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An Interdisciplinary Approach of Science and Islamic Law in Determining the Halal Status of Modern Food Products

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Abstract: The development of biotechnology technology in food production poses new challenges in determining the halal status of products, especially for Muslim consumers. This article discusses various modern biotechnology techniques such as genetic engineering, precision fermentation, cell culture, and microbial biotechnology, and their impact on Islamic law and ethics. Using a multidisciplinary approach between science and fiqh, it examines how genetically modified products can be declared halal or haram based on the maqasid principle of sharia, which includes the preservation of religion, soul, mind, offspring and property. It also highlights the importance of MUI fatwa and halal certification institutions to accommodate food biotechnology innovations. This article emphasises the need for science-based halal education and harmonisation of global halal standards so that biotechnology food products can be widely accepted by the world's Muslim communities.

Keywords: Food biotechnology, halal, Islamic fiqh, maqasid sharia, genetic engineering, halal certification.

I. Introduction

Technological advances in the field of biotechnology have had a significant impact on the food production sector. Through genetic engineering, cell culture, precision fermentation, and microbial biotechnology, the food production process no longer relies entirely on conventional methods. Technologies such as Genetically Modified Organisms (GMOs), in-vitro meat and synthetic proteins present great opportunities in creating a more efficient, nutritious and sustainable food supply. However, these developments also pose new challenges, particularly in the context of Islamic law and the halalness of products.

For Muslims, halalness includes not only the substance aspect of a food, but also the production process and the source of origin of the ingredients used. This is a serious concern because some biotechnology techniques can involve elements derived from non-halal living things, or production processes that are not in accordance with Islamic law. Therefore, it is important to integrate biotechnology and fiqh studies to produce products that are not only innovative but also in accordance with Islamic principles.

In addition, differences in halal certification standards between countries and the lack of public understanding of biotechnology issues further complicate the acceptance of biotechnology products among Muslim consumers. In this context, there is a need for synergy between scientists, scholars, halal certification authorities, and adequate education for the public to avoid disinformation and unfounded concerns.

Therefore, this paper aims to examine biotechnology techniques in food production, examining them from the perspective of Islamic fiqh and halal ethics, and reviewing halal certification practices in several Muslim regions. It will also discuss new concepts in food biotechnology and their implications for Islamic law, taking the maqasid shariah principle as the basis for evaluation.

II. Research Methodology

This research uses a qualitative approach with a descriptive-analytical library research method. The study was conducted on various relevant primary and secondary sources, including scientific literature on food biotechnology, classical and contemporary sources of Islamic law, fatwas of religious institutions such as the Indonesian Ulema Council (MUI), and official documents of halal certification agencies from other countries.

The normative-theological approach is used to analyse the compatibility of modern biotechnology practices with the principles of Islamic law, including maqasid sharia (the objectives of Islamic law) which include the preservation of religion, soul, mind, offspring and property. The analysis is conducted by reviewing the verses of the Qur'an, the hadiths of the Prophet Muhammad, as well as the views of the scholars of the madhhab, both classical and contemporary.

On the other hand, a scientific approach is used to objectively examine modern biotechnology technologies, including the working principles of genetic engineering, tissue culture, precision fermentation, and in-vitro meat technology. The aim is to understand the scientific processes at play so that they can be legally and ethically evaluated.

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The data collected is analysed qualitatively to identify the intersection between scientific and shar'i aspects, and to formulate guidelines or recommendations regarding the halal status of food biotechnology products. Thus, this methodology is expected to provide a comprehensive understanding of food biotechnology issues from an Islamic perspective.

III. Discussion

Biotechnology Techniques in Food Production

Genetically Modified Organism (GMO), also commonly known as genetic engineering, is the basis of the field of biotechnology which includes gene manipulation, gene cloning, recombinant DNA, genetic modification technology, and modern genetics using procedures for identification, replication, modification and transfer of genetic material from cells, tissues and organs (Sutarno, 2016). This technology utilises living subjects to obtain a variety of organisms with new gene arrangements or can be called DNA recombination technology. Some of the main techniques used in modern food production include:

a. Genetic Engineering, examples: pest-resistant GMO crops, CRISPR-derived animals (such as GMO salmon).

b. Precision Fermentation, used to microbiologically produce enzymes, milk proteins or flavours without animals.

c. Cell Culture and In-Vitro Meat, meat grown from stem cells without slaughter.

d. Microbial Biotechnology, for nutritional enhancement, such as biofortification (e.g. Golden Rice).

Biotechnology is described as a technology that uses and utilises biological systems to obtain goods and services that are useful for human welfare. There are two kinds of biotechnology: conventional or traditional biotechnology and modern biotechnology. Traditional biotechnology without genetic engineering focuses on natural selection of microbes used in environmental modification to obtain optimal products such as making tape, tempeh, bread, beer, and others. While modern biotechnology with genetic engineering utilises human skills in manipulating living things so that they can be used to produce desired goods in the field of food production, for example, transgenic plants. Both conventional and modern biotechnology can be used for food conservation. The use of conventional biotechnology is used to improve the nutritional value and flavour of food while modern biotechnology acts as a way to produce food in large quantities and improve nutritional value using genetic engineering (Wusqo, 2014).

Scientifically, genetic engineering is the genetic manipulation or change in the genetic makeup of an organism. The goal of genetic engineering is to obtain superior organisms. Genetic engineering is a synthesis process using recombinant DNA technology. The result of genetic engineering is an organism that has the desired traits or an organism with superior traits. Genetically modified organisms are called transgenic organisms (Purnawidjaya, 2015).

Islamic Fiqh Perspective and Ethical Evaluation

Islamic law, which is described as a comprehensive and elastic rule of law, raises an assumption and understanding that Islamic law is in accordance with the situation and conditions. Islam is considered to be able to fulfil the demands of human needs. This assumption is not wrong, because in principle, Islamic law is able to fulfil the needs of all levels of society. Not only that, Islamic law is able to anticipate all the problems that develop in various regions of the world with the fairest, best and most harmonious provisions. The ability to respond to Islamic law is because in addition to having completeness, Islamic law also stands firmly on the basis of thought and reasoning. It also stands on the basis of considerations that lead to the height of human nature and human nature and always pay attention to everything that is happening and developing in society. The development of legal forms and structures that exist in a society, always follow the flow in accordance with the developments that occur in society itself. This becomes something absolute because every time changes occur. Sometimes the change in law is due to the expiration of a rule of law or because of the community's need for a new law that is more in line with the times, which is able to guarantee the interests that exist in society itself.

One of the positive contributions of technological development is to address the case of determining the legal status in the development of food technology. Departing from the rules of halal in the Koran and Sunnah, experts formulate a foundation for the development of means of human welfare. One of the basic studies in this case is the word of Allah SWT,

حُرِّمَتْ عَلَيْكُمُ الْمَيْتَةُ وَالدَّمُ وَلَحْمُ الْخِنْزِيْرِ وَمَآ اُهِلَّ لِغَيْرِ اللّٰهِ بِهٖ وَالْمُنْخَنِقَةُ وَالْمَوْقُوْذَةُ وَالْمُتَرَدِّيَةُ وَالنَّطِيْحَةُ وَمَآ اَكَلَ السَّبُعُ اِلَّا مَا ذَكَّيْتُمْۗ وَمَا ذُبِحَ عَلَى النُّصُبِ وَاَنْ تَسْتَقْسِمُوْا بِالْاَزْلَامِۗ ذٰلِكُمْ. فِسْقٌۗ اَلْيَوْمَ يَىِٕسَ الَّذِيْنَ كَفَرُوْا مِنْ دِيْنِكُمْ فَلَا تَخْشَوْهُمْ وَاخْشَوْنِۗ اَلْيَوْمَ اَكْمَلْتُ لَكُمْ دِيْنَكُمْ وَاَتْمَمْتُ عَلَيْكُمْ نِعْمَتِيْ وَرَضِيْتُ لَكُمُ الْاِسْلَامَ دِيْنًاۗ فَمَنِ اضْطُرَّ فِيْ مَخْمَصَةٍ غَيْرَ مُتَجَانِفٍ لِّاِثْمٍۙ فَاِنَّ اللّٰهَ غَفُوْرٌ رَّحِيْمٌ

Translation:

Forbidden to you (to eat) carrion, blood, pork, and (the flesh of) animals slaughtered not in the name of Allah, the strangled, the beaten, the fallen, the gored, and the devoured by wild animals, except that which (you) slaughter. (Also forbidden is) that which is slaughtered for idols, and (likewise) casting lots with the azlam (arrow), (for) that is an unlawful deed. On this day the disbelievers have despaired of overcoming your religion. Therefore, fear them not, but fear Me. On this day I have perfected your religion for you, I have made My favour sufficient for you, and I have approved Islam as your religion. So, whoever is compelled by hunger, not wishing to sin, surely Allah is Forgiving, Merciful. (Qs. al-Ma'idah: 5/3)

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In this verse, Allah Swt. explains that it is forbidden for human beings (Muslims) to eat carcasses, blood, pork, (animal meat) slaughtered in the name of other than Allah and animals that die without the process of slaughtering except in the circumstances that have been mentioned.Rasulullah Saw. which was narrated by Tirmizi who said that "everything that is cut from a living animal, it ranks as carrion." Indirectly, this hadith explains that the body parts of animals that are separated and cut without the process of slaughtering first are equated with carrion, which is haram.

Based on the book Al-Igna fi Halli Al-Fazhi Abi Syuja written by Muhammad Al-Khathibi Ash-Sharbini in (Hasibuan & Muslim, 2022) explained that something taken from a living animal is ruled according to the carcass of the animal, if the carcass is pure then it is ruled pure, and if the carcass is unclean then it is ruled unclean, and the separate limbs of fish or locusts are pure, while those of other species are unclean (except for hair or fur).

The classification of meat that is permissible to eat includes captured land animals such as camels, oxen, goats and other domesticated animals such as pets and birds kept at home. To quote Al-Ghazali, animals are permissible to eat that are slaughtered by the People of the Book. While the meat that is forbidden to eat: 1) all types of animal carcasses that die before slaughter (except fish and locusts), 2) food that has flowing blood (other than the liver and spleen), 3) khinzir meat (including skin and bones), 4) Was (siba') animals, which are animals that catch other animals and eat ferociously: lions, wolves and others, 5) birds with sharp nails (dzimikhlabin minath-thairi): eagles, eagles and other similar birds. Taking animal parts for food engineering activities must be obtained from animals that are halal to eat and slaughtered according to Islamic law, including plant-based engineering that takes animal meat cells as media and ingredients. It is haram to consume if it comes from haram animals, such as pork flavour (Al-Ghazali, 1998; Hamdan et al., 2019; Al-Qaradhawi, 2022).

Dr. Ir. Anton Apriantono M.S. (Minister of Agriculture 2004-2009) said that the government is responsible for regulating and supervising that genetically modified products are halal. The government provides guidelines that regulate the determination of whether biotechnology food products are halal or not. Therefore, MUI issued a fatwa on this matter which is contained in MUI Fatwa Number 35 of 2013 on Genetic Engineering and its Products. MUI Fatwa Number 35 Year 2013 on Genetic Engineering and its Products is issued with the following legal provisions:

1) Genetic engineering of animals, plants and microbes (microorganisms) is permissible, with the condition that:

a. It is done for the sake of benefit (beneficial):

b. does not cause harm (mudharat), either to humans or the environment; and

c. not using genes or other parts derived from the human body.

2) Genetically modified plants are halal and may be used, provided that:

a. beneficial; and

b. not harmful.

3) Genetically modified products in food products, medicines, and cosmetics are halal with the conditions:

a. Useful

b. not harmful; and

c. the source of origin of genes in genetically modified products does not come from haram.

1. Maqasid Sharia

On the issue of modern food, scholars have established guidelines that must be followed in producing modern food products that characterise halalan tayyiban food and are free from doubt. Entrepreneurs of modern food products must understand the concept of halal food in Islam so as not to cause difficulties to Muslims who are consumers of modern food products. According to al-Qaradawiyy (1989), the concept of halalan tayyiban must be adhered to by entrepreneurs and also modern food controllers in order to achieve maqasid sharia while maintaining daruriyyat al-khams, namely:

Preserving Religion

Religion is a priority in making choices, being a belief and guiding in various actions and choosing alternatives to fulfil life's needs. It is not justified to ignore religion to pursue worldly interests. Allah swt, says:

وَاٰمِنُوْا بِمَآ اَنْزَلْتُ مُصَدِّقًا لِّمَا مَعَكُمْ وَلَا تَكُوْنُوْٓا اَوَّلَ كَافِرٍۢ بِهٖ ۖ وَلَا تَشْتَرُوْا بِاٰيٰتِيْ ثَمَنًا قَلِيْلًا وَّاِيَّايَ فَاتَّقُوْنِ

Translation:

Believe in that (Qur'ān) which I have sent down as a confirmation of that which was with you (the Torah) and do not be the first to disbelieve in it. Do not exchange My verses for a cheap price and fear only Me. (QS. Al-Baqarah: 2/41)

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The above verse clearly prohibits Muslims from ignoring all the prohibitions and commands of Allah just to pursue the temporary favours of this world. So, who does so belongs to the group that insults Allah and His Messenger (al-Qurtubiyy, 1967). Therefore, Muslims must be wise in choosing food so as not to eat food that is produced from a mixture of sources that are haram in Islam (JAKIM, 2010). For example, GMO potato products are mixed with haram animal sources. Although there is evidence that GMO potatoes have their own benefits, it is important to remember that they are made from animals that are forbidden to eat. After research, it was found that the current situation has not reached the stage of urgency or emergency so that it is forced to legalise something that has been forbidden.

Therefore, Muzakarah Khas Jawatan kuasa Fatwa Majlis Kebangsaan Bagi Hal Ehwal Ugama Islam Malaysia which convened on 12 Jul 1999 has agreed to prohibit all types of GMF or GMO foods that are produced from animal sources that are haram to eat. This is because the study found that the kemudaratan of these food products is more than the benefit. The Ijtihad made is also based on the fiqh principle:

درء المفاسد مقدم على جلب المصالح

Meaning: "Abandoning a mafsadah (predominant) is better than taking a maslahah (little)" (al-Sullamiyy, 2001).

This method implies that the use of GMFs derived from haram ingredients is a mafsadah and abandoning it is better even though there is some maslahat in the GMF product. This is because the mafsadah is more dominant than the small amount of maslahat.

Safeguarding the Soul

Islam places great emphasis on its followers to prioritise the preservation of life and living. As Allah swt said,

وَلَا تَقْتُلُوا النَّفْسَ الَّتِيْ حَرَّمَ اللّٰهُ اِلَّا بِالْحَقِّۗ وَمَنْ قُتِلَ مَظْلُوْمًا فَقَدْ جَعَلْنَا لِوَلِيِّهٖ سُلْطٰنًا فَلَا يُسْرِفْ فِّى الْقَتْلِۗ اِنَّهٗ كَانَ مَنْصُوْرًا

Translation:

You shall not kill anyone whom Allah has forbidden (to kill), except with a just cause. And whoever is killed wrongfully, We have given power to his guardian. But let him not exceed the limit in killing. Indeed, he is one who has been helped. (QS. al-Isra': 17/33).

Based on the above verse, it is sinful for one to neglect personal safety or health because he has abandoned a matter that is highly demanded in Islam. By this, Muslims must choose modern foods that are able to provide health to themselves instead of choosing foods that invite negative effects while endangering human life and health (alSuyutiyy, 2001).

If Muslims are interested in benefiting from modern food products, Muslims must be wise in choosing them so that they provide more benefit than mafsadah to religion, life, mind, offspring and property. Example: in 1992, Calgene had submitted this tomato to the U.S. Food and Drug Administration (FDA) for testing. According to Duman, J.G, De Vries, A.I. (1976), the result of the decision obtained by the FDA, found that the tomato did not contain any ingredients that were harmful to health, as well as did not require a notification label that it was a GM food. This decision also allowed the tomato to be commercially marketed in 1994 (Duman et. al., 1976).

Preserving the Intellect

The preservation of the intellect is something that is highly demanded in Islam. This is because the mind is the most important organ in humans to distinguish between humans and other creatures created by Allah. Therefore, it must be maintained and anyone who neglects this responsibility has abandoned the command of Allah SWT to protect the mind as He said:

يٰٓاَيُّهَا الَّذِيْنَ اٰمَنُوْٓا اِنَّمَا الْخَمْرُ وَالْمَيْسِرُ وَالْاَنْصَابُ وَالْاَزْلَامُ رِجْسٌ مِّنْ عَمَلِ الشَّيْطٰنِ فَاجْتَنِبُوْهُ لَعَلَّكُمْ تُفْلِحُوْنَ

Translation: O you who believe, drinking alcohol, gambling, (sacrificing to) idols, and casting lots with arrows are abominable (and) among the deeds of the devil. So, avoid them so that you may be fortunate. (QS. al-Ma'idah: 5/90).

The above verse clearly forbids Muslims from approaching such abominable acts which may lead to the corruption of the mind, creed and person (al-Suyutiyy, 2001). Therefore, modern food products mixed with haram ingredients such as alcohol are strictly forbidden in Islam. There is a fiqh principle that explains this:

إذا اجتمع الحَلل والحرام فغلب الحرام

Meaning: "If there is a mixture of halal and haram sources, the haram will be more dominant" (al-Suyutiyy, 2001).

Therefore, scholars have agreed to prohibit all types of food products that can lead to damage to the mind. This is because to preserve the mind from damage caused by eating food mixed with intoxicating wine (al-Qurtubiyy, 1967).

Preserving Heredity

Modern food produced today is growing rapidly so that every even layer of society can get it easily. In fact, each of these food products needs to be studied so that it is free from the occurrence of mixing with haram sources. This is to ensure the happiness of future generations is guaranteed and can give birth to quality offspring. As the word of Allah swt.,

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يٰٓاَيُّهَا النَّاسُ كُلُوْا مِمَّا فِى الْاَرْضِ حَلٰلًا طَيِّبًا ۖوَّلَا تَتَّبِعُوْا خُطُوٰتِ الشَّيْطٰنِ ۗاِنَّهٗ لَكُمْ عَدُوٌّ مُّبِيْنٌ

Translation:

O mankind, eat of the lawful (food) of the earth and do not follow the steps of the devil. Indeed, he is a real enemy to you (QS. al-Baqarah: 2/168).

Based on the above arguments, Islam emphasizes the aspect of halal and clean food to its people, to maintain the benefit of mankind rather than taking food that will give harm to human descendants and not follow the steps of the devil.

Islam decides a case based on facts or solid reasons in terms of determining the law. Any matter that needs to be ruled upon must be based on solid data and benefit the people. If the maslahah dominates the modern food, then the law is halal. However, if it is seen that the mafsadah is greater, then the law is haram.

Safeguarding Possessions

Humans are often associated with the love of wealth and wealth. This is because it is among the favours favoured by most humans, both rich and poor. In obtaining wealth, humans are willing to do anything. As Allah swt, says:

وَالْبَنُوْنَ زِيْنَةُ الْحَيٰوةِ الدُّنْيَا ۚ وَالْبٰقِيٰتُ الصّٰلِحٰتُ خَيْرٌ عِنْدَ رَبِّكَ ثَوَابًا وَّخَيْرٌ اَمَلًا

Translation:

Possessions and children are the adornment of the life of the world, but eternal good deeds are a better recompense in the sight of your Lord, and better to hope for. (Qs. al-Kahf: 18/46).

Islam does not prohibit its people from accumulating wealth, but any wealth that is collected must come from the results of labour based on the rules of sharia. This is because every property of the children of Adam will be accounted for in the hereafter (al-Suyutiyy, 2001). Al-Qurtubiyy (1967) argues that every thing that Muslims want to do must not cause harm to humans whether in matters of food, drink, use, games, financial affairs and so on. If the action performed has a negative impact on one of the five basic human principles, namely religion, life, reason, lineage and property, then the law is haram. As Allah swt, in His word:

وَاَنْفِقُوْا فِيْ سَبِيْلِ اللّٰهِ وَلَا تُلْقُوْا بِاَيْدِيْكُمْ اِلَى التَّهْلُكَةِ ۛ وَاَحْسِنُوْا ۛ اِنَّ اللّٰهَ يُحِبُّ الْمُحْسِنِيْنَ

Translation:

Spend in the way of Allah, do not plunge yourselves into destruction, and do good. Verily, Allah loves those who do good. (Qs. al-Baqarah: 2/195).

As we know from freelance studies by scientists, modern food products such as GMF are more cost-effective and able to last longer. This is also able to save costs in human daily life because it is cheaper than the original product. In addition, with the advantage of being able to last longer, it can avoid wasteful behaviour in daily life. Therefore, modern food products must outweigh the positive impacts of being a legitimate and halal product in the eyes of Islam. Moreover, it also needs to comply with the maqasid sharia while improving the lives of people in the future.

IV. Conclusion

The development of biotechnology in food production has a major impact on global food availability and sustainability. Techniques such as genetic engineering, cell culture and precision fermentation are capable of producing more efficient and nutritionally valuable food products. However, from an Islamic perspective, these innovations must be tested for halalness through a fiqh and maqasid sharia approach that considers five key principles: safeguarding religion, soul, mind, offspring and property.

Islamic law is dynamic and responsive to the times. Therefore, collaboration between biotechnology scientists and fiqh scholars is needed in formulating halal fatwas and policies that are relevant to innovative products such as in-vitro meat and GMOs. Halal certification is also required to be more adaptive to scientific developments, through strict but flexible evaluation criteria, so that there is no legal vacuum in the face of new products.

On the other hand, science-based halal education needs to be improved to equip Muslim consumers with the right understanding, so that they can make consumption decisions in accordance with sharia. Finally, harmonisation of halal standards between countries is a strategic step to support the growth of the global halal industry based on biotechnological innovation.

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