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Original Research Article

Explicating the Calligraphic Conventions in Tiraz Fabrics from the First to the Eighth Century AH in Iran

Reyhane Eslami[1]; Farhad Khosravi Bizhaem[2]

1. Master's in Persian Painting, Faculty of Handicrafts, Art University of Isfahan, Isfahan, Iran.
2. Corresponding Author, Associate Professor at Department of Calligraphy and Persian Painting, Faculty of Handicrafts, Art University of Isfahan, Isfahan, Iran.
E-mail: f.khosravi@aui.ac.ir

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Abstract

Introduction: The advent of Islam in Iran brought about a profound transformation in Iranian thought and art, reshaping pre-Islamic values and themes. Being a remarkable innovation in this period, textile production incorporating calligraphic motifs—particularly tiraz fabrics adorned with embroidered inscriptions—attained a distinguished status. Moreover, calligraphy, and especially the Kufic script, played a pivotal role in the artistic expression of the era. The present study aims to analyze and classify the calligraphic patterns found in tiraz textiles and to examine the characteristics of their underlying calligraphic conventions. The central research question addresses how key calligraphic components—namely proportion (nesbat), baseline alignment (korsi), black and white balance (savad va bayāz), and composition (tarkib)—were manifested in tiraz fabrics produced in Iran from the 1st to the 8th century AH.

Research Method: The study employs a descriptive-analytical method grounded in the examination of museum artifacts through a library-based approach. The research population comprised 110 extant textile samples, of which 15 were selected for detailed analysis in the current study.

Findings: The Kufic inscriptions featured in the textiles under study were examined with respect to the four components of proportion, baseline alignment, black-white balance, and composition. The analysis revealed that, concerning letter proportions, most inscriptions did not adhere to strict formal regulations, while greater consistency in baseline alignment was observed in the first and fourth script lines. Moreover, most inscriptions exhibited a discernible degree of regularity in terms of black-white balance and overall compositional structure.

Conclusion: The findings indicate that among the studied components, composition and proportion respectively demonstrate the highest and lowest levels of adherence to classical calligraphic conventions. Despite noticeable variation in letter proportions, the inscriptions maintain an overall sense of balance and harmony.

Keywords

Islamic Textiles; Tiraz, Calligraphic Motifs, Textile Weaving in Islamic Iran, Kufic Inscriptions

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Introduction and Problem Definition

Iranian art underwent a profound transformation with the advent of Islam, a shift that manifested across all artistic domains, including textile production. Over time, weavers gradually moved away from Sasanian decorative motifs and began incorporating written scripts, giving their works a novel aesthetic dimension. These textiles, known as tiraz, often featured borders adorned with woven inscriptions created using gold or colored threads. Islamic calligraphy, particularly in the form of decorative Kufic scripts, evolved over time, producing a unique combination of order, rhythm, and spatial composition. Studies on textiles from the 1st to the 8th centuries AH demonstrate that early inscriptions were simple and uniform, yet their diversity and structural coherence increased over time. As a craft, textile production reflects the culture, rituals, and identity of each era and offers a renewed vision of Islamic-Iranian tradition and civilization. Accordingly, a precise understanding of the aesthetic and calligraphic dimensions of these textiles is of particular importance. Examining the characteristics of written scripts and calligraphic principles in tiraz fabrics provides valuable insight into the artistic mindset of past masters. Considering the absence of a standardized system for Kufic script, studies of this nature can contribute to the revival and preservation of this significant cultural heritage. The aim of this study is to analyze and classify the calligraphic motifs featured in tiraz textiles and to examine the characteristics of their calligraphic conventions. The central research question concerns the key calligraphic components that characterize tiraz fabrics produced in Iran from the 1st to the 8th centuries AH. Following a review of previous research and a discussion of the historical and aesthetic background of tiraz production and decorative Kufic script, selected samples are introduced and analyzed according to four principal features: baseline alignment (korsi), proportion (nesbat), black–white balance (savad va bayāz), and composition (tarkib).

Research Method

This study is fundamental in nature and follows a descriptive–analytical research design. Data were collected through extensive library research, drawing upon credible written and online sources. The temporal scope of the study encompasses the 1st to the 8th centuries AH, and its geographical scope includes Greater Iran. In the initial survey, approximately 110 samples—including textiles, garments, and grave coverings—were examined. From among these, 15 samples were purposefully selected for detailed qualitative analysis based on the diversity of their calligraphic patterns. The selected tiraz textiles were then analyzed according to four major principles of calligraphy: proportion (nesbat), composition (tarkib), baseline alignment (korsi), and black-white balance (savad va bayāz).

Research Background

In the course of the present study, a number of sources concerning Islamic textiles were reviewed. Among them is a book titled «Textiles of the Islamic World» by «John Gillow», which but makes no explicit reference to tiraz textiles. Moreover, no comprehensive studies were found that systematically examine the rules of calligraphy as manifested in the inscriptions woven into textiles. In what follows the most significant specialized sources in this field are briefly introduced. «Fathi» (2007) investigated «The Inscriptions on Textiles of the Islamic Period» from historical, social, and artistic perspectives, classifying them into three categories: eulogistic and devotional textiles, grave coverings, and official gifts. These fabrics were woven either on one side (decorative) or on both sides (legible and decorative), employing Kufic, Naskh, and Thuluth scripts. Fathi emphasizes that calligraphy, in addition

to its semantic and aesthetic functions, also plays a significant graphic role alongside other ornamental motifs. «Dadvar and Hadidi» (2011), in their study titled «An Examination of the Motifs on Early Islamic Textiles (1st Century AH to the Late Seljuk Period)», categorized various ornamental themes and analyzed their evolution before and after the advent of Islam. They focused in particular on animal, vegetal, human, and geometric patterns as well as innovations in epigraphic design during this period, highlighting the aesthetic synthesis of Sasanian and Islamic elements and the symbolic meanings embedded in Iranian allegorical imagery within textile patterns. «Zakariaei Kermani and Rahro Esfahani» (2016), in their article «A Typology of Fatimid Tiraz Textiles Based on Formal, Motif, and Compositional Components», examined the form and structure of tiraz textiles and proposed a typological framework based on formal characteristics. Their findings indicate that most Fatimid tiraz textiles feature Kufic inscriptions arranged in horizontal bands interwoven with vegetal and animal motifs. «Mohammadi et al.» (2018), in the article «A Study of Script and Writing in Islamic Textiles and Its Application in Contemporary Visual Arts (A Case Study of Tiraz)», discussed the significance of calligraphic inscriptions on textiles from the 1st century AH to the modern era. They conclude that in both historical and contemporary contexts, scripts serve a prominent aesthetic and graphic function, though in modern art they are reinterpreted using innovative visual approaches. In addition to the above, which address tiraz textiles directly, other studies have explored aspects of Kufic epigraphy. «Makinnejad» (2018), in the article «The Structure and Characteristics of Decorative (Floral and Interlaced) Kufic Inscriptions in the Seljuk and Ilkhanid Periods», identified three major systems of decorative Kufic: scriptural, geometric, and vegetal. «Farid» (2021), in his book «The Confluence of Motif and Script in Iranian Art», defined writing as serving two interrelated functions—communicative and ornamental—and examined calligraphic styles from the 3rd to the 7th centuries AH. He argues that although the basic letterforms remained structurally similar, each inscription demonstrates a unique arrangement suited to its spatial context. Furthermore, «Fadaei-Tehrani» (2023), in the article «Islamic Tiraz or Sasanian Tiraz: Christian Clavus-Tablion», proposes that Islamic tiraz textiles were adapted from the Sasanian tiraz and the Christian clavus–tablion tradition, substituting Christian decorative elements with Islamic inscriptions. In sum, previous studies have primarily addressed the functional and symbolic use of writing, the typology of Islamic textiles, and the analysis of inscriptions. However, the present study distinguishes itself by focusing specifically on the calligraphic conventions governing the inscriptions on tiraz textiles, an aspect that has received little scholarly attention to date.

Islamic Textiles in Iran

Textiles ranked among the most significant manufactured and commercial commodities in the early Islamic centuries, and in certain regions of Iran, taxes were even paid in the form of woven fabrics (Baker, 2006, 60). A substantial portion of textile motifs from the early and middle Islamic periods reflects the enduring influence of Sasanian weaving traditions. Given the religious restrictions on the depiction of the human figure in early Islam, vegetal, geometric, and animal motifs became dominant in textile decoration, while script emerged as a shared and meaning-bearing visual element—particularly in textile ornamentation—acquiring a distinctive symbolic and aesthetic role. Although some scholars have attributed the first use of calligraphic motifs on textiles to the late 3rd century AH (Roohfar, 2009, 17), the findings of the present study indicate the existence of examples dating back to the 1st and 2nd centuries AH (Fig 1), thereby challenging the assumption of a later emergence of this tradition.

A Brief History of Tiraz

The term tiraz is defined in Moin's Dictionary as «the ornamented border of a garment, dyed in a color distinct from the main fabric; a type of royal textile; writing or inscription woven or embroidered by craftsmen on the edge of a garment» (Moin, 1974, 2216). The weaving of the names of Muslim rulers onto silk fabrics was among the most important artistic and political practices of the early and middle Islamic centuries. These inscriptions, typically embroidered or woven as decorative borders, distinguished a special class of textiles known as tiraz, which held an esteemed position in society. Although some researchers maintain that prior to the reign of ʿAbd al-Malik ibn Marwān (ca. 65 AH / 685 CE), tiraz inscriptions were executed in Pahlavi or Roman scripts and that he later decreed the use of Arabic script—specifically the phrase «lā ilāha illā Allāh»—on tiraz fabrics (Hasan Ibrahim, 1959, 173; Baker, 2006, 60), the present author has not encountered any surviving examples that corroborate this account. Tiraz textiles were generally categorized into «tiraz khāssa» (imperial or private tiraz) and «tiraz ʿāmma» (public tiraz), with the former reserved for rulers and their close associates (Freih, 1995, 154). The textile workshops were known as «Dār al-Tirāz», and the head of such a workshop was referred to as the ustād al-tirāz (master of tiraz), responsible for supervising artisans and weavers, managing financial affairs, and assessing the value of the produced textiles (Ibn Khaldūn, 2003, 510). Because tiraz textiles often served propagandistic and political purposes—conveying the power and legitimacy of rulers—the inscriptions were woven in colors contrasting with the fabric ground and in slightly raised relief, ensuring greater visibility and visual impact (Ali-Nejad Osbuei, 2012). In the course of collecting comparative materials for this study, several textiles attributed to the Far East (China) were also examined. The first example, dating to the 1st–3rd centuries CE (Figure 2), and the second, to the 3rd–5th centuries CE, both exhibit animal, vegetal, and calligraphic designs. The inscriptions on these textiles are associated with Chinese dynastic authority. Notably, the first specimen represents the earliest inscribed textile identified among all the samples examined in this research.



Fig 1. Tirāz fabric, Africa, 1st century AH. Collection: Victoria and Albert Museum. Source: Victoria and Albert Museum, 2023.



Fig 2. Tirāz fabric, China, 1st–3rd century CE. Collection: The Metropolitan Museum of Art. Source: The Metropolitan Museum of Art, 2023.

Decorative Kufic Script and Its Calligraphic Principles

Kufic script is generally divided into three categories: plain (simple), architectural (bannā'ī), and decorative. In decorative Kufic, the degree of composing, elongating, and interlacing of letters and words is free, allowing for the creation of highly diverse compositions (Fazaeli, 1983, 160). The most significant forms of decoration include letters embellished with stems and leaves, floral motifs, arabesques, geometric knots, and interlaced or intertwined patterns. Numerous examples of such decorative Kufic

inscriptions can be found on stone, brick, metal, and textiles (Grohmann, 2004, 7-8). Among the various types of decorative Kufic, the following forms are noteworthy: notched (nākhonak-dār), foliated (mowarraq), floral (mozahhar), knotted (mo'aqqad), perforated (moshabbak), circular (madawwar), intertwined (mo'ashshaq), and mowashshaḥ. Throughout Islamic history, numerous calligraphers have examined and categorized the principles and rules of calligraphy. The synthesis of these principles as discussed in historical treatises—though differing slightly in detail—amounts to twelve major rules, generally grouped under two overarching categories: good arrangement (ḥosn-e waż') and good formation (ḥosn-e taškīl). These rules include: composition (tarkīb), baseline alignment (korsi), proportion (nesbat), strength and delicacy, horizontal and curved movement (saṭḥ wa dowr), real ascenders and descenders, virtual ascenders and descenders, balance of black and white (sawād wa bayāż), emptiness and fullness (khalwat wa jalwat), fluidity (ersāl), pen placement, and ink management (morkabb-bardāri) (Ghelichkhani, 2011, 289, 291, 294). Some of these principles, such as proportion, are tangible and can be measured using the traditional dot unit, while others—like horizontal and curved balance or emptiness and fullness—are less quantifiable. In this study, four principles are examined in more detail: baseline (korsi), proportion (nesbat), balance of black and white (sawād wa bayāż), and composition (tarkīb).

a. Baseline (Korsi): «Lexically meaning seat or support, korsi in calligraphic terminology refers to the alignment of similar letters and words on the same visual level within a line, verse, or sentence». Baselines are classified into horizontal and vertical types. According to classical masters, the horizontal baseline typically comprises three, four, or five parallel lines (Fazaeli, 2013, 104).

b. Proportion (Nesbat): This principle concerns «maintaining harmony between the size of letters and words and the width of the pen used, ensuring that letters of the same kind and shape are uniform and consistent, and that balance and symmetry are observed in both isolated and compound forms» (Fazaeli, 2013, 85; Ghelichkhani, 2011, 97).
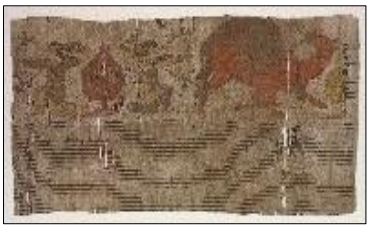
c. Balance of Black and White (Sawād wa Bayāż): «Sawād literally means «blackness» and bayāż is «whiteness». This rule addresses the proportional relationship between black and white spaces throughout the written surface—within letter interiors, between word components, and across the entire page» (Ghelichkhani, 2011, 229).

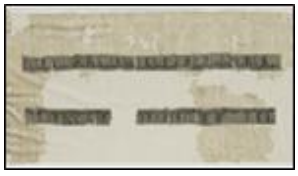
d. Composition (Tarkīb-bandī): Composition, or tarkīb-bandī, refers to «the harmonious arrangement and integration of letters, words, sentences, and lines, resulting in a balanced and aesthetically pleasing overall design that appeals to healthy refined tastes» (Fazaeli, 2013, 89).

Examination of Selected Tirāz Fabrics

Among the 110 textile samples constituting the research corpus, 15 tirāz fragments were selected for detailed study. For ease of reference, the selected samples are presented in Table 1, accompanied by their respective descriptions and sources.

Table 1. Description of the selected tirāz samples. Source: Authors.

Sample No	Sample Image	Sample Description
1		Silk fabric, 43 × 101.5 cm; Script: *Kufic nākhonak-dār* (notched Kufic); Abbasid period, Iran; Collection: Cleveland Museum; Source: Cleveland Museum of Art, 2023.
2		Silk fabric (*mulḥam*), 35.6 × 37.5 cm; Script: *Kufic nākhonak-dār*; Abbasid period, Eastern Khorasan or Turkmenistan; Collection: Metropolitan Museum of Art; Source: Metropolitan Museum of Art, 2023
3		Silk fabric, 9.5 × 10 cm; Script: *Kufic mozahhar nākhonak-dār* (floral-notched Kufic); Abbasid period, Iran; Collection: Al-Sabah Museum; Source: Spuhler, 2020, p. 233.
4		Silk fabric, 61.6 × 74.3 cm; Script: *Kufic mozahhar nākhonak-dār*; Buyid period, Iran; Collection: Cleveland Museum of Art; Source: Cleveland Museum of Art, 2023.
5		Silk fabric, 127.5 × 176.5 cm; Script: *Kufic nākhonak-dār*; Buyid period, Iran; Collection: Cleveland Museum of Art; Source: Cleveland Museum of Art, 2023.

Sample No	Sample Image	Sample Description
6		Silk fabric, 55.2 × 64.7 cm; Script: *Kufic mo'aqqad mowarraq* (knotted-foliated Kufic); Buyid period, Iran; Collection: Cleveland Museum of Art; Source: Cleveland Museum of Art, 2023.
7		Silk fabric, 30.5 × 61 cm; script: *Kufic mozahhar nākhonak-dār mowashshaḥ* (floral-notched interlaced Kufic); Buyid period, Iran; Collection: Cleveland Museum of Art; Source: Collection: Cleveland Museum of Art, 2023.
8		Silk fabric, 55.3 × 69.8 cm; script: *Kufic mowarraq nākhonak-dār* (foliated-notched Kufic); Buyid period, Iran; Collection: Cleveland Museum of Art; Source: Cleveland Museum of Art, 2023.
9		Silk fabric, 37.1 × 74.2 cm; Script: *Kufic mowarraq* (foliated Kufic); Buyid period; Iran or Iraq; Collection: Cleveland Museum of Art; Source: Cleveland Museum of Art, 2023.
10		Silk fabric, 38.5 × 67 cm; Script: *Kufic mowarraq mowashshaḥ* (interlaced foliated Kufic); Buyid or Seljuk period, Iran or Iraq; Collection: Cleveland Museum of Art; Source: Cleveland Museum of Art, 2023.
11		Silk fabric, 102.5 × 210.5 cm; Script: *Kufic mowarraq nākhonak-dār*; Buyid period, Iran or Iraq; Collection: Cleveland Museum of Art. Source: Cleveland Museum of Art, 2023.
12		Silk fabric, 27.4 × 38.9 cm; Script: *Kufic mozahhar* (floral Kufic); Seljuk period; Iran; Collection: Yale University Art Gallery. Source: Cleveland Museum of Art, 2023

Sample No	Sample Image	Sample Description
13		Silk fabric, 15.5 × 31 cm; Script: *Kufic mowarraq mowashshaḥ*; Ghuri period, Eastern Iran; Collection: Al-Sabah Museum; Source: Spuhler, 2020, p. 266.
14		Silk fabric, 127 × 149.8 cm; Script: Kufic nākhonak-dār mowashshaḥ (interlaced notched Kufic); probably 4th–8th century AH; Iran or Iraq; Collection: Cleveland Museum of Art. Source: Cleveland Museum of Art, 2023.
15		Silk fabric, 18.5 × 28.3 cm; Script: *Kufic mozahhar nākhonak-dār mo'aqqad* (floral-notched-knotted Kufic); probably 4th–8th century AH; Rey; Collection: Cleveland Museum of Art. Source: Cleveland Museum of Art, 2023.

Analysis of Calligraphic Principles in Tirāz Textiles (1st–8th Centuries AH)

1. Korsī (Baseline Alignment): To examine the spatial placement of letters, four kursī lines (guidelines) were identified: the first or lower korsī (asfal), for the base of rounded letters; the second or main korsī, for the baseline of the letter stems; the third korsī, corresponding to the level of short ascenders or teeth; andthe fourth or upper korsī (a'lā), for the tops of tall ascenders (Fig 3). All the analyzed samples—except samples 2, 3 (Figure 4), and 8—adhere to the lower baseline (korsī asfal). In samples 4, 6, 7, 10, 13, and 15, in addition to letters aligned with the lower baseline, several other letters positioned along the second korsī exhibit decorative extensions descending below the primary line.



Fig 3. Position of the first to fourth baseline lines. Source: Authors.

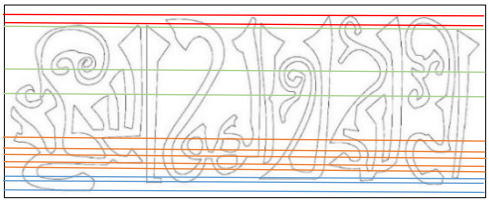


Fig 4. Variability of baseline lines in sample 3. Source: Authors.

Samples 4, 6, 13, and 15 also maintain alignment across the third and fourth korsī levels. In sample 10, although the third korsī shows general regularity, the tooth (ـنـ) in the word ajtani aligns horizontally with the teeth in sīn (س) in order to preserve overall compositional balance. In the same piece, the fourth korsī regulates the ascenders (alif and lām), whereas

the ornamental forms of jīm (ج) and ḥāʾ (ح) deviate slightly from it. Because the inscription in this piece follows an octagonal geometric layout, the korsī line appears visually fragmented, resulting in the ascenders converging more closely at the top — a configuration not seen in inscriptions written along a straight korsī line. Among all inscriptions studied, complete adherence to all korsī levels occurs only in samples 12 and 14; however, near-complete consistency is also observed in samples 5 and 11. In sample 5, minor variations appear along the neckline area due to its circular layout, which affects the vertical scale of the ascenders, yet none of the ascenders exceed the upper korsī boundary. In this same piece, the curved baseline causes minor deviations in the teeth section — notably, the yāʾ (ی) in yā raḥīm (یا رحیم) and yā laṭīf (یا لطیف) does not strictly follow the korsī. In sample 11, it is noteworthy that some letters with teeth elements appear irregularly aligned with the ascenders and occupy the fourth korsī line.

2. Nesbat (Proportion): Concerning proportion, the important point is that in contemporary calligraphy pens, the standard unit of measurement is the diameter of the dot (Figure 5). Since decorative Kufic is largely devoid of dots, such a unit of measurement cannot be applied to it. Therefore, the measurement criterion in this research is determined based on the thickness of the vertical stroke of the «alef» in each sample. This is done by considering a square (referring to the side of the square, not its diagonal) equal to the pen width used for the «alef», and this becomes the unit of measurement for each inscription (Figure 6).

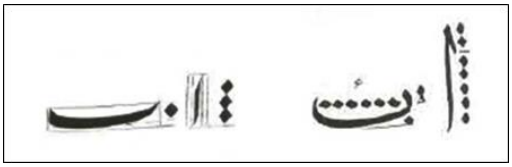


Fig 5. Measurement standard (diameter of one dot) in Thuluth and Nastaliq scripts. Source: Authors.

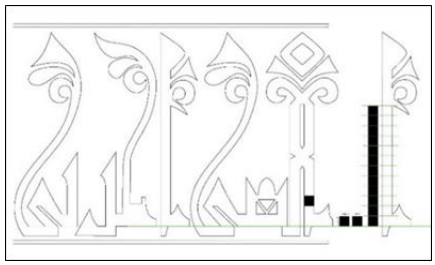


Fig 6. Measurement standard for letter proportions (a square equal to the width of an «alef»). Source: Authors.

1.2. Ascenders: Analysis of the ascenders (afrashtehā) indicates that, except for samples 2, 3, 5, and 8, where differences in alif height are clearly visible, all other samples display consistent proportions. In sample 2, the design of the alif (الف) terminal varies depending on the adjacent letters, which directly affects the ascenders' height. The ratio of ascender height to pen width in this sample is 30:1. The alif appears in seven distinct forms within the inscription (Figure 7). In sample 3, only one alif differs in height from the others, positioned partly over the preceding letter for compositional balance. The height-to-width ratio here is 15:1. In sample 5, which also follows a 15:1 ratio, variations in alif (الف) and lām (ل) heights are observable between the main inscription and the circular neckline inscription. The circular design has a clear influence on letter height: the ascenders gradually decrease in size from the upper neckline toward the inner curve (Figure 8), ranging from 15 units to 10 units. In sample 8, the ratio of 11:1 holds true for all ascenders except one, measuring 10 units, likely due to its positioning above the yāʾ (ی) in the final word ilā (إلى).

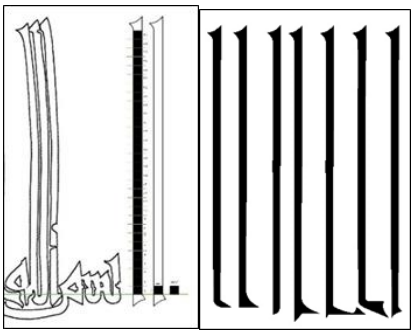


Figure 7. Design of various 'alef' forms in sample 2. Source: Authors.

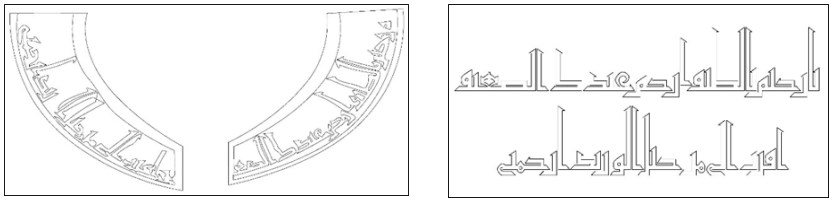


Fig 8. Line drawing of sample 5, the inscription on the shirt collar and its writing conventions. Source: Authors.

2.2. Denticles (Teeth): The proportional analysis of the denticles demonstrates uniformity in the design of the letters in samples 4, 6, 11, 12, 13, 14, and 15. In some cases, however, a considerable variation in proportions is observed — notably in samples 1 (7-23 units), 2 (2-30 units), and 3 (5-8 units). The denticulate letters in the inscriptions around the sleeves and the back panel of sample 5 show a consistent ratio of 5.5 units; nevertheless, in the collar inscriptions, due to the curvature of the text line, the proportions gradually change from larger to smaller, ranging between 4 and 2 units (Figures 5 and 6). In samples 7 and 9, the proportions of the denticles remain consistent across all letters except for «ـسـ/ ـشـ», which deviate slightly in size. In sample 8, the denticles are designed in two sizes, corresponding to 3 and 4 units, respectively. Sample 10 presents a harmonized and repetitive pattern of denticles, except for the «nūn» (ـنـ) in the word ʾajtani (اجتنی), which slightly exceeds the uniform proportion for compositional balance. In certain inscriptions—such as samples 2, 3, and 11—some denticles have been deliberately elongated to the height of ascenders, appearing in the uppermost alignment line.

2.3. Circular Letters: In evaluating rounded letters (س، ق، ل، ن، ی), factors such as the curvature length, loop closure, and the distance between the bowl of the letter and the baseline are considered. The examination of yāʾ (ی) in inscriptions 2, 4, and 15 indicates that samples 4 and 15 maintain consistent proportions across repetitions, whereas sample 2—found in the words nabī (نبی), banī al-ʿAbbās (بنی العباس), and ʿAlī (علی)—exhibits no fixed ratio in any of the measured parameters. In analyzing the letter sīn (س), it is evident that samples 6, 7, and 8 feature accurately designed and executed proportions (Figure 9). The consistent repetition of the letter lām (ل) with identical proportions is observed in samples 5 and 8. The letter nūn (ن) shows a stable proportional structure in samples 4, 5, and 11. In sample 1, the letter (ن) in the word maʾtayn (مأتین) exceeds the standard ratio by two units across all examined instances. In sample 2, the letter designs—similar to other irregularly proportioned letters—lack fixed measurement, as seen in the words al-Raḥmān

(الرحمن) and al-Mubīn (المبين). A notable feature observed in many inscriptions is the angular (rather than fully circular) design of these rounded letters. Furthermore, in several cases, non-rounded letters such as wāw (و), mīm (م), and ze (ز) have been given circular, ornamental forms (Fig 10).



Fig 9. Line drawing of inscriptions 6, 7, and 8, showing the repetition of fixed proportions for the letter «س». Source: Authors.

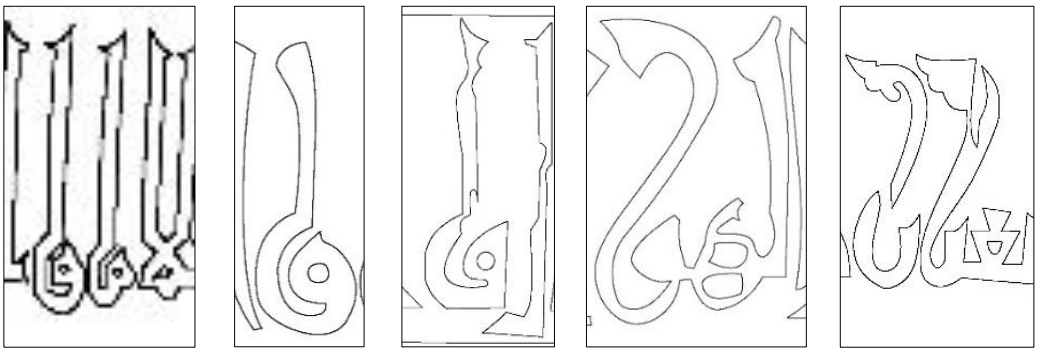


Fig 10. Variable proportions of curves in the letters «ز»,«و», and «م». Source: Authors.

2.4 Eyes (Inner Voids): Uniform proportionality among letter eyes is observed in most samples. The variations that do exist pertain to specific letters, while similar letters retain comparable ratios. In sample 1, the eye of hāʾ (ـه) in ṣibghah (صبغه) and the conjunctive wāw (و) both follow a ratio of 1:2 units. Likewise, in the word Aḥmad (احمد), the designer created a triangular configuration containing three eyes, each with the same 1:2 ratio. The eyes of hāʾ (ـه) in sanah (سنه), mīm (ـمـ) in maʾtayn (مأتين), and ghayn (ـغـ) in ṣibghah (صبغه) appear uniform in size; however, the eye of ṣād (ـصـ) in ṣibghah (صبغه) and nāṣirī (ناصرى)displays clear variation (Figure 11). In sample 3, each letter's eye has been treated individually: the hāʾ (هـ) is oval, the wāw (و) circular, and the hāʾ (ـه) in ʾinnah (انه) lacks a closed form. Even if considered elliptical, it does not conform proportionally to the eyes of hāʾ (هـ) and wāw (و). In ʾashjaʿ (اشجع), the eye of ʿayn (ـع) is open and triangular. Overall, this sample shows no internal consistency in the proportional design of letter eyes (Fig 12).

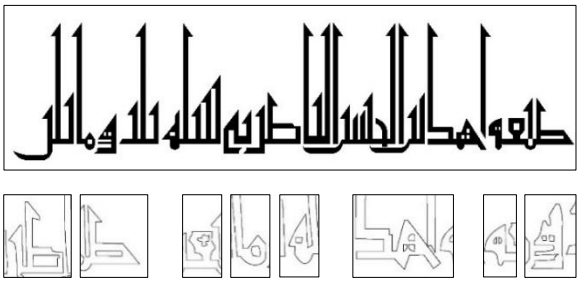


Fig 11. Variable proportions in the counters of the letters «ص», «م», «ـه», «حـ», «و», sample 1. Source: The authors.

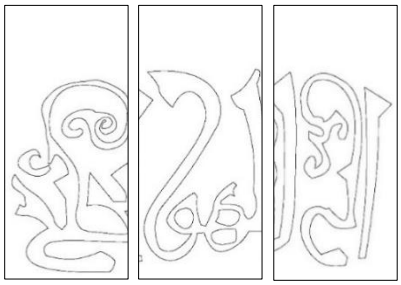


Fig 12. Variable proportions in the counters of sample 3 in the letters, «ـه», «و», «ـع». Source: The authors.

2.5. Descenders: In some samples, a subtle rightward extension appears at the base of alif (الف). This feature is consistently repeated with identical proportions in samples 6 and 15, while in sample 7, the elongation of alif (الف) occurs with two different ratios. In sample 2, the proportions of descending letters mīm and alif (م و الف) appear irregular and uncoordinated. In contrast, sample 5 maintains homogeneous proportions for the descenders of alif (الف), mīm (م), and yāʾ (ی) across multiple repetitions within the inscription. Similar proportional consistency is observed in the mīm of sample 4. In sample 9, the descender of yāʾ (ی) exhibits variable ratios in different instances (Fig 13).

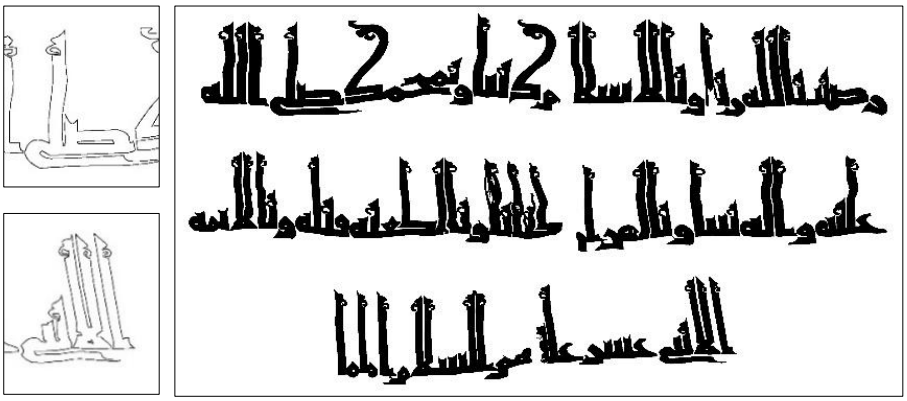


Fig 13. Variable proportions in the tail of the letter «ی», sample 9. Source: Authors.

The letters jīm (ج), ḥāʾ (ح), and mīm (م) in sample 10 demonstrate precise and well-defined proportions that fit harmoniously within the geometric framework. However, the yāʾ (ی) in sample 11 disrupts this harmony, showing ratios of 3, 4, and 5 units. Overall, the analysis reveals that letters are not necessarily designed with fixed dimensions within a single inscription; in many cases, proportional variation occurs. The variable letter proportions in each sample are summarized in Table 2.

Table 2. Variable Letter Proportions in the Selected Samples .Source: Authors.

No.	Sample	Ascender	DentIcle	Round	Eye	Descender
1	Sample 1	-	✓	✓	✓	-
2	Sample 2	✓	✓	✓	✓	✓
3	Sample 3	✓	✓	✓	✓	-
4	Sample 4	-	-	✓	✓	-
5	Sample 5	✓	✓	✓	-	✓
6	Sample 6	-	-	-	-	-
7	Sample 7	-	✓	✓	-	✓
8	Sample 8	✓	✓	✓	-	-
9	Sample 9	-	✓	-	-	✓
10	Sample 10	-	✓	✓	-	✓
11	Sample 11	-	✓	✓	✓	✓
12	Sample 12	-	-	-	✓	-
13	Sample 13	-	-	-	-	-
14	Sample 14	-	-	-	-	-
15	Sample15	-	-	✓	✓	-

Table 2 illustrates that only in samples 6, 13, and 14 are the letter proportions completely consistent, while most other specimens display varying proportions across different letters. These variations are most evident in the teeth-like extensions and circular forms, followed by noticeable differences in loops and tails. From a broader perspective, sample 2 exhibits inconsistent proportions throughout all parts of the letters, whereas samples 3, 5, and 11 show divergence in four distinct components.

3. Black and White Balance (Savad va Bayāz): A visual examination of the balance between black and white spaces within and between letters and words reveals that in samples 1, 2, 3, 5, 9, 11, and 15, the distribution of positive and negative space within the defined frame of the inscription appears well balanced. In samples 1, 2, 5, and 11, despite the high textual density and dominance of positive space, the presence of tall, spaced-out ascenders introduces visual equilibrium within the composition. Similarly, in samples 3, 5, 9, 11, and 15, this principle is maintained through the inclusion of clearly demarcated frames for the written area. In sample 5, the designer seems to have carefully balanced the space around the neckline; the circular layout of the inscription generates a harmonious linear decorative rhythm. In sample 11, the circular portion containing the inscription also demonstrates a balanced text arrangement, though the inner section—also inscribed—appears denser and more compact. Overall, the use of contrasting light and dark tones in the fabric and its inscriptions creates a generally harmonious visual equilibrium within the textual field (Fig 14). In contrast, samples 4, 6, 8, and 12 exhibit a predominance of dark tones within the written areas. Regarding sample 12, it appears that the hollowed-out letter forms reduce the visual density and proximity between words; had the inscription been woven entirely in a darker solid tone, the positive space would have been more visually pronounced (Figure 15). Samples 7, 10, 13, and 14 are four examples of mowashshaḥ (decorated/floriated) Kufic script in the study, where almost the entire frame of the inscription section contains decorations, and very little negative space is observed in the entirety of all four cases. In these four samples, if we disregard the peripheral decorations and consider only the written section, different conditions are observed. In samples 7 and 10, the positive and negative space shows a balanced, and one might even say symmetrical,

condition. However, in sample 13, even without considering the decorations, more positive space is seen in the inscription. Regarding sample 14, it can be said that in this inscription, negative space dominates in the writing section alone. In the section concerning proportion and composition, some of the negative spaces between letters and the internal white space within words (bayaz) have been explained.

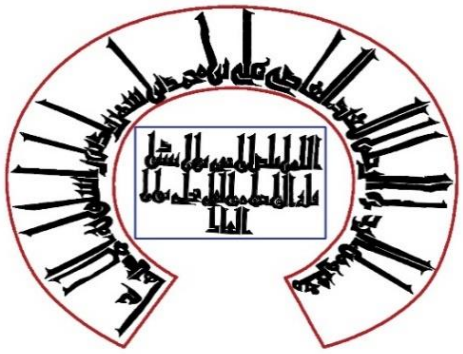


Fig 14. Positive and negative space in the circular inscription of sample 11, linear drawing of the curved section. Source: Authors.



Fig 15. Positive and negative space in sample 12. Source: Authors.

4. Composition: An analysis of compositional structure reveals that, in most of the examined samples, the general rule governing the arrangement of letters and words (with the exception of samples 3, 6, 7, and 15) is the extreme proximity of letters, with minimal spacing observed between individual letters and words. The design of these calligraphic forms generally follows a distinct structural order and exhibits a notable degree of visual harmony, as seen in samples 1, 5, 6, 11, and 14. In decorative Kufic inscriptions, in addition to letters that are naturally elongated—such as alif (الف), lam(ل), and ṭāʾ(ط)—some other letters were also extended or ornamented depending on their position within the text and the compositional intent of the designer. This technique, which introduces artificially elevated decorative extensions, appears repeatedly in the samples under study. The compositional arrangement in samples 6, 7, 8, and 13 demonstrates the designer's deliberate precision in letter placement, creating a coherent balance between ascenders, teeth-like strokes, and ornamental forms. In most samples, the ascenders are positioned in a way that—though not strictly repetitive—maintains a general rhythmic coordination. They appear individually, in pairs, or in small groups at relatively regular intervals. In many cases, teeth-like letters yāʾ, tāʾ, nūn (ـيـ, ـتـ, and ـنـ)and other letters (such as wāw (و), dāl (د), mīm(م), hāʾ(ـه), etc.) fill the empty interlinear spaces, contributing to a visually rhythmic and melodic effect. In sample 1, the varying lengths of the teeth-like strokes between the ascenders create a sense of rhythmic balance. The designer also introduced an innovative treatment of loops, placing two open spaces inside the letters wāw (و) and hāʾ(ـه). In the word Aḥmad, the letters ḥāʾ (ح) and mīm (م) are connected in a triangular configuration, enclosing three internal voids, which together contribute to an overall cohesive and harmonious composition. In sample 5, the composition varies across different parts of the garment. The inscriptions on the sleeves—comprising one wide band flanked by two narrower bands—exhibit a stable and orderly structure, where the letters adhere to a consistent rule. Around the collar, however, the alignment of the ascenders shifts in correspondence with the circular curvature of the neckline. It is noteworthy that curved

forms are generally rare in these designs, appearing only in specific instances—such as the curved terminal of the letter lām (ـلـ) in the word al-Dawla (الدوله). In sample 10, a dense combination of written and decorative elements is seen within a geometric form. In this inscription, besides the spatial arrangement created by the vertical and angular forms of the uprights set within a narrow octagonal frame, the letters are positioned in a specific and orderly written form. The distinctive rules of this inscription lie in the design of the letters jīm (ج) and he (ه). In samples 9, 11, and 14, harmony and balance in the composition between the letters and words are observable. Sample 12 is only non-systematic in the orientation of its upright strokes (Fig 16).

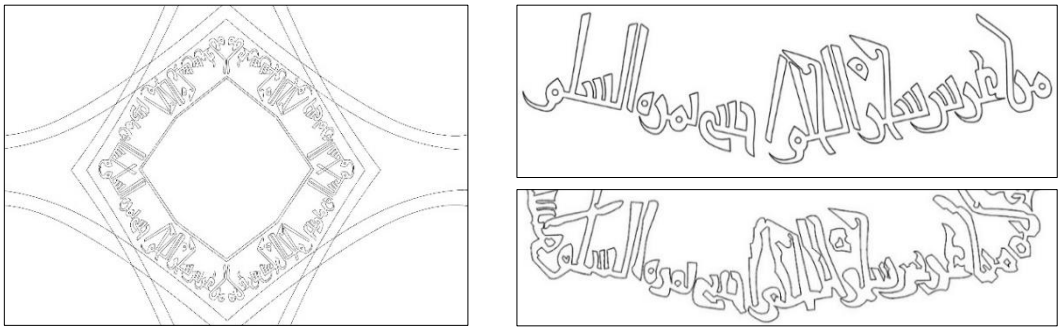


Fig 16. Calligraphic conventions of sample 10 in an angular style and dense composition within the octagonal frame of the textile. Source: Authors.

In samples 3 and 15, making a definitive judgment about compositional structure is challenging, as these are fragmentary pieces—only small portions of the original textiles remain, leaving the overall layout unknown. Finally, after analyzing all four calligraphic components examined in this study, Table 3 presents the degree of adherence to calligraphic conventions observed in each of the analyzed inscriptions.

Table 3. Adherence to Calligraphic Conventions in the Analyzed Samples. Source: Authors.

No.	Sample	Regularity in Proportions	Alignment with Baseline (Korsi)	Balance of Positive and Negative Space	Compositional Harmony and Coherence
1	Sample 1	-	-	✓	✓
2	Sample 2	-	-	✓	✓
3	Sample 3	-	-	✓	-
4	Sample 4	✓	✓	-	✓
5	Sample 5	✓	✓	✓	✓
6	Sample 6	✓	✓	✓	✓
7	Sample 7	✓	-	✓	✓
8	Sample 8	✓	-	-	✓
9	Sample 9	✓	✓	✓	✓
10	Sample 10	✓	✓	✓	✓
11	Sample 11	-	✓	✓	✓
12	Sample 12	✓	✓	-	✓
13	Sample 13	✓	✓	-	✓
14	Sample 14	✓	✓	-	✓
15	Sample 15	-	✓	✓	✓

The findings presented in Table 3 indicate that among all the examined samples, Sample 3 shows the least adherence to the identified components. The majority of the samples exhibit consistency in three or all four components. From another perspective, the component of composition demonstrates the highest level of adherence, while in the remaining components—proportion, baseline alignment, and black and white balance—more than half of the samples conform to the prescribed conventions.

Conclusion

One of the distinguishing features of tirāz textiles, which flourished remarkably after the advent of Islam, was the prominence of inscriptional motifs as their main decorative element. In these textiles, Kufic script, in its various ornamental forms, played a major role in the overall design. The purpose of this study was to analyze and categorize the inscriptional patterns found in tirāz fabrics and to examine the calligraphic conventions. In response to the central research question—What are the distinctive calligraphic components of the tirāz textiles produced in Iran from the 1st to the 8th centuries AH?— the study first investigated the calligraphic rules applied in the patterns of these fabrics. The selected calligraphic conventions used in the analysis include four components—proportion, baseline alignment (korsī), positive–negative balance (sawād wa bayāz), and composition—derived from the twelve traditional principles of calligraphy. The analysis of proportions reveals that the proportional relationships among letter and word sizes are not uniform or strictly rule-bound across the samples; only three samples (6, 13, and 14) maintain precise proportional balance. Sample 2 is the only one showing full variability across all proportional parameters. Considering the four baselines (korsī lines), none of the samples display equal spacing between these lines. Regarding the adherence of letterforms to the baseline structure, only two samples (12 and 14) fully conform to all baseline rules, whereas one sample (3) follows none of them. In terms of positive–negative balance, most samples (1, 2, 3, 5, 6, 7, 9, 10, 11, and 15) exhibit an overall equilibrium across the inscriptional surface, while one sample (14) displays dominance of negative space. The majority of the studied inscriptions demonstrate visual harmony in composition and arrangement of vertical extensions, even when decorative elongations are attached to letterforms. The analysis of letterform features indicates that the ratio between the shortest and tallest ascenders varies from 4.5 to 30 units. The same variability is observed in the height of teeth (dandānah), ranging from 2 to 23 units. Variations in the length and curvature of loops and in the distance between bowl terminals and the baseline show clear differences in the creation of circular forms. These findings highlight composition and proportion as the two most significant components of the study: composition shows the highest adherence, while proportion displays the lowest consistency with the classical rules of calligraphy. Overall, despite the multiple variations in detail, most inscriptions in the selected samples demonstrate general regularity and geometric precision. They are largely angular in structure and often conform to the first and fourth baselines, which helps maintain visual balance within the framed inscriptional areas. Collectively, the findings indicate that while ornamental Kufic script follows underlying conventions of balance and harmony, it was not constrained by the strict and codified rules characteristic of scripts such as Naskh, Thuluth, or Muḥaqqaq. From a contemporary perspective, it appears that the artists and designers of the period approached their work creatively—much like modern graphic designers—designing unique and customized letterforms for each individual inscription.

Author Contributions

This article is derived from the MA thesis of Author 1 in the field of Persian Painting, titled «Thematic Analysis and Formulation of the Calligraphic Principles in Tirāz Fabrics from the 1st to the 8th Centuries AH in Iran», supervised by Author 2 at Isfahan University of Art.

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Conflict of Interest

The author (s) declare that there are no potential conflicts of interest related to this research, in writing, and publication of this article

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