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Research Article

Photosynthesis in The Qur'an: A Comparative Study of The Interpretation of The Science of The Ministry of Religion of The Republic of Indonesia and The Interpretation of The Verses of Al-Kauniyah Fi Al-Qur'an Al-Karim By Zaghlul An-Najjar

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Abstract. This study explores the concept of photosynthesis as described in the Qur'an. The research examines verses that reference plant life, such as Surah Al-An'am: 99, and analyzes their relevance to the process of photosynthesis, which involves chlorophyll, sunlight, and the production of oxygen. Through a comparative approach, the study contrasts two interpretations: the Ministry of Religion's Tafsir Ilmi, which combines traditional exegesis with scientific insights to highlight the symbiotic relationship between faith and science, and Zaghlul An-Najjar's Tafsir Ayat Al-Kauniyah, which delves into specific scientific elements within the Qur'anic text. This study emphasizes how both interpretations seek to reconcile religious teachings with modern scientific understanding, providing readers with a multifaceted view of how photosynthesis is portrayed in Islamic scripture. It highlights key verses linking natural processes to divine creation, suggesting that scientific phenomena like photosynthesis are aligned with Islamic teachings on the interdependence between nature and spirituality. The findings underscore the Qur'an's relevance to contemporary science and its potential to inspire deeper ecological awareness within the framework of religious belief.

Keyword: Tafsir Ilmi; Photosynthesis; Comparison

INTRODUCTION

Studying the Qur'an using science and science is an effort to strengthen faith and is expected to build Islamic civilization(N. N. S. Y. Dahliana, 2023). Few people realize that science is a very effective medium of Islamic da'wah because the Qur'an will not be seen as superior except by believers, so science can open the eyes of ordinary people to see the truth of Islam independently. Science is the strongest means of proving the scientific truth of the Qur'an(Assoc. Prof. Dr. Waston, 2020).

The Qur'an has verses that describe the diversity of living things, including plants. There are plant names that are mentioned directly in the Qur'an and describe how they live and develop. One of the verses that describes how plants live is found in Surah Al-An'am verse 99 which explains that in plants there is a green substance that is important for plant life(Nurrohim et al., 2024). The green substance is termed chlorophyll in modern science(Rhain et al., 2022). This chlorophyll is one of the most important elements in the growth process in all kinds of plants by utilizing solar energy to carry out this process called photosynthesis(Nasihin et al., 2021). The term photosynthesis in science was only invented in 1778 by the Royal Austrian physician Jan Ingenhousz who showed that sunlight impacts plants to restore damaged air(Wirate House, 2017). The Qur'an has described this since 1400 years ago(Khaeroni, 2017).

The discovery of scientific discoveries as mentioned above requires a comprehensive approach to science in interpreting the verses of the Qur'an, namely scientific interpretation. One of the interesting books of scientific interpretation is the scientific interpretation by Indonesian scholars and scientists, namely, the Ministry of Religious Affairs, Lajnah Pentashihan Mushaf al-Qur'an (LPMQ) and the Indonesian Institute of Sciences (LIPI) collaborated in the preparation and publication of this scientific interpretation(Azzuhro, 2021). The scientific pattern in the Tafsir of the Ministry of Religion of the Republic of Indonesia displays aspects of science and technology by trying to integrate modern knowledge with the interpretation of the Qur'an(Azizy, 2015). The Ministry of Religion's interpretation

greatly influenced the discussion of modern interpretation in Indonesia, improving and harmonizing the understanding of religious teachings with the dynamics of society and contemporary science(Nurin PK., 2023). Not only is the Tafsir Ilmi of the Ministry of Religion of the Republic of Indonesia interesting to discuss, but there is also a tafsir that has a scientific style written by modern mufassir who has scientific capacity in the field of science and its writing, namely Tafsir Ayat Al-Kauniyah fi Al-Qur'an Al-Karim by Zaghlul An-Najar(Y. Dahliana & Wahab, 2023). This study will further examine Photosynthesis in the Qur'an by comparing the differences in the discussion of interpretation and its interpretation carried out by the Ministry of Religion of the Republic of Indonesia and Zaghlul An-Najar.

This research is interesting because, by connecting modern science with the interpretation of the Qur'an, it is by understanding how this process is implicitly described in the Qur'an, thus helping us understand how science and revelation interact with each other(Mahmud, 2024). Explains the complex and harmonious relationship between the revelation of the Qur'an and modern science, especially photosynthesis(Rhain et al., 2024). The comparative study between the Tafsir of the Ministry of Religion of the Republic of Indonesia and Zaghlul An-Najar enriches the perspective by combining traditional and scientific approaches to kauniyah verses. This provides an opportunity for readers to better understand how the Qur'an, as a book rich in meaning, remains relevant in the context of the development of modern science.

Problem Formulation and Objectives

Based on this background, this study is focused on examining several main issues. *First*, this study will explore how the interpretation of verses related to photosynthesis in the Tafsir Ilmi of the Ministry of Religion of the Republic of Indonesia and the Tafsir Ayat Al-Kauniyah Fi Al-Qur'an Al-Karim by Zaghlul An-Najjar(Hidayat & Khaq, 2024). This analysis aims to understand the approach and method used by each interpretation in integrating the science of photosynthesis with the interpretation of the Qur'an(Nugroho et al., 2024). *Second*, this study will explore the similarities and differences in interpretation between the *Tafsir of the Ministry of Religion of the Republic of Indonesia* and *Zaghlul An-Najjar*'s interpretation of the phenomenon of photosynthesis(Azizah et al., 2024). This discussion is expected to reveal the unique perspectives and perspectives of each interpretation, both in terms of scientific depth and in relation to spiritual values, which ultimately provides a more comprehensive understanding of how the Qur'an views natural phenomena.

Literature Review

This study examines how the Qur'an explains the process of photosynthesis in the Qur'an and answers related to the compatibility of the Qur'an and Science. It is important to outline the literature review in a study with the aim of assessing the validity of a study and showing differences with previous research.

Previous research related to photosynthesis in the Qur'an was carried out by, among others, Elok Dzikrinina Amelya Zahra(Dzikrinina & Zahra, 2023)- Khairun Nisa(Nisa, 2022), Ramadea Tarisa Aini,(AINI, 2024) Moch. Syaddad Ardiansyah,

(Ardiansyah, 2023) Fitroh Alvi Fuadi,(Fuadi, 2018) Searching for the Crown, (Hoyrunnissa, 2022) Apriliani Mersa Putri,(Putri & Aprilia, 2023) Nurul Saadah Mohammad Zaini and Robiatul Adawiyah,(Nurul Saadah Mohammad Zaini & Robiatul Adawiyah Mohd, 2022) Dwi Rini Astuti(Dwi Rini Astuti, 2020) and Nora Juwita D, Rosadi and Lukman Nul Hakim(Rosadi & Hakim, 2023) . Meanwhile, Elok Dzikrinina Amelya Zahra explained the important role of photosynthesis in life and its benefits for all creatures in several interpretations of verses of the Qur'an. Meanwhile, Khairun Nisa focuses on research on interpretive analysis *Jaghl al-Raghib an-Najjar* and its relevance to science and technology(Hasan et al., 2024). Meanwhile, Ramadea Tarisa Aini explained about the mechanism of photosynthesis in the Qur'an and focused on its relevance to nature and living things, Ramadea explained that through various functions of photosynthesis, there is a mutual involvement called ecology(Isaac, 2024). Meanwhile, Moch. Syaddad Ardiansyah mentioned all factors that affect the growth and development of plants. Meanwhile, Fitroh Alvi Fuadi explained the interpretation of the verse about the morphology of plants in *Tafsir al-Jawahir* by explaining all the elements that exist in plants(Sulaiman et al., 2024). Meanwhile, Fitriana Hoyrunnisa discussed in general about plants and the process of plant development exposed to the Qur'an and explained the contents of the Qur'an scientifically through science(Enceng et al., 2024).

Meanwhile, Apriliani Mersa Putri and Latifah Aprilia use two views, namely the view of the Qur'an and Hadith which from both explain that there are many benefits from the existence of nature, one of which is plants that grow through a metabolic process that has two grooves, namely catabolism which is respiration and anabolism which builds complex molecules from simple molecules, for example the process of photosynthesis. Meanwhile, Nurul Saadah Mohammad Zaini and Robiatul Adawiyah describe the concept of plant-based food using six pillars, namely plants derived from water, green substances of leaves, food levels based on plants, types of plants, the level of ripeness of fruits and the power of Allah in the creation of this plant nature by focusing on *Tafsi's mafatihl ghayab*. Meanwhile, Dwi Rini Astuti explained about the term *Achi-Sazar AL-akhḍar* The green tree refers to the green substance of the leaves or commonly known as chlorophyll in the Book of Tafsīr Al-Mishbāh by M. Quraish Shihab. Meanwhile, Nora Juwita D, Rosadi and Lukman Nul Hakim used two research methods, namely the maudhui interpretation method and Farid Essack 1's hermeneutic theory which emphasizes the role of readers in understanding the text.

Based on the results of the literature review above, no comparative research has been found on the Tafsir Ilmi of the Ministry of Religion of the Republic of Indonesia and the Tafsir Ayat Al-Kauniyah fi Al-Qur'an Al-Karim by Zaghlul An-Najjar on photosynthesis(Abubakar, 2024). This shows that there is a gap in study that can be further explored to understand the phenomenon of photosynthesis from the perspective of Islamic science, as explained in the scientific interpretation.

Photosynthesis

Photosynthesis is a biochemical process carried out by plants in which light energy is used to make carbohydrates from inorganic materials such as carbon dioxide

(CO_2) and water (H_2O). Photosynthesis is a process of making food that occurs in plants to obtain energy(Maftukhah et al., 2023). Photosynthesis literally means synthesis using light. In the mechanism of photosynthesis, plants contain a special light-absorbing leaf green substance called chlorophyll. In this green substance, there is a unique organ called chloroplast which is where photosynthesis takes place(Harisanti et al., 2024). The main organ in plants where photosynthesis takes place is the leaf(Suyatman, 2021); (Adanu, 2024);(Al-Kausar, 2024).

There are factors that affect the occurrence of the photosynthesis process as follows:

- Light Intensity

  Sunlight is an important factor in the progress of photosynthesis. Sunlight is the main source of energy for photosynthetic reactions.(Harisanti et al., 2024) The intensity of sunlight also affects the rate of photosynthesis. If the light intensity is too low, the rate of photosynthesis will slow down due to lack of energy. But if the light intensity is too high, photosynthesis can be disrupted due to excess energy absorbed.(Suyatman, 2021) The quality and intensity of light are very important. Blue (434-520 nm) and red (625-740 nm) wavelengths are the wavelengths at which chlorophyll pigments most effectively absorb and reflect light(Maftukhah et al., 2023).
- Chlorophyll

  Chlorophyll is a green pigment found in plants, algae, and photosynthetic bacteria. Each leaf on the plant has a different content. Chlorophyll is very important in the process of photosynthesis, because from this chlorophyll plants will get energy from light.(Zakiyah et al., 2018) The sunlight captured by chlorophyll is then converted into chemical energy. The three main functions of chlorophyll in the process of photosynthesis are to harness solar energy, cause CO_2 fixation to produce carbohydrates, and provide energy for the entire ecosystem. The carbohydrates formed during photosynthesis are converted into proteins, fats, nucleic acids, and other organic molecules. Chlorophyll absorbs light in the form of electromagnetic radiation on the visible spectrum. Although sunlight contains all the colors in the visible spectrum from red to purple, not all wavelengths are well absorbed by chlorophyll. Chlorophyll is referred to as the central pigment in the photosynthetic reaction because it is able to absorb the light absorbed by other pigments through photosynthesis(Suyatman, 2021).
- Carbon dioxide

  Carbon dioxide is a waste gas left over from respiration from human and animal respiration. Plants get carbon dioxide in this free air through stomata. The more carbon dioxide in the air, the more material plants get for the photosynthesis process.(Wirate House, 2017)
- Temperature

  Enzymes that act on the process of photosynthesis can only function at ideal temperatures. In general, photosynthesis goes faster with temperature to the limit of enzyme tolerance. (Sayekti & Desstya, 2017)
- Up to air

Plants need water for photosynthesis to take place. Photosynthesis will be hampered in the absence of water. Lack of water will cause the stomata to close, thus inhibiting the absorption of carbon dioxide, thereby reducing the rate of photosynthesis.(Wirate House, 2017)

Chloroplasts: Where Photosynthesis Occurs

Most plants carry out photosynthesis on the leaves, including all the green parts of the plant, including green stems and immature fruits, have chloroplasts. The leaf surface contains about five million chloroplasts per square millimeter. Chlorophyll, the green pigment inside chloroplasts, is mainly found in mesophyll cells, the tissue inside the leaves. Chloroplasts drive the synthesis of organic molecules by absorbing (absorbing) light energy. Carbon dioxide enters the leaves and oxygen exits through tiny pores called stomata (from the Greek word for mouth). The vessels transport the water absorbed by the roots to the leaves. Leaves also use vessels to deliver sugars to roots and other non-photosynthetic parts of plants.

Typically, mesophyll cells have about 30 to 40 chloroplasts, each measuring about 2-4 μm by 4-7 μm. The stroma, a viscous liquid inside the chloroplast, is covered by a membrane consisting of two membranes. The stroma is separated from the other part, the interior of the thylakoid, or the thylakoid space, by an intricate system of interconnected membranous sacs called thylakoids (thylakoids). In some places, thylakoid sacs are piled up to form grana. The thylakoid membrane contains chlorophyll. After looking at where photosynthesis occurs in plants, we are ready to study the process of photosynthesis further. (Neil A. Campbell, 2008)

Mechanism of Photosynthesis

In general, all cells that have chloroplasts have the potential to carry out this reaction. The results of photosynthesis are sent to nearby tissues first. Basically, the reaction circuit in photosynthesis can be divided into two main parts:

- **Bright Reaction**

  Bright reactions are carried out by molecules in the telacoid membrane. Converts sunlight energy into chemical energy in ATP and NADPH. Through the process of breaking water ($H_{2O)}$ into Hydrogen ions (H^+) and water molecules using light energy, the bright reaction releases O2, produces ATP, and forms $NADPH_2$.
- **Dark reaction (Calvin Cycle)**

  Dark reactions (do not need light, but need carbon dioxide). A dark reaction occurs in a part of the chloroplast called the stroma. It uses ATP and NADPH to produce sugars from carbon dioxide. Then it returns ADP, inorganic phosphate, and $NADP^+$ to a bright reaction.(Neil A. Campbell, 2008)

RESEARCH METHODOLOGY

The type of research used in this study is library research so that the collection of data and information in this research is in the form of literature materials, namely books, documents, scientific journals, and others that can be references. The type of approach carried out is a qualitative approach.

This research is a literature research, so the data studied is only data generated from written sources from which data will produce literature research also by diving into books, books, scientific papers, journals, and others. To answer the questions in this study, the data needed includes:

1. Scientific perspective photosynthesis: Collecting relevant previous research and can be used as a reference from books, journals, scientific papers, and others.
2. Fotosintesis prespektif Al-Qur'an :
   a. Looking for Qur'anic verses about photosynthesis
   b. Looking for an explanation of the verses that have been found in the Tafsir book of the Ministry of Religion of the Republic of Indonesia
   c. Looking for an explanation of the verses that have been found in the Book of Tafsir Ayat Kauniyah fii tafsir Al-Qur'an by Zaghlul An-Najar

The primary data sources in this study are the book of Tafsir Ilmi of the Ministry of Religion of the Republic of Indonesia entitled Plants in the Perspective of the Qur'an and Science and the Book of Tafsir Ayat Kauniyah fii tafsir Al-Qur'an by Zaghlul An-Najar. Meanwhile, secondary data sources in this study include commentaries on the Qur'an, science books, articles, journals, and scientific writings that discuss morphology, plants, and photosynthesis.

After the data is collected, then analyze the data using the descriptive analysis method, that is, a method that reveals a problem by describing information obtained from all sources in a systematic manner.(Nazir, 1985) The analysis process is as follows: *First* describes the process of photosynthesis in the Qur'an according to the scientific interpretation of the Ministry of Religion of the Republic of Indonesia(AN, 2019). *Second* explain the verses about photosynthesis in the Qur'an according to Zhaghul An-Najar. *Third*, each of these explanations is juxtaposed to get differences and similarities from the discussion of the interpretation.

DISCUSSION

Photosynthesis in the interpretation of the Ministry of Religion of the Republic of Indonesia

The Ministry of Religion's interpretation reviews from a scientific perspective, plants are living things that produce energy. Plants play an important role in cleaning the air, keeping the air temperature relatively constant, and balancing the proportion of gases in the atmosphere(AN, 2015a). Plants produce oxygen that is sucked during the respiratory process of humans and animals. In the same way, plants provide most of the food and nutrient content necessary for these two living creatures to survive. Different from cells in humans and animals, plant cells have the ability to take advantage of sunlight directly by converting energy into chemical energy, which is then stored in the form of nutrients. This process is called photosynthesis.

Interpretation Analysis of the process of photosynthesis in the Qur'an can be done by referring to several verses that show the relationship between natural elements, such as water, light, and plants. The following verse that is relevant to the discussion is, where Allah says: ((LIPI), 2011)

1. QS. Al-An'am :99

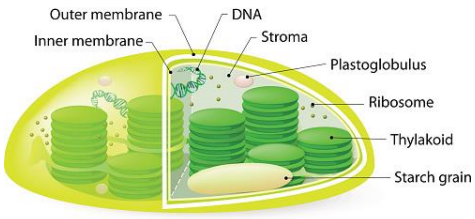
وَهُوَ الَّذِي أَنْزَلَ مِنَ السَّمَاءِ مَاءً فَأَخْرَجْنَا بِهِ نَبَاتَ كُلِّ شَيْءٍ فَأَخْرَجْنَا مِنْهُ خَضِرًا نُخْرِجُ مِنْهُ حَبًّا مُتَرَاكِبًا وَمِنَ النَّخْلِ مِنْ طَلْعِهَا قِنْوَانٌ دَانِيَةٌ وَجَنَّاتٍ مِنْ أَعْنَابٍ وَالزَّيْتُونَ وَالرُّمَّانَ مُشْتَبِهًا وَغَيْرَ مُتَشَابِهٍ ۗ انْظُرُوا إِلَىٰ ثَمَرِهِ إِذَا أَثْمَرَ وَيَنْعِهِ ۚ إِنَّ فِي ذَٰلِكُمْ لَآيَاتٍ لِقَوْمٍ يُؤْمِنُونَ

*"And He is the one who sent down rainwater from the sky, and We grew with it all kinds of vegetation, and We brought out from the vegetation **green plants**. We remove from the green plant a lot of grains; and out of the mayang korma unraveled the stalks that were outstanding, and the vineyards, and olives and pomegranates that were similar and unlike. Pay attention to the fruit when the tree bears fruit and (also pay attention) to its ripeness. Indeed, in such things there are signs (of Allah's power) for those who believe."*

The above surah explains photosynthesis and other plant growth processes. Here is an analysis of the interpretation for photosynthesis:

a. The Role of Water
   In this verse, Allah mentions that He is the One who sends down water from the heavens and produces various kinds of plants, including those that produce seeds and fruits(AN, Syakira, et al., 2024). The emphasis on the fact that God sent down water from heaven is a very important process of photosynthesis.
b. Green Plants
   In the Qur'an, Al-Khadir is often associated with the idea of "green substance", which refers to photosynthesis and chlorophyll. In the Indonesian translation, the meaning of the verse is very limited, namely "green plants" that have the ability to produce many products from it(AN, 2015b). In the English translation, the meaning more clearly leads to chloroplasts by referring to them as *"green substances"* related to plant growth and more easily associated with "green plants" that produce grains, fruits, and various plant parts This process is very important because it produces oxygen, which is essential for life on Earth, and glucose, which is a source of energy for plants and other living things.

Figure 1. Structure of chloroplast cells.



(Source: www.istockphoto.com)

c. Photosynthesis process

In photosynthesis, chlorophyll captures sunlight and converts it into chemical energy needed to make glucose from carbon dioxide and water. This process occurs in chloroplasts. The chemical reaction summarized is $6H_2O + 6CO_2 \rightarrow C_6H_{12}O_6 + 6O_2$, in which chlorophyll serves as a catalyst that allows the reaction to occur, producing glucose as an energy source for plants and oxygen as a by-product. The process of photosynthesis, which consists of two important phases: the Light reaction and the dark reaction. Light Reaction: Photosynthesis is the first stage of photosynthesis, which occurs in grana chloroplasts. Energy-carrying molecules such as ATP and NADPH require direct light energy to be created. This energy would then be used in the second stage, the Dark Reaction. Dark Reaction, the second stage of the process does not require direct light and usually occurs in the stroma of chloroplasts(AN, Khasanah, et al., 2024). Light reaction products such as ATP and NADPH are used to bind carbon dioxide molecules into C-C covalent bonds, producing carbohydrates. The new findings show that light actually stimulates the main enzymes in the Dark Reaction. Since the presence of light also affects this process, the term "Dark Reaction" is inappropriate.

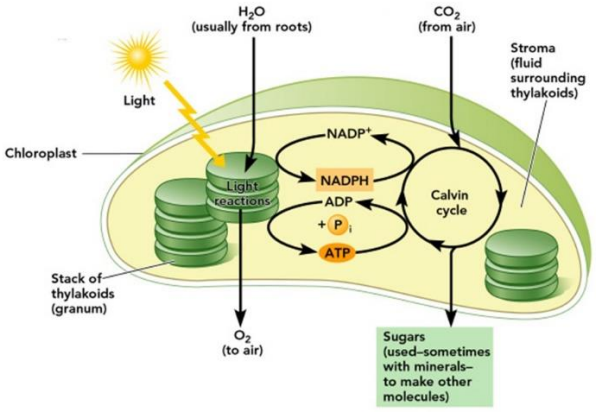
The process of photosynthesis occurs in the morning, when sunlight is most concentrated, also indicating when plant oxygen production reaches its peak. As mentioned in the Qur'an in QS. At-Takwir: 17-18, Allah said:

وَالَّيۡلِ اِذَا عَسۡعَسَ ۙ﴿۱۷﴾ وَالصُّبۡحِ اِذَا تَنَفَّسَ ۙ﴿۱۸﴾

"For the sake of the night when it is late, and for the sake of the dawn when the dawn has risen."

In English, the word *"idza tanaffas"* means when it breathes in, which if interpreted again in Indonesian means to take a breath. This state is a form of process that occurs in plants that is comparable to the situation when a person inhales or inhales oxygen deeply. The use of this English translation is used because it is felt more appropriate and can be seen to emphasize at dawn when the sun begins to set, which is the time when oxygen production begins, and at the current level of oxygen production reaches its peak(AN et al., 2022). Modern discoveries have supported the explanation that the productivity of photosynthesis is measured by the amount of oxygen gas produced. This suggests that the most productive working time is in the morning, when the sun is at its most. The plant begins to sweat and at dawn and will rest fully at night.

Figure 2. The process of photosynthesis in chloroplasts.



(Source: www.anakagronomy.com)

d. Plant Diversity

This verse also shows the diversity of agricultural products, such as grains, dates, grapes, olives, and pomegranates. This reflects the wealth of photosynthetic results that contribute to ecosystems and human needs. In the above verse *"Pay attention to the fruit when the tree bears fruit and (also pay attention) to its ripeness. Indeed, in such a thing there are signs (of Allah's power) for those who believe"*, emphasizing when the life cycle of plants, that is, when the process of fruit formation begins at the stage when the leaves are still green. This phase is closely related to the ripeness of the fruit, which is characterized when the leaves begin to turn yellow and the cells begin to die. At this stage, the plant stops forming new fruit because most of the plant's energy and resources have been diverted to ripening the existing fruit(Farisi & AN, 2023). This indicates the existence of a natural mechanism that regulates the growth cycle and maturity of plants, where leaf color change is an indicator of the final phase of fruit production.

Thus, Surah Al-An'ām verse 99 not only explains the process of plant growth, but also relates it to the scientific principles underlying photosynthesis, showing the relationship between faith and science.

2. QS. Al-Waqiah 71-72

أَفَرَءَيْتُمُ النَّارَ الَّتِى تُورُونَ ﴿٧١﴾ ءَأَنتُمْ أَنشَأْتُمْ شَجَرَتَهَآ أَمْ نَحْنُ الْمُنشِـُٔونَ ﴿٧٢﴾

*"So have you ever noticed about the fire you light **(with wood)?** Are you the one who grows the wood or are We the one who grows?"* (Al-Waqi'ah: 71-72)

There is a tendency that the verse relates photosynthesis and oxygen production. In science, *"syajara"* does not mean a tree or wood, but refers to the oxygen released during the process of photosynthesis. Chloroplasts and chlorophyll are present in every green plant. Chlorophyll is processed with carbon dioxide and water to produce carbon hydrates, glucose, and oxygen after absorbing sunlight(Rahmadianty & AN, 2023). During this process, plants use the carbohydrates

and glucose produced from the leaves to make flour, fat, and protein. The second product of photosynthesis is oxygen. Photosynthesis produces all the oxygen present on Earth, which is used for combustion and respiration.

Photosynthesis, a natural process that constantly produces food and oxygen for humans and animals, is a very complex process. Although this process has not been fully explained scientifically, the results are very real and beneficial. Photosynthesis is carried out by trillions of plant cells, also known as "green factories", which carry out complex chemical reactions that are very precise on a microscopic scale. In addition, it is emphasized that plants have converted solar energy into chemical or electrical energy, which can now only be done by humans with advanced technology. Invisible, every plant cell has an incredible ability to transform this energy.

In a spiritual context, this Tafsir Ilmi of the Ministry of Religion implies that this very complex and perfect system was created by Allah with the aim that humans can observe, understand, and realize His greatness(Salsabila & AN, 2024). Plant cells, which are very small and simple in appearance, are actually sophisticated "factories" that work automatically, non-stop, and with high precision. This is proof of God's power that should attract people's attention and contemplation.

3. QS. Yasin : 80

Surah Yasin (36:80) reads:

الَّذِي جَعَلَ لَكُمْ مِنَ الشَّجَرِ الْأَخْضَرِ نَارًا فَإِذَا أَنْتُمْ مِنْهُ تُوقِدُونَ

*"That is, God who made for you a fire out of **green wood**, so suddenly you light (fire) from that wood".*

The verse above contains the words *"Allah made for you fire from green wood"* which can be interpreted that there is a green substance on the tree. This substance plays a role in the growth of trees in producing wood. From the green wood, fire can be ignited. Tree growth involving green substances or called chlorophyll in science is a process of photosynthesis(Nirwana & Akhyar, 2019). From this process, trees produce food for their growth, thus producing twigs and branches that can be used as firewood. The following is an analysis of the photosynthesis process in QS. Yasin: 80 :

1. Green Trees and Photosynthesis
   This verse mentions *"green wood,"* which refers to chlorophyll, the green pigment in leaves that serves to capture sunlight necessary in the process of photosynthesis. The process of photosynthesis is the way plants convert light energy into chemical energy, which allows them to grow and produce organic matter. In the presence of light, plants can convert water and carbon dioxide into glucose and oxygen, which are the result of photosynthesis.
2. Use of Energy from Plants
   This verse also shows how humans use the results of photosynthesis, namely by using wood from trees to make fire. It reflects the relationship between humans

and nature, where humans benefit from the natural processes that occur in plants.

Thus, Surah Yasin verse 80 not only describes the process of photosynthesis, but also emphasizes the importance of plants in ecosystems and the relationship between Allah's creation and human needs(Suri & Nirwana AN, 2022). This verse suggests that green wood, which comes from plants that carry out photosynthesis, can be used to produce fire(Basir et al., 2022). This indicates the importance of oxygen and energy produced from the process of photosynthesis. Further, the process of photosynthesis is not only important for plants, but also for the ecosystem as a whole(Akhyar et al., 2021). Plants serve as major producers in the food chain, providing food and oxygen for animals and humans. In this context, the Qur'an hints that plants have a very important role in maintaining the balance of ecosystems and human life.

In this analysis, we can also see that the Qur'an provides a deep understanding of the natural processes that occur around us, which is in line with modern scientific discoveries. For example, the understanding of photosynthesis that has developed in modern science suggests that this process involves complex chemical reactions that take place inside chloroplasts, in which sunlight is used to convert water and carbon dioxide into glucose and oxygen(Anshara et al., 2024). Thus, the Qur'an not only hints at the process of photosynthesis, but also emphasizes the importance of plants in ecosystems and human life. This shows that the knowledge contained in the Qur'an can serve as a bridge between science and spirituality, inviting humans to better understand and appreciate Allah's creation.

Photosynthesis in the Tafsir of the Verse of Al-Kauniyah Fi Al-Qur'an Al-Karim by Zaghlul An-Najjar

1. QS. Al-An'am :99

According to Zaghlul An-Najjar on Surah Al-An'am verse 99, this verse provides an in-depth description of the process of creation and growth of plants as proof of Allah's power. Zaghlul An-Najjar explains how this verse contains scientific cues that invite us to understand natural mechanisms, such as photosynthesis and the water cycle, as a sign of God's greatness(Pratama et al., 2024). This interpretation aims to show that the verses of the Qur'an include science that continues to be relevant and in accordance with the progress of modern science. Zhaglul An-Najjar interprets Surah Al-An'am verse 99 as follows(An-Najjar, 2009):

The interpretation of Surah Al-An'am verse 99 provides a relevant explanation about the process of photosynthesis in the context of plant growth. In the word فَأَخْرَجْنَا مِنْهُ خَضِرًا the leaves appear from the seeds contained in the green dye called chlorophyll. Chlorophyll has the ability to absorb something in the amount of sunlight and convert it into chemical energy. Plant growth begins from germinated seeds, where the roots absorb water and nutrients from the soil, while the leaves capture sunlight and carbon dioxide from the atmosphere. This process allows plants to carry out photosynthesis, which produces chemical energy in the form of carbohydrates necessary for growth.

Plants use most of the carbohydrates produced from photosynthesis as food to provide the energy they need to grow. In addition, more of the carbohydrates that plants need are stored in cells as starchy substances and sugars, which are then used to produce grains, grains, and fruits.

Plants get the energy they need to grow is photosynthesis, a process in which carbohydrates combine with oxygen to release energy, carbon dioxide, and water. When plants are in bright sunlight, the rate of photosynthesis increases, and plants produce more carbohydrates and oxygen than they consume(Affani & An, 2024). The internal respiration rate increases during total darkness, so the plant consumes the carbohydrates it produces to burn it, producing the energy needed for growth in addition to carbon dioxide CO_2 and water H_2O. At dusk and dawn, the internal respiration process is balanced because photosynthesis produces enough carbohydrates and oxygen for internal respiration alone, but also produces carbon dioxide and water.

2. QS. Al-Waqiah 71-74

اَفَرَءَيتُمُ النَّارَ الَّتِى تُورُونَ ﴿٧١﴾ ءَاَنتُم اَنشَاتُم شَجَرَتَهَآ اَم نَحنُ المُنشِـُٔونَ ﴿٧٢﴾ نَحنُ جَعَلنٰهَا تَذكِرَةً وَّمَتَاعًا لِّلمُقوِينَ ﴿٧٣﴾ فَسَبِّح بِاسمِ رَبِّكَ العَظِيمِ ﴿٧٤﴾

"So have you ever noticed about the fire that you light (with wood)?, Are you the one who grows the wood or Are We the one who grows?"

Based on the classification made by Zaghlul an Najjar(An-Najjar, 2009), his interpretation of this verse is focused on five main themes that show the scientific aspects of the verses. The five themes include:

1. Scientific signs in the verses of the Qur'an
2. The role of chlorophyll as a source of energy and food
3. Carbohydrate formation through photosynthesis
4. The formation of vegetable proteins through the process of photosynthesis,
5. Green trees are the main source of energy.

At the beginning of the tafsir, Zaghlul An-Najjar explained how fire can be lit, then explained the importance of the role of green trees. Fire and green trees are closely related. In ancient times, the Arabs used wood from *the marakh* and *affar* trees to light a fire by rubbing two pieces of wood. This process produces fire from the friction of wood, which then develops into a variety of energy sources, including wood fuels, dry hay, charcoal, coal, oil, natural gas, as well as vegetable oils and animal fats. Green trees, through the process of photosynthesis, become a way for humans to understand the importance of solar energy(Faisal Purnomosidi et al., 2024). Plants show the essence of the existence of God-given energy, which has only been fully understood in modern science in the last few decades. Thus, green trees not only play a role in providing oxygen, but also become a symbol of God's greatness in providing an essential source of energy for life.

3. QS. Yasin : 80

الَّذِي جَعَلَ لَكُمْ مِنَ الشَّجَرِ الْأَخْضَرِ نَارًا فَإِذَا أَنْتُمْ مِنْهُ تُوقِدُونَ

It means: *"that is, God who made for you a fire out of **green wood**, so suddenly you light (fire) from that wood"*.

According to Zaghlul an Najjar, this 80th verse talks about the divine decree that produces fire from green trees. This sentence is a contradiction, because the fire we understand can be created using materials that tend to be dry or can also be in certain ways and green trees are usually damp and wet trees that can extinguish fires. Therefore, Zaghlul an Najjar begins this discussion with the process of the occurrence of the green tree with the term *"scientific instructions for this noble verse"*.

Zaghlul an Najjar explained the amazing process that occurs in green plants, namely, the process of photosynthesis. The process of photosynthesis requires sunlight, carbon dioxide, and water. In processing these materials to produce oxygen, plants need the role of chlorophyll that only green plants have(Cahyono et al., 2024). Chlorophyll is termed by Zaghlul an Najjar as *"yakhdhuru"* and chloropas by the term *"bilastiidaat"* or plastide. Plastids are one of the organelles found in plants and algae. These organelles are commonly called chloroplasts, that is, where photosynthesis occurs and have a double membrane (outer and inner).

Chlorophyll contained in plastides is formed with the help of sunlight and is used in the process of decomposing water into oxygen that occurs in plant leaves which are then released into the air. Meanwhile, carbon dioxide that reacts with hydrogen will be absorbed by plants and produce sugars, starches and carbohydrates(Akram et al., 2024). So it can be understood that QS. Yasin verse 80 explains the process of forming oxygen produced from green plants. Zaghlul an Najjār explained that the verse in the Qur'an, namely in the word *sajarah*, which used to be understood as referring to trees or firewood, can now be interpreted as an explanation of energy derived from organic materials, such as oil, gas, and firewood. This energy comes from the process of photosynthesis of green plants and plays an important role in human life. This verse not only discusses the creation of fire from green trees, but also describes the process of photosynthesis in plants. God gave plants the ability to absorb the sun's energy and convert water and carbon dioxide into oxygen(Kerwanto et al., 2024);(Elbashir et al., 2024);(Beni, 2024). This process also produces carbon, which is involved in the energy cycle between plants, animals, and humans(Uthman, 2024);(Heravi, 2024);(Hidayah et al., 2024). Photosynthesis produces oxygen that is essential for life, illustrating the vital role of plants in maintaining atmospheric balance.

Comparison of the Interpretation of the Interpretation of the Science of the Ministry of Religion of the Republic of Indonesia with the Tafsir of the Verse of Al-Kauniyah Fi Al-Qur'an Al-Karim by Zaghlul An-Najjar on Photosynthesis

The following is a longer explanation of the similarities and differences between the scientific interpretation of the Ministry of Religion of the Republic of Indonesia and the interpretation of Zaghlul An-Najjar:

Similarity of the Interpretation of the Interpretation of the Science of the Ministry of Religion of the Republic of Indonesia with the Interpretation of the Verse of Al-Kauniyah Fi Al-Qur'an Al-Karim by Zaghlul An-Najjar on Photosynthesis

The interpretation of the Tafsir Ilmi of the Ministry of Religion of the Republic of Indonesia with the Tafsir of the Verses of Al-Kauniyah Fi Al-Qur'an Al-Karim by Zaghlul An-Najjar has several similarities, namely they both integrate the verses of the Qur'an with the sciences, one of which is the phenomenon of photosynthesis. An explanation of the similarities between the two interpretations can be seen in the following table:

Table 1. Equation of Interpretation

Aspects	Tafsir Ilmi Kemenag RI	Tafsir Ayat Al-Kauniyah Fi Al-Qur'an Al-Karim
Tafsir Method	Using the maudhu'i method with a scientific pattern. Integrating modern science with the interpretation of the Qur'an. Scientific explanations dominate to clarify the scientific cues in the sentences.	Similar to the Tafsir Ilmi of the Ministry of Religion of the Republic of Indonesia, using the maudhu'i method with a scientific pattern. Include chemical terms to describe the process of photosynthesis according to verses related to plants and the power of God.
Use of sentences	Using verses describing plant growth and photosynthesis to show the relationship between religion and science.	Citing verses about plant growth and the process of photosynthesis, reinforces the scientific relevance in interpretation.
Science	Using images as an intermediary medium to help Understanding the meaning of scientific interpretation	Similar to the Tafsir Ilmi of the Ministry of Religion of the Republic of Indonesia, this tafsir adds an image to the explanation described

The Difference in the Interpretation of the Interpretation of the Science of the Ministry of Religion of the Republic of Indonesia with the Interpretation of the Verse of Al-Kauniyah Fi Al-Qur'an Al-Karim by Zaghlul An-Najjar on Photosynthesis

The Tafsir Ilmi of the Ministry of Religion of the Republic of Indonesia and the Tafsir Ayat Al-Kauniyah Fi Al-Qur'an Al-Karim by Zaghlul An-Najjar have several differences in their approaches and focus of interpretation. Although both use scientific methods in understanding Qur'anic verses related to natural phenomena,

each interpretation has different characteristics and emphasis. Further explanation can be seen in the following table:

Table 2. Differences in Interpretation

Aspects	Tafsir Ilmi Kemenag RI	Tafsir Ayat Al-Kauniyah Fi Al-Qur'an Al-Karim
Focus of Interpretation	Emphasizing the integration between religious teachings and science in social, cultural, and environmental contexts.	It focuses more on specific scientific explanations regarding the process of photosynthesis and its mechanisms.
Methodology	A comprehensive approach that spans a wide range of disciplines. Explaining photosynthesis as part of God's creation, in the context of ecosystems in general.	Using a detailed scientific approach, explain the mechanism of photosynthesis, including chlorophyll and its cycle step by step.
Sentence Usage	Using QS. Al-Waqiah with only two verses, as well as additions from QS. At-Takwir verses 17-18 which are not in the tafsir of An-Najjar.	Interpreting QS. Al-Waqiah with four verses to further detail the process of photosynthesis
Depth of Explanation	It tends to the social and spiritual implications of scientific knowledge about photosynthesis.	Provides a more in-depth scientific explanation of the mechanisms of photosynthesis, including the use of energy by plants.

These two interpretations complement each other in providing a broader understanding of the relationship between revelation and science. With their different approaches, they both contribute to a better understanding of how the Qur'an can be interpreted in the context of modern science, as well as how such knowledge can strengthen religious faith and practice.

CONCLUSION

Thus, we have learned about Photosynthesis in the Qur'an based on the scientific interpretation of the Ministry of Religion and the Tafsir of the Verse of Al-Kauniyah Fi Al-Qur'an Al-Karim by Zaghlul An-Najjar. In it, it is more dominant in discussing information that leads to the scientific knowledge of the Qur'an. Referring to the verses that can be concluded that:

1. The interpretation of Tafsir Ilmi Kamanag focuses on the word *al-kidzir*, both of which state that the word is interpreted as chlorophyll in modern science, namely as "green substance". The scientific interpretation of the Ministry of Religion explains the basics of science and combines the interpretation of the verse in QS. At-Takwir: 17-18 which explains about the morning air that affects the rate of photosynthesis, also several times uses foreign terms to make it easier to find explanations related to photosynthesis and pay attention to ecosystems and human needs. The same goes for QS. Al-Waqiah verses 71-72, underline the word *syajara* which in modern science is not interpreted as a tree but is interpreted as oxygen that is released during photosynthesis. And in QS. Jasin: 80 focuses on the word *"Allah made for you fire out of green wood"* which can be interpreted as having a green substance on the tree. The hiaju wood refers to chlorophyll, a green pigment in leaves that functions to capture sunlight needed in the process of photosynthesis. This verse shows how humans can utilize the results of photosynthesis by using wood from trees to make fire. This reflects the relationship between humans and nature, where humans benefit from natural processes that occur in plants.
2. Interpretation of Tafsir Ayat Al-Kauniyah Fi Al-Qur'an Al-Karim by Zaghlul An-Najjar, in QS. Al-Maidah: 99 emphasizes the word *khadzira* which is interpreted with chlorophyll, which is green dye. Zaghlul in this verse only focuses on the process of photosynthesis in the word by describing in detail how the working mechanism of photosynthesis and the energy it produces. This energy is used by plants to grow and develop. In contrast to Tafsir Ilmi Kamana, Surah Al-Waqiah Zaghlul interprets photosynthesis using verses 71-74, which are divided into five classifications, namely, scientific signs in the verses of the Qur'an, the role of chlorophyll as a source of energy, the formation of carbohydrates and proteins through photosynthesis, and green trees are the primary source of obtaining this energy. Zaghlul first explained about fire, then explained about the important role of green trees. This green tree will later carry out photosynthesis which will produce energy. Then in QS. Yasin verse 80 explains the amazing process that occurs in green plants, namely, the process of photosynthesis. Chlorophyll is termed by Zaghlul an Najjar as *"yakhdhuru"* and chloropas by the term *"bilastiidaat"* or plastide. Chlorophyll contained in plastides is formed with the help of sunlight and is used in the process of decomposing water into oxygen that occurs in plant leaves which are then released into the air. Zaghlul an Najjār explained that the verse in the Qur'an, namely in the word *sajarah*, which used to be understood as referring to trees or firewood, can now be interpreted as an explanation of energy derived from organic materials, such as oil, gas, and firewood. This energy comes from the process of photosynthesis of green plants and plays an important role in human life.
3. The similarity in the Tafsir Ilmi of the Ministry of Religion of the Republic of Indonesia and the Tafsir Ayat Al-Kauniyah Fi Al-Qur'an Al-Karim by Zaghlul An-Najjar About Photosynthesis is that both have a method of interpretation of maudhu'I and have a scientific pattern that integrates modern science with the interpretation of the Qur'an. Both include chemical terms in it that describe the

process of photosynthesis. In the use of verses, broadly speaking, both use the same verse. However, there are several differences such as the focus of research, the Tafsir Ilmi of the Ministry of Religion of the Republic of Indonesia emphasizes more on the integration aspect between religious teachings and science, uses a more comprehensive approach in interpretation, which covers various disciplines, and tends to the social and spiritual implications of scientific knowledge. Whereas, Zaghlul An-Najjar focuses on specific scientific explanations of the process of photosynthesis, takes a more detailed scientific approach, and provides a more in-depth explanation of scientific mechanisms, These two interpretations complement each other in providing a broader understanding of the relationship between revelation and science.

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