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Electromagnetic Radiation of Extra Virgin Olive Oil: A Scientific Reflection on the Qur'anic Verse of Light (Q. 24:35)

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ABSTRACT:

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Olive oil is one of the most widely consumed and popular vegetable oils, with numerous applications including in the food industry. Among the factors influencing its quality, environmental conditions, particularly light exposure, play a significant role. Light radiation can trigger specific processes within olive oil that lead to chemical changes and a decline in quality. In religious literature, especially within the Qur'an, olive oil holds a prominent status; notably, it is the only edible oil explicitly mentioned in the Qur'an. In verse 35 of Surah Al-Nūr, God draws a metaphor between His divine essence and light, establishing a symbolic connection between olive oil and illumination. The verse describes a light whose source is a blessed olive tree and further states that its oil is so luminous that it nearly gives light even without being touched by fire. The scientific investigation of this phenomenon forms the core objective of this study.

This research presents a Qur'anic interpretation informed by key lexical analysis, exegetical perspectives and recent scientific findings, focusing on a unique property of olive oil. Studies indicate that extra virgin olive oil is among the rare types of oils extracted not from seeds but directly from the olive fruit, resulting in a high concentration of chlorophyll. The chlorophyll content enables the oil to emit light under ambient illumination, particularly in the infrared and visible regions of the electromagnetic spectrum (with chlorophyll fluorescence occurring in the red region). Since the visible range of the electromagnetic spectrum spans wavelengths from red to violet (low

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to high energy), the light emitted by olive oil, depending on the intensity of surrounding light, approaches the threshold of human visual perception. In essence, olive oil can nearly emit light without contact with fire, a phenomenon remarkably echoed in verse 35 of Surah Al-Nūr.

KEYWORDS: The Qur'an and Science, Scientific Miracle, Scientific Interpretation, Olive Oil, Verse of Light.

1. Introduction

Scientific interpretation of the Qur'an involves elucidating concepts related to natural phenomena mentioned in the verses of the Qur'an through established scientific findings. Discussions surrounding the intersection of Qur'anic exegesis and contemporary science, particularly in relation to scientific miracles, have long attracted the attention of Islamic scholars and commentators. However, with the rapid advancement of empirical sciences in recent centuries, this field has gained even greater significance. Scientific interpretation is inherently interdisciplinary, requiring the integration of various fields such as Qur'anic studies, empirical sciences, Arabic literature, history, and more. Given the numerous verses in the Qur'an that reference natural phenomena, a precise explanation of these verses using the latest verified scientific discoveries is both necessary and valuable.

One notable topic within this domain is the mention of specific foods in the Qur'an, especially olives and their connection to divine revelation. The Qur'an refers to the olive fruit (Q. 80:29; 95:1; 6:99; 6:141; 16:11), the olive tree (Q. 24:35), and olive oil (Q. 24:35). The word olive (*zaytūn*) appears six times in the Qur'an; in five instances it appears alongside other fruits and foods, while only once (Q. 24:35) is olive oil mentioned independently. This verse draws a distinctive connection between olive oil and light, which is the focal point of this study.

اللَّهُ نُورُ السَّماواتِ وَ الْأَرْضِ مَثَلُ نُورِهِ كَمِشْكاةٍ فيها مِصْباحٌ الْمِصْباحُ في زُجاجَةٍ الزُّجاجَةُ كَأَنَّها كَوْكَبٌ دُرِّيٌّ يُوقَدُ مِنْ شَجَرَةٍ مُبارَكَةٍ زَيْتُونَةٍ لا شَرْقِيَّةٍ وَ لا غَرْبِيَّةٍ يَكادُ زَيْتُها يُضيءُ وَ لَوْ لَمْ تَمْسَسْهُ نارٌ نُورٌ عَلى نُورٍ يَهْدِي اللَّهُ لِنُورِهِ مَنْ يَشاءُ وَ يَضْرِبُ اللَّهُ الْأَمْثالَ لِلنَّاسِ وَ اللَّهُ بِكُلِّ شَيْءٍ عَليمٌ (النور/35)

Allah is the Light of the heavens and the earth. The parable of His Light is a niche wherein is a lamp the lamp is in a glass, the glass as it were a glittering star lit from a blessed olive tree, neither eastern nor western, whose oil almost lights up, though fire should not touch it. Light upon light. Allah guides to His Light whomever He wishes. Allah draws parables for mankind, and Allah has knowledge of all things (Q. 24:35)

The phrase "*whose oil almost lights up, though fire should not touch it*"

has intrigued scholars alike, suggesting that olive oil possesses an inherent luminosity or light-emitting quality. This study aims to investigate whether olive oil emits electromagnetic radiation, thereby providing a scientific basis for the metaphorical language used in the Qur'anic verse.

In physics, material light refers to all or part of the electromagnetic wave spectrum, with different segments of the spectrum corresponding to varying frequencies and energy levels. Electromagnetic radiation, such as sunlight or radio waves, consists of oscillating electric and magnetic fields. These waves travel through space at the speed of light (approximately 300,000 kilometers per second), and, depending on their frequency, encompass various types such as microwaves, visible light, X-rays, and radio waves. Although each type possesses distinct characteristics, they all belong to the electromagnetic spectrum and can be collectively referred to as light.

This study undertakes an interdisciplinary analysis of verse 35 of Surah al-Nūr, which references the luminous quality of olive oil. The research involves a detailed examination of the vocabulary used in the verse, interpretations offered by various exegetes, and the latest empirical findings regarding the optical properties of olive oil. Through this interdisciplinary Qur'anic inquiry, the study aims to offer a more precise understanding of the verse's meaning.

2. Literature Review

In the book *Olive in the Qur'an and Modern Medicine* by Khavari (2014), the therapeutic benefits of olive oil are discussed based on Qur'anic verses, prophetic traditions, and medical opinions. The author emphasizes Islam's encouragement of consuming olive oil and its numerous health benefits. Another book titled *Medicinal Properties of Qur'anic Plants and Fruits* by Vash (2015) explores various exegetical views on verse Q. 24:35. In addition to geographical context, the book highlights other aspects of olive oil. The article *An Overview of the Properties of Olive Plant from the Viewpoint of the Holy Qur'an and Narratives* by Sajadi Kaboudi et al. (2019) discusses the significance of olive oil from both Qur'anic and scientific viewpoints. It covers topics such as the importance of olives in Islamic texts, their medicinal properties, scientific validation of their benefits, and recommendations for their use.

In the article *Physiological Effects of Olive from the Viewpoint of Holy Qur'an and Nutrition* by Emam Jomeh et al. (2017), the authors examine the medicinal properties of olives. They conclude, based on religious texts and scientific studies, that olive compounds possess strong antioxidant

properties that help protect the body from disease. Baher (2002) investigates nutritional, medicinal, and historical aspects of olives with reference to Qur'anic verses. Hekmatpour and Khandan Barani (2018) examine Qur'anic references to various fruits. Scientific studies have shown that these fruits possess high antioxidant activity, suggesting that the Qur'an emphasizes healthy nutrition and the healing properties of certain foods. Taqavizadeh (2014) analyzes verse Q. 6:99 and related verses. She highlights the unique characteristics of each fruit mentioned in the verse and their differences in growth and ripening processes. The article *The Benefits of Olives and the Flammability of Their Oil from the Perspective of the Qur'an and Science* explores the significance of olives in the Qur'an. It references verse Q. 24:35 to highlight the exceptional properties of olive oil and the connection between scientific knowledge and Qur'anic teachings (Qur'anic Elites Network 2020). Gerami (2011) analyzes the symbolic meaning of olives in the Qur'an, particularly in relation to light, guidance, and spirituality in Islamic texts.

Although extensive research has been conducted on olives and their mention in the Qur'an, there remain unexplored aspects such as the issue of light emanating from olive oil without contact with fire, which will be addressed in this article.

3. Qur'anic Analysis

Before examining the exegetical views regarding the phrase "*yakādu zaytuhā yuḍīʾu wa law lam tamsashhu nār*" (Its oil would almost glow, even if untouched by fire), it is essential first to conduct a detailed lexical study of the key terms used in this expression.

3.1. Lexical Investigation: Zaytūn, Zayt & Ḍawʾ

The terms *zaytūn* and *zaytūnah* refer to both the olive tree and its fruit. Like the pair *shajar* and *shajarah*, which distinguish singular and plural for "tree," *zaytūnah* is the singular form of *zaytūn* (Qorashi 1992, 3: 190). While *zaytūn* occurs five times in the Qur'an, *zaytūnah* appears only once, in the description of a blessed olive tree that is "neither of the east nor of the west" (al-Rāghib al-Iṣfahānī 1991, 384). The term *zayt* means the oil of *zaytūn* and its verb form denotes the act of anointing or lubricating with oil. For example, the phrase *zittu raʾsaī* means "I oiled my head" (al-Farāhīdī 1990, 7: 378; Ibn Fāris 1984, 3: 39).

The term *ḍawʾ* signifies illumination or the act of lighting up (Qorashi 1992, 4: 202). It refers to making something clear and visible. Both *ḍawʾ*

and *ḍiyāʾ* mean "light" or "radiance." *ḍiyāʾ* specifically refers to something that becomes apparent and visible to the observer (al-Farāhīdī 1990, 7: 74). It is the emission from luminous bodies (al-Rāghib al-Iṣfahānī 1991, 514). Following this lexical analysis, the next section will explore the interpretations offered by various Qur'anic exegetes regarding this verse.

3.2. Exegetical Perspectives

Exegetes have offered diverse interpretations of the phrase *yakādu zaytuhā yuḍīʾu wa law lam tamsashhu nār* (Its oil would almost glow, even if untouched by fire). These views can be categorized into several thematic groups:

3.2.1. Symbolism of Purity and Divine Light

Some exegetes believe that olive oil is referenced due to its inherent purity, viewing it as a symbol of God's pure light. They emphasize the clarity of olive oil, which metaphorically reflects divine illumination. They highlight the Qur'anic description of the olive tree as "neither of the east nor of the west," interpreting this as a reference to its spiritual purity and its connection to divine light. Moreover, they highlight how the image of nearly self-illuminating oil stands for moral, spiritual, or divine purity; an exaggerated, symbolic praise that points beyond the physical object to a deeper truth.

Scholars in this group read the image primarily as a spiritual or symbolic assertion, an overstatement of its beauty, clarity, and high quality (al-Qurṭubī 1995, 12: 259). God Almighty described its oil as being "on the verge of emitting light even if fire had not touched it." This is because, when the oil is pure and unadulterated and is observed from a distance, it appears as if it possesses an intrinsic radiance. Consequently, when fire touches it, its luminosity is intensified upon an already luminous base. The olive oil itself varies according to the nature of its tree. If it is "neither of the east nor of the west," meaning it is exposed to the sun in all its states throughout the day, its olives mature more perfectly. Consequently, its oil is purer and more readily separable from its dregs, because the abundance of sunlight affects this. When these elements combine and cooperate, that light becomes pure and perfect, making it fitting to be established as a metaphor for the guidance of God (Fakhr al-Rāzī 1999, 23: 390). Another opinion is that its oil is not an oil from this limited, observable realm. Rather, it is another, wondrous kind of oil: "Its oil would almost glow, even if no fire touched it." Thus, it is transparent by its very essence and luminous by its very nature, to the extent that it almost illuminates without any combustion (Sayyid Quṭb 1991,

4: 2520).

3.2.2. Natural Purity and Reflective Qualities

This group focuses on physical causes like tree placement, sun exposure, oil clarity, and the lamp's glass and niche. These explanations show how natural and material conditions produce exceptionally clear, reflective oil that appears luminous and burns brilliantly. Those emphasizing natural, material causes present detailed physical explanations as mentioned in the following. They (the olives) are situated on level ground, in a vast, open, and elevated place, fully exposed to the sun. It is illuminated from the beginning of the day until its end so that its oil may be purer and more refined, as noted by several preceding scholars. It is for this reason that the Qur'an says "even if fire had not touched it," meaning, for the light of the oil's radiance (Ibn Kathīr 1998, 6: 55). The apparent context indicates that the intended meaning is the purity of the oil and its perfect readiness for combustion, and that this is contingent upon the two aforementioned attributes: "neither of the east nor of the west" (Tabataba'i 1996, 15: 124). Some scholars mention that the light of the lamp varies according to the difference in the fuel that ignites it. If that oil is pure and unadulterated, its condition is unlike its condition when it is turbid. Among combustible oils, none manifests the purity found in olive oil. It can reach a degree of clarity and fineness akin to water, yet with an added whiteness and a radiance shimmering within its parts (Fakhr al-Rāzī 1999, 23: 386).

The oil for this lamp is taken from an olive tree in an open plain, untouched by the eastern shadow when the sun sets or the western shadow when the sun rises. Rather, it accompanies the sun throughout the entire day, receiving its rays at both sunrise and sunset. It is thus both eastern and western, deriving its share from both attributes. Consequently, its oil is more luminous and purer. Alternatively, this may signify that the tree is not growing in the far east or far west of the inhabited world, but rather in Syria, whose olive oil is reputed to be the finest, so that "its oil is on the verge of glowing" even from behind its skin, "even if fire had not touched it." Thus, due to its purity and radiance, the oil itself is nearly luminous without any fire. It is through the combination of the niche, which concentrates the light; the glass, which intensifies it; the kindled lamp; and the pure oil, that the light attains its greatest strength. For without the niche, the light would scatter in all six directions; without the purity of the oil, its glow would not be dazzling; and without the glass, it would not be multiplied (Ṭanṭāwī al-Jawharī 2004, 12: 21; Makarem Shirazi 1995, 14: 476).

3.2.3. Natural Luminosity without Fire

These interpretations concentrate on the oil's intrinsic radiance or the idea that, by its nature, the oil seems to glow even before any flame touches it. They emphasize an almost-physical luminosity or pre-existing brilliance that makes the oil look as if it could emit light independently of combustion. A scholar mentions that based on its (olive oil's) purity and intense luminosity, "even if fire had not touched it," that is, prior to being reached by the fire and igniting (al-Ṭabrisī 1993, 7: 225). On account of its purity and superior quality, its oil virtually radiates light even in the absence of fire to ignite it (al-Ṭūsī, 2010, 7: 438). That is to say, it glows almost by its very essence, without any fire, due to its radiance and intense brilliance. "Light upon light" signifies multiplied or compounded light. For the light of the lamp is intensified in its illumination by the purity of the oil, the lustre of the glass, and the manner in which the niche confines its rays (al-Bayḍāwī 1997, 4: 107).

A comprehensive categorization of these interpretations is presented in Table 1, summarizing the exegetical views related to the phrase "Its oil would almost glow, even if untouched by fire."

Table 1. Categorization of exegetical views on the phrase "Its oil would almost glow, even if untouched by fire (Q. 24:35)

Commentators	Symbolism of purity and divine light	Natural purity and reflective qualities	Natural luminosity without fire
Al-Ṭabrisī			✓
Al-Qurṭubī	✓		
Fakhr al-Rāzī	✓	✓	
Ibn Kathīr		✓	
Tabataba'i		✓	
Al-Ṭūsī			✓
Al-Bayḍāwī			✓
Ṭanṭāwī al-Jawharī		✓	
Sayyid Quṭb	✓		
Makarem Shirazi		✓	

As shown in Table 1, even exegetes who adopted a scientific interpretive approach did not go beyond viewing the phrase "Its oil would almost glow, even if untouched by fire" as a metaphor for the reflective purity of olive oil. However, this interpretation confronts some considerations:

- Purity vs. reflectivity: Higher-quality olive oil, such as extra-virgin

olive oil, contains more natural compounds and thus is less pure in the chemical sense, resulting in reduced light reflectivity. Yet the verse, particularly the preceding phrase "lit from a blessed olive tree, neither of the east nor of the west," clearly refers to high-quality oil.

- Universality of light reflection: Light reflection is not exclusive to olive oil. Any oil, depending on its level of impurities, can reflect light. Therefore, interpreting the verse solely as a reference to light reflection does not uniquely highlight olive oil.
- Semantic precision of *yuḍīʾu*: The Qur'anic term *yuḍīʾu* (to give light) implies active emission rather than passive reflection. As discussed in the lexical analysis, this term denotes radiance and illumination, not mere reflectivity.

Given these three considerations, the next section will propose a scientifically grounded interpretation of olive oil's luminous properties, one that not only addresses the shortcomings of previous exegeses but also reveals a remarkable scientific insight embedded in the Qur'an over 14 centuries ago.

4. Recent Scientific Findings on the Optical Properties of Olive Oil

As mentioned in the introduction, the visible spectrum of electromagnetic waves spans wavelengths from approximately 700 nanometers (red) to 400 nanometers (violet). The lowest energy within this range corresponds to the red end of the spectrum, and electromagnetic waves with energies lower than red are not visible to the human eye.

Extra-virgin olive oil is extracted from the olive fruit, unlike many other oils that are derived from oilseeds. This type of olive oil possesses a complex chemical composition, one of its unique features being its high chlorophyll content. The presence of chlorophyll enables the oil to emit light when exposed to radiation across various regions of the electromagnetic spectrum, most notably in the red region.

4.1. Chlorophyll Fluorescence

Chlorophyll fluorescence in olive oil is a valuable tool for assessing the quality and condition of the oil, especially extra-virgin olive oil. This technique utilizes the distinctive fluorescence characteristics of chlorophyll and its derivatives to monitor changes caused by photo-oxidation and thermal degradation, and to differentiate between various types of olive oils.

The fluorescence properties of chlorophyll offer insights into degradation processes and the overall quality of the oil. Fluorescence spectroscopy, combined with multidimensional classification methods, can effectively monitor the storage conditions of extra-virgin olive oil within the chlorophyll spectral region. This approach allows for the distinction between light-exposed and non-exposed samples, as well as between heat-treated and untreated samples, indicating the formation of secondary oxidation products (Manzano et al. 2019).

In terms of optical properties, extra-virgin olive oil is distinct from other oils. This distinction is revealed through the detection of red fluorescence emission around 670 nanometers, a signature wavelength of chlorophyll. This method also highlights the oil's sensitivity to photodegradation under ambient light, a phenomenon less pronounced in refined oils (Hossain et al. 2020).

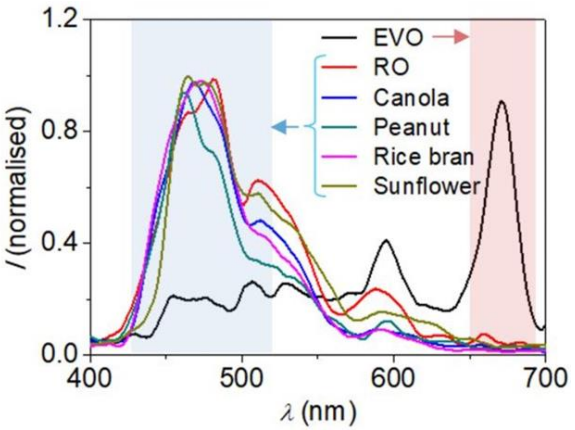

Figure 1. Fluorescence emission spectrum of various vegetable oils, highlighting the unique red emission of extra-virgin olive oil due to its significant chlorophyll content (Hossain et al. 2020).

As illustrated in Figure 1, the fluorescence emission wavelength specific to extra-virgin olive oil lies around 670 nanometers, which corresponds to the red region of the visible spectrum. In contrast, other vegetable oils, such as sunflower oil, canola oil, and peanut oil, exhibit fluorescence emissions in the wavelength range of 460 to 490 nanometers, located within the blue region of the visible spectrum.

The fluorescence associated with chlorophyll in extra-virgin olive oil under ambient light conditions is relatively weak and not visible to the naked eye. However, when stimulated with ultraviolet (UV) light, this chlorophyll fluorescence becomes visible to human vision (Ansar et al. 2023). As shown

in Figure 2, the intensity of chlorophyll fluorescence in different olive oil samples under UV radiation is presented. The higher the fluorescence intensity around the 673-nanometer wavelength, the greater the concentration of chlorophyll in that particular olive oil sample.

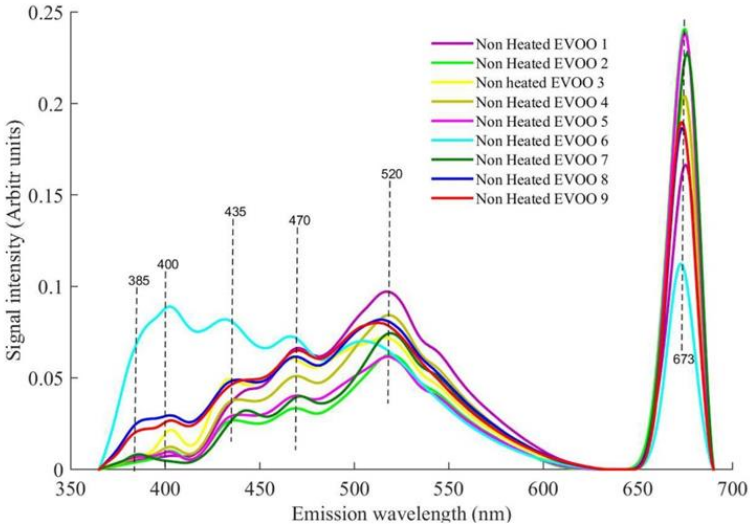

Figure 2. Chlorophyll fluorescence spectrum of nine different olive oil samples (Ansar et al. 2023).

4.2. Light Emission from Olive Oil under Electromagnetic Radiation

The emission of light from olive oil occurs when it is exposed to electromagnetic waves, particularly within the infrared and visible regions of the spectrum. This emission is most prominent in the area known as chlorophyll fluorescence. The light emitted from olive oil lies at the boundary of the visible spectrum, specifically within the red region, making it nearly perceptible to the human eye.

As a scientific summary, chlorophyll fluorescence in olive oil is recognized as a unique characteristic that reflects its optical behavior. The significant presence of chlorophyll in extra-virgin olive oil enables it to emit light in the red region of the electromagnetic spectrum when exposed to light. It is important to note that when the oil is exposed to ambient light (electromagnetic waves with low energy and intensity), the fluorescence in the red region exists but is not visible to the naked eye. However, if the oil is exposed to light with sufficient energy and intensity, such as UV radiation, the chlorophyll fluorescence becomes visible to the human eye.

5. Conclusion

The phrase "Its oil would almost glow, even if untouched by fire" (Q. 24:35) was examined through both Qur'anic and scientific lenses. The study began with a lexical analysis of the verse, followed by a categorization of exegetical views regarding its meaning and implications. As shown in the exegetical review, most exegetes, including those with a scientific interpretive approach, have interpreted the purity of olive oil as the reason for its light-reflecting properties, considering this as the intended meaning of the verse. However, this interpretation faces three critical challenges:

- The purer and higher-quality the olive oil (e.g., extra-virgin), the lower its light reflectivity due to increased natural compounds.
- Light reflection is not unique to olive oil; many oils can reflect light depending on their impurity levels.
- The Qur'anic term *yuḍīʾu* refers to active light emission rather than passive reflection, as confirmed by classical lexicons.

This study aimed to propose a more accurate interpretation of the verse, one that aligns closely with both the literal wording and the latest scientific findings. As discussed in the scientific section, extra-virgin olive oil contains a comparatively high concentration of chlorophyll among edible oils, which gives it a distinctive capacity to emit red fluorescence when excited by light in appropriate regions of the spectrum. When exposed to light, it radiates in the red region of the electromagnetic spectrum. Although this emission is not visible under low-intensity ambient light, it becomes perceptible to the naked eye when the oil is exposed to light of sufficient energy and intensity, such as ultraviolet radiation.

This phenomenon bears a striking semantic resemblance to the Qur'anic phrase "It nearly gives light, even if no fire touches it." It is evident that such a property of olive oil has only been discovered in recent years, thanks to significant advancements in precise scientific instrumentation, highlighting a remarkable aspect of the Qur'an's scientific insight.

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