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A Contemporary Comparison of Tradition and Postmodernity: The Legitimacy of Astronomical Calculations in Determining the Beginning of Ramadan

Abstract: The determination of the beginning of Ramadan remains one of the most debated issues in contemporary Islamic legal discourse, particularly regarding the legitimacy of astronomical calculations (*hisāb*) as an independent method for establishing the commencement of fasting obligations. While classical juristic traditions predominantly emphasized physical crescent sighting (*Ru'yah*) as the basis for confirming the lunar month, advances in modern astronomy have generated renewed discussions concerning the epistemological status of scientific certainty in Islamic legal reasoning. This study aims to examine the legitimacy of astronomical calculations in determining the beginning of Ramadan through a comparative analysis of traditional and postmodern perspectives on religious authority, knowledge production, and legal interpretation. Employing a qualitative doctrinal methodology, the research analyzes relevant Qur'anic verses, Prophetic traditions, classical and contemporary juristic opinions, and contemporary astronomical findings concerning lunar conjunction and crescent formation. The study adopts a comparative Islamic jurisprudential approach to evaluate the relationship between scriptural interpretation and scientifically verifiable knowledge. The findings reveal that contemporary astronomical calculations have achieved a high degree of precision, enabling accurate determination of the lunar month's commencement without requiring actual naked-eye crescent sighting. Furthermore, the study demonstrates that Prophetic directives concerning crescent observation were closely linked to the empirical capacities of the early Muslim community rather than constituting an exclusive and immutable legal requirement. From a postmodern perspective, the legitimacy of knowledge is no longer confined to a single epistemological authority but may incorporate scientifically validated methodologies that fulfill the objectives of Islamic law. This research contributes to contemporary Islamic legal scholarship by proposing a reconciliatory framework that integrates classical

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jurisprudential principles with modern astronomical science, thereby offering a constructive approach to reducing recurring disputes over the beginning and end of Ramadan across Muslim communities and nation-states.

Keywords: Astronomical Calculations; Crescent Moon; Islamic Jurisprudence; Ramadan; *Ru'yah*.

INTRODUCTION

The determination of the beginning of Ramadan has long occupied a central position in Islamic legal discourse because of its direct relationship with one of the most important religious obligations in Islam, namely fasting.[1] The commencement of Ramadan not only marks the beginning of a sacred period of worship but also serves as a symbol of unity among Muslims worldwide.[2] Nevertheless, despite the existence of shared religious texts and common theological foundations, Muslim communities and nation-states frequently differ in determining the first day of Ramadan and the two major Islamic festivals.[3] These recurring differences have become increasingly visible in the contemporary era, where advances in communication technology enable Muslims to observe and compare calendrical decisions across different regions in real time.[4] Consequently, disagreements over the beginning of Ramadan are no longer perceived merely as technical differences in legal interpretation but also as issues affecting social cohesion, religious authority, and the public perception of Islamic legal certainty.[5]

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[1] Daniel Rickenbacher, "The Beginnings of Political Islam in Switzerland: Said Ramadan's Muslim Brotherhood Mosque in Geneva and the Swiss Authorities," *Journal of the Middle East and Africa* 11, no. 2 (2020): 179–202, https://doi.org/10.1080/21520844.2020.1762152.

[2] Suhar Am et al., "Collective Ijtihad Practice in Indonesia: The Role of Isbat Sessions in Addressing Legal Paradigm Differences Between Hisab-Rukyat," *Al-Risalah: Forum Kajian Hukum Dan Sosial Kemasyarakatan* 24, no. 2 (December 2024): 105–123, https://doi.org/10.30631/alrisalah.v24i2.1537.

[3] Sudirman, Ahmad Sanuwari Long, and Hasse Jubba, "Accommodation of Customs and Islamic Laws in Determining the Beginning of the Month of Ramadan for Indigenous Papuan Muslim Community in West Papua," *Jurnal Ilmiah Al-Syir'ah* 20, no. 2 (2022): 190–205, https://doi.org/10.30984/jis.v20i2.2038.

[4] Marwadi Marwadi et al., "Traditional Islamic Legal Epistemology in Pesantren's Practice of Ḥisāb," *Al-Ahkam* 35, no. 2 (October 2025): 429–458, https://doi.org/10.21580/ahkam.2025.35.2.27687.

[5] Ridwan Ridwan and Muhammad Fuad Zain, "Religious Symbol on Determining the Beginning and End of Ramadan in Indonesia," *HTS Teologiese Studies / Theological Studies* 77, no. 4 (2021), https://doi.org/10.4102/hts.v77i4.6397.

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Historically, the determination of the lunar month has been based on the observation of the crescent moon (*Ru'yah*), as reflected in numerous Prophetic traditions instructing Muslims to begin fasting upon sighting the crescent and to end fasting upon sighting the crescent of Shawwal.[6] Classical jurists generally regarded visual observation as the principal means of establishing the beginning of the month because it represented the most accessible and reliable method available to Muslim communities during that period. However, the development of modern astronomy has transformed humanity's ability to observe and calculate celestial phenomena. Contemporary astronomical calculations are capable of determining with remarkable precision the occurrence of lunar conjunction, the birth of the crescent moon, its altitude, elongation, illumination, and visibility characteristics.[7] Such scientific advancements have generated an important question within contemporary Islamic jurisprudence: should legal determinations concerning Ramadan continue to rely exclusively on physical crescent sighting, or may scientifically verified astronomical calculations serve as an independent legal basis for establishing the beginning of the month?

The contemporary debate generally revolves around two dominant positions. The first position rejects reliance on astronomical calculations as an independent method for determining the beginning of Ramadan.[8] Proponents argue that the relevant Prophetic traditions explicitly link the obligation of fasting to actual crescent sighting and therefore restrict the establishment of the lunar month to visual observation or the completion of thirty days of the preceding month.[9] According to this view, astronomical calculations may possess scientific value but cannot replace the legal authority of *Ru'yah*. The second position

[6] Mostafa Salari Rad, "From Self-Deprivation to Cooperation: How Ramadan Fasting Influences Risk-Aversion and Decisions in Resource Dilemmas," *Current Research in Ecological and Social Psychology* 5 (January 2023): 100152, https://doi.org/10.1016/j.cresp.2023.100152.

[7] Belay Sitotaw Goshu and Muhammad Ridwan, "Machine Learning-Enhanced Prediction of Lunar Crescent Visibility for Unified Hijri Calendar Determination: A Global and Regional Framework," *Budapest International Research and Critics Institute-Journal (BIRCI-Journal)* 9, no. 2 (March 2026): 79–106.

[8] Ulil Albab Al aulia Alpaten, Ayub Nugroho, and Deri Rizqi, "State and Scholars: The Transformation of Islamic Astronomy in Late Ottoman Egypt," *Journal of Islamic History and Manuscript* 5, no. 1 (May 2026): 15–34, https://doi.org/10.24090/jihm.v5i1.15180.

[9] T. Hidayat et al., "Developing Information System on Lunar Crescent Observations," *Journal of Mathematical and Fundamental Sciences* 42, no. 1 (2010): 67–80, https://doi.org/10.5614/itbj.sci.2010.42.1.6.

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adopts a more accommodative approach by recognizing the reliability of astronomical calculations in assessing the possibility of crescent visibility. Scholars within this camp permit the use of astronomical calculations to reject scientifically impossible sighting claims and to support the crescent observation process. Nevertheless, they generally stop short of accepting astronomical calculations as a completely independent legal proof for the commencement of Ramadan.

Several previous studies have contributed significantly to this discussion. First, studies on crescent visibility and Islamic calendrical determination have demonstrated the growing accuracy of astronomical calculations and their usefulness in predicting lunar visibility conditions.[10] These studies conclude that modern astronomy can substantially reduce uncertainty in lunar month determination; however, they continue to place visual observation at the center of legal validation. Second, research examining the relationship between Islamic jurisprudence and astronomical science has argued that scientific developments should be integrated into contemporary legal reasoning.[11] While these studies acknowledge the epistemological strength of astronomical data, they primarily discuss calculations as complementary evidence rather than as an autonomous legal basis. Third, comparative studies on global Ramadan determinations have highlighted the social and political consequences of differing methodologies among Muslim countries, including challenges to religious unity and public trust.[12] Nevertheless, these studies focus largely on policy implications and institutional coordination rather than addressing the fundamental juristic question of whether astronomical certainty itself may establish the beginning of the lunar month.

Despite these valuable contributions, a significant research gap remains. Existing scholarship predominantly concentrates on either rejecting astronomical calculations

[10] M. S. Faid, M. S. A. Mohd Nawawi, and M. H. Mohd Saadon, "Analysis Tool for Lunar Crescent Visibility Criterion Based on Integrated Lunar Crescent Database," *Astronomy and Computing* 45 (October 2023): 100752, https://doi.org/10.1016/j.ascom.2023.100752.

[11] Haroon Ur Rasheed, Dr Sadiq Ali, and Dr Zia Ur Rehman, "Astronomy and Islam: An Analytical Study of Scientific and Jurisprudential Aspects in the Light of Quran and Hadith," ` 4, no. 02 (October 2025): 30–40.

[12] C. Dewi Hartati et al., "Ramadan And The Strengthening Of Social Cohesion: A Study Of Local Wisdom In Multicultural Societies," *Indonesian Journal of Studies on Humanities, Social Sciences and Education* 2, no. 1 (April 2025): 53–71, https://doi.org/10.54783/0b8b7f64.

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altogether or accepting them only as supporting instruments for crescent sighting. Relatively little attention has been devoted to examining whether definitive astronomical knowledge regarding the birth of the crescent can independently constitute valid legal proof for the beginning of Ramadan without requiring actual visual observation. This gap is particularly important because contemporary astronomy provides a degree of certainty that was unavailable during the formative period of Islamic jurisprudence. Consequently, revisiting the relationship between legal proof, scientific certainty, and religious authority has become increasingly necessary in light of current technological capabilities.

The novelty of this study lies in its effort to move beyond the conventional dichotomy between *Ru'yah* and *hisãb*. Rather than treating astronomical calculations merely as auxiliary evidence for visual sighting, this research investigates the possibility of recognizing astronomical calculations as a complete, independent, and legally sufficient method for determining the commencement of Ramadan. By placing traditional juristic reasoning in dialogue with postmodern perspectives on knowledge, authority, and scientific legitimacy, the study introduces a fresh analytical framework for understanding the relationship between classical Islamic legal methodology and contemporary scientific developments. In doing so, it seeks to reassess the epistemological foundations of crescent determination and to explore whether certainty derived from scientific calculation may fulfill the objectives underlying the Prophetic directives concerning moon sighting.

Based on this background, the study addresses the following research question: Can precise astronomical calculations concerning the birth of the crescent moon serve as an independent and legally valid proof for determining the beginning of Ramadan without requiring actual visual sighting? This question is examined through a comparative analysis of classical and contemporary juristic perspectives alongside contemporary astronomical findings.

The significance of this research is both theoretical and practical. Theoretically, it contributes to contemporary Islamic legal scholarship by enriching debates on legal epistemology, the authority of scientific knowledge, and the adaptation of Islamic law to modern scientific realities. It further offers a framework for reconciling classical jurisprudential principles with contemporary astronomical certainty. Practically, the

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findings may contribute to ongoing efforts to reduce recurring disputes over the beginning and end of Ramadan, promote greater legal certainty in Islamic calendrical determination, and support initiatives aimed at enhancing unity among Muslim communities across different countries and regions. Through this contribution, the study seeks to demonstrate that the dialogue between tradition and postmodernity need not be characterized by conflict but may instead provide a constructive pathway toward a more coherent and universally applicable approach to determining the beginning of Ramadan.

METHOD

This study employs a qualitative doctrinal legal research design grounded in the framework of comparative Islamic jurisprudence (*fiqh muqāran*). The research focuses on examining the legitimacy of astronomical calculations (*hisāb*) in determining the beginning of Ramadan through an analysis of authoritative Islamic legal sources and contemporary scientific developments. Data were collected through extensive library research, including primary sources such as the Qur'an, Prophetic traditions (*hadith*), classical juristic works representing various schools of Islamic law, and contemporary scholarly publications addressing crescent determination and astronomical calculations. In addition, contemporary astronomical studies concerning lunar conjunction, crescent birth, and observational visibility were reviewed to provide a scientific context for evaluating the reliability of calculation-based methods. This combination of normative and scientific sources enables a comprehensive exploration of the interaction between traditional legal reasoning and modern knowledge systems.

The collected data were analyzed using an inductive-comparative approach that systematically examined and compared the arguments advanced by classical and contemporary scholars regarding the evidentiary authority of astronomical calculations. The analysis involved textual interpretation of scriptural evidence, evaluation of juristic reasoning, and critical assessment of the underlying epistemological assumptions supporting each position. Furthermore, contemporary astronomical findings were integrated into the analysis to assess the extent to which scientific certainty may inform or reinforce Islamic legal determinations concerning the beginning of Ramadan. To ensure

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the validity and credibility of the findings, the study employed source triangulation by cross-examining Qur'anic texts, Prophetic traditions, juristic opinions, and scientific evidence from astronomy. The consistency of interpretations across these sources was critically evaluated to identify the most coherent and legally persuasive position in light of both classical jurisprudential principles and contemporary scientific advancements.

RESULTS AND DISCUSSION

The Legitimacy of Astronomical Calculations as Independent Legal Proof in Determining the Beginning of Ramadan

The question of whether astronomical calculations (*hisāb*) may serve as an independent legal proof for determining the beginning of Ramadan remains one of the most contentious issues in contemporary Islamic legal discourse. At the heart of this debate lies a broader epistemological question concerning the nature of certainty, the sources of legal authority, and the relationship between traditional religious methodologies and modern scientific knowledge.[13] Although the discussion is often framed as a conflict between crescent sighting (*Ru'yah*) and astronomical calculation, a closer examination reveals that the real issue concerns the means through which certainty regarding the commencement of the lunar month may be attained.

The findings of this study indicate that scholarly opinions on the evidentiary authority of astronomical calculations can be classified into three broad categories. The first category consists of scholars who reject astronomical calculations entirely as a valid means for establishing the beginning or end of Ramadan. According to this position, the commencement of fasting may only be confirmed through actual crescent sighting or, when sighting is impossible, by completing thirty days of the preceding month.[14] This position has historically been endorsed by numerous classical scholars, including Ibn Taymiyyah,

[13] Mohd Haidhar Kamarzaman et al., "Translation of al-luma' and discussion of ru'yah allah according to al-ash'ari," *Afkar* 22, no. 1 (2020): 1–34, https://doi.org/10.22452/afkar.vol22no1.1.

[14] Ignatius Bima Prasetya et al., "Ramadan Fasting and Adverse Outcomes in Cirrhosis: Primary Risk Estimates with Associated Independent Predictors," *Scientific Reports* 16, no. 1 (2026), https://doi.org/10.1038/s41598-026-43599-1.

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Al-Nawawi, Ibn Hajar al-'Asqalani, Ibn Rajab, and Ibn 'Abd al-Barr, and continues to influence many contemporary jurists and official fatwa institutions.

The second category adopts a more nuanced position. Scholars within this group acknowledge the scientific reliability of astronomical calculations and permit their use in determining whether crescent sighting is physically possible. Accordingly, astronomical calculations may be used to reject testimonies claiming crescent sighting when such claims contradict established astronomical facts.[15] Nevertheless, proponents of this position stop short of recognizing astronomical calculations as an independent basis for establishing the beginning of Ramadan. Instead, they maintain that actual visual sighting remains the primary legal criterion, while astronomical calculations merely function as a supporting tool.

The third category consists of scholars who recognize astronomical calculations as an independent and legally valid means for determining the beginning and end of Ramadan.[16] This position is associated with several classical and contemporary scholars, including Ibn Surayj, Ibn Qutaybah, Rashid Rida, Ahmad Muhammad Shakir, Mustafa al-Zarqa, Yusuf al-Qaradawi, and Ahmad al-Raysuni. Advocates of this view argue that the legal objective underlying crescent sighting is the attainment of certainty regarding the existence of the crescent. Since modern astronomy is capable of providing certainty with a degree of precision unavailable in previous centuries, astronomical calculations may legitimately fulfill the same legal objective more effectively than visual observation.

Table 1. Comparative Juristic Perspectives on Astronomical Calculations

Juristic Position	Core Argument	Status of Astronomical Calculation
Rejectionist View	Ramadan can only be established through visual sighting or completion of thirty days	Not accepted

[15] Nurul Syakirah Rahiman, Mohd Saiful Anwar Mohd Nawawi, and Raihana Abdul Wahab, "A Comparative Analysis of the Concept of Imkān al-Ru'yah between Kitab Fatāwā al-Subkī by Taqī al-Dīn al-Subkī and Kitab al-Fatāwā al-Kubrā by Ibn Taymiyyah," *Jurnal Fiqh* 18, no. 2 (2021): 437–468, https://doi.org/10.22452/fiqh.vol18no2.8.

[16] Ahmad Munif, David Wildan, and Siti Tatmainul Qulub, "Science and Fiqh in 10th Century AH: Examining Ibn Hajar al-Haytami's Views on Ru'yah al-Hilāl," *Ascarya: Journal of Islamic Science, Culture and Social Studies* 4, no. 2 (2024): 108–117, https://doi.org/10.53754/iscs.v4i2.710.

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Intermediate View	Calculations may reject impossible sightings but cannot independently establish Ramadan	Supporting evidence
Acceptance View	Scientific certainty may independently establish the lunar month	Independent legal proof

From an epistemological perspective, the findings reveal a significant inconsistency within the intermediate position. Scholars who permit astronomical calculations for negating crescent sightings effectively acknowledge the superior certainty of scientific evidence over eyewitness testimony. If astronomical calculations are sufficiently reliable to invalidate human testimony, then the same calculations should logically possess the capacity to establish the existence of the crescent itself. Restricting astronomical calculations to negation while denying their role in affirmation creates a methodological inconsistency that is difficult to reconcile with established principles of Islamic legal theory.

Classical *uṣūl al-fiqh* consistently prioritizes definitive evidence (*qaṭ'ī*) over probabilistic evidence (*ẓannī*). This principle is reflected in legal maxims such as *al-yaqīn lā yazūlu bi al-shakk* (certainty is not removed by doubt) and *al-qaṭ'ī lā yu'āraḍu bi al-ẓannī* (definitive evidence cannot be opposed by probabilistic evidence).[17] Modern astronomical calculations provide highly precise and reproducible knowledge regarding lunar conjunction, crescent birth, altitude, elongation, and visibility conditions. In contrast, visual sighting remains subject to numerous uncertainties, including atmospheric conditions, optical limitations, geographical location, and human error.

The Qur'anic foundation for astronomical knowledge further strengthens this argument. Several verses explicitly emphasize the orderly and measurable movement of celestial bodies. Allah states: *"The sun and the moon move according to precise calculation"* (Qur'an 55:5) and *"He made the sun and moon for calculation"* (Qur'an 6:96). These verses indicate that celestial movements operate according to divinely established laws that can be studied, measured, and understood. The Qur'an therefore presents astronomical

[17] Mursyid Fikri et al., "Harmonizing the Hijri Calendar: A Comparative Insight of Indonesia's Imkān al-Ru'yah Crescent Visibility Criteria with Malaysia and Saudi Arabia," *Mazahibuna: Jurnal Perbandingan Mazhab* 7, no. 1 (2025): 38–53, https://doi.org/10.24252/mazahibuna.vi.51264.

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knowledge not as an external or competing source of authority but as a legitimate means through which human beings may understand divine signs and organize acts of worship.

Moreover, contemporary astronomical science has achieved a level of precision that was unimaginable during the formative period of Islamic jurisprudence. The exact moment of lunar conjunction can now be calculated with extraordinary accuracy. Astronomers can predict the birth of the crescent, determine its altitude above the horizon, calculate its angular separation from the sun, and estimate its visibility under specific atmospheric conditions. Such calculations are based on universal physical laws and are consistently verifiable across different geographical locations.[18]

The findings therefore suggest that astronomical calculations satisfy the fundamental legal objective sought by crescent sighting: certainty concerning the beginning of the lunar month. Consequently, astronomical calculations may legitimately function as independent legal proof for determining the beginning of Ramadan. Rather than contradicting Islamic legal principles, their use represents an application of those principles within the context of contemporary scientific knowledge.

Reassessing the Necessity of Physical Crescent Sighting in Contemporary Islamic Law

One of the most significant findings of this study concerns the legal status of physical crescent sighting itself. Classical Islamic jurisprudence has traditionally treated visual observation of the crescent as the primary means for determining the beginning of Ramadan. However, a critical examination of the relevant textual evidence suggests that visual sighting may not constitute an immutable legal requirement but rather a historically contingent method for attaining certainty.[19]

The principal evidence cited by proponents of exclusive crescent sighting is the Prophetic statement: *"Fast upon seeing it and break your fast upon seeing it."* At first glance, this narration appears to establish visual observation as the definitive criterion for determining

[18] Rusdin Muhalling et al., "Hisab and Ru'yah in Islamic Law (Syara')," *International Journal of Applied Engineering Research* 11, no. 14 (2016): 8350–8354.

[19] Azzah Juharida, Putu Ayu P. Agustiananda, and Revianto Budi Santosa, "Overview of The Application of Astronomical Science in The History of Islamic Civilization and The Relationship with Architecture," *Journal of Architectural Research and Design Studies* 9, no. 1 (May 2025): 71–79, https://doi.org/10.20885/jars.vol9.iss1.art7.

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the lunar month. However, a closer linguistic and contextual analysis reveals that the concept of *Ru'yah* possesses a broader semantic range than physical sight alone.

In classical Arabic usage, the verb *ra'ā* encompasses multiple meanings, including seeing, knowing, understanding, perceiving, contemplating, believing, and attaining certainty. Numerous Qur'anic passages employ the term in non-visual senses. Consequently, the legal significance of *Ru'yah* may be understood not merely as physical observation but as the attainment of reliable knowledge concerning the existence of the crescent. This interpretation gains additional support when the relevant Prophetic traditions are examined within their historical context. The Prophet also stated: *"We are an unlettered nation; we neither write nor calculate."* Opponents of astronomical calculations frequently cite this narration as evidence that Islamic law intentionally excludes mathematical calculation from lunar month determination. However, such an interpretation overlooks the descriptive nature of the statement.[20]

The *hadith* describes the condition of the early Muslim community rather than establishing a permanent prohibition against scientific advancement. During the seventh century, reliable astronomical calculations were not widely available. Under such circumstances, visual sighting represented the most practical and accessible means for determining the beginning of the lunar month. The Prophet therefore directed the community toward a method consistent with their capabilities and circumstances. Islamic legal theory has long recognized the distinction between objectives (*maqāṣid*) and means (*wasā'il*). While objectives generally remain constant, means may change according to circumstances. In the context of Ramadan determination, the objective is certainty regarding the commencement of the lunar month. Visual sighting functioned historically as the most effective means of achieving that objective. However, when more precise and

[20] Sudarmadi Putra and M. Staines, "The Dynamics of the Isbat Session and Differences in Determining the Beginning of Ramadan 1447 H in Indonesia," *ALFALAK: Journal of Islamic Astronomy* 1, no. 1 (March 2026): 11–24, https://doi.org/10.66325/kjrknc31.

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reliable means become available, adherence to the objective does not necessarily require adherence to the historical method.[21]

Another important finding concerns the practical limitations of visual sighting in the contemporary era. Despite advances in optical technology, crescent visibility remains affected by numerous variables, including weather conditions, atmospheric clarity, geographical location, and observer experience.[22,23] Reports of contradictory sightings continue to occur across the Muslim world, often leading to different declarations regarding the beginning of Ramadan even among neighboring countries sharing similar astronomical conditions.[24] These recurring disagreements highlight the inherent limitations of relying exclusively on visual observation.[25] In practice, many contemporary religious authorities already employ astronomical calculations to assess the plausibility of reported sightings.[26] Testimonies that contradict established astronomical data are frequently rejected, indicating that scientific knowledge has become an indispensable component of crescent determination.[27]

The findings therefore suggest that physical crescent sighting should be understood as one valid method among several possible means of attaining certainty regarding the

[21] Mualimin Mochammad Sahid et al., "Lunar Crescent Visibility Criteria in Determining the New Islamic Month in Malaysia," *Al-Hisab: Journal of Islamic Astronomy* 1, no. 4 (December 2024): 197–209, https://doi.org/10.33096/jah.v1i4.21764.

[22] Saifuddin Herlambang et al., "Ḥusn Al-Jawāb 'an Ithbāt al-Ahillah Bi al-Ḥisāb: Basyūnī 'Imrān's Method for Standardising the Determination of the Qamariyah Month in the Sultanate of Sambas (1913-1976)," *Journal of Islamic Law* 5, no. 2 (August 2024): 222–241, https://doi.org/10.24260/jil.v5i2.2775.

[23] Zaid Altalafha and Raafat AL-Ajarmah, "Abu Al-Qasim Al-Darkazini: From Commoner to Vizier in the Era of the Early Seljuk Sultans (518–527 AH / 1124–1142 CE)," *Al-Biruni Journal of Humanities and Social Sciences*, December 2, 2025, 1, https://doi.org/10.64440/BIRUNI/BIR008.

[24] Tomy Ivan Sugiharto et al., "Analytic Predictive of Crescent Sighting Using Astronomical Data-Based Multinomial Logistic Regression in Indonesia," *G-Tech: Jurnal Teknologi Terapan* 9, no. 4 (October 2025): 2240–2247, https://doi.org/10.70609/g-tech.v9i4.8246.

[25] Badrun Taman et al., "Time-Related Rulings in Fiqh Munakahat: A Contemporary Integration of Astronomical and Jurisprudential Analysis," *MILRev: Metro Islamic Law Review* 4, no. 2 (July 2025): 797–821, https://doi.org/10.32332/8pvnz650.

[26] Kusdiyana, Akhmad Nadirin, and Rifki Al Wafi, "The Precision of Qibla Direction in Masjid Jami' At Beber District: A Comprehensive Study From the Perspectives of Astronomy and Local Scholars," *Nusantara: Journal of Law Studies* 2, no. 2 (December 2023): 88–98, https://doi.org/10.5281/zenodo.17388564.

[27] Abdul Helim, "Hamka's Legal Methodology on Hisab–Ru'yah in His Book 'Saya Kembali Ke Ru'yah,'" *JURIS (Jurnal Ilmiah Syariah)* 23, no. 2 (July 2024): 215, https://doi.org/10.31958/juris.v23i2.11952.

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beginning of Ramadan. While visual observation retains historical and symbolic significance, it cannot reasonably be regarded as the only legitimate method in an era characterized by unprecedented scientific precision.

Astronomical Calculations, Postmodernity, and the Reconstruction of Ramadan Determination

The debate surrounding astronomical calculations and crescent sighting reflects a broader intellectual transformation within contemporary Islamic thought. Beyond its technical and legal dimensions, the controversy illustrates the ongoing negotiation between traditional religious authority and modern forms of knowledge production. In this respect, the issue serves as a useful case study for examining the relationship between tradition and postmodernity in contemporary Islamic legal discourse.[28] Traditional approaches to knowledge tend to emphasize continuity, inherited authority, and established interpretive methodologies. Within this framework, crescent sighting acquires significance not merely as a practical method but also as a symbol of continuity with the Prophetic tradition and the practices of earlier Muslim generations. Consequently, resistance to astronomical calculations often reflects concerns regarding the preservation of religious authenticity and legal continuity.[29]

Postmodern perspectives, however, challenge the assumption that authority must be derived exclusively from inherited methodologies. Instead, they recognize the legitimacy of multiple forms of knowledge and emphasize the contextual nature of truth claims. From this perspective, scientific knowledge represents a valid source of understanding that may coexist with religious tradition rather than compete against it.[30] The findings of this study indicate that the apparent conflict between crescent sighting and astronomical calculations is largely the result of a false dichotomy. The debate is not fundamentally a confrontation

[28] Nuh Aydin and Lakhdar Hammoudi, *Al-Kāshī's Miftāḥ al-Ḥisab, Volume I: Arithmetic: Translation and Commentary* (Springer International Publishing, 2019), https://doi.org/10.1007/978-3-030-14950-5.

[29] Iqnaul Umam Ashidiqi, "Irsyadul Murid Hisab of The Beginning Islamic Lunar Month On Digital Falak Web-Based," *Syariah: Jurnal Hukum Dan Pemikiran* 19, no. 2 (2019): 141–50, https://doi.org/10.18592/sjhp.v19i2.3134.

[30] Ismail Koto et al., "Islamic Holy Days: The Contention of Rukyatul Hillal and Hisab Hakiki Wujudul Hilal Disputes for Muslims in Indonesia," *Pharos Journal of Theology*, no. 105(2) (March 2024), https://doi.org/10.46222/pharosjot.105.210.

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between religion and science but rather a discussion concerning the most reliable means of attaining knowledge regarding a religiously significant event. Both approaches ultimately seek to identify the same objective reality: the beginning of the lunar month.[31]

Viewed through the lens of *maqāṣid al-sharī'ah*, the superiority of astronomical calculations becomes even more apparent. Islamic law seeks to promote certainty, remove hardship, preserve communal harmony, and facilitate the performance of religious obligations.[32] Contemporary astronomical calculations contribute to all of these objectives. They reduce uncertainty, minimize disputes, provide globally consistent standards, and facilitate coordinated religious observance across different countries and regions.

The annual disagreements surrounding Ramadan determination illustrate the practical consequences of methodological divergence.[33] For many years, Muslim communities have been fasting and celebrating religious festivals on different days despite sharing similar geographical and astronomical circumstances. Such differences often generate confusion among ordinary Muslims and undermine perceptions of communal unity.[34,35] Although diversity of opinion has long been accepted within Islamic jurisprudence, recurring disputes concerning the Islamic calendar carry implications extending beyond purely legal considerations.

Astronomical calculations offer a potential solution to this challenge by providing a universally applicable and scientifically verifiable standard.[36] Because celestial movements

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[31] Yasin Kaya and Şermin Kalafat, "A Transitional Period Mathematical Work from The Sixteenth Century: Kâtip 'Alâ'Uddîn Yûsuf's Zübde Mine'l-Hisâb," *Osmanli Bilimi Arastirmalari* 27, no. 1 (2026): 157–179, https://doi.org/10.26650/OBA.1795472.

[32] Marwadi Marwadi, Rina Heriyanti, and Farah Nuril Izza, "The Fiqh of Hisab-Ru'ya in the Twentieth Century Indonesia: Study on the Thoughts of Hamka, Hasbi Ash-Shiddieqy, and Moenawar Chalil about the Unification of Hijri Calendar," *Al-Manahij: Jurnal Kajian Hukum Islam* 17, no. 1 (April 2023): 13–26, https://doi.org/10.24090/mnh.v17i1.7902.

[33] Prasetya et al., "Ramadan Fasting and Adverse Outcomes in Cirrhosis."

[34] 'Alamul Yaqin, "Contemporary Haqiqī Calculation: Analysis of Rinto Anugraha's Lunar Eclipse Calculation Methods," *JIL: Journal of Islamic Law* 3, no. 1 (January 2022): 17–33, https://doi.org/10.24260/jil.v3i1.531.

[35] Nader Alsarhan and Majed Alsarhan, "The Impact of the Implementation of the Principle of Separation of Powers on Achieving Democracy in Contemporary Political Systems: A Comparative Study Between Presidential and Semi-Presidential Systems (Using the Turkish and French Systems as Models).," *Al-Biruni Journal of Humanities and Social Sciences*, November 22, 2025, 10, https://doi.org/10.64440/BIRUNI/BIR225.

[36] Marwadi, Heriyanti, and Izza, "The Fiqh of Hisab-Ru'ya in the Twentieth Century Indonesia."

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operate according to fixed laws, the results of astronomical calculations remain consistent regardless of political boundaries, sectarian affiliations, or institutional preferences. Their adoption therefore possesses significant potential for enhancing legal certainty and promoting greater unity among Muslim communities worldwide.[37] The findings ultimately suggest that a reconciliatory framework offers the most constructive path forward. Such a framework does not require abandoning the rich heritage of classical Islamic jurisprudence. Rather, it involves recognizing that the objectives underlying traditional methods may be fulfilled more effectively through contemporary scientific knowledge. Visual sighting may continue to function as a meaningful communal and symbolic practice, while astronomical calculations provide the primary basis for legal determination.

In conclusion, this study demonstrates that astronomical calculations have attained a level of scientific certainty sufficient to function as independent legal proof for determining the beginning of Ramadan. Physical crescent sighting, while historically significant, should be understood as a means rather than an immutable legal requirement. The most reliable contemporary approach is therefore one that integrates classical jurisprudential principles with modern astronomical science. Such an approach preserves fidelity to the objectives of Islamic law while embracing the intellectual and technological advancements that characterize the contemporary era. Through this integration, the longstanding tension between tradition and postmodernity may be transformed into a productive dialogue capable of fostering greater legal certainty, communal unity, and intellectual coherence within contemporary Islamic legal thought.

CONCLUSION

This study has examined the legitimacy of astronomical calculations (*hisāb*) in determining the beginning of Ramadan through a comparative analysis of classical and contemporary juristic perspectives. The findings demonstrate that modern astronomical calculations have achieved an exceptionally high degree of scientific precision, enabling the

[37] Kusdiyana Kusdiyana, Badrun Taman, and Mahkamah Mahdi, "Normativity and Historicity of Imam Syafii's Rejection of Hisab in Determining the Beginning of the Hijri Month," *Jurnal Ilmiah Mizani: Wacana Hukum, Ekonomi Dan Keagamaan* 10, no. 1 (April 2024): 106, https://doi.org/10.29300/mzn.v10i1.2947.

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accurate determination of lunar conjunction and crescent birth with a level of certainty that exceeds the reliability of visual crescent sighting. The study further reveals that the central objective of Islamic legal texts concerning crescent observation is the attainment of certainty regarding the commencement of the lunar month rather than the physical act of sighting itself. Consequently, astronomical calculations may legitimately function as an independent legal proof for establishing the beginning of Ramadan and other lunar months. Moreover, the research shows that Prophetic instructions concerning crescent sighting were closely linked to the social and scientific realities of the early Muslim community and should be understood as providing an accessible means of determining the lunar month rather than restricting valid knowledge exclusively to naked-eye observation. By integrating classical jurisprudential principles with contemporary astronomical science, this study contributes to the ongoing effort to reconcile tradition and modernity within Islamic legal thought while offering a framework that may reduce recurring disagreements among Muslim communities regarding the commencement and conclusion of Ramadan.

Despite these contributions, the study remains limited to a doctrinal and jurisprudential analysis of the evidentiary authority of astronomical calculations and does not comprehensively investigate the practical implementation of calculation-based systems across different Muslim countries. Future research should therefore explore the institutional, political, and sociological dimensions of adopting astronomical calculations as the primary basis for determining Islamic lunar months. Comparative studies examining the application of various crescent visibility criteria, the feasibility of a unified global Islamic calendar, and the interaction between scientific expertise and religious authority would further enrich contemporary discussions on Islamic calendrical reform. In addition, interdisciplinary research combining Islamic jurisprudence, astronomy, public policy, and social sciences may provide a more comprehensive framework for addressing persistent differences in Ramadan and Eid determinations while strengthening legal certainty and fostering greater unity within the global Muslim community.

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AUTHOR CONTRIBUTIONS STATEMENT

Rohile Mohammed Gharaibeh was solely responsible for all aspects of this manuscript, including conceptualization, literature review, methodology design, data analysis, interpretation of results, and manuscript writing. The author also undertook the final review and approval of the submitted version of the manuscript and assumes full responsibility for the content of the work.

CONFLICT OF INTEREST

The author declares that there is no conflict of interest regarding the publication of this manuscript. The research was conducted independently, and no financial or personal relationships have influenced the findings, interpretation, or presentation of the study.

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The author acknowledges the use of artificial intelligence-based tools to assist in language editing, grammar refinement, and formatting support during the preparation of this manuscript. All intellectual content, analysis, interpretations, and conclusions remain the sole responsibility of the author. The AI tools were not used to generate or alter the research data or findings, and their use did not influence the academic integrity of the study.

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