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Investigation of the Efficiency of Occupational Health and Safety Education of Agriculture Department Students in Vocational High Schools

Sena Yaren Sarıcan[1,*], Arzu Fırlarer[2,3], Füsun Eyidoğan[2]

[1] Başkent University, Institute of Food, Agriculture and Livestock Development, Department of Sustainable Agriculture and Food "Systems, Ankara, Türkiye

[2] Başkent University, Faculty of Science and Literature, Department of Molecular Biology and Genetics, Ankara, Türkiye

[3] Başkent University, Knowledge, Innovation and Technology Transfer Office, Ankara, Türkiye

HIGHLIGHTS

- This study aims to investigate the effectiveness of occupational health and safety training prepared for students studying in the relevant departments of vocational high schools.
- It has been observed by this study that increasing OHS training in agriculture and making the curriculum interesting can encourage students who graduate from their fields to start working in the agricultural sector.

Abstract

The basis of occupational hazards and risks in agriculture, which is a high-risk sector, is due to the behavior of farmers based on a lack of knowledge. In this sense, farmers are required to have knowledge of occupational health and safety (OHS) in agriculture and to carry out their work with the following health and safety measures. The easiest way to achieve this is to implement these measures by making a habit of them together with technical experts working with the farmers in the field. In this context, it is important that agricultural, food, and laboratory technicians, who play an important role in ensuring soil and animal health and safety, acquire this information during their training. This study aims to investigate the effectiveness of occupational health and safety training prepared for students studying in the relevant departments of vocational high schools. Occupational health and safety training in agriculture was given to students from the agriculture and laboratory department of İstanbul Mehmet Akif Ersoy Vocational and Technical Anatolian High School, which was determined as a pilot school in Ankara, and the awareness of high school students in the field of occupational health and safety was measured and especially on OHS in pesticide use. The tests applied at the beginning and end of the training were analyzed at the end of the study and it was concluded that they gained the awareness to a large extent. While the awareness score was 55 in the test performed at the beginning of the training, the awareness score increased to 95 after the training.

Keywords: Vocational High School, Agriculture, Occupational Health, Occupational Safety, Awareness

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*Correspondence**:** senayaren1998@gmail.com

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1. Introduction

Occupational health and safety (OHS) are one of the most important issues that need attention in the name of health and safety in every field in the world. Producing solutions by developing Occupational Health and Safety measures, which is one of the biggest needs in the industry, is an important problem that many countries face globally. According to the estimates research of the International Labor Organization (ILO), every 15 seconds an employee dies due to a work accident or occupational disease, and approximately 2.3 million workers die from work-related diseases in the working environment every year (ILO 2022). Each occupational accident and occupational disease hurt the country's economy. Although there are many steps to be taken for safe production, there are trained employees who can create strategies in every country. For this reason, examining the previous literature reviews by comprehensively and systematically understanding the research and development trends will increase the potential to predict the development and future trends in this field.

According to the data from the ILO, about 2.3 million years ago, the death rates of workers due to occupational accidents and diseases were higher (ILO 2022).

Occupational health problems continue to increase in low-income countries due to the transition from subsistence agriculture to industrialization, the working conditions of agricultural workers, and the lack of control of risks. To increase the controls and raise awareness, OHS public units have been established in many countries that provide the management structure related to Occupational Health and Safety. It is thought that the importance of these units is great because of the activities that can be done jointly with the state (Atusingwize et al., 2019).

The value of integrating it with the occupational health and safety activities necessary for the improvement of occupational health is increasing (Biswas et al. 2021). It is known that more than half of the people are in the working class. However, a significant number of people in this class also work in the agricultural sector. The determining factor for the health status of each class employee is the working environment. It is of great importance to draw attention to occupational health and safety, as the agricultural sector also creates a dangerous working environment. The success of the vocational training given to the new entrants to this sector, rather than the vocational training given to the employees who have gained many years of experience, results in a higher safety culture. It is known that occupational accidents and occupational diseases that employees may encounter with occupational health and safety training can result in minimum negativity (Olcay et al., 2021). In addition, it is very important to make progress in the field of OHS so that all kinds of work accidents and occupational diseases are recorded.

The shrinkage of agricultural lands per capita, climate changes, and the decrease in water resources in countries reveal the importance of the education given in Agricultural Vocational High Schools. Gaining the basic skills of modern and traditional agriculture is an important issue that needs to be prioritized. To ensure sustainable agricultural development, labor productivity must meet the basic needs of agricultural workers, as well as provide suitable working conditions for agricultural workers. Vocational high school students who will take part in the agricultural sector should have taken the basic equipment of the field as well as the basis of occupational health and safety.

Agricultural workers may be exposed to pesticides, insecticides, silage in silo holds, moldy straw and sugarcane, fungal spores, and chemicals such as ozone, methane, and ammonia. All these have a very negative effect on the respiratory tract. Against all these dangers, the dust in the environment should be cleaned, good ventilation should be done in the silo warehouses, and humidity and moldy environments should be destroyed. However, these measures are not enough to eliminate all dangers. Respiratory protective equipment must be used, especially when spraying or walking around these areas where there are other

respiratory risks. In addition to these, integrated pesticide management, good social medicine practices, vaccines, pest control, protective creams, good pesticide use practices, re-entering the land at the right time after pesticide use, identifying and separating carcinogens, labeling the boxes according to safety rules are the latest in terms of occupational health and safety. is extremely important.

Pesticides are biologically active chemicals that cause troublesome insects, animals, microorganisms, weeds, and other pests to die or change their behavior. The first substances used as pesticides were arsenic and sulfur. Later, it was linked to the use of botanical substances such as nicotine (Li et al., 2016).

It is known that hundreds of pesticides are used in the world. In the classification made by the World Health Organization, 33 of the 700 most used pesticides are harmful to human health, 48 are very dangerous, 118 are moderately hazardous and 139 are less dangerous. World pesticide consumption increased to 3.2 million tons in 2001. 75% of pesticide consumption belongs to developed countries and the USA, Western Europe, and Japan rank first among these countries. Considering the use of pesticides in Turkey by pesticide groups; it is seen that the most important group is insecticides with 47%, followed by herbicides with 24%, and fungicides with a share of 16% (Ahioğlu 2008).

It is known that pesticides are widely used in the agricultural sector to prevent harmful or harmful organisms. However, in addition to preventing this pesticide from harming the plant, it has negative effects in many areas from soil structure to the health of the pesticide applicator. Therefore, controlled use and correct use are of great importance. In recent years, despite the increase in the number of countries where important measures have been taken to prevent the unconscious increase in pesticide use, it is difficult to record developments that will eliminate the negative effects. For this reason, the inclusion of these issues in newly organized training gains importance in terms of increasing the precautionary elements (Wang et al., 2020).

The main objective of this study is to create occupational health and safety awareness to prepare the agricultural and laboratory department students at vocational high schools for their professions. In the application part of the study, three-day basic level OHS training was given to the students. The content of the training has been prepared specifically for Occupational Health and Safety in Agriculture, and the OHS titles for pesticide use are emphasized in the program.

This study, it was aimed to prepare vocational high school students and future agricultural workers with high awareness and increased knowledge of OHS. Since it is not possible to gain awareness of OHS in agriculture in all its dimensions with theoretical education alone, practical training of students in this field or providing internship opportunities will help to further expand their perspectives.

2. Materials and Methods

Occupational health and safety training in agriculture was given to 39 students from the agriculture and laboratory department of Borsa İstanbul Mehmet Akif Ersoy Vocational and Technical Anatolian High School, which was determined as a pilot school in Ankara, and the awareness of high school students in the field of occupational health and safety, and especially in pesticide use, awareness on OHS has been tested and evaluated for data analysis. In the training given to the students, verbal expression, visual content, and gamified expressions were used as methods. Before the training, the awareness of the students in the field of Occupational Health and Safety was determined by 20 questions and the content was adjusted according to these results. After the training and studies carried out after the awareness evaluation, a separate test was applied to follow the development status. The data obtained by these tests were evaluated by graphing. During the training, support was received from the high school teachers to attract the students to the subject at the maximum level, and the teachers in charge of the research were provided with high school education. In the awareness meetings held with the students, the fact that the training is visual and creative drama application shows that they are more interested.

To carry out the study first, information such as the ages of the students and the fields they studied were learned during the acquaintance at the beginning of the education. In the study, 39 students (15 girls and 24 boys) at Borsa İstanbul Mehmet Akif Ersoy Vocational and Technical Anatolian High School in Ankara's Çankaya district were interviewed, and tests were applied to monitor their awareness development at the beginning and end of the education. Attention was paid to the fact that the 9th and 10th-grade students selected were students of the agriculture and laboratory departments, and it was ensured that the teachers of the same field in the high school participated during the education.

Table 1. 3-day training program applied to students

1. Day	2. Day	3. Day
Pre-Test Practice, what is Occupational Health and Safety? OHS Historical Development (90 minutes)	Pesticide, Uses, and Health Effects (90 minutes)	Selection and Use of Applied Personal Protective Equipment in the Agriculture Sector (90 minutes)
General Description of Occupational Health and Safety in Agriculture (90 minutes)	Pesticide Label Information, Considerations for Pesticide Usage (90 minutes)	Example applications (90 minutes)
Risk Factors in Agricultural Enterprises (90 minutes)	Risk Management in Pesticide Applications (90 minutes)	Drama Application (90 minutes)
Occupational Diseases and Work Accidents (90 minutes)	Preventive Approaches in Pesticide Applications (90 minutes)	Mini-Exam and End of Training Knowledge Level Measurement Application (90 minutes)

In the 6 open-ended questions in the first test applied before the education; His basic knowledge of OHS training, pesticide identification, and personal protective equipment (PPE) was tested. With open-ended questions, it was predicted that the students would be able to express their thoughts without being within certain limits, and positive results were obtained. In addition, students were expected to rate their knowledge level. An OHS expert was also consulted to evaluate the content of the questions.

After the 3-day 18-hour training applied after the first test, another test was applied to monitor the awareness development. In this application, students were asked to answer the questions by imagining the environments in which they could work in the following years. They were asked to describe the dangers they may encounter in the working environment and the precautions they can take, to explain their thoughts on the selection of personal protective equipment and the hygiene of the working environment.

As indicated in Table 1, the content of the training has been planned specifically for the use of pesticides in agricultural areas and the continuation of work by occupational health and safety. The risks they may encounter in the field of agriculture and the precautions they can take are mentioned. Then, information was given about the personal protective equipment that should be used during spraying.

Since the working group is between the ages of 14-15, it has been given importance to gamify each application and educational content. Before the awareness development follow-up test, a creative drama application was made to evaluate a problem given by the educators in an agricultural study area that they determined.

3. Results and Discussion

The agricultural sector has a very special and important place in the country's economy, as it is an economic sector and makes significant contributions to the country's exports. On the other hand, because of the increase in food supply with the increasing population, the strategic importance of the agricultural sector is increasing, and ensuring sustainability in agriculture gains more importance. In this framework, more research and awareness studies are needed to solve the problems by considering the labor factor in the agricultural sector as a function of economic and social development.

One of the most important parameters in ensuring the sustainability of agriculture in our country will be possible by improving the occupational health and safety conditions of labor-intensive workers in the agricultural sector. Considering the contribution of the agriculture sector to the national economy and the raw material and capital it provides to the industrial sector, its direct interest in food production and nutrition, its high rate in the active labor force, its contribution to the protection of environmental health and the provision of ecological balance, it is seen that its sustainability concerns the whole country. When evaluated in terms of both economy and employment, it is seen that occupational health and safety in agriculture is an issue that cannot be neglected.

In Labor Law No. 4857 published in May 2003 (Anonymous 2003), agriculture and forestry enterprises are excluded from the scope (Labor Law 2003: 4/b). With the June 2012 publication of the Occupational Health and Safety Law No. 6331 (Anonymous 2012), which includes important changes in the occupational health and safety legislation in our country, all employees in the public and private sectors have been included in the scope of the Law and the necessary legal requirements for the protection of the health and safety of those working in the agricultural sector have been included. regulations have started to be implemented (Occupational Health and Safety Law 2012). However, the completion of legal regulations alone is not sufficient to prevent the risks of occupational accidents and occupational diseases occurring in this field. These arrangements will be possible with the development and implementation of solutions for raising awareness, raising awareness, and solving concrete problems related to occupational health and safety for those who work in the agricultural sector and who are candidates in the sector. In this context, the effectiveness of methods on how to increase OHS training in agriculture and make the curriculum interesting, and how to create environments where students who graduate from their fields can encourage to start working in the agricultural sector are examined in this study.

The evaluation of the awareness development monitoring test results of the 9th and 10th-grade students who received education in two different fields of the vocational high school was made by the OHS experts and educators. Since vocational high schools are less preferred by female students, the number of male students in the study is high. Considering the rate of 38.4% female students and 61.6% male students, it was determined that the answers given were not related to gender distribution.

It was observed that the student's awareness of "OHS and Pesticides" increased significantly with the tests and drama practice applied at the beginning and end of the education. The drama practice applied to ensure the long-term permanence of the acquired knowledge has greatly contributed to education. It was decided by the educators of the high school that it was a method that could be applied in later processes as well.

According to our observations during the study, we interpret that the students of the agriculture department are more prone and interested in pesticides than the students of the laboratory department. In the test applied at the beginning of the education, the students of the agriculture department gave conscious answers to the pesticide questions and showed that their perception levels on this subject were high. Since most of the participants were chosen as agriculture students, their interest in occupational health and safety training specific to agriculture was high. When the opinions of the students were taken at the end of the

training, positive feedback was encountered. It is possible to interpret the feedback as an increase in awareness of OHS. These data show that it has been concluded that education has achieved its purpose.

In the test applied at the beginning of the education, most of the students rated the occupational health and safety knowledge level in agriculture as "Average". In this test, while the students could not define the danger in agriculture, they increased their level of knowledge enough to both define and give examples in the test applied at the end of the education. It was determined that 71% of the students were more aware of personal protective equipment than other subjects.

The questions with the highest level of response in open-ended questions were personal protective equipment (PPE) questions. The reason for this is thought to be due to familiarity with the protective equipment. The visual content of the subjects is the reason for preference because it increases recall. It was very useful to show examples of personal protective equipment explained during the training.

In addition to the training, it was interesting for the young people to listen to the experiences of the educators. During the interviews held at the end of the training, the student's requests for internships in this field and department visits arose.

With the applied training, the youth, who are the agricultural and laboratory workers of the future, have a basic level of occupational health and safety knowledge. However, by knowing pesticides, the use of which has increased in recent years, they have grasped the seriousness of pesticide use in agriculture.

The effectiveness of the training can be seen more clearly by showing the results of the tests applied at the beginning and end of the training graphically. The answers given to the open-ended questions of the first test administered to a total of 39 students are shown in Figure 1, Figure 2, and Figure 3.

“What is the first word that comes to your mind when you think of occupational health and safety?” The answer with the highest rate to the question was "Health and Accident". However, the least that comes to mind is “Efficiency” with 3%. It is thought that these results are due to the words in the question evoking information about the subject.

Figure 1. Write the first word that comes to your mind when you say OHS

According to the information shown in Figure 2, it is seen that students mostly understand that it is a drug when they hear the word pesticide. They associated this word with at least 'insect'. However, considering that it is also related to the department they are studying, it is seen that they know that it is a drug used in agriculture and may leave residues.

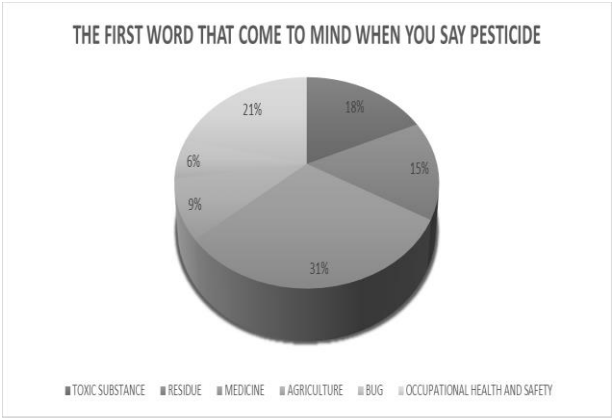

Figure 2. The first word that comes to mind when you say pesticide.

Evaluation of personal protective equipment by students is given in Figure 3. First, the abbreviation PPE was opened during the training, and it was seen that the first words that came to mind were personal equipment (gloves, glasses, masks, etc.). It is also seen that there are students who use the expressions at the root of the question in their answers. One of the topics of discussion on the agenda, the supervision of the use of PPE is also among the answers of the youth.

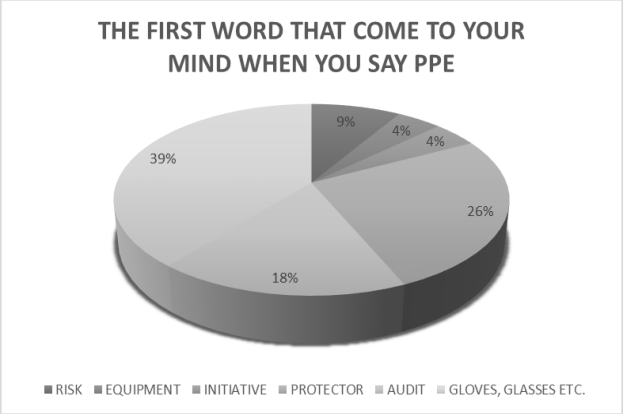

Figure 3. The first word that comes to your mind when you say PPE.

In the awareness assessment made by the students at the beginning of the education, it was interpreted that they had mastered the basic concepts and it could be observed that they were highly interested in the subjects they could visualize in their minds. According to the information given by high school teachers, it can be interpreted that they have mastered the basic objectives of occupational health and safety because they are familiar with the expressions in their curriculum.

The percentiles of the answers to the test administered at the end of the training are shown in Figure 4, Figure 5, and Figure 6. According to the information in Figure 4, in the answers given by the students who received OHS training in agriculture, among the dangers that agricultural workers may be exposed to, 25% of the total participants were "Construction machinery and equipment". "Poisonings/respiratory problems",

which followed this with 19%, are thought to be caused by the pesticide issue included in the education. The dangers (insect bites, natural disasters) that young people hear around them are also among the answers. Since people working in the production, storage, transportation, and sale of pesticides, practitioners using pesticides, agricultural workers working in pesticide-used areas, consumers who eat food containing pesticide residues, and people from all segments of society exposed to pesticides contaminating the environment, studies are carried out considering different risks. To determine these risks, the acute (immediate), subacute (short-term), and chronic (long-term) toxicity of pesticides on animals are examined. The answers given by the students show that they have a basic level of knowledge on this subject.

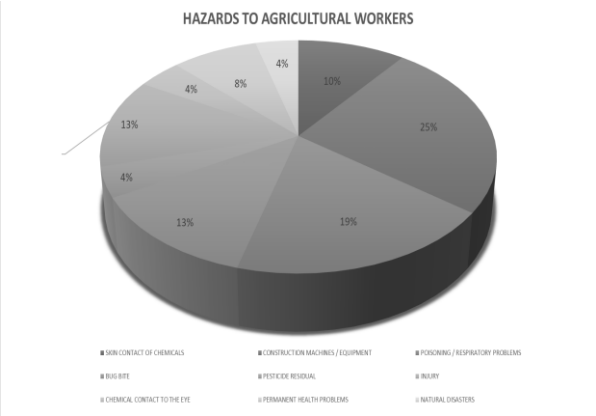

Figure 4. Hazards to agricultural workers.

The answers are given to the question "Measures to be taken in occupational health and safety", which is one of the most important questions in which training effectiveness is measured, satisfied our trainers. Personal protective equipment, which is an important issue to be considered in OHS, constitutes a large portion of the answers given. (Figure 5) The emphasis of future employers and workers in the response to employee training following PPE added value to training.

Figure 5. Measures to be taken in occupational health and safety.

After the importance of PPE was emphasized throughout the training, the answers to gloves, glasses, aprons, and masks written by most of the students who received vocational training (Figure 6) show that they understood the subject.

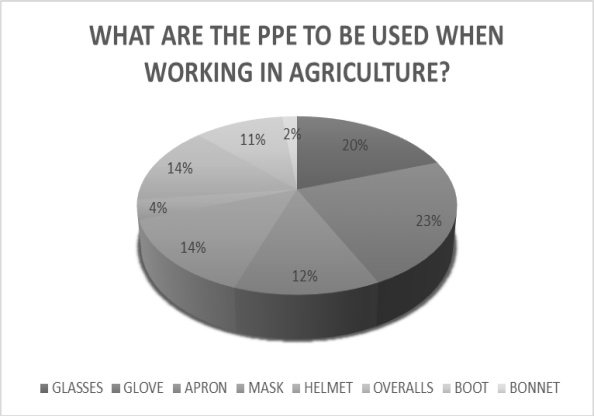

Figure 6. What is the PPE to be used when working in agriculture?

Based on this study, what needs to be done to raise awareness of occupational health and safety in agriculture can be summarized as follows.

1. To improve occupational health and safety services, the risks to which the employees in the field are exposed should be detailed and training modules and methods should be developed that will enable the employees to gain a safety culture specific to the workplace.

2. Vocational training modules specific to the agricultural sector should be developed, including occupational health and safety measures.

3. Since the employees in the sector are self-employed, or family-run, methods from different sectors should be developed to improve occupational health and safety.

4. Relevant training should be held in places where agricultural workers can easily reach, and the right and wrong examples from previous experiences should be visualized, especially in identifying risks and taking precautions.

5. Although it is not a result of the study, it can be interpreted that increasing the level of knowledge and awareness of the technical personnel who will work with agricultural workers on occupational health and safety can contribute to field studies.

6. Field research carried out in the sector should develop research and research projects like the studies presented in cooperation with relevant institutions, organizations, and social partners. It should be ensured that the gains to be addressed through these studies are disseminated.

7. More projects should be developed to increase awareness of occupational health and safety of trainers, researchers, and academicians working in different fields of agriculture and should be implemented with the candidates in this sector. Publications on the studies should be increased.

8. Exemplary risk assessment studies for sub-activity areas of agriculture should be increased and sample practices should be expanded together with those working in sub-activity areas.

9. Occupational health and safety awareness levels of all relevant occupational groups that are in one-to-one communication with those working in the field should be increased.

4. Conclusions

With this study, it has been observed that occupational health and safety in the agricultural sector is one of the areas in need of improvement and that the studies in this field should be continued within the framework of effective cooperation of all relevant stakeholders (Sert et al., 2018).

According to the NACE (Nomenclature des Activités Économiques dans la Communauté Européenne) coding system, it will be possible to ensure the health of young people who will work in the agricultural sector, which is in the dangerous class, when necessary, precautions are taken.

As a result, the consciousness level of vocational high school students should be maximized due to the health and safety risks in the working environment. For this reason, in addition to providing occupational health and safety training as semester courses, they should be given in detail within the titles of each course throughout the training process, and their awareness should be increased in their fields. Young people should also be encouraged to develop themselves by ensuring that the increased awareness remains constant. As a result of providing these, it will be ensured that agricultural and laboratory workers will take precautions by foreseeing the dangers and risks in the working environment.

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