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Determination of Occupational Safety Perceptions of Greenhouse Employees in Türkiye: The Case of Fethiye District of Muğla Province

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Abstract Greenhouses are part of production area and where more occupational safety precautions can be taken and safe and has a more comfortable working conditions are available compared to other agricultural production areas. Greenhouse farming enterprises and their applicability are also becoming widespread as the demand for production changes within time. As the amount of production increases with the widespread use of greenhouse cultivation, it is possible that working accidents and occupational diseases will occur at a higher rate. Due to this reason, it is important to develop awareness about taking precautions against working accidents and occupational diseases. In this study, to determine the occupational safety perception levels of greenhouse workers, a survey was conducted with 75 greenhouse employees using the proportional sampling method from the employers and employees in the Fethiye district of Muğla province, where greenhouse cultivation is widely practiced, and the data obtained were evaluated. The effects of the participants' demographic characteristics on their occupational health and safety perceptions were examined. According to the results, it was determined that the gender, marital status and age factors of the employees had no effect on their perception of occupational security, on the other hand work experience, permanent or casual working style and daily working hours influenced their perception of job security ($p<0.05$). The difference in the level of awareness between them has reached up to 22%. The factors related to the working period have the main effect, and the general awareness score was calculated as 2.346, which corresponds to a 45% awareness level. According to these results, it is suggested that the awareness level of greenhouse employees should be increased through training and seminars.

Keywords Greenhouse, occupational health and safety, perception of job security, Fethiye

Introduction

In recent years, with the increasing population and food demand, the need for agricultural production is also rising, and production problems may occur due to climatic changes. The importance of greenhouse cultivation is increasing due to its ability to provide the climatic conditions required for production in all seasons of the year, mitigating the negativities caused by these problems. The widespread use of greenhouse farming as a production environment has made the health and safety perceptions of greenhouse workers more visible. The occupational safety perceptions of greenhouse employees are of vital importance for the sustainability of the sector and the welfare of the employees. Greenhouse cultivation is becoming widespread due to reasons such as its preference in the production of fruits and vegetables with high added value, more controlled and efficient use of inputs in production, and higher efficiency from unit area, similar to vertical farming. Occupational safety in greenhouses, as in other agricultural production areas, is an issue that cannot be neglected, as well as production safety and employee health and safety. Some studies have been found to determine occupational safety and awareness of possible hazards during agricultural production. However, very few of these studies are directed towards the occupational health and safety perceptions of greenhouse employees. These studies have differences in terms of production type and plant type. A study to determine the sociodemographic characteristics, working conditions and access levels of occupational health and safety services of greenhouse agricultural workers working in greenhouses in Kocahasanlı town of Erdemli district of Mersin province.

According to the results, 95.2% of the employees reported that they were not informed about greenhouse agricultural labor, and 59.5% reported that no precautions were taken in the greenhouse against the adverse weather conditions of the working season. In addition, all of the respondents (100%) reported that health checks and periodic check-ups were not carried out before starting work [1]. In a study conducted by Turhanoğulları [2], the qualifications, behaviors, working conditions, risks they may encounter in terms of health and safety, knowledge levels about risks and methods of protection from risks were investigated in greenhouse enterprises in Antalya. Result of the research, it was determined that the employees were not significantly informed about the risks arising from working conditions and the precautions to be taken against the risks, that they had wrong attitudes and practices, that they had health-related complaints and that they had various work accidents.
In another study conducted to determine the occupational safety perceptions of greenhouse workers, it was determined that greenhouse workers had high awareness of mechanical and psycho-social issues, but it was reported that greenhouse workers were reluctant to take the necessary precautions against the dangers and risks brought by their daily work [3]. Many factors in the greenhouse can cause occupational accidents or occupational diseases in the long term. These factors; high temperature, high humidity, transportation and lifting operations, chemicals and pesticides, equipment and vehicle use, noise, vibration, falling and height, cutting and drilling tools, ergonomic problems, electrical equipment, workload and stress, training and unconscious movement and behaviors. A study reported that the general causes of work accidents are due to reasons such as agricultural machinery, noise, vibration, thermal, lighting, chemicals, dust-gases, animal risks [4]. Although many negative effects seen in outdoor environments are not observed, the disadvantage of greenhouses is that air circulation is low due to the closed environment. Since the increasing air temperatures, especially in the summer months, will cause very high temperatures in the greenhouse, both the quality of the breathing air and the working conditions must be at a certain level. The fact that vertical farming systems, which are frequently applied abroad, can also be applied in greenhouses has increased the interest in greenhouse cultivation and also creates an employment opportunity, especially for female employees [5]. The Mediterranean region, where the study was conducted, is a region where greenhouse cultivation is used at a rate of 84% in agricultural product cultivation [6]. The objective of this study is to determine the occupational health and safety perceptions of greenhouse workers in Fethiye district, which constitutes a significant part of the greenhouse production area of Muğla province and where greenhouse activities are intensively carried out.

Materials and Methods

The research was conducted as a face-to-face survey with seventy-five greenhouse workers in the Fethiye district of Muğla province between 2020-2021 (Figure 1). In order to determine the occupational safety awareness levels of greenhouse employees, information such as age, gender, marital status, education level, job status, wage status, working years and daily working hours were obtained through a survey. The answers obtained were evaluated and it was investigated whether the factors listed above had an effect on the levels of awareness and attitude.

Figure 1: Muğla province and districts where the study was conducted

Muğla province is Turkey's 4th largest producer with 31543 decares of greenhouse area in greenhouse cultivation, where greenhouse cultivation is carried out intensively [7]. It was reported by Kor & Dinler [8] that there are a total of 2869 greenhouses in Seydikemer, Fethiye and Ortaca districts in Muğla province. The production area of greenhouse cultivation in Fethiye district is 12430 decares and constitutes approximately 33% of Muğla province (Table 1).

Table 1: Change in production area of Turkey-Muğla-Fethiye regions according to years [7]

Year	Türkiye greenhouse area (da)	Muğla greenhouse area (da)	Fethiye greenhouse area (da)
2023	764.702	32.535	10.766
2022	810.881	31.543	12.430
2021	854.599	31.573	12.151
2020	805.159	39.740	12.328
2019	789.603	39.047	12.130

Proportional sampling method was used to determine the number of surveys to be conducted face-to-face in the study [9]. In previous studies, it was reported that there were 2869 businesses in Fethiye, Ortaca and Seydikemer districts. Exact data on the number of businesses in the Fethiye region could not be obtained, and in order to increase the reliability of the survey and the accuracy of the data in the survey, the total number of businesses in Fethiye, Ortaca and Seydikemer districts was used in equation 1. In a study conducted in the region, 92.39% of greenhouse producers stated that they wanted to continue greenhouse cultivation in the future [10]. In the study, the rate of those who quits greenhouse cultivation activities was taken as p: 0.5 in order to maximize the number of samples in order to increase the reliability of the survey [11]. In the equation, it was determined that a survey should be conducted with 67 employees based on a 10% margin of error within a 95% confidence interval, but in the study, this number was exceeded, and 75 face-to-face surveys were conducted.

$$n = \frac{N*p*(1-p)}{(N-1)*\sigma p^2+p*(1-p)} \quad \text{(Eq. 1)}$$

In equality;

n= sample size

N = number of businesses in the population

σp^2 = Variance of the ratio

r = Deviation from the mean (10%)

p = Shows the proportion of businesses in the population that have given up greenhouse production

In the survey, producers and employees were asked a total of 68 questions in 7 sections, including personal information, biological, chemical, physical, mechanical, psychological-sociological and health-related awareness, and the occupational safety perception level was calculated by converting abstract answers into numerical values. The survey form was printed out and filled out in the form of questions and answers in the greenhouses where the study was conducted. The answers consisted of two parts, between 1 and 5 and 1 and 3, using the Likert scale, and the answers were converted into numerical scores. The questions, which consist of two parts, were determined during the evaluation phase, with 1 being the lowest level of awareness and 4 being the highest level of consciousness. SPSS 26.0 data analysis program was used to evaluate the data, Cronbach's Alpha values, which indicate the reliability of the survey, were calculated and DUNCAN multiple comparison test was used at the $p<0.05$ level to compare the groups.

The 7 sections that make up the survey are as follows;

A. Personal Information
B. Bioawareness
C. Chemical Awareness
D. Physical Awareness
E. Mechanical Awareness
F. Psychological-Sociological Awareness
G. Health Awareness

Results & Discussion

In the survey study, the level of awareness against pests that may threaten individual health, including 6 main groups, was determined, and the Cronbach's Alpha value, which is an indicator of the reliability of the surveys, was calculated and it is seen that these values vary between 0.78 and 0.89. Under all main headings in the survey, Cronbach's Alpha value is above the value of 0.70, which is accepted for the reliability of the survey,

and it can be said that the survey is reliable. The demographic distribution of the participants in the survey is given in Table 2.

Table 2: Demographic characteristics of participants

Gender	N (frequency)	% (percentage)
Women	29	39
Men	46	61
Marital status		
Married	36	48
Single	38	52
Age		
18-30	41	55
31-45	25	33
45 or more	8	11
Education		
Elementary	17	23
Mid school	20	27
High school	23	30
Collage	15	20
Working status		
Paid worker	25	33
Owner	31	41
Family worker	19	26
Paid status		
Daily worker	26	38
Permanent worker	42	62
Working years		
0-4	30	40
5-9	22	29
10 or more	23	31
Daily work hours		
0-4	21	28
5-8	34	45
9 or more	20	27
Total	**75**	**100**

The distribution of the participants in the survey was determined according to gender, marital status, age, education level, job status, wage status, working years and average working hours. In the gender distribution of employees, the number of men is higher than women. The marital status of the employees was distributed quite evenly. Since 88% of those whose greenhouses were stolen are aged 45 and under, it can be said that the employees are in the young-middle age group. This shows that the young population is more involved in greenhouse work. In terms of educational status, the majority of employees are high school graduates, followed by secondary school, primary school and university graduates, respectively. This distribution shows that the education level is generally high school or below. This shows that the education levels of the employees are higher compared to other studies [1,3,12].

When the job status is examined, 33% of the employees are involved in production as paid workers, 41% as business managers and 25% as family workers. The high rate of operators shows that a significant part of the greenhouse business is carried out as family business. When the wage situation was examined, it was determined that most of the employees (62%) were engaged in production as permanent employees. A higher proportion of permanent employees also indicates the existence of a stable workforce. Considering the years of employment, although the proportion of employees working for 0-4 years is the highest (40%), considering the age distribution of the employees, it shows that they will continue to work in this sector for a long time because

they are young. Additionally, the rate of employees working for 5 years or more (60%) confirms this opinion. In terms of average daily working hours, employees mostly work 5-8 hours per day, which reflects the length of a standard working day. Generally speaking, the majority of employees are young, male, high school graduates and married individuals. The majority of the workforce consists of permanent employees and a significant portion of them work as managers. A significant portion of the workforce has 0-4 years of experience in their jobs, but the proportion of long-term employees is also notable. The effects of this demographic structure on occupational safety perceptions are shown in Table 3.

Table 3: Occupational safety perception levels depending on demographic characteristics

Gender	**Biological (Cα: 0,88)**	**Chemical (Cα: 0,88)**	**Physical (Cα: 0,78)**	**Mechanical (Cα: 0,79)**	**Psychosocial (Cα: 0,81)**	**Health (Cα: 0,87)**	**General (Cα: 0,96)**
Women	2.79 ±0.102	2.32 ±0.067	2.38 ±0.650	2.38 ±0.618	2.37 ±0.070	2.32 ±0.075	2.38 ±0.063
Men	2.56 ±0.106	2.29 ±0.074	2.33 ±0.861	2.20 ±0.823	2.26 ±0.062	2.36 ±0.078	2.33 ±0.072
Marital status	**Biological**	**Chemical**	**Physical**	**Mechanical**	**Psychosocial**	**Health**	**General**
Married	2.70 ±0.113	2.27 ±0.074	2.40 ±0.081	2.33 ±0.739	2.32 ±0.067	2.35 ±0.085	2.36 ±0.074
Single	2.60 ±0.105	2.33 ±0.073	2.30 ±0.083	2.21 ±0.085	2.29 ±0.065	2.34 ±0.068	2.34 ±0.064
Age	**Biological**	**Chemical**	**Physical**	**Mechanical**	**Psychosocial**	**Health**	**General**
18-30	2.55^{ab} ±0.101	2.23 ±0.619	2.24 ±0.066	2.19 ±0.734	2.26 ±0.057	2.24 ±0.064	2.26 ±0.056
31-45	2.93^{a} ±0.125	2.46 ±0.106	2.55 ±0.114	2.38 ±0.101	2.43 ±0.087	2.53 ±0.093	2.55 ±0.094
45 or more	2.44^{b} ±0.247	2.23 ±0.159	2.31 ±0.190	2.42 ±0.169	2.24 ±0.149	2.43 ±0.235	2.35 ±0.169
Education	**Biological**	**Chemical**	**Physical**	**Mechanical**	**Psychosocial**	**Health**	**General**
Elementary	2.26^{b} ±0.179	2.02^{b} ±0.088	2.07^{b} ±0.904	2.06 ±0.108	2.11^{b} ±0.090	2.12^{b} ±0.124	2.12^{b} ±0.095
Mid school	2.65^{ab} ±0.136	2.29^{ab} ±0.987	2.29^{b} ±0.104	2.28 ±0.120	2.28^{ab} ±0.083	2.34^{ab} ±0.095	2.32^{ab} ±0.095
High school	2.73^{a} ±0.130	2.49^{a} ±0.107	2.63^{a} ±0.119	2.36 ±0.969	2.51^{a} ±0.090	2.58^{a} ±0.096	2.54^{a} ±0.099
Collage	2.98^{a} ±0.144	2.36^{a} ±0.846	2.31^{b} ±0.088	2.35 ±0.121	2.28^{ab} ±0.092	2.26^{b} ±0.106	2.38^{ab} ±0.076
Working status	**Biological**	**Chemical**	**Physical**	**Mechanical**	**Psychosocial**	**Health**	**General**
Paid worker	2.39^{b} ±0.127	2.11^{b} ±0.758	2.17 ±0.742	2.16 ±0.077	2.17 ±0.686	2.04^{b} ±0.758	2.14^{b} ±0.068
Owner	2.87^{a} ±0.123	2.42^{a} ±0.790	2.49 ±0.092	2.40 ±0.937	2.40 ±0.073	2.55^{a} ±0.778	2.53^{a} ±0.075
Family worker	2.66^{ab} ±0.132	2.38^{a} ±0.115	2.35 ±0.133	2.21 ±0.120	2.30 ±0.100	2.41^{a} ±0.103	2.34^{ab} ±0.093
Paid status	**Biological**	**Chemical**	**Physical**	**Mechanical**	**Psychosocial**	**Health**	**General**
Daily	2.22^{b} ±0.108	2.08^{b} ±0.075	2.10^{b} ±0.781	2.04^{b} ±0.092	2.11^{b} ±0.063	2.09^{b} ±0.076	2.09^{b} ±0.069
Permanent	2.90^{a} ±0.096	2.49^{a} ±0.063	2.56^{a} ±0.650	2.42^{a} ±0.062	2.47^{a} ±0.056	2.52^{a} ±0.065	2.53^{a} ±0.057

Working years	Biological	Chemical	Physical	Mechanical	Psychosocial	Health	General
0-4	2.60^{ab} ±0.115	2.21 ±0.076	2.23 ±0.078	2.20 ±0.079	2.25 ±0.068	2.21^{b} ±0.074	2.25^{b} ±0.069
5-9	2.47^{b} ±0.152	2.24 ±0.088	2.29 ±0.091	2.23 ±0.101	2.25 ±0.076	2.27^{b} ±0.092	2.30^{ab} ±0.089
10 or more	2.90^{a} ±0.129	2.49 ±0.103	2.55 ±0.124	2.39 ±0.114	2.42 ±0.096	2.57^{a} ±0.106	2.52^{a} ±0.092
Daily work hours	**Biological**	**Chemical**	**Physical**	**Mechanical**	**Psychosocial**	**Health**	**General**
0-4	2.14^{c} ±0.120	2.03^{b} ±0.078	1.95^{b} ±0.071	1.98^{b} ±0.102	2.11^{b} ±0.073	2.10^{b} ±0.066	2.06^{b} ±0.069
5-8	2.67^{b} ±0.102	2.36^{a} ±0.074	2.45^{a} ±0.086	2.38^{a} ±0.072	2.35^{ab} ±0.068	2.41^{a} ±0.071	2.41^{a} ±0.068
9 or more	3.16^{a} ±0.109	2.49^{a} ±0.099	2.58^{a} ±0.093	2.38^{a} ±0.112	2.41^{a} ±0.096	2.47^{a} ±0.137	2.53^{a} ±0.092

Cα = Cronbach's Alpha values

Factors affecting awareness about occupational health and safety; education level, job status, paid employment status, working years and average working hours. When other factors were examined, it was determined that gender, marital status and age factors did not have a significant effect on perception levels ($p < 0.05$). While occupational safety perception levels are expected to increase with the increase in education level, it is seen that those who are educated at high school level have the highest level of awareness. This situation may have been caused by the fact that those who started working after high school have longer experience than those who graduated from university and their working age is younger. Although this difference in education was not statistically significant between secondary school, high school and university, it created a difference in perception levels. While in a study, the cause of accidents in greenhouses was determined to be the level of education [13], in this study, the main reason was determined to be daily working hours. The most important finding obtained in the study was obtained in terms of working time or experience. In the evaluation made according to job status, it was determined that business owners had the highest perception level of job security, while paid workers had the lowest perception level. It can be said that this result is related to the fact that operators are directly affected by the profit or loss of the business or product. Similarly, it has been determined that permanent workers who work according to their wage status have significantly higher occupational safety perception levels compared to workers who are called casual workers and are generally employed in periods when the labor force requirement increases. The fact that permanent employees are in the greenhouses for long periods of time and have the chance to observe more danger or potential accident situations compared to daily workers has contributed to the high perception levels. When we look at the daily working hours, which is a factor that can be evaluated as experience, we see that results similar to other working hours are obtained. As the average daily working hours increased, perception levels increased and the difference between the groups reached up to 22%.

Conclusion

Within the scope of the study, the effects of demographic characteristics on occupational health and safety perceptions were examined by evaluating the data obtained through a face-to-face survey with greenhouse workers in the Fethiye district of Muğla province. While there may be cases where demographic characteristics affect occupational health and safety perceptions, factors that do not have an effect were also identified. The most striking finding in the study appears to stem from the working hours. The average general perception level value on this subject was calculated as 2.346, which corresponds to a 45% perception level. Considering this situation, it can be said that all greenhouse employees should be aware of occupational safety issues in greenhouses, prevent potential accidents, and be informed about occupational diseases that may arise from continuous work. To increase the consciousness and awareness of employees in this regard, training activities on

occupational health and safety should be continued periodically, both at the beginning of employment and throughout their working hours.

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