INTERNATIONAL JOURNAL
IHYA' 'ULUM AL-DIN

International Journal Ihya' 'Ulum al-Din
Vol 25, No 2 (2023): 154–167
DOI: https://doi.org/10.21580/ihya.25.2.18178

Karl Popper's Falsification Theory of the Determination of the Gregorian Calendar Based on the Book of Risalatul Falakiyah K.H Misbachul Munir

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Citation (APA):
Munfaridah, I., Maliha, N. F., Royyani, M. A., Bayumi, K. M. A. S. (2023). Karl Popper's falsification theory of the determination of the Gregorian Calendar based on the Book of Risalatul Falakiyah K.H Misbachul Munir. *International Journal Ihya' 'Ulum al-Din*, 25(2), 154-167. https://doi.org/10.21580/ihya.25.2.18178

Submitted: 07 Jan 2023
Revised: 07 Nov 2023
Accepted: 04 Dec 2023
Published: 21 Dec 2023

Abstract: The book of Risalatul Falakiyah is the work of KH. Misbachul Munir has a unique side compared to the Gregorian Calendar in general. This uniqueness is seen at the start of the calculation of the day and the market, namely Tuesday Pahing, while the count generally starts on Sunday Legi. This article aims to analyze the total of the Gregorian Calendar based on the book of Risalatul Falakiyah based on Karl Poper's falsification theory and analyze the accuracy of the comparison between the concept of calculating the Gregorian Calendar of the book of Risalatul Falakiyah using contemporary calculations based on technology. This research uses library research by conducting qualitative-descriptive analysis of data collected through documentation and interviews. The results showed: First, based on Karl Popper's falsification theory that the Gregorian calendar calculation theory of the book of Risalatul Falakiyah by K.H Misbachul Munir was proven by its correctness by comparing and testing its calculations with the standard formula of science obtained the same results. Second, based on the comparison and testing of technology-based calendar masehi calculations with mawaqit, it was found that the calendar calculation results from the book of Risalatul Falakiyah had the same accuracy as the calculation of mawaqit software.

Keywords: Karl Popper's falsification, Gregorian Calendar, Risalatul Falakiyah, K.H. Misbachul Munir

Abstrak: Kitab Risalatul Falakiyah merupakan karya KH. Misbachul Munir yang memiliki sisi keunikan dibadingkan kalender masehi pada umumnya. Keunikan tersebut dilihat dari sisi dimulainya perhitungan hari dan pasarannya yakni selasa pahing, sedangkan perhitungan pada umumnya dimulai hari

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ahad legi. Artikel ini bertujuan melakukan analisis terhadap perhitungan kalender masehi berdasarkan kitab Risalatul Falakiyah berdasarkan teori Falsifikasi Karl Poper serta melakukan analisis akurasi perbandingan antara konsep perhitungan kalender masehi kitab Risalatul Falakiyah menggunakan perhitungan kontemporer berbasis teknologi. Penelitian ini menggunakan penelitian pustaka (Library research) dengan melakukan analisis secara kualitatif-deskriptif terhadap data-data yang dikumpulkan baik secara dokumentasi maupun wawancara. Hasil penelitian menunjukan: Pertama, berdasarkan teori falsifikasi Karl Popper bahwa Teori perhitungan kalender Masehi kitab Risalatul Falakiyah karya K.H Misbachul Munir dibuktikan dengan kebenarannya dengan membandingkan dan menguji perhitungannnya dengan rumus baku ilmu falak didapatkan hasil yang sama persis. Kedua, berdasarkan perbandingan dan pengujian perhitungan kalender masehi yang berbasis teknologi dengan mawaqit didapatkan bahwa hasil perhitungan kalender dari kitab Risalatul Falakiyah memiliki akurasi yang sama dengan perhitungan software mawaqit.

Kata Kunci: Falsifikasi Karl Popper, Kalender Masehi, Kitab Risalatul Falakiyah, K.H. Misbachul Munir

Introduction

In calendar terms, a calendar is a grouping of parts of time with a purpose, namely as a sign and calculation of time. In the history of human civilization, the calendar has had an essential role for previous societies because it was a tool to determine all their activities, such as hunting, migrating, farming, worship, and religious celebrations. At the same time, today's society does not consider it essential (Azhari, 2005:115). This system is still and continues to be an excellent concern for humans because it is closely related to daily human activities both as individual beings and as social beings used to organize days, weeks, months, years, and even hours, minutes, and seconds. (Rohmah, 2019:17).

Based on research in 1987, in the world known and recorded, there are about 40 calendar systems currently in use but generally categorized into three major madzhab in calendar calculations (Saksono, 2007:47). The first is a calendar whose estimates are based on the Earth's journey around the Sun or evolution. This system is also called the solar Calendar (Shamsiyah) or masehi; even the astronomical language is known as the solar calendar.

An example of this solar calendar is the Gregorian Calendar, used for civil purposes worldwide. The second is a calendar based on the Moon's journey during its orbit around the Earth. This system is called the Qomariah calendar, known by its astronomical term, the Lunar Calendar. The third combines the two methods known as the lunisolar calendar. Examples of a third system are the Jewish, Chinese, and pre-Islamic Arabic calendars (Saksono, 2007:48). Based on the explanation of the three kinds of calendars that researchers have conveyed above, the focus of the research studied is the Gregorian Calendar or solar Calendar, because the determination of the calendar is based on heliocentric theory, namely the Earth evolves or the Earth orbits the Sun, whose number of days is 365.2425 days in one year. So, it is known as the year of Shamsiyah, the solar system, or solar year.

Technology and science in the modern era are increasingly advanced and developed, which is characterized by various events such as the renewal of the Gregorian Calendar, which has a reason, namely the fact that the Gregorian Calendar has an average difference of 0.0003 days per year with the current tropical year value. Then, the difference will be accumulated into one day in 3600 years (Riza & Izzuddin, 2020).

Seeing this phenomenon, K.H Misbachul Munir, in one of his works, namely the book of Risalatul Falakiyah, made a formulation or formula that was realized by making tables of numbers that aimed to make these tables easy to learn, understand, and practice by the public in general and to falak activists in particular, namely to determine the Gregorian Calendar.

The Book of Risalatul Falakiyah has several materials presented. Still, researchers prefer to examine the Gregorian Calendar, which focuses on "The Thought of Falak Science K.H Misbachul Munir in the Determination of the Gregorian Calendar based on the book of Risalatul Falakiyah." The data to be researched and analyzed is about calculating the day and market of the Common Year, and researchers will present examples of making the Gregorian Calendar. The calculation method and formula used by K.H Misbachul Munir based on the book of Risalatul Falakiyah is a more straightforward and practical manual calculation. Then, even more unique in determining the day and market, K.H. Misbachul Munir used his birthday as a formula to start choosing the fall of the Gregorian calendar date on what day and demand, calculated from Tuesday Pahing. This is one of the reasons why researchers study the book of Risalatul Falakiyah to determine the Gregorian Calendar. The focus of the study is on the falsification analysis of the calculation of the Gregorian Calendar based on the book of Risalatul Falakiyah and the analysis of the accuracy of the comparison between the concept of calculating the Gregorian Calendar of the Book of Risalatul Falakiyah using contemporary technology-based calculations.

Results and Discussion

Understanding Calendar and Gregorian Calendar

The calendar is of English origin Calendar. In the English language dictionary, a calendar is derived from the Latin kalendarium, which means "debt bookkeeping record" or "loan interest record book." The word Kalendarium in Latin comes from the word Kalendae, which means the first day of each month (Darsono, 2010:27).

The Calendar in Arabic is called "Taqwim," which means fixing, balancing, and limiting (islah, ta'dil, and tahdid). A calendar in Arabic is also called tarikh or at-tarikh, which means knowing and limiting time (ta'rif al-waqt wa tahdiduhu). A calendar (taqwim) reflects the applied system of time that humans do based on The basics. It remains a handle, sign, and rule against the activities and course of daily human life throughout history (Butar-butar, 2018:17).

The calendar circulating in the world is very diverse. However, when viewed from the reference calculation, it can be categorized into three types, namely (Hambali & Rokhmad, 2011; Sabda, 2019).

1. Calendar Solar

The solar calendar is also called the Shamsiah calendar; the solar or solar calendar is a dating system based on the revolution of the Earth around the Sun. Planet Earth orbits the Sun within a year. One year is divided into months and days. This calendar is also known as the tropical year (sanah al-madariyyah), which is the last period and the passage of two positions on the Sun from the point of Aries (madar al-

hamal) pseudo-around the Earth with an essential time of 365 days, 5 hours, 48 minutes, 46 seconds or 365.2422 days. This period also describes a series of days and nights. Along the way, there is diversity in the length of this solar year. Some set 360 days, 365 days, 365.25 days. So again, regarding the number of months.

2. Lunar Calendar

The lunar calendar, also called the Kamariyah calendar, Candra calendar, or lunar calendar, is a dating system based on the calculation of the phases of the Moon, namely the circulation of the Moon around the Earth in its orbit with a period of 29 days, 12 hours, 44 minutes 2.8 seconds or 29.530589 days. Of this circulation, in 12

The Moon equals 354.3670694 days or 354 days 8 hours, 48 minutes, 35 seconds. This number is less than a solar year of about 11 days (10 days, 21 hours). The Lunar calendar starts from the setting of the Sun (after the conjunction of the Moon and Sun), which is marked by the appearance of the Moon or by calculation (this). Muslims use this calendar to determine the times of worship, especially the determination of the beginning of Ramadan, Shawwal, and Dhulhijjah.

3. Sun-Moon Calendar (Lunisolar)

The Lunisolar calendar, also called the Suryacandra calendar, is a calendar that uses the phases of the Moon as the primary reference but also adds seasonal changes in the calculation each year. This calendar is usually marked by leap months every few years or consecutively. Thus, the number of months a year can reach 112 to 13.

The calendar is needed by humankind for social purposes as well as worship. The reference to compile the calendar is a cycle of fixed movement between two celestial bodies, the Moon and the Sun. The dating system that is arranged based on the synodic process of the Moon is called the Lunar Calendar (Qamariyah, Lunar). At the same time, the calendar organized based on the Sun's tropical cycle is called the Solar Calendar (Syamsiyah, Solar). The dating system compiled concerning both is called the Solar Moon Calendar (Qamari-Syamsi, Luni-Solar) (Rohmah, 2019:28).

As one part of this study, the Gregorian Calendar is the solar system calendar that perfects the Julian calendar (Butar-Butar, 2014). Gregorian Calendar, another name the Gregorian Calendar or the New Style Calendar (New Style Calendar), is the result of the reform of the Julius calendar. This calendar is mainly used throughout the Western world and has become the standard for calculating international days (Sari, 2022:30).

Historically, the Gregorian Calendar has been closely related to Easter as a celebration of Christianity. Since Ancient Rome, the calculation of Easter has been based on the lunar calendar, i.e., following the lunar cycle. However, this method has many shortcomings and difficulties. Later in the 16th century, Pope Gregory XIII ordered the creation of a new calendar known as the Gregorian Calendar. The purpose is to correct the inaccuracies of the Julian calendar. In 1582, Pope Gregory XIII issued a decree converting the Julian calendar into the Gregorian Calendar. (Jannah, 2023:109-115)

Paus Gregorius XIII improved by agreeing to a reference tropical count of 365.2425 days, 0.0075 days shorter than Julian. He added new rules and corrections to the Julian calendar to correspond to the Sun's annual movement. (Farah et al., 2022:65). Paus Gregorius XIII's efforts show that reforming the Gregorian Calendar is essential to maintain compatibility between Christian religious celebrations and

the movement of the Sun and to ensure that these crucial dates remain relevant and meaningful to Christians around the world (Muhyiddin, 2004).

Falsifikasi Karl Popper

Falsification is looking at something based on the side of error. If you view a theory as wrong, various efforts are made to prove it wrong until a new idea is made to replace it. Popper has proven falsification (an approach to prove the error of a thing or event), contrary to the concept of verification (proving truth). A theory, if it is never proven wrong, then it will be strengthened, but it can still be dropped if there is a discrepancy in data that can bring down the theory. Popper's falsification is a theory of denial of the justification of A verification of a science or theory. In short, falsification is the opposite of verification. Popper states that an approach is not absolute. The truth is only if it can be verified, but it will be more robust if a theory can survive falsification. Popper argued that there is no such thing as verification; all that can be recognized as valid is falsification, which is fact-finding that ensures that a hypothesis cannot be defined. This approach denies that statements about natural reality are more rational than other statements.

We say that a theory is falsified only if we have accepted basic statements that refute it. This condition is essential but insufficient because we have seen that single, unrepeatable events are meaningless to science. Thus, a handful of misguided basic statements that refute a theory hardly lead us to reject it as falsified. We will consider it manufactured only if we have found a reproducible effect that refutes the idea. In other words, we only accept falsification if a low-level, empirical hypothesis describing the impact is proposed and collaborated. This type of hypothesis can be called falsifying (Popper, 2017:84).

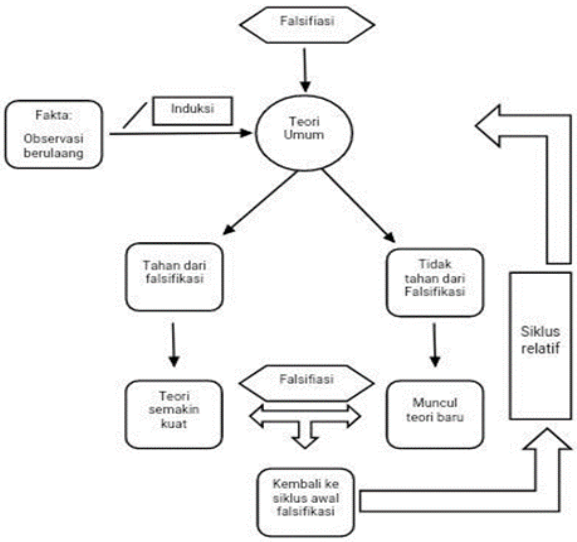

Figure 1. Siklus Falsifikasi Ilmu Pengetahuan (Heribdp, 2021)

Based on the picture of the falsification cycle, it is evident that criticism of theory and science is a necessity. With all the ideas they create, scientists need not avoid falsifying these theories and concepts. In this case, falsification does not intend to destroy what already exists; it only wants to improve things that need to be enhanced and strengthen the existing theory.

K.H Misbachul Munir and His Work

Nahdlatul Ulama has several scholars and science experts, such as Kiai Muhammad Syafi'i (Cakung Jakarta Utara), Kiai Nur Ahmad (Kriyan Jepara), and Kiai Misbahul Munir (Bandongan Magelang). However, their scientific calculation findings sometimes differ from structural NU or PBNU (Mughits, 2016:381). K.H Misbachul Munir was born on Tuesday, April 21, 1942, and died on Tuesday, November 10, 2020. Tuesday Pahing, or the day of his birth, is used as a benchmark formula in the book of Risalatul Falakiyah to determine the day and market in deciding the Gregorian Calendar. Many people need to learn that the figure of Mbah Munir is one of the experts in science who has been unfortunate for approximately 40 years across from one Ponpes to another to gain knowledge as an international standard science expert.

Figure 2. K.H. Misbachul Munir

At a young age, K.H. Misbachul Munir was able to study two books of falak, namely the book of Rasail and Taqribul Maqshod, where the book of Rasail is a book which explains the procedures for how to determine the day for 1 Ramadan and eclipse. The Taqribul Maqshod is a book that describes how to use Rubu', a quarter-circle tool used to select days and dates. It is a two-dimensional miniature of a quarter of the globe. In the scientific tradition of classical astronomy, rubu compiles the entire dating system, from arranging prayer times and formulating days and dates to predicting the arrival of lunar and solar eclipses.

After finishing the People's School (Sekolah Rakyat), K.H. Misbachul Munir continued his studies at Pondok Sirojul Muhlasin, Payaman Village, which is one of the villages located in Secang district, Magelang Regency. Although his father is a science clerk, he always takes time off from the cottage to study falak with Raden Ismail Tumbu from Tegalrejo Islamic Boarding School. Raden Tumbu was also the one who taught his father (Kiai Yasin) about Falak. From historical records, various Ponpes have been visited and used to gain knowledge of Falak and hisab. Ponpes include; Ponpes Payaman, Secang, Magelang for six years, Ponpes Tebu Ireng Jombang East Java, where he studied other falak books, namely; Durusul Falakiyyah and Badi'atul Mitsal for three years, then moved to Jampes Kediri Islamic Boarding School for three years, after that moved to Darul Hikam Islamic Boarding School in Bendo Kediri for six years.

Then, as he is familiarly called, Mbah Kiai Munir learned and studied the science of falak specifically directly to the kiai experts in Falak. Among them are four kiai in Kertososno, Nganjuk East Java are Kiai Zuhdi, kiai Ghazali, Kiai Dimyati, and Kiai Kurdi Fanai, great scholars of East Java Falak science for four years. Finally, I studied with a village Falak expert cleric in Salam District, Magelang, led by Munir Marwoto, for 33 years. After learning enough science and Mondok, all the knowledge he learned became

a provision of his understanding of science, and he established a particular Islamic boarding school for science, namely Markazul Falakiyah located in Semali Hamlet, Salamkanci Village, Bandongan District, Magelang Regency, Central Java. Then K.H. Misbachul Munir held a wedding, and from the results of his marriage, Mbah Munir had two children, namely Miftahudin Al Muti'i, who now works as a member of Brimob in Pontianak and Miftachul Huda Al Hakimi is now a young cleric in the city Moka-moka, Bengkulu. After he died, none of his sons became substitutes, and he continued his struggle to teach Falak and become Kiai Falak. So, there was the last student of K.H. Misbachul Munir, sister Chamid, who diligently continued her struggle to teach falak science at Pondok Markazul Falakiyah and continued her effort to create a National calendar that was used by several institutions and agencies in the Magelang area. Some of his works are:

1. Risalatul Falakiyyah is the book to seek ijtima' wal-Qusufaini wal-Auqot and the beginning of the month of Qamariyyah. This book explains how to find the occurrence of solar and lunar eclipses and how to find or calculate the beginning of the time of the Hijri month.
2. Fatilatul Mustadiin: This book explains how to calculate Qibla, the beginning of prayer times, and the general hours of the whole world using tools rubu' mujayyab.
3. Markazul Falakiyyah: This book explains how to calculate the designation of religious holidays such as waisak, nyepi, imlek, and Isa al-Masih. Calculations use the circulation of the Sun called a calendar miladiyyah/syamsiyyah.
4. Zamrodatul Falakiyyah This book explains how to convert between the Hijri and Gregorian calendars. It also explains prayer times and how to determine the direction of Qibla.
5. Zinatul Chasibin: This book explains how to know the occurrence of solar and lunar eclipses and how to calculate them.
6. Minhajur Ros Shodiin. This book explains and calculates the beginning of the Hijri time, which is of higher accuracy than the book of Risalatul Falakiyyah.
7. Nurul Falakiyyah. This book explains how to calculate Qibla's direction using the Sun's shadow continuously.
8. Tanwirul Falakiyyah. This book explains how to determine the direction of Qibla using the help of a science calculator.
9. Muhtarul Falakiyyah Ijtima'. This book explains how to determine the occurrence of Ijtima', lunar, and solar eclipses.
10. As-Simarul Falakiyyah Li Sa'ah Wa 'Auqot Wal Kiblat Kuluha bil Qathi'. This book explains how to determine national times and hours using logarithmic tools and calculators.
11. Intihaul Falakiyyah Auqat. This book shortens how to calculate prayer times using the WIB clock without using the Istiwa clock (Muhajir & Fathudin, 2023).

Determination of the Gregorian Calendar Based on the Book of Risalatul Falakiyah

In determining the Gregorian Calendar based on the book of Risalatul Falakiyah, the steps are as follows:

1. Prepare a practical schedule for composing national dates, namely, as a guideline for calculating the Gregorian Calendar

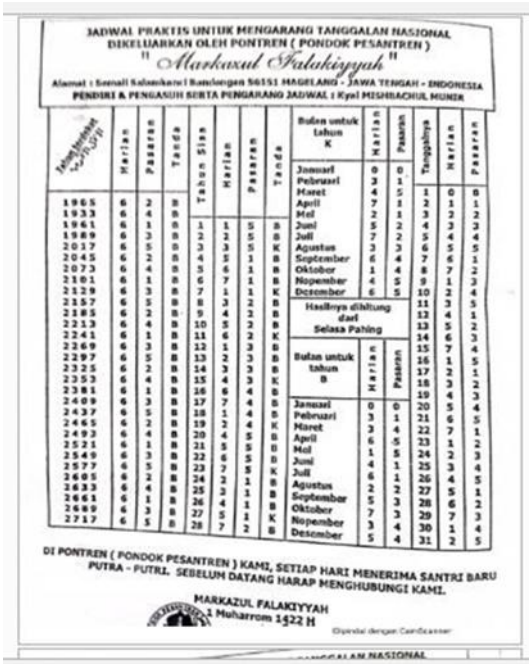

Figure 3. Practical Timetable for Composing National Dates

2. What day does January 1, 2022, fall on, and what market?

January 1, 2022	**Searched years**	**Day**	**Market (Pasaran)**	**Sign**
	2022	-	-	-
Searched for the nearest year ➔	2017	6	5	B
Residual years (deduction 2022 -2017)	5→	6	1	B
Months searched	January	0	0	-
Date searched	1	0	0	-
Summed		**12**	**6**	
Falling on the day and the market→		Saturday	Pahing	

Table 1. Calculation Date: January 1

3. The table explains the guidelines for determining the column of daily numbers and the market we see in the practical schedule data for composing a national calendar derived from the book of Risalatul Falakiyah. Then we enter the year we are looking for, which is 2022, and then we find the closest and smallest year to 2022 (see in the schedule column the nearest year), which is 2017 (if the year we are looking for is already available in the formula, then there is no need to take the nearest year).
4. The next step is to find the daily and market for 2017 available in the schedule; we sort the year 2017 swipe right to meet the daily = 6 and the market = 5 sign = B (Basithoh).

5. Then we find the remaining year, namely the reduction of 2022 – 2017 = 5, then we look for the schedule with the remaining year column and swipe right to meet the day = 6 market = 1 sign = B (Basithoh)
6. Next, find the calculated month (in a practical schedule), namely January, by choosing the month for the Basithoh year because the result we specified in the previous step is the meeting sign B (Basithoh year), so that January meets the day = 0 market = 0.
7. After the month is searched, the date searched is the 1st; by looking at the date column (in a practical schedule), daily = 0 market = 0.
8. Add up the daily column and its market. His daily: 6 + 6 + 0 + 0 = 12. Since the number of days in a week there are seven days, then 12 – 7 = 5

   The market: 5 + 1 + 0 + 0 = 6 because there are 5 markets, then 6 – 5 = 1
9. The day starts on Tuesday, and the market starts from Pahing. The last result of day 5 is Saturday, and the market with a result of 1 is Pahing.
10. In conclusion, January 1, 2022, falls on Saturday Pahing.

So, to make this year's calendar easier, January 1 has met the day and market. Then, sort the next date by limiting each month to 30 or 31 days, except in February.

The formula for determining the age of days in one month based on the book of Risalatul Falakiyah is as follows:

With the Nadhom formula (Faaza Rajulun Khutimma bihajjin), it is possible to determine the number of days in a month, which is calculated from January to December based on the number of letters, where letters dotted the number of days are 31 days and letters that have no dots day totaling 30 days except alif aged 28 / 29 days. More details by looking at the table that the author made below:

Letter	Moon	Number of days
ف	January	31
ا	February	28/29
ز	Maret	31
ر	April	30
ج	Mei	31
ل	Juni	30
خ	July	31
ك	August	31
م	September	30
ب	Oktober	31
ح	November	30
ج	December	31

Table 2. Nadhom Formula

Based on Popper's falsification theory that the Gregorian calendar calculation theory, the book of Risalatul Falakiyah by K.H Misbachul Munir is proven by its correctness by comparing and testing its calculations with the standard formula of science, which obtained precisely the same results. K.H. Misbachul Munir's theory about the total of the Gregorian Calendar cannot be falsified because it is proven to be accurate and strengthened by observations and interviews from one of K.H. Misbachul Munir's students and several representatives of institutions that the Gregorian Calendar K.H. Misbachul

Munir still exists and is still widespread in the community as evidenced also by the request for printing houses to be sent to various institutions in Magelang Regency.

This also follows Popper's theory, which asserts that the truth of the proposition of science is not determined through a verification test but an attempt to deny its fact through various systematic experiments. The greater the effort to refute a theory, and if it continues to survive, the more solid its existence will be. This principle in Popper's falsification theory seems very good if applied in various scientific studies in Islam.

Falsified Analysis of the Calculation of the Gregorian Calendar Kitab Risalatul Falakiyah

In the calculations that the author has exemplified in the previous chapter (see Table 1), based on the book of Risalatul Falakiyah, January 1, 2022, falls on Saturday Pahing, where the calculation must be proven by the Gregorian calendar calculation formula following the standard science formula as follows:

January 1, 2022 M

Time elapsed = 2021 years, more than one day.

or 2021: 4 = 505 cycles, over one year, over one day

505 cycles = 505 x 1461 day = 737805 day

1 year = 1 x 365 day = 365 day

1 day = 1 day

Sum = 738171 day

Correction Gregorius 10 + 3 = 13 day

so 738171 – 13 = 738158

738158: 7 = 105451, more 1 day = Saturday (calculated from Saturday) 738158 : 5 = 147631, more 3 days = Pahing (Calculated start Kliwon)

So, January 1, 2022, falls on a Saturday Pahing, whose results are the same as the calculations from the book of Risalatul Falakiyah. So that after the day and market on January 1 of a year is known, then to determine the day and need on each of the 1st of the following months, the following schedule can be used in addition to using the nadhom from the book of Risalatul Falakiyah.

Day and Market (Pasaran) Schedule of the Common Year

Bulan	**Basithah**		**Kabisat**	
	Day	Market	**Day**	Market
January	1	1	1	1
February	4	2	4	2
Maret	4	5	5	1
April	7	1	1	2
Mei	2	2	3	2
Juni	5	2	6	3
July	7	2	1	3

August	3	3	4	4
September	6	4	7	5
Oktober	1	4	2	5
November	4	5	5	1
Desember	6	5	7	1

Table 3. Nadhom Risalatul Falakiyah Book

With a note that any day and market on January 1 of any year is worth 1 (one), so that for every 1st of the following months, the day and market order what day and market from January 1 following the numbers on the schedule (Days and Markets) above.

2022 Calendar (Basithoh)

No	**Tanggal**	**Hari**		**Pasaran**	
1	1 January	1	Saturday	1	Pahing
2	1 February	4	Tuesday	2	Pon
3	1 Maret	4	Tuesday	5	Legi
4	1 April	7	Friday	1	Pahing
5	1 Mei	2	Sunday	1	Pahing
6	1 Juni	5	Wednesday	2	Pon
7	1 Juli	7	Friday	2	Pon
8	1 Agustus	3	Monday	3	Wage
9	1 September	6	Thursday	4	Kliwon
10	1Oktober	1	Saturday	4	Kliwon
11	1 November	4	Tuesday	5	Legi
12	1 December	6	Thursday	5	Legi

Table 4. Nadhom Risalatul Falakiyah Book

Based on the results of testing, comparison, and proof from the calculation of the Gregorian Calendar of the book of Risalatul Falakiyah with the analysis of the standard formula of Imu Falak, the same result was obtained, namely January 1, 2022, falling on Saturday Pahing. Then, each beginning of the month also falls on the same day, according to the calculation results in the table above.

Popper's falsification theory is based on the belief that no theory is entirely correct. Still, the theory is accepted as a truth if it is not successfully falsified (proven wrong). For example, Newton's theory of gravity was accepted as accurate for centuries because motionless bodies float randomly from the Earth. The theory of gravity follows the results of experiments and research but continues to be the target of scientific evidence. Then, Einstein made falsifiable hypotheses or predictions. This theory is different from Newton's theory, for example, of the bending of light due to gravitational pull.

Based on Popper's falsification theory that the Gregorian calendar calculation theory, the book of Risalatul Falakiyah by K.H Misbachul Munir is proven by its correctness by comparing and testing its calculations with the standard formula of science, which obtained precisely the same results. K.H. Misbachul Munir's theory about the total of the Gregorian Calendar cannot be falsified because it is proven to be accurate and strengthened by observations and interviews from one of K.H. Misbachul Munir's students and several representatives of institutions that the Gregorian Calendar K.H. Misbachul Munir still exists and is still widespread in the community as evidenced also by the request for printing houses to be sent to various institutions in Magelang Regency.

This also follows Popper's theory, which asserts that the truth of the proposition of science is not determined through a verification test but an attempt to deny its fact through various systematic experiments. The greater the effort to refute a theory, and if it continues to survive, the more solid its existence will be. This principle in Popper's falsification theory seems very good if applied in various scientific studies in Islam.

Analysis of The Accuracy of The Calculation of The Gregorian Calendar Based on Mawaqit Software (Technology-Based)

Mawaqit's origin is from the plural form of miqat in Arabic. Mawaqit is a computer program created by Al-Farghani's astronomer group, ICMI Orsat Netherlands. It is a computer program that was first built with Borland (Turbo) Pascal language version 7.0; it has been revised several times. The program contains menus of commands to calculate prayer times, Qibla direction, the beginning of Hijri, and Common Months, each from any place on the surface of the Earth desired by the user (Azhari, 2005:142).

Based on an online interview with Dr. Ing Khafid, one of the creators of Mawaqit, explained that to be more apparent, the content of the program is depicted in Figure 3.8, which contains the structure of the 2001 version of the Mawaqit program, starting from the main menu to two special menus which are sub-menus, namely praying and calendar. Yangmana for the praying menu, contains commands related to the five daily fardhu prayers. The prayer schedule can be displayed for a specific date, the current date (computer date), a specific month, or a specific year. In addition, it can also be done to determine the direction of Qibla precisely from certain positions throughout the face of this Earth. As for the calendar menu, it contains orders related to the determination (estimate) of the beginning of the month of qamariyah (hijri), the decision of fasting and Eid al-Fitr is explicitly separated, as well as the beginning of the month AD or the masehinya calendar. Then, in the mawaqit, there are also guidelines for merukyat hilal and the possibility of its appearance (visibility). Furthermore, for those who need information about the phases of the Moon (ijtimak, first quarter, full Moon, and last quarter), the command is also provided, as well as the power to calculate the part of the Moon that reflects sunlight seen from the surface of the Earth (illumination).

In technology-based calculations, including mawaqit software that can display various menus, especially the problem of calculating the Gregorian calendar, which aims to test the accuracy of the results of the calculation of the Gregorian calendar book of Risalatul Falakiyah by K.H. Misbachul Munir, while the accuracy test is as follows:

The results of the Gregorian calendar calculation from the book of Risalatul Falakiyah have similarities with the results of technology-based AD calendar calculations; this is based on the statement of accuracy theory that accuracy measures the accuracy and similarity of results at the same time by comparing them to absolute values. Therefore, the closer the size, the higher the level of accuracy.

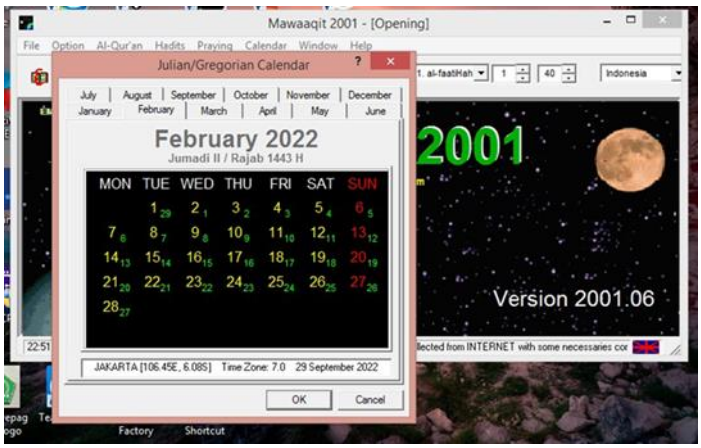

Figure 4. Software Mawaqit

Conclusion

From the description above, it can be concluded as follows: First, based on Popper's falsification theory, the Gregorian calendar calculation theory of the book of Risalatul Falakiyah by K.H Misbachul Munir is proven by its correctness by comparing and testing its calculations with the standard formula of science which obtained the same results. K.H. Misbachul Munir's theory about the analysis of the Gregorian Calendar cannot be falsified because it is proven to be accurate and strengthened by observations and interviews from one of K.H. Misbachul Munir's students and several representatives of institutions that the Gregorian Calendar K.H. Misbachul Munir still exists and is still widespread in the community as evidenced by the request for printing houses to be sent to various institutions in Magelang Regency.

This also follows Popper's theory, which asserts that the truth of the proposition of science is not determined through a verification test but an attempt to deny its fact through various systematic experiments. The greater the effort to refute a theory, the more solid it will be if it continues to survive. This principle in Popper's falsification theory is excellent if applied in various scientific studies in Islam.

Second, based on the comparison and testing of technology-based AD calculations, the author analyzes these three essential parts: input, process, and output. So it is found that the results of the calculation of the Gregorian Calendar from the book of Risalatul Falakiyah have similarities and similarities with the results of technology-based AD calendar calculations; this is based on the statement of accuracy theory that accuracy measures the accuracy and similarity of results at the same time by comparing them to absolute values. Therefore, the closer the size, the higher the level of accuracy. The results of the Gregorian calendar calculation based on the book of Risalatul Falakiyah can be accurate because the calculation results are proportional and the same as technology-based calculations, especially in this study comparison using mawaqit software.

References

Azhari, S. (2005). *Ensiklopedi hisab rukyat*. Pustaka Pelajar.

Butar-butar, A. J. R. (2018). *Pengantar Ilmu Falak: Teori, Praktik, dan Fikih* (1st ed.). Rajawali Pers.

Butar-Butar, A. J. R. (2014). Kalender: Sejarah Dan Arti Pentingnya Dalam Kehidupan. *Semarang: Cv. Bisnis Muia Konsultama*.

Darsono, R. (2010). *Penanggalan Islam, Tinjauan Sistem, Fiqih dan Hisab Penanggalan*. Yogyakarta: Labda Press.

Farah, L. A., Saifulloh, M., & Roesuldi, J. (2022). Studi Komparasi Sejarah dan Aturan Kalender Tahun Masehi: Julian dan Gregorian. *AL-AFAQ: Jurnal Ilmu Falak Dan Astronomi*, *4*(1), 65–77.

Hambali, S., & Rokhmad, A. (2011). *Almanak sepanjang masa: sejarah sistem penanggalan masehi, hijriyah dan jawa*. Program Pascasarjana IAIN Walisongo Semarang.

Heribdp. (2021). *Post-Modernism: Krusialitas Falsifikasi Karl Popper*. Artikula.Id. artikula.id/heribdp/falsifikasi-karl-popper/#.

Jannah, E. U. (2023). Date Of Easter Sebagai Reformasi Kalender Masehi. *AL-AFAQ: Jurnal Ilmu Falak Dan Astronomi*, *5*(1), 109–119.

Mughits, A. (2016). Kajian Ilmu Falak di Pesantren Salaf di Jawa Tengah dan Jawa Timur. *Asy-Syir'ah: Jurnal Ilmu Syari'ah Dan Hukum*, *50*(2), 379–398.

Muhajir, M., & Fathudin, F. (2023). Epistemologi Keilmuan KH. Misbachul Munir Ahli Falak Salamkanci Bandongan Magelang. *Jurnal Alwatzikhoebillah: Kajian Islam, Pendidikan, Ekonomi, Humaniora*, *9*(2), 334–340.

Muhyiddin, K. (2004). Ilmu Falak dalam Teori dan Praktik. *Yogyakarta: Buana Pustaka*.

Popper, K. R. (2017). *Logika Penemuan Ilmiah*.

Riza, M. H., & Izzuddin, A. (2020). Pembaruan kalender masehi Delambre dan implikasinya terhadap jadwal waktu Salat. *Ulul Albab: Jurnal Studi Dan Penelitian Hukum Islam*, *3*(2), 163–184.

Rohmah, N. (2019). Dinamika Almanak Masa Pra Islam Hingga Era Islam; Studi atas Penanggalan Sistem Solar, Lunar dan Luni-Solar. *QALAMUNA: Jurnal Pendidikan, Sosial, Dan Agama*, *11*(2), 157–172.

Sabda, A. (2019). Ilmu Falak, Rumusan Syar'i dan Astronomi. *Bandung: Persis Pers*.

Saksono, T. (2007). Mengompromikan Hisab Rukyat. *Jakarta: Amythas Publicita*.

Sari, I. P. (2022). Analisa Pergeseran Kalender Gregorian Menjadi Kalender Dunia. *AL-AFAQ: Jurnal Ilmu Falak Dan Astronomi*, *4*(1), 20–31.