, 2011). Those vulnerable to exposure to these chemicals are populations such as farmers and farm workers and those living near plantations, but could also include pregnant women due to the nature of them being vulnerable during these stages of their life.

**Conclusion:**

Overall, as portrayed throughout, there are some serious issues with the substances used to control pests in farms. People who are farmers and expose themselves to pesticide use frequently have to be extremely careful when using those chemicals because if they don’t, not only are they exposing themselves to harmful chemicals, but they are exposing the biodiversity surrounding these crops to it and runoff from pesticides are a serious issue. It is evident we need to move away from the use of chemicals to a more natural and safer alternative that can be used for centuries to come. Moving to a safer alternative such as the use of biopesticides which are naturally occurring in the environment can be biodegradable, more effective in the long term and even less expensive! They prove to be a less toxic form of pest control compared to the more conventional use of toxic pesticides. As a result of this, less species of animals would be directly impacted and allowed to live a normal life. As for workers of farms and who work with the toxic chemicals, they would also be better protected from these toxins. If there are studies that show that even frogs were mutated and had female parts after being exposed to atrazine, imagine the effects that they have on us as humans alone. Cancers and diseases will develop overtime if these things aren’t taken care of, and as a country we should be already moving away from this to a safer alternative. Therefore, would it make sense to be willingly consuming chemicals that have been permeated within the fruits and vegetables you eat, while there are safer alternatives that we should be moving on forward with?

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