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Research article

Evaluation of products grown with pesticides in terms of Islamic law

Ali Yuksek*[1]

[1] *Ondokuz Mayis University, Faculty of Divinity, Department of Basic Islamic Sciences, 55200, Samsun, Türkiye*

Abstract

Throughout history, healthy food has been one of the most important issues of every society. Religious, halal, clean and healthy food perspectives are the most natural rights of every person and it is necessary to respect others right. A Muslim must be sensitive and aware about halal and haram in their lives and one of the most important issues related to halal and haram is food. A wide variety of foods are consumed every day. However, the food is obtained due to biotechnology tools which are part of our daily lives. Firstly, the safety of these products in terms of health, and secondly is whether these products are halal for Muslims. Indeed, protecting human and environmental health is one of religious and humanitarian duty. In this study, it is tried to present the effects of chemical fertilizers and pesticides used in agricultural food production on human, animal and environment and the perspective of the religion of Islam against these effects. These substances have a number of positive and negative effects on people and the environment. Currently, we can see variety of foods as seen natural, contain many harmful substances that threaten human health using technologic tools. At the beginning of the study, the nature of pesticides and how they can affect plants, animals and humans was discussed. In the later parts of the study, it is tried to interpret the halal and haram of these products in terms of Islam.

Keywords: *Chemical fertilizer; human health; humanitarian; legal theory; pesticide*

1. Introduction

Islam religion is the body of divine orders and prohibitions sent by Allah to enable people to find happiness in this life and the hereafter. Protecting the life, property, mental and physical health of people in this integrity is among its main goals (Yuksek, 2018; Baqarah 2/195). It has always recommended what is good and beneficial in all matters and warned people against the bad and harmful. If something is prohibited in Islam, that thing is definitely harmful to people in one way or another. It has many recommendations and imperatives for a healthy and happy life (Kasani, 1982; Cayiroglu, 2014). For example, while Islam stands in favor of cleanliness and health, it has included these among the basic conditions of worship. It has also ordered to consume halal and healthy food for mental and physical health and a dignified life. Therefore, it is forbidden to consume certain plants and animal meats and to drink some beverages (Zeydan, 1976; Yuksek, 2016).

It was easy to know about prohibited and suspicious foods in the past. These are listed in fiqh books (Ibn Rushd, 1975; Kasani, 1982; Zuhayli, 1991). However, today, the widespread use of biotech foods and production of products, whose ingredient can only be known by those concerned, have made this (Yaradoddi et al., 2024). This has become even more difficult especially with the introduction of chemical/synthetic pesticides, genetically modified products and chemical fertilizers in agricultural production (Tokel et al., 2022; Hutsaliuk et al., 2024). In the past, the lack of color, taste and odor of water, the natural color and taste of a foodstuff, or the absence of a prohibitive religious text about a product were sufficient for its consumption (Kasani, 1982; Zuhayli, 1991; Taberi, 1998). Lately, we can see that many natural looking fruits and vegetables can actually be full of harmful substances that threaten human health. We started looking at almost every product with suspicious eyes (Sharma, 2015; Sharma et al., 2018). Scientists have a great responsibility to ensure that the

* Corresponding author.
E-mail address: ali.yuksek@omu.edu.tr (A. Yuksek).
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products we consume are healthy and halal. It is of great importance that scientists work meticulously and to warn people and to provide people with the right suggestions when necessary in order for people to reach healthy and halal food (Yuksek, 2018). As far as we know, no provision regarding the interpretation of the products obtained with the chemicals used in agriculture from the Islamic point of view has been found in the literature. Therefore, the purpose of this research is to discuss the suitability of the products obtained from the agricultural areas, where chemical substances are used in recent years, from the Islamic point of view.

2. Method

2.1. The purpose and importance of the research

One of the most important problems of Muslims today is access to halal and healthy food. Deep concerns have been raised about the food being healthy and halal, especially along with the production of chemical pesticides and fertilizers and genetically modified products after the green revolution in agriculture. This study points out the elements that threaten our health to some extent. There are various studies on that subject (Dhankhar and Kumar, 2023; Kaur et al., 2024; Yadav et al., 2024). However, there are very few studies that include the evaluation of these products from the Islamic point of view (Medani et al., 2024). It was aimed to contribute to this field with this article.

2.2. Hypotheses of the research

Our world today is faced with a number of problems. The most important of these are the factors that threaten human and environmental health. Most of these problems are produced by people due to various concerns. Some of these are pesticides and chemical fertilizers, which are widely used against harmful organisms seen in agricultural production areas and are harmful to the environment and human health. This situation also adversely affects the daily life of the Muslim, because it is necessary to consume halal food for belief and worship life. Scientists have a great responsibility in the matters of providing healthy and halal food and warning people against pests.

2.3. Scope and limitation

The scope of our research consists of presenting the positive and negative aspects of chemical fertilizers and chemical fertilizers and their varieties used in agriculture with scientific criteria, and then evaluating them in terms of Islamic Law.

2.4. Methodology

This research is an interdisciplinary joint study. The results were achieved by blending the subjects of medicine, biology, agriculture, chemical pharmacology and genetic science data within the framework of Islamic texts.

3. Findings and interpretation

3.1. Pesticides and their types

Chemical or biological control substances used during the production, consumption and storage of food products in agricultural production in order to destroy the living creatures or to reduce their damages that reduce the mineral-vitamin value of the products and cause damages to products are called pesticides (Stephenson et al., 2006; Zacharia, 2011; Botitsi et al., 2017). Pesticides, in other words, are all kinds of chemicals and natural substances used in agricultural control. These are chemical substances consisting of various chemicals or their mixtures used to prevent harmful organisms such as insects and disease factors seen especially in agricultural production areas, and to reduce the damage of weeds (Nicolopoulou-Stamati, 2016; Meftaul et al., 2020).

Pesticides can be chemical substances as well as microbial creatures like bacteria, (Aksoy et al., 2017), fungus, virus (Bahaman et al., 2020), etc. that can be used as biological agents. Some organisms that damage agricultural products and make pesticide use necessary; disease-spreading insects, weeds, birds, some mammals, pathogens, worms and some microorganisms that damage crops in agricultural production (Gun and Aytac, 2019). Although pesticides have some benefits, they can also pose significant problems for some plants and animals due to their toxicity. These will be discussed in the following sections.

We can give biopreparations consumed for pesticide purposes, insect and plant growth regulators, pheromones, nutritional inhibitors, insect repellents, various traps, plant activators, preparations used in the treatment of physiological diseases as the examples of the chemicals used for agricultural purposes and pesticide-like substances. Pesticides are named according to their intended use. Their types are as follows:

Insecticide: Chemicals used against animal organisms such as insects.

Fungicide: Chemical substances used against fungi.

Herbicide: Chemicals used against weeds.

Molluscicide: Chemical substances used against animals that are classified as mollusks.

Rodenticide: Chemicals used against rodents.

Nematicide: Chemicals used against nematodes.

Acaricide: Chemicals used against mites (Chiari et al., 2017; Derbalah et al., 2019; Bertero et al., 2020; Ebadollahi et al., 2021; Kankam, 2021; Wang et al., 2024).

Pesticides have wide range of uses in agricultural production, especially against pests, diseases and weeds. At the same time, it is continuously used in herbal and animal production against internal and external parasites. Due to this wide range of use, pesticides contain many different auxiliary substances in addition to many active substances in their formulations. For this reason, pesticides can create very different effects from each other (Tiryaki et al., 2010; Yadav and Devi, 2017; Ansari et al., 2024).

3.2. History and usage stories of pesticides

Pesticides used in agricultural production have been used at primitive level since the formation of settled civilizations. However, with the green revolution in agriculture, it has been widely used in almost every part of the world. The use of pesticides has become widespread, especially in order to increase productivity in agriculture and to combat pests that prevent it (Arvas and Kaya, 2019; Mansfield et al., 2024).

The first pesticide used is fungicide. The substance used for this purpose is sulfur. Later, it was used as an insecticide in materials such as arsenic, copper and iron. These are inorganic substances. The first natural organic compounds used were

derris, nicotine and pyrethrum (Banaszkiewicz, 2010; Dagar, P., and Ramakrishna, 2024).

The variety of chemicals called pesticides has increased rapidly after 1950. This increase also resulted an increase in its usage rates. DDT, which is banned in Turkey and Europe due to its health hazards, is a pesticide that is classified as the first synthetic organic insecticide used. Later, pesticides such as 2,4-D and MCPA, which are still classified as herbicides, have emerged commercially (Yadav and Devi, 2017).

In 2019, the agrochemical market worldwide was worth approximately 234.2 billion U.S. dollars. This is expected to increase to more than 300 billion U.S. dollars in 2025 (Statista, 2010). The most important pesticides produced and consumed are insecticides, fungicides and herbicides respectively. In the world, herbicides rank first among pesticides with a share of 47%; it is followed by insecticides with 29% and fungicides with a share of 19%. Herbicides and insecticides make up more than 70% of the pesticides consumed. Pesticides consumption varies by region and country. For example, while it is 15.3 kg/ha in Columbia, 3.10 kg/ha in China, 8.8 kg/ha in Netherlands and 2.2 kg/ha in the USA (Plummer, 2013); whereas it is 1.3 kg/ha in Turkey, which is lower when compared with the other countries (Ozdem and Karahan, 2018).

3.3. Toxicity of chemical pesticides

The fight made by using chemicals with natural and/or synthetic properties that have the effect of killing unwanted living creatures that cause losses in plant production is called "Chemical Control" (White and Leesch, 2018). Pesticides, which are chemical control agents, kill the unwanted organism due to reasons such as blocking the nervous system, blocking a vital protein synthesis, disrupting the nervous system, damaging the skin, and destroying digestive organs of the living creatures (Huong et al., 2020; Lee et al., 2020; Prakash and Verma, 2020). The toxic effects of pesticides can be sudden or gradual. This depends on the active ingredient of the pesticide, as well as on its amount. The effect of pesticides weakens relatively over time. At the same time, pesticides can harm non-target beneficial organisms. In addition to these, pesticides released into the nature damage the natural structure and can enter the food chain as residue (Cozma et al., 2017; Kadlikova et al., 2021).

Synthetic chemicals that enter the body structure of living creatures are affected by bio-chemical reactions in the body of the living creature and over time they break down and turn into less harmful/harmless forms, and/or toxic metabolites. Chemicals that get into the body of the unwanted plants, poultry creatures that cause harm and the microorganisms that cause disease, are mixed into the nature from the body of the living creatures as a result of the killing effect and are included in the passive decomposition process (Abdulrazaq et al., 2020; Erguc et al., 2021).

Pesticides that are mixed with nature have a tendency to decompose and decrease their damage relatively due to the effects of soil, water, sun and living creatures. As a result of the aforementioned decomposition, some of the new forms may be harmful, accumulate in the earth or in the bodies of living creatures, but eventually decompose over time in nature (Yadav and Devi, 2017; Ozdem and Karahan, 2018). Affected systems, acute and chronic mode of actions of pesticides are explained in general in Fig (Mackley-Ward, 2022). For example, the Dalapon herbicide causes the plant to die because it stops the production of pentanoic acid (Kaya et al., 2013; 2020).

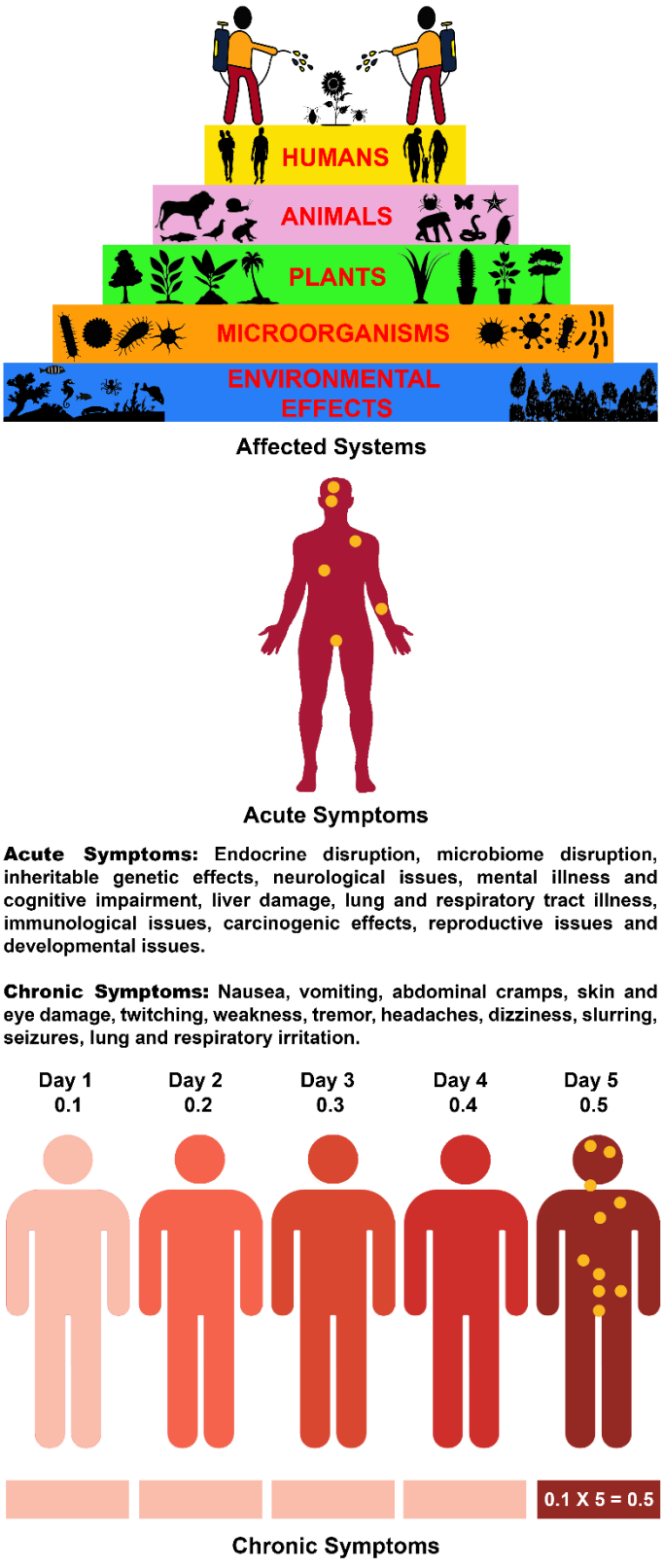

Fig. Systems affected by pesticides, and their acute and chronic effects on humans.

It is a known fact that the use of these pesticides, which have the effect of harming and killing unwanted living creatures, in agricultural production, they can cause many damages and pose risks for soil, air, humans and animals besides its some benefits. For this reason, these chemicals, which are referred as agricultural poison and called pesticides in the literature, are generally produced with advanced technologies and are released

to the market after being subjected to controls. The evaluation of pesticides is made in terms of biosafety and it is aimed only to harm the target organism and not to harm other living creatures and nature (Pagano et al., 2023; Asefa et al., 2024; Oirdi et al., 2024). The production and consumption processes of plant protection products are implemented according to a number of important standards developed by the International Plant Protection Convention (IPPC), which operates under the United Nations Food and Agriculture Organization (FAO). These standards are easily accessible on many websites (IPPC, 2021; FAO, 2021)

In addition, there are a total of 341 Standards on Plant Protection Products created by the European and Mediterranean Plant Protection Organization (EPPO), of which Turkey is a member, based on geographical and regional variations and developed with the participation of all relevant experts in the relevant field and updated frequently according to the needs. Again, these standards can be accessed from the internet addresses (EPPO, 2021).

4. Islamic literature

Since the subject we are working on involves two different fields, we consider it appropriate to include concepts such as pesticides, fungicides, and toxic, and then some Islamic concepts such as haram (unlawful, forbidden), halal (lawful or allowed, permissible) and istihalah (change of form, transformation) for the experts of both segments to understand the subject well. Thus, we think that the conclusion part will be better grasped.

Halal: It means free, permissible in the dictionary and not prohibited in terms of Islam (Feyrûzâbâdî, 1987; Erdogan, 1998). As the Islamic term, halal is allowed by Allah to be done and the prohibition and sin knot has been resolved (Karadavi, 1973), which is religiously permissible to do, a deed that is permissible, there is no question in its execution or use according to Sharia Law (Koca, 1998; Diyanet İşleri Başkanlığı, 2006). The words Mubah, Caiz and legitimate are used in the same sense as the word halal. It is the opposite of haram (Diyanet İşleri Başkanlığı, 2006). There are many different variants in Quran and Sunnah (Baqarah 2 / 296,228,229,275; A'raf 7/157; Tahrîm 66/11; Maidah 5 / 5.88; Nahl 16/116; Hajj 22/30; Taha 20/27; Maidah 5/2 Baqarah 2/275; A 'raf 7/157; Tahrîm 66/11; Abu Dawud, "Tahâret" 41; Tirmidhi, "Tahâret", 52; Bukhari, "Adhan", 8; Muslim, "Salat", 11).

Haram: It means something that is forbidden in the dictionary or something that is forbidden to a person, not permissible and not halal (Feyrûzâbâdî, 1987). As an Islamic term, haram refers to a deed that is strictly and bindingly required not to be committed (Koca, 1997; Kocak et al., 2015).

This certainty and bindingness are due to the fact that the request reaches us with conclusive evidence, that is, with mutawatir evidence. In order for a deed or something to be haram, it must be prohibited by both the verses of the Qur'an, and the evidences that are definite or almost definite and whose intention is clearly understandable, such as mutawatir or the famous sunnah (Diyanet İşleri Başkanlığı, 2006). To commit haram is a sin, it entails blame. A person who commits haram will suffer torment in the hereafter, and there may be some religious punishments in this world. Acts such as eating pork, consuming alcoholic beverages, backbiting, talebearing, and committing adultery can be examples of haram. Haram things may cause material or moral harm to humans, animals and the environment. But harm in an absolute sense does not mean haram. Sometimes Allah may prohibit things just as a test. A person who commits haram must repent. Considering something forbidden by Islam as haram is a matter of faith. Accordingly, it is blasphemy to deny something that is forbidden with definitive evidence (Diyanet İşleri Başkanlığı, 2006; Atar, 2011). The authority to make something haram or halal belongs to Allah in the absolute sense, and with his permission, the Prophet can also make something forbidden (Yunus, 12/40; Nisa 4/80; Ahzab, 33/36; Nisa, 4/59; Taberi, 1998; Kocak et al., 2015).

Tayyib: It means the opposite of filth, something that is not dirty/filthy; it means clean, permissible/halal, pleasing (Yerinde, 2011). In addition, clean foods that do not harm the mind and body, and the things that do not have the rights of others are also called tayyib (Erdogan, 1998). Tayyib is also used in the Qur'an to mean halal and clean foods, halal meat, plants, fishes and spoils, people who protect themselves from ignorance and evil, clean lands, righteous deeds (Taberi, 1998; Senol, 2014).

Habis: Lexical definition of habis (foul)is the attribute of everything that is foul, whether in terms of taste or smell; it is defined as something that is tangible or abstract, which is disliked because of its essence, being dirty, disgusting and worthless (Duman, 1996). According to the Quran, when a food is habis, it means something haram. Habis foods are harmful both materially and morally (Senol, 2014).

Najasat: In the dictionary, it is the opposite of taharet, that is, cleanliness. It means material or spiritual dirt/filth. As an Islamic term, najasat is impurities such as blood, swine, mayta, which have religious evidence that they are dirty [Mâide 5/3 "It is forbidden to you to eat mayta (dead animal meat), blood, pork and animals slaughtered in the name of anybody other than Allah"]. What is essential in Islam is that the substances are clean. Impurities have been classified in various respects. These are as follows:

Necaset-i Galîza (Heavy filth): Blood, urine, stool, semen, pieces of meat severed from the body, pus oozing from wounds, purulence, vomit and pork meat and blood, etc. are dirt/filth. If they exceed a certain area in the human body, clothing or place of prayer, they will prevent the acceptance of pray. In addition, animal carcasses that are not slaughtered according to the Islamic method or died by themselves, and the feces, urine and saliva of animals, whose meat is not eaten, and the feces of some animals such as goose and chicken, whose meat is eaten, and the flowing blood of land animals, wine and all alcohol-containing beverages according to the preferred belief are najasets (Yuksek, 2018).

Najaset-i Hafife (Light filth): These are filths, for which there is no definite evidence or for which there is a dispute about being filthy according to sharia. We can give examples of the feces and urine of animals such as horses, mules and donkeys, and sheep, goats, and cattle whose meat is eaten (Baysa, 2018).

Everything is clean according to sharia as long as there is no evidence to suggest that something is filthy, impure (Mecelle, Article 5). According to this, the soil types of the earth, solid-liquid mines extracted from underground, water, all plants and their fruits are clean. Fruit and vegetable juices, vinegars are clean. The human body is clean as long as it does not contain impure material. The water that remains from wudu and ghusl is pure and clean according to sharia. Fish species and dead fish considered as clean. The blood remaining in the flesh of animals slaughtered in accordance with Islamic methods is also considered clean. The external bodies of animals are clean. Pig

is an exception to this. The solid parts of the dead animal such as bones, horns, feathers and teeth are clean. If human and animal feces are burned and turned into ash, they are also clean (Diyanet İşleri Başkanlığı, 2006).

Istihalah: In the dictionary, it means the change and transformation of the essence of something (Feyrûzâbâdî, 1987; Cevheri, 1984; Erdogan, 1998). There is a change in the nature and quality of something (Feyyumi, 1987). Istihalah as an Islamic term means the transformation of one nature into another, the transformation of something from its own nature and quality into another nature and quality, the change of impure substance by itself or by a means and to become clean (Zuhayli, 1991). In other words, it can be defined as the transformation of the nature/essence of something, which is impure or haram to use, from itself into a completely different substance in terms of names, attributes and features (Erdogan, 1998). Istihalah can occur in different ways. It can be through combustion, fermentation, solidification, having life, chemical processes, etc. (Cayiroglu, 2014; Aslan, 2016). For example, the transformation of wine into vinegar without adding any additives into the wine, and the burning of animal excrement into ash is such a process. Kasani (1982), one of the Hanafi scholars, state that the soil changes the impure substances over time, in other words, it turns it into its own nature by causing metamorphosis. Therefore, we can say that istihalah is the transformation of a substance into another substance that is completely different from itself (Yuksek, 2018). Today, istihalah concerns many areas such as the food, cosmetics and pharmaceutical industries. Scientists discuss whether chemical fertilizers and pesticides are clean, healthy and halal after being absorbed and transformed by plants. This subject is also one of the important issues of our study.

Istihlak: Basically, it means extinction, perishing, ending something (Mustafa, 1972). As a term, it means a small amount of haram or impure substance mixing with a large amount of halal and clean substance and as it spreads and disperses in it, although it continues to exist, it loses its features such as color, taste, smell. For example, a small amount of alcohol or blood, which is considered impure, mixes with water or another liquid, and disappears inside it. Alcohol and blood in this situation are considered as consumed. Even though they do not change the taste, odor and color of the liquid they mix into, its presence there is obvious. Although istihalah is a chemical change, istihlak is a physical event (Cayiroglu, 2014; Yuksek, 2018).

4.1. Basic criteria for the permissibility and prohibition of a product in Islamic law

In Islam, the primary principle is permissibility and freedom. Prohibitions are limited in number. There are many factors that may lead to something being prohibited in Islam. These factors can make a food item or action prohibited. We can summarize these factors briefly as follows:

4.1.1. The textual evidence factors

Textual evidence in Islamic literature refers to the Quran and hadith texts (Erdogan, 1998). Whether something is halal (permissible) or haram (prohibited) is determined primarily by the presence of clear textual evidence. Ultimately, the authority to determine what is halal and haram belongs to Allah. In this regard, Allah says: “Do not say about what your lying tongues describe”: “This is lawful and this is forbidden”, to fabricate lies and attribute them to Allah. “Those who fabricate lies against Allah will not prosper” (Nahl, 16/116). Therefore, whether something is considered halal or haram, or whether a food item is permissible to eat, is within the decree of Allah. With Allah’s permission, Prophet Muhammad may prohibit or permit something. As mentioned in the Quran: “Whoever obeys the Messenger has obeyed Allah” (Nisa, 4/80); “Whatever the Messenger gives you, accept it, and whatever he forbids you, refrain from it. Be conscious of Allah. Allah is severe in retribution” (Hashr, 59/7). In Islamic jurisprudence, the principle is that “Where there are Quran and Sunnah texts, there is no room for personal reasoning (ijtihad)” (Majalla, 1876, 14). Therefore, a Muslim servant obeys or refrains from something solely because Allah commanded or prohibited it, seeking to earn His pleasure. The servant focuses on fulfilling Allah’s command rather than analyzing the benefits and wisdom behind it. A believer readily accepts and stays away from many prohibitions stated in the Quran without questioning them, as part of their devotion (Erdogan, 1998). For example, the requirement to mention the name of Allah when slaughtering an animal is a commandment of this nature. This practice has no direct impact on food safety (An’am, 6/121; Haddad, 1978; Yuksek, 2018).

4.1.2. Benefit and harm factor

Harm is the opposite of benefit and profit, describing the material or spiritual loss, poverty, hardship, illness, danger, and other negative aspects that an individual face. Harm is characterized as a decrease in material or spiritual wealth without one’s consent (Erdogan, 1998). These meanings are frequently used in various verses of the Quran and the words of the Prophet (Fath, 48/12; Baqara, 2/102; Muwatta, Akziye, 31). Losses in an individual’s material or spiritual values, hardships, bodily harm, or deteriorating health are considered harmful. In other words, harm refers to subsequent losses or damages in an individual’s spiritual, physical, or financial well-being. Harm is categorized into types based on whether it is general, severe, material, or spiritual (Aybakan, 2013).

According to the teachings of the Prophet, a Muslim cannot harm others and cannot be content with harm inflicted upon themselves (Muwatta, “Akziye”, 31; Ibn Majah, “Ahkam”, 17). Providing ease, eliminating hardship and harm, and considering the general and specific benefits of individuals are the fundamental goals in Islam. Therefore, rules have been established in Islamic law regarding the prohibition of actions and behaviors that cause harm and compensating for the harms endured. In principle, necessary measures should be taken to prevent harm, importance should be given to precaution, legal rights should be protected when harm is incurred, and patience should be shown in the face of incurred losses. Despite efforts, it is not entirely possible to be immune to harm in this world. Hence, when evaluating an action or product, consideration is given to whether the benefit or harm outweighs the other. Based on this evaluation, religious judgments are made (Sener, 1970).

In regulations related to harm, a two-fold objective is pursued. The fundamental aim is to prevent the occurrence of harm. In such regulatory frameworks, preventive measures are considered akin to preventive medicine, starting from the principle of precaution. In cases where it is impossible to completely prevent harm, efforts are made to prevent the exacerbation of harm and to minimize it as much as possible. The regulations in the first phase are for preventive purposes,

while those in the second phase are for compensation.

Preventing harm is more important than providing benefit (Mecelle, Article 24). Sometimes, when a legitimate behavior is used for an illegitimate result, that behavior is prevented (Mecelle, Article 24; Cabir, 2011). Harm is prevented. What causes harm is prevented. The person who caused the damage is compensated for the damage (Aybakan, 2013; Kahveci, 2002).

One of the reasons why some foods and beverages or the chemicals used in their cultivation are haram is that the substance is harmful to human, animal or environmental health. Because the main purpose of all the provisions in the sacred texts is to realize the five basic purposes of Islam. These are to protect the mind, religion, life, property and generation (Kocak et al, 2015). For these reasons, poisonous mind-blowing substances that harm human mental and physical health have been banned. This is also the reason why it is forbidden to eat stinky and spoiled foods. Because Allah wants people to eat halal and clean things (A'raf 7/157). Physical and mental health enables people to live a happy, prosperous life. In addition, a person is obliged to protect the mental and physical health entrusted to him. It is a requirement of servitude to stay away from things that will harm him. One of the most basic conditions for being able to serve Allah is to have a healthy mind and body (Assaf, 1999; Kahraman 2012).

4.1.3. The prevalence of harm over benefit

In Islam, if something has both benefits and harms but the harm outweighs the benefit, then that thing is prohibited. A prime example of this is alcoholic beverages. In this regard, Allah says in the Quran, "They ask you about wine and gambling. Say, in them is great sin and [yet, some] benefit for people. But their sin is greater than their benefit" (Baqara 2/219). While Allah mentions the benefits of alcoholic beverages in the Quran, He has prohibited them because their harms outweigh the benefits. The Prophet also described alcohol as the mother of all evils (Ibn Majah, Ashriba, 1).

4.1.4. Something being harmful to humans, animals, or the environment

Islam has allowed things that are beneficial to all creatures and prohibited things that are harmful. Humans are responsible for preserving their bodies and their health, which are entrusted to them (Assaf, 1999). One of the fundamental goals of Islam is to protect the health of the mind, body, and environment (Cayiroglu, 2014). Anything that contradicts this goal should be prevented. Therefore, anything that harms an individual's mental and physical health is considered prohibited in Islam. The prohibition of harmful substances like drugs, poisons, and intoxicants is based on this principle (Assaf, 1999). The main reason why drugs like heroin, marijuana, opium, and cocaine are prohibited is that they harm an individual's mind, body, lineage, religion, and reputation (Zerkesi, 1990). In this regard, Allah has commanded, "Do not put yourselves in danger with your own hands..." (Baqara 2/195); "Do not kill yourselves" (Nisa 4/29).

4.1.5. The perception of something being repulsive or disgusting to a sound mind

Whether something is considered good or repulsive is dependent on the perspective of a sound mind. For example, a sound-minded individual would not find blood, carrion, mice, snakes, scorpions, flies, spiders, pus, semen, pre-ejaculate, or urine appealing (Serahsi, 1989; Cessas, 1994; Kasani, 1982; Ibn Nujeim, 1997).

Each individual's preferences and tastes can vary. A person's morality and character are shaped according to the region and culture they live in. Therefore, a type of food that a person enjoys may be considered halal (permissible) only for them, while consuming something that their soul finds repulsive could be haram (forbidden) for that person alone (Şa'rânî, 1989). Thus, when there is no evidence to determine whether something is halal or haram, it is appropriate to act according to scientific evidence and sound reasoning (Riza, 1946).

4.1.6. The consumption of meat from predatory and wild animals

Animals such as lions, tigers, wolves, jackals, hyenas, bears, and monkeys, as well as predatory birds like eagles and vultures, which are aggressive, catch their prey with claws and canine teeth, kill, tear apart, and generally feed on meat, are referred to as predatory wild animals. Prophet Muhammad prohibited the consumption of meat from these animals (Abu Dawud, Et'ime, 33; Leknevi, 2009; Cayiroglu, 2014). The wisdom behind the prohibition is that predatory animals usually feed on carrion and impure substances, which can potentially transmit diseases to humans.

4.1.7. Acceptance of something as impure based on custom

In matters where there is no ruling in the Quran or Sunnah, Islamic scholars commonly refer to the consensus or analogy of scholars (Yunus, 10/71; Kocak, et al, 2015). If there is no clear evidence, Islamic scholars unanimously agree that customs and traditions can be considered (Baqara, 2/233; A'raf, 7/199; Zeydan, 1976). Some words, actions, or food items are considered haram based on customs, and religious rulings are made accordingly. Therefore, societal perspectives are essential in the prohibition of certain things.

4.1.8. The manner in which a product is obtained

Another reason a product may be considered haram is if it is obtained without adhering to Islamic principles. For example, eating an apple is halal, but consuming someone else's apple without permission is forbidden in Islam. Forbidden items are categorized based on their essence or how they are obtained. For instance, an animal that dies on its own, pork, or wine are explicitly forbidden in the Quran. However, if a product or a food item is obtained through fraud, deception, theft, gambling, bribery, or interest, then these are also considered within the scope of haram (forbidden) (Kocak et al., 2015; Cayiroglu, 2014).

4.2. The importance of health in Islam and other religions

Protection of individual and public health is one of the main goals of the Islam religion (Kocak et al., 2015). Therefore, it attached great importance to the mental and physical health of people. It prohibited any food, drink, behavior or life that would destroy or restrict them. It has made some legal arrangements for their protection. For example, Allah Almighty in the Quran emphasized this with his verses "Let not your own hands contribute to your destruction" (Baqarah 2/195); "He makes the

clean things lawful (halal) to them and prohibits (haram) all corrupt things" (Araf 7/157). The Messenger Muhammad (SAW) also pointed out the importance of the matter by saying:

Islam has laid down important principles for the protection of health. For example, it prohibited murder and causing death (Nisa 4/93), endangering health and life (Baqarah 2/195), consuming food, drink and harmful substances that deteriorate mental and physical health of the human being such as alcoholic beverages and drugs (Maidah 5/90), blood, carrion, pork and their products (Baqarah 2/173). As a matter of fact, the wisdom in the prohibition of these harmful substances is the protection of human health.

Again, it is not permissible to use various toxic substances, bleach, vitriol (nitric acid), harmful chemicals, unnecessary drugs used for various purposes that harm the mental and physical health of the human being. This prohibition is again expressed on the verses of Allah "Do not kill your own souls" (Nisa 4/29); "Do not endanger yourself with your own hands" (Baqarah 2/195) (Boran, 2016).

Here, when we look at the holy texts of Islam on eliminating health and endangering it, it is difficult to view the use of pesticides and yield-increasing drugs in agriculture as religiously permissible, which have scientific data today which indicate that they adversely affect our health and are harmful (Blair et al., 2015). As a matter of fact, it is one of the basic principles in Islam that everything that causes harm is prohibited and that what causes harm must be removed immediately. There is a consensus among Islamic scholars that it is not permissible to produce and consume harmful substances (Aybakan, 2013; Kocak et al., 2015).

In addition, the fact that Islam attaches importance to cleanliness, hygiene, healthy and halal food and accepts them as faith (Müddessir 7/4), the requirement of cleanliness in prayers, washing hands before and after meals, and brushing our teeth are always underlying the value Islam attaches to health and its attitude towards protecting it.

4.3. Health in other religions

Protecting health and banishing diseases and what causes them are among the goals of other religions. For example, in the scriptures of Judaism and Christianity, there are many passages on the protection and maintenance of health. For example, in the scriptures of Judaism and Christianity, there are many passages on the protection and maintenance of health. Because people not in good mental and physical health, cannot fulfill their duties towards their Lord and the society (Numbers, 19/11-22; Deuteronomy, 23/12-14; Exodus, 15/25-26; Cantique Rabbah, 6, 11, (9); Luke, 4/31-37; Luke, 4/40-41; Markos, 1/40-44; Luke, 13/10-16, 14/1-4, 22/50-51).

5. Impact of pesticide types on health of living organisms and environment, potential risks and considerations

Environmental impact: Studies on the effects of chemical pesticides used in agriculture in our natural habitats and their interactions in the environment have increased further with the collaboration of toxicologists, microbiologists, agricultural engineers, biologists, chemists, ecotoxicologists, and biotechnologists (Tiryaki et al., 2010; Yadav and Devi, 2017).

Pesticides released in the environment during the production and/or usage phase cause pollution. In the new scientific data indicator, it has been shown that pesticides enter the natural cycle and have harmful effects on the water and the soil, thus the environment, as a result of some pesticides used against aquatic plants being applied directly to the water and soil (Führ, 1982; Rajmohan et al., 2020).

While some of the pesticides can be applied directly on the soil, some of them are applied on the plant or to the seeds as a seed coating. Some of these, especially in pesticides applied to the surfaces of plants, pass to the soil and then to the elements of the other ecosystem, and therefore, pesticides can move in the soil over time depending on the solubility, quality and type of the soil, persistence and climatic factors. As a result of the researches, it has been proven that if some organic chlorinated pesticides are applied to the soil, more than 50% of them can remain in the field for 15-16 years. And thus harm the environment (Wang'ombe, 2014; Rajmohan et al., 2020).

Impact on living organisms: Pesticides that affect all living creatures have a harmful effect on many living things, especially humans. For example, it is seen as harmful on human skin, respiratory tract, digestive system and many other organs as residue. Especially DDT (Dichlorodiphenyltrichloroethane), Hexachlorobenzene (HCB), Endrin, Aldrin and Heptachlor and similar herbicides, organic chlorides, which have long-term persistence in nature and the capacity to accumulate in the organism, also cause chronic poisoning, albeit at low doses (Yildiz et al., 2005; Duke, 2017; Jonathan et al., 2024).

Effects on body and organ weights: Some pesticides affect body and organ weights of humans and some other living things in different scale and periods (Dinca et al., 2023).

After various scientific studies on humans, it has been revealed that pesticides show hematological toxicity effect. For example, some pesticides may affect the hematological parameters and the leukocyte system in non-identical manner (Lee et al., 2016; El-Gendy et al., 2022).

Immunotoxic effects: Synthetic chemical pesticides such as PCBs, chlorinated dibenzo-p-dioxins, endosulfan, aldicarb, carbaryl, carbofuran, malation, atrazine and 2,4-D have significant immunotoxic effects. These substances increase the risk of autoimmune reactions and cause an increase in allergic reactions (Fujitani et al., 1997; Kim et al., 2017).

Dermal effects: Chemical pesticides such as Benomyl, DDT, endosulfan, which were frequently used in the past, caused contact allergic dermatitis in people working in agriculture (Dennis et al., 2010; Ambaye et al., 2024).

Biochemical effects: Pesticides used for agricultural purposes progress to the living body via the skin, respiratory or digestive organs and are metabolized in the liver by the cytochrome P450-dependent monooxygenase system and cause side effects (Bailey et al., 2015; Shinya et al., 2023).

Teratogenic and mutagenic effects: According to the latest findings, it has been proven that pesticides have teratogenic and mutagenic effects. The presence of dose and stress is an important factor in the creation of the teratogenic effect. Pesticides with teratogenic effect are 2,4,5-T and 2,4-D herbicides, organic phosphorous, captan, folpet and difolatan. Pesticides with mutagenic effects (diazinon, ziram etc.) can cause chromosomal breakages (Koutros et al., 2009; 2016; Guerrero Ramírez et al., 2023).

Genotoxic effects: a correlation has been found between chemical pesticides, which are almost an integral part of agricultural production in the last century, and cancer incidence. Cancer incidence is generally low among those employed in agricultural production. Nevertheless, in the last quarter century, the risk of specific cancer types increased further among those

working in agriculture (Valcke et al., 2017). These specific types of cancer are leukemia, Hodkin's disease, non-Hodkin's lymphoma, multiple myeloma, and lip, stomach, prostate, brain and breast cancers (Packard et al., 2019; Latifovic et al., 2020; Togawa et al., 2021). In addition, the study of Mehrpour et al. (2014) showed that pesticides containing organophosphorus reduce sperm activity, decrease testicular weight, damage sperm DNA and create abnormal sperm morphologies. Also, pesticides can trigger hypospadias disease (Michalakis et al., 2014).

6. Alternatives to synthetic pesticides

Natural pesticides: From past to present, natural pesticides can be used at different proportions and purposes as an alternative to synthetic pesticides (Khalili et al., 2019; Kocacaliskan et al., 2019). Naturally derived pesticides are the most environmentally friendly alternatives to synthetics, with their low natural persistence and broad biological activity spectrum. In addition to this, these products of natural origin have few side effects on other living creatures, and the development of these natural products continues with computerized bioinformatics tools (Bahaman et al., 2020). Some herbal extracts have high toxicity and repellent effects against pests, common dandelion/*Cinnamomum camphora*, trigonella and cinnamon can be given as an example to these (Roy et al., 2015; Abdul et al., 2019; Kaya et al., 2019).

Microbial pesticides: Importance of the microorganisms that have been used consciously and unconsciously from the past to the present have increased in recent years. Microorganisms have been used as natural pesticides in recent years (Aksoy et al., 2018). Thus, the damages of some pesticides have been tried to be eliminated in a natural way (Sadof and Sclar, 2000; Dayakar et al., 2015; Akcay and Kaya, 2019).

Non-chemical weed control: The important thing in this method is to prepare the soil well before growing the crop. For example, it is important to make soil analyzes beforehand and to use appropriate soil improvement methods. These will minimize the effects of unwanted plants and organisms. In addition to crop rotation in agricultural production, appropriate soil tillage and mechanical interventions are methods that can be an alternative to chemical weed control in certain areas (Pannacci et al., 2017; Mennan et al., 2020).

7. Scientific consensus on use of chemicals

One of the principles of increasing productivity in plant production is to eliminate harmful organisms from the plant. In the improvement studies carried out in herbal production, no new findings could be obtained that would lead to a significant increase in yield in economically important plants such as wheat, corn, rice, cotton, sunflower etc. since the beginning of 2000s. In other words, the possibility of increasing the total agricultural production through improvement has become very low and the genetic capacity of the species has almost reached the limit. In addition, some important negative effects of the agricultural production model made in the last two centuries on natural resources, especially soil, water and biological diversity, have become visible (Aksoy et al., 2021; Tokel and Erkencioglu, 2021; Tokel et al., 2022).

The 21st century prediction for 9 basic factors that will affect agricultural production is given below. On a global basis, increase of 30% (9-10 billion) in the human population, 60% in food need, 160% in greenhouse gas emissions, 4°C in global warming, and increase in disease and pest pressure are predicted. However, it is calculated that there will be a decrease of 23% in vegetative biological diversity, 24% in the land size per person, 20% in water used in agriculture, and 8% in yield per unit area. It would be more correct not to consider phytosanitary studies only as reducing losses in primary production. Herbal products continue to be damaged by harmful organisms after the fields, vineyards, orchards and greenhouses. Because the failure in taking the necessary measures in plant health may cause conditions, which are harmful to human health, impair food safety and cause food loss of around 15% after production, such as insect infestation, mold and toxin development caused by bacterial or fungal factors. It is calculated that at the end of the 21st century the world population will be 50% more than today and the food demand will be 60-70% more than the present day with the effect of the diet regime. So, when asked what could be done in this situation, the first and only answer to this question is the plan to increase total global food production of today by 60-70% (IPCC, 2021).

While the total population of the world in 1900 was approximately 1.5 billion in 1900, it is more than 7.5 billion today. The United Nations expects the human population to continue to grow and reach 9-10 billion by 2075. The population of Turkey is expected to be 98.1 million in 2055, then 100 million and afterwards stabilize by decreasing a little (United Nations, 2021a).

In the light of the latest scientific information obtained, the human population has increased approximately 4 times in 100 years and it is expected that it will increase by 50% in the next century, but it will stabilize in the 22nd and 23rd centuries (United Nations, 2021b). In addition to these data that affect food production, another issue that should be considered is the daily eating habits. In other words, it is the rate of daily food intake in kilocalories per person. This amount increases day by day with the increasing income level and welfare level. According to the data of the United Nations Food and Agriculture Organization (FAO), the wealthiest 20% of the world population uses 76.6% of the total food produced. Again, 60%, which constitutes the majority of the world population, uses 21.9% of the food produced, while the poorest 20% consume only 1.5% of it. These statistics indicate that the most developed countries (North America and Western Europe) consume 3400-3800 kcal per person, but the rest of the world is only fed by half or less than half of these figures. FAO also stated that the world population suffering from starvation exceeded 840 million by 2020, and also that the population with malnutrition was at least 925 million (World Vision, 2021).

8. Conclusion and suggestions

Preserving the mental and physical health of man is one of the five goals of all divine religions that have been sent down to the world. The religion of Islam attaches great importance to human health for the realization of this purpose. It is against all kinds of factors that will endanger the mental and physical health of the human being. Therefore, any substance that harms him is considered as haram. Islam ordered the consumption of healthy, clean and halal foods, prohibited alcohol and drugs because they intoxicate the mind and negatively affects right thinking, and eating pork, insects, carrion, blood, pus, toxic chemicals because they are harmful to the health of the body.

There is no scientific data showing that the use of natural pesticides is harmful to living things and the environment.

However, according to researches on chemical/synthetic pesticides, it has been demonstrated with scientific data that their residues can be found on plants and living organisms, and that they adversely affect people who consume such foods. Scientific researches have even revealed that these substances are passed on from mother to baby through breastfeeding (Gokmen and Yurttagul, 2001). Therefore, it would not be correct to say that this process is within the scope of the istihalah (transformation) in Islamic law. As a matter of fact, it is a reality that harmful pesticide residues in fruits and vegetables can be seen through technological means. In a study conducted in the UK on infant formulas, the presence of chemical pesticide residues in infant formula was proven, and application made to the court to stop the production of that product. As a result of the lawsuit, the company concerned was found guilty and sentenced. Subsequently, the company's products were withdrawn from the market (Daily Mail, 2021). This situation is important in terms of revealing the danger and seriousness of pesticides.

In addition, the use of pesticides with proven harm to health (mentioned above) to increase product yield or to have some economic benefit cannot make pesticides safe and religiously permissible. Because, Allah commands the consumption of halal, clean and healthy foods and prohibits those who are harmful, useless or those whose harm is more than their benefits. In addition to these, Allah has been a guarantor for the sustenance of every creature He has created.

It is toughed that the production or consumption of products that contain harmful substances are not suitable in terms of Islam. Pesticides with proven negative effects on humans, animals and the environment should be kept at the dosages specified by the relevant experts. Otherwise, it is toughed that it is not suitable for them to be used in terms of Islam.

Ethical statement: During the preparation of this study titled "Evaluation of Products Grown with Pesticides in Terms of Islamic Law", scientific, ethical and quotation principles were observed, the data collected were not tampered with and this study was not sent to any other academic media for evaluation.

Conflict of interest: The author declares that he has no conflict of interests.

Informed consent: The author declares that this manuscript did not involve human or animal participants and informed consent was not collected.

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