

# HITIT JOURNAL OF OCCUPATIONAL HEALT & SAFETY

e-ISSN: 3062-0198

Volume: 1 • Number: 1 • ID: 024003  
March 2024

## EXPOSURE OF AGRICULTURAL WORKERS TO PESTICIDES AND SAFETY MEASURES

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### Article Information

**Article Type:** Research Article

**Doi:** -

**Received:** 01.10.2023

**Accepted:** 28.10.2023

**Published:** 01.03.2024

### Cite As

Kılıç E., Yıldırım T. & Köse D. A. Exposure of Agricultural Workers to Pesticides and Safety Measures. Hitit Journal of Occupational Health & Safety. 2024; Vol.1 Number 1 ID: 024003.

**Author Contributions:** Esra KILIÇ conceived the idea, collected and organized all the data. Tuğrul YILDIRIM prepared and interpreted the results. Dursun Ali KÖSE drew the graphics and compiled the results into a manuscript.

**Review:** Single anonymized - Two Internal (Editorial board members) and Double anonymized - Two External Double-blind Peer Review It was confirmed that it did not contain plagiarism by similarity scanning (Turnitin).

**Ethical Statement:** It is declared that scientific and ethical principles have been followed while conducting and writing this study and that all the sources used have been properly cited.

**Complaints:** [hjohs@hitit.edu.tr](mailto:hjohs@hitit.edu.tr)

**Conflicts of Interest:** The author(s) has no conflict of interest to declare.

**Grant Support:** The author(s) acknowledge that they received no external funding to support this research.

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# EXPOSURE OF AGRICULTURAL WORKERS TO PESTICIDES AND SAFETY MEASURES

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## ABSTRACT

Pesticides are used to increase agricultural production and maintain productivity, and excessive and unconscious use harms both employee and public health. It is used frequently and intensively by agricultural workers, especially in our country. This situation exposes them to chemicals through respiration, digestion, skin and eyes and causes health problems. Chemical substances are most exposed during spraying processes. Pesticides create chemical hazards and risks in terms of occupational health and safety.

Preparation, transportation, and storage of pesticides cause new problems. Agricultural workers who use and prepare pesticides are also exposed to physical, chemical, ergonomic, biological, and psychosocial risks.

In this study, the ways in which agricultural workers are exposed to pesticides, their importance and effect are explained, examples from the literature review are given, and the dangerous and risky situations in terms of occupational health and safety are emphasized. In addition, it has been determined what kind of acute and chronic health risks children and adults may be exposed to because of consumption of pesticide residue foods. In this respect, it has been revealed that it is very important for both employees and public health to regularly control the foods sprayed in agriculture before they are offered for consumption, and to reduce the frequency of application and the number of pesticides. To ensure the use of pesticides and other harmful chemicals in a way that does not pose a danger or risk to agricultural workers, and to mediate the importance of ambient ventilation in indoor environments, most importantly in greenhouses.

**Keywords:** Pesticides, exposure routes, agricultural workers, poisoning, occupational health and safety

## INTRODUCTION

According to ILO data, more than one third of the world's workforce is employed in agriculture, and with this feature, the agricultural sector draws attention as the second largest employment source after the service sector. While approximately 9 percent of the labor force is employed in agriculture in developed countries, this rate can reach up to 60 percent of the total labor force in developing countries. Considering the total number of workers, according to the estimates of the ILO, 1.3 billion people around the world are engaged in agriculture. Although it covers such a large part of working life, unfortunately, the agriculture sector has been determined as the sector with the highest risk ratio in terms of occupational health and safety, after the mining and construction sectors. Again, according to ILO estimations, half of the fatal occupational accidents in the world are caused by the agricultural sector. This means that 170,000 agricultural workers lose their lives every year around the world (Uysal, 2012).

The use of pesticides used by agricultural workers has an important place. In particular, the unconscious and uncontrolled use of these drugs leads to major health problems. As a result of scientific studies, pesticides have been banned due to the fact that they cause tumors or cancer, and also cause diseases such as mental retardation and infertility. Despite this prohibition, unconscious and uncontrolled use continues in some regions of our country (Gül, 2017). According to statistical data, pesticide consumption in Turkey increased by

270% between 1979 and 2007. Especially in 2002, it was 12.199 tons, in 2006 it was 18.258 tons with an increase of 50%, and in 2007 it was 22,681 tons with an increase of 24.22% (Delen, 2008).

Occupational diseases and other diseases are frequently experienced due to the low level of education of the workers working in the agricultural sector in our country and the insufficient safety culture. Agricultural workers are exposed to chemicals with the pesticides they use. These workers are required to take preventive measures to identify the risks they are exposed to while using pesticides and to eliminate or reduce these risks to an acceptable level.

According to the World Health Organization data, each year 3 million agricultural workers suffer from pesticide poisoning, while approximately 180,000 of them die. According to another study, there is a risk of pesticide poisoning working at different rates in developing countries (Gül, 2017).

Chemical substances used in agriculture to destroy insects, microorganisms and other damages that harm plants are called "pesticides".

The unconscious use of pesticides by agricultural workers causes health problems and various diseases. Therefore, it was necessary to develop necessary studies on the use of these substances. The nuisance of houseflies and mosquitoes has been eliminated by the use of pesticides (Sarp, 2011).

Agricultural workers are exposed to chemicals during their spraying operations, as well as applications that increase efficiency such as fertilization and irrigation. Because of this situation, the harmful effects of pesticides should be struggled against (Gezer, 2006).

Pesticides have an acute or chronic effect on the health of agricultural workers. It is inevitable that these substances will cause acute effects by inhalation, ingestion or skin contact, and chronic effects if the residues of these substances are ingested and included in the digestive system.

### Classification of Pesticides

Pesticides are the chemicals of greatest concern to the health and safety of agricultural workers.

Pesticides are classified according to their effects, toxicity, use techniques and chemical structures.

Classification according to the types of pests they are active in;

- Herbicides: Herbicides
- Insecticides: Insecticides
- Acaricides: Acaricides
- Fungicides: Fungicides
- Piscicides: Fish killers
- Avicides: Bird killers
- Rodenticides: Mice killers
- Nematicides: They kill worms in the soil.
- Molluscicides: Molluscicides
- Bacteria: Bactericides

Classification of pesticides according to their chemical content;

- Organophosphorus compounds
- Chlorinated hydrocarbons
- Disinfectants
- Carbamates
- Striazines
- Synthetic prethyroids
- Others

Classification of pesticides according to their mode of action

- Semi-demands
- Non-systemic
- Respiratory poison
- In the plant
- Systemic
- In the pest
- stomach poison
- Touch (contact) poison (Şahin, 2009).

### Usage Areas of Pesticides

Pesticides in the agricultural sector, insect control, fertilization processes, planting products, construction works, livestock works (farm animals), field and garden works, industry sector, industrial sector (solvents, disinfectants), pool works (ornamental pool, artificial lake), tradesmen. It is frequently used against harmful creatures in (selling vegetables and fruits), mining, housework, fish farming, cleaning industry, food industry, manufacturing production sectors, garden, landscaping works, playgrounds.

Pesticide use varies according to the fields. Especially in the agricultural sector, their use is quite common and they are located in most of our living space with the foods produced. As the amount of use increases, the exposure rate increases proportionally. They are at great risk as they are mostly used by agricultural workers. It is also very common in terms of environment. Care should be taken to use it in a controlled and limited manner (Şahin, 2009, Aktürk, 2019).

### Application

All work should be done with caution, as pesticide applications carry a significant risk of exposure, both by inhalation and skin contact. Whether very hazardous pesticides can be substituted for less hazardous pesticides must be continually evaluated.

During the spraying process, the wind direction may change suddenly, causing the pesticide to be sprayed towards the agricultural workers. Outdoor spraying should be done in minimum wind conditions or in the most ideal meteorological conditions where it can be applied to minimize the exposure of agricultural workers. Spraying in greenhouses or similar non-open environments should be done in such a way that the wind movement does not affect the exposure of the workers at a minimum level or even at all. Temperature and ambient humidity should also be taken into account when determining the time and duration of the spraying during the day. If conditions allow, closed cabinets or other types of enclosures should be used where appropriate

to minimize worker exposure. Spray equipment to be mounted on vehicles should be placed in such a way that it does not adversely affect the stability of the vehicle. In addition, while working, necessary precautions should be taken to prevent the operator from being harmed during spraying. Agricultural workers spraying in the greenhouse may inhale the pesticide due to the air movements caused by the ventilation systems. However, this situation can be corrected by providing training (ÇSGB, 2022).

### **Re-entering the Sprayed Area**

After the application process is over, pesticide residues may remain in the environment. Contact with the skin and inhalation of these residues by workers can cause exposure. Re-entering the sprayed environment can lead to serious poisoning and situations that require first aid activities. According to the procedures, for all pesticide applications, the appropriate period during which entry to the sprayed area will be prohibited should be determined. Warning signs regarding the period of prohibition to enter the area after spraying should be in a position where all employees can notice and access, or they should be announced to the employees in some way.

In cases where it is necessary to re-enter the sprayed environment, special trainings should be given to agricultural workers (MoLSS, 2022).

### **Ways of Exposure of Agricultural Workers to Pesticides**

#### ***Inhalation exposure***

Respiratory exposure of agricultural workers to pesticides occurs by breathing in the vapors and dusts emitted into the ambient air during the use of pesticides in the form of liquid, gas, or powder. The most dangerous form of exposure is inhalation of pesticides into the body. Unconscious and uncontrolled work, especially when working in a closed environment, increases the exposure by breathing. The harmful effects of these drugs cannot go out in a closed environment and directly endanger the health of agricultural workers. Significant risks are seen on agricultural workers as a result of respiration. As a result of inhalation of these drugs, various diseases such as respiratory problems, fatigue, cough, vomiting, blood pressure problem, abdominal pain, forgetfulness, insomnia, nausea, dizziness can be seen on agricultural workers and even cause death (Gül, 2017).

Spraying in the open air can reduce the effect on agricultural workers by mixing with the air. For example, agricultural workers using these pesticides in greenhouse cultivation are directly exposed to the damage of these pesticides by respiration due to the closed area, but agricultural workers working in open areas are exposed to the effects of harmful pesticides to some extent

and are less exposed. In fact, agricultural workers should enter the greenhouse after a certain period of time, waiting for the effect of the pesticide to wear off after spraying (Sakartepe, 2016).

#### ***Exposure through ingestion***

The ingestion of pesticides used in agriculture by agricultural workers may cause some health problems. Pesticides used by farmers can even be found on our table indirectly. Agricultural workers can be exposed to these pesticides through eating, drinking and smoking activities without washing hands after direct contact with these pesticides. Thus, various diseases such as nausea, vomiting, diarrhea, weakness, and even advanced levels of cancer can result. Generally, agricultural workers ingest these substances by eating and drinking by mistake. For example, if agricultural workers eat a drug without a label, it may cause serious poisoning (Akpınar and Özyıldırım, 2016).

#### ***Skin exposure***

The most common entry of pesticides into the body is through the skin. Absorption of drugs used as liquids through the skin is usually rapid. The effects of cancer, reproduction, development and immune system upon ingestion have been emphasized (Gezer, 2006). Absorption through the skin in the body shows various differences. The amount of pesticide may vary depending on the duration of stay on the skin, previous effects such as wounds and cuts on the skin. Pesticides are usually associated with dermatitis or allergy diseases. According to studies, hair, nail disorders and skin cancer are less common (Tunçdemir, 2016).

Exposure occurs by direct contact with the skin during the use of drugs. For example, organic phosphorus can cause skin irritation because it is easily absorbed and comes into direct contact with the skin. Dichlorvos (DDVP) is a poison used by agricultural workers to control their animals against parasites. Since this poison is quite dangerous and risky, agricultural workers should not come into direct contact with their skin (Şahin, 2009). Paraquat are herbicides that cause blistering and ulceration of the skin and discoloration of the nails when they come into contact with the skin.

Since pesticides can cause infertility for male agricultural workers, pesticide exposure should be avoided (Anonymous, 2013).

#### ***Eye exposure***

Another exposure route is through the eye. Agricultural workers should act cautiously because chemicals are easy to enter through the eyes. In addition to the eye being a sensitive organ, it would be beneficial for agricultural workers to take personal precautions to ensure that it is least damaged. For example, safety glasses should be used when using disinfectant or abrasive cleaning

agents. Animal manures are also irritating to the eye tract, so agricultural workers should be careful. Complaints such as burning, tearing, redness and even temporary blindness may occur in the eyes of the agricultural worker who contacts the chemical pesticide in his eye. Eyes should not be rubbed during spraying. After spraying, clothes should be changed, hands and faces should be washed with water and cleaned (Anlı, 2018).

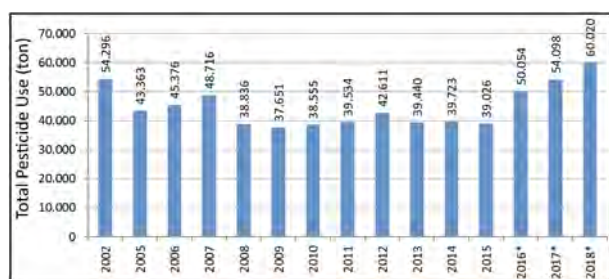
### Usage Cases of Pesticides in Our Country

Pesticides are generally used in quite different intensities, depending on the climatic conditions, the level of development and prevalence of the countries. Türkiye has very rich plant species. Therefore, there are many pesticide types used depending on the cultivation of a wide variety of plants (Göl, 2021).

**Table 1.** Pesticide use cases in Turkey between 2015-2016 and 2017, divided into groups

YEARS	Insecticides (Ton)	Fungicides (Ton)	Herbicides (Ton)	Acaricides (Ton)	Rodenticide+ Molluscide (Ton)	Others (Ton)	Total (Ton)
2015	8.117	15.984	7.825	1.576	197	5.327	39.026
2016	10.425	20.485	10.025	2.025	259	6.835	50.054
2107	11.436	22.006	11.759	2.452	236	6.209	54.098

According to the data of the Ministry of Agriculture and Forestry, General Directorate of Food and Control, the amount values depending on the type of pesticide used in 2015-2017 are given in Table 1. While the amount of pesticides in our country was 39,026 tons in 2015, it increased to 54,098 tons by 2017, an increase of 38.62%.



\*Due to the changes in the calculation method after 2016, the amount of usage seems high.

**Figure 1.** Total pesticide use in our country by years

The amount of pesticide use indicated in Figure 1 varies from year to year. In this respect, the use of pesticides should be treated by considering the amount and effect factors (Anonymous, 2019).



**Figure 2.** Amount of pesticide use in Turkey in 2017 (Anonymous, 2019).

## MATERIAL AND METHOD

### Pesticide Accidents

**Case study 1-** The family who ate pomegranate in Kayseri was hospitalized.

On October 30, 2019, Saliha, who ate pomegranate after dinner in Kayseri, became ill. The pesticide came to the cracked place of the pomegranate and as a result of the researches, 4-year-old Saliha Çakır, who ate the pomegranate, died as a result of pesticide poisoning (Anonymous, 2021).

**Case study 2-** The case of three people related to carbofuran poisoning is mentioned. Two people were formulation plant workers who prepared 10% granules. The other person was an entomologist who began to feel uncomfortable while weighing the 50% water-dispersible powder formulation. She developed symptoms suggestive of carbamate poisoning, such as profuse sweating, weakness, blurred vision, and nausea. Then both were taken to the doctor 3 hours later. One doctor administered atropine and the other did not. The patient who received atropine (0.02 g im) completely recovered within 30 minutes. The untreated patient recovered within 2-3 hours. The entomologist also experienced mild discomfort that regressed without atropine administration within 4 to 6 hours (Tobin, 1970).

**Case study 3-** A spray incident that occurred during the spraying process.

The classic signs of ChE poisoning were seen in the aircraft co-pilot as a result of a pinhole leak in the high-pressure pump line that emitted a fine aerosol of mexacarbate formulation to the fuselage. Untreated, these toxic symptoms progressed to paralysis of the extremities. With the interventions in the hospital, the symptoms decreased rapidly. After 3 days the co-pilot returned to normal (Richardson & Batteese 1973).

**Case study 4-** A study was conducted on 19 agricultural workers in the USSR. In the study, whole blood ChE activity was measured before and after 4 to 6 hour exposures to carbaryl in air for 3-4 days. Significant ChE inhibition was found in men exposed to mean airborne carbaryl concentrations of up to 4 mg/m<sup>3</sup>. No objective signs of disease



were observed. No change was measured at 0.7 mg/m<sup>3</sup> (Yakim, 1967).

**Case study 5-** The study conducted by 'Kuzu 2020' consisted of patients who applied to the Emergency Service of Akdeniz University Medical Faculty Hospital; It was stated that there was a 42-year-old woman and a 10-month-old baby due to mercury poisoning, 3 of the 4 people who were poisoned by eating ornamental plants in the house were girls between the ages of 1-6, there was a woman who got sick after eating bitter melon, and there were 4 people who swallowed a clock battery (Lamb, 2020).

## RESULTS

It is possible for pesticides to have a direct or indirect negative effect on agricultural workers. The effect of pesticides on the body of agricultural workers is possible through the ingestion of the ingested substance into the body through respiration, digestion, skin and eyes.

Eating or drinking pesticide-contaminated food can cause toxic effects. Pesticides are transmitted to agricultural workers through food, and then they can show their effects in the form of poisoning, genetics and diseases that can cause cancer. In addition, it has been stated that agricultural workers' contact with pesticides causes carcinogens, effects on growth, reproduction and immune system. In this case, mortality is generally low, but may vary depending on the amount and dose of pesticide taken. In general, pesticides also show their effect in the form of acute and chronic diseases.

Pesticides can contaminate food as well as water. When agricultural workers take this drinking water directly or indirectly into their bodies, they face various health problems. This may cause significant concern. Agricultural workers need to know very well that these substances are toxic and have cancer-causing, hereditary damage and lethal effects when taken into the body. In general studies, it has been observed that the risk of cancer is higher in agricultural workers who use pesticides directly (Gezer, 2006).

While pesticides affect the health of agricultural workers, they can also reduce the body's sensitivity without realizing it. The unconscious and uncontrolled use of these substances is important in terms of adaptation as well as endurance in the body of agricultural workers.

Studies conducted on agricultural workers and family members have shown that there is a high risk of exposure in situations such as applying pesticides directly with bare hands or using them without work clothes (Tunçdemir, 2016).

Davies et al. (1980, 1984) classified pesticides by categorizing them according to their exposure, periods and conditions (Figure 3)



Figure 3. Pesticide exposure types (Tunçdemir, 2016).

## Major Acute and Chronic Effects of Pesticides

**Acute Effect:** Pesticides enter the body of agricultural workers directly through respiration, digestion, eyes and skin. Toxic effects occur by eating or drinking food contaminated with pesticides. When using pesticides, the sudden effect of the dose taken in contact with it in a short time is called poisoning. This effect is called the "acute effect". In addition, this situation may vary depending on the dose and amount of chemical substances (Gezer, 2006).

**Chronic Effect:** It is the feature of showing the effect of the chemical substance taken slowly or in a long time. Time and accumulation in the body are the most important features of this effect. If it recurs repeatedly, it is chronic. In this respect, it may have a carcinogenic effect for agricultural workers (Şahin, 2009).

## Harmful and Toxic Drugs Used by Agricultural Workers

Depending on the agricultural diversity in our country, various types of pesticides can be used in different regions. Information was collected about the pesticides used predominantly by the Central Anatolia Region, according to their types and effects. In order to obtain information on the use of pesticides, information was obtained from experts engaged in the trade of agricultural products.

Table 2. Some pesticides used by agricultural workers

Pesticide Type	Preferability	Domain
Maneb	It's a banned drug	–
Zineb	Not actively used in Turkey	–
Azinphos	Not used for 10 years	–
3-a grubu insektisit- Lambda Cyhalothrin	It is among the most preferred	Sunn pest, wheat worm, earthworm, fruit worm, fruit flies
4-a grubu Acetamidrid	A most preferred insecticide is insecticide.	Aphids, whitefly, psilla pests
1-b grubu Malathion	A most preferred insecticide is insecticide.	Cochnil (bark lice), amber pests, leafworm

Grup 6 İnsektisit+ Akarisit- Abamectin	Insecticide is insecticide	Red spiders, mites, fruit flies
Grup 23 Larvasit- diflubenzuron	Acts as larval inhibitor in all insects	It is used as an insect growth regulator
Grup 1-a primikarb	Aficide is an insecticide	Thrips and aphids
Grup 7-c Propoksifen	Larvacid is an insecticide	Crustacean lice, fruit flies

### Practices Affecting Agricultural Workers During Spraying

Agricultural workers may encounter certain situations when using pesticides;

- Not being careful while working with moving equipment,
  - Failure to act consciously about the time during spraying,
  - Leaving materials such as containers, buckets, boxes that are contaminated with pesticides around,
  - To be cautious against negative situations that may arise against lack of attention,
  - Applying pesticides in accordance with gender and age,
  - Taking care to carry out the spraying work at the right time and in the appropriate environment (atmospheric condition),
  - Using appropriate control methods against harmful and toxic effects of drugs,
  - Considering the health of the agricultural workers and the community in every spraying,
  - Correct selection of pesticides and review of the selection,
  - Include important information in Risk Assessments and Material Safety Forms and to continue working within the scope of this information,
  - Paying attention to air temperature and climatic conditions in the use of pesticides,
  - The application of pesticides by agricultural workers in accordance with their purpose,
  - Being sensitive to environmental pollution during and after spraying,
  - Giving importance to the advice given by experts or authorities,
- items such as can be listed (Sarp, 2011).

### Purpose of Occupational Health and Safety in Working with Agricultural Workers

To protect the life and health of agricultural workers, to maintain their physical and mental health, to keep them away from dangers and risks and to work peacefully and happily. It aims to provide general and specific comprehensive information about pesticides. On the other hand, it is inevitable for agricultural workers to work in an unhealthy and insecure environment, reflecting the cost both to themselves and to the country. Therefore, it would be beneficial to provide a suitable and safe

working environment for agricultural workers.

The employer is also responsible for the implementation of occupational health and safety. The employer is obliged to take occupational health and safety measures in the environment where agricultural workers work. Informing agricultural workers about their legal rights and responsibilities is important in terms of eliminating professional risks and uncertainties. Agricultural workers may quit their jobs in the face of a serious and unavoidable dangerous situation. They must comply with the set instructions and procedures while working. They are responsible for using pesticides and personal protective equipment in accordance with the purpose of the training they have received. It is beneficial for sustainability to reduce the exposure of agricultural workers to pesticides used in the working environment to an acceptable level and to confirm the reduced level (Anlı, 2018).

Necessary precautions should be taken to prevent exposure of pregnant agricultural workers, children and animals during pesticide applications. Pregnant farmers, children and animals should be kept away from the application area (Anonymous, 2013).

### Precautions to be Taken Against Pesticide Exposure of Agricultural Workers

They must have sufficient knowledge about the pesticides used in agriculture and other fields. They should get the necessary help from experts. During spraying, first of all, it should be understood what the harmful factor is. Later, this factor may need to be accurately determined, defined and determined according to experience.

Agricultural workers should carry out the spraying operations in accordance with the usage situation. Medications should be prepared and administered safely. Priority should be given to pesticides that have the least harmful effects on employee health, are low risk or do not harm the environment. It is necessary to fight against the use of pesticides that are not allowed or restricted in developed countries (Erdoğan, 2010).

The use of unlicensed pesticides is dangerous and therefore should not be used. Care should be taken not to use pesticides other than for their intended purpose. Dangerous and risky situations should be considered. Pesticides can be used in many ways. Warnings should be reviewed before each method is used. Pesticides should not be used in living areas, especially in homes. It should be kept away from the environment especially where children and pregnant women are present.

The instructions for use of the pesticides and the MSDS must be read. If poisoning occurs, what to do should be explained (Sakartepe, 2016).

Problems with pesticides can persist even during use. For this reason, necessary help should be

sought from experts. In particular, it can be directed to factors such as the identification of hazards, the use of pesticides, transportation, filling and emptying, cleaning (Erdoğan, 2010). Special precautions must be taken for the disposal of finished wastes and empty boxes. The LC50 and LD50 values of the pesticides used should be known and clearly stated (Şahin, 2009). Drugs with low toxicity should be used as much as possible. Excessive use of doses and repeated applications without reason should be avoided. It should be ensured that personal protective equipment is used against the health and safety hazards of pesticides (Karlıoğlu, 2007). Health education should be given to agricultural workers in order to prevent the negative effects of pesticides.

The right equipment should be preferred while working. All equipment should be well protected and maintained (Erdoğan, 2018).

## CONCLUSION and RECOMMENDATIONS

✓ Pesticides used by agricultural workers should be brought under control and awareness should be raised. It should be kept in mind that these drugs are toxic substances and affect not only agricultural workers but also the environment, primarily and indirectly, on public health. In order to eliminate the stated problems, employees should be trained, working environment and conditions should be improved.

✓ It has been stated that the use of personal protective equipment by agricultural workers is not sufficient. Therefore, awareness should be created about the importance, maintenance, repair, cleaning and effect of the use of personal protective equipment.

✓ Necessary precautions should be taken on time and on the spot. If the precautions are not taken adequately, the situation of threatening the health of the agricultural workers increases.

✓ Agricultural workers must read the instructions on the pesticides before using pesticides. They also need to understand the instruction they read. This is where the level of education comes into play.

✓ They should be warned not to eat or drink while working with pesticides and be informed about the possible consequences.

✓ Agricultural workers must change their clothes after spraying or post-application work is finished. Cleaning (washing and other processes) of these clothes in a similar way to daily clothes should definitely be prevented. The contamination of pesticide residues is important. Contaminated work clothes should not be worn again. If these residues remain on work clothes for a long time, necessary precautions should be taken to prevent family exposure.

✓ Pesticides should not be transported or stored

together with food and beverages. Since this situation is quite dangerous, it should be prevented and necessary strict measures should be taken.

✓ Empty boxes of used pesticides, which are in danger of seriously harming the health of employees, should be removed from the environment in an appropriate manner.

✓ Drinking water should not be in a place where pesticides can affect it. Employees should be sensitive in this regard.

✓ Agricultural workers should not take the pesticides they use to their homes. It should not be forgotten that children and other people at home may also be at risk.

✓ When working with sprayers, work clothes or protective clothing must be worn.

✓ Prescription pesticides should be taken and applied according to the user manual during the use phase.

✓ Necessary support should be provided to protect the health of the employees. Necessary studies should be carried out in order to prevent situations such as work accidents, near misses, occupational diseases and incapacity to work. Agricultural workers should be encouraged to use pesticides in optimal amounts. It should be ensured that they actively participate in the activities to be carried out for the purpose of information.

✓ Attention should be paid to the issue of proper ventilation in works performed in closed areas (such as greenhouses, barns, warehouses), and they should be provided with training and support on ventilation applications.

✓ Agricultural workers should be made aware of the fact that animals are removed from the sprayed environment before the application of pesticides in the environment where farm animals are present.

✓ Spraying products should not be left open, they should be kept locked up at all times. Emergency studies should be carried out, and if the environment is suitable, drills should be carried out.

✓ Health examinations of all employees should be carried out periodically and diseases that may occur should be prevented before they occur. Studies should be carried out to ensure that agricultural workers receive adequate health education on health surveillance.

✓ Each employee should obtain a vocational training certificate specific to the field he/she works in. Work to be done in terms of occupational health and safety should be considered permanent.

✓ Agricultural workers and other producers should not use chemical pesticides in such a way as to damage the natural environment and harm employee health in order to obtain more products. It can be said that when these drugs are used more



than necessary, endurance problems may occur. Thus, in the future, disease and poisoning may increase gradually.

✓ It will be more efficient and healthy for the authorities recommending pesticides to make suggestions not only according to the statements and observations of the agricultural workers, but also by going to the working environment and seeing them.

✓ Methods should be found to reduce the use of chemical drugs. Thus, the negative effects of employee health will be reduced and the duration of resistance to pesticides will be improved.

✓ In particular, the use of wrong drugs that threaten employee health and cause deterioration of the natural balance should be prevented.

✓ Using pesticides more and continuously does not mean that the yield will increase continuously. Therefore, more control should be done during the study and excessive and unnecessary spraying should be reduced or eliminated.

✓ Appropriate precautions should be taken, taking into account the content of pesticides used and previous accidents. Common problems, occupational diseases and near-miss events should be emphasized while spraying.

✓ Prevention and protection measures should be taken in accordance with the standards for the healthy and safe working of agricultural workers. Studies should be carried out taking into account educational levels and language differences. When a serious and dangerous situation is encountered, it should be ensured that the work is stopped and the employees are removed from the area.

✓ Before starting pesticide application, health examinations of agricultural workers should be carried out regularly without neglecting them.

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