The Emergence of a Possible Coded Vocabulary After the Application of an Algorithm in the Voynich Manuscript

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Abstract

The Voynich manuscript is an illustrated codex and a controversial piece of lines of an unknown language. There have been countless hypotheses on its possible content and many deciphering ideas have emerged. Among these ideas, Iteration theory refers to a layer-by-layer cipher and uses algorithmic techniques to decipher the writings. In this study, the first ten botanical pages of Voynich manuscript had been examined using the algorithmic method. The result shows possible terms which repeat in different paragraphs; coded words that based on the Persian dictionary output, might be related to the plants and celestial animals of the night sky.

Keywords: Decipherment, Voynich Manuscript, Persian theory, Multi-letter Cipher, Dehkhoda lexicon

1. Introduction

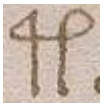
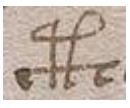
Acquired in 1912 by Wilfred Voynich and handed down among many individuals, Voynich manuscript remains unknown and has never been definitively commented upon, yet its imagery and strange writings occupy the mind of every viewer [2] [9]. Countless possibilities have been raised in the mind of the people and further examinations are required to evaluate the accuracy of the suggestions. Therefore, the results of different examinations can be a small but effective step in narrowing down a large set of possibilities.

The present study was undertaken to evaluate the Iteration Theory [7], and speed up the future research on the questionable Voynich manuscript. The mysterious Voynich manuscript is well illustrated and its figures can be helpful to test the accuracy of the findings of any method. Therefore, in case of a successful decoding, it is expected to find the deciphered vocabulary related to the illustrated figures. For example, by selecting herbals pages, words about plants would be expected to emerge.

2. Materials and Methods

In current study, a decipherment method has been employed from the new theory of iteration, which describes the formation of text as a written form of a language game. According to this idea, by going backwards in the game and removing repetitive sequences, we must reach the text of origin. The first ten botanical pages of the Voynich manuscript were selected; f1v, f2r, f2v, f3r, f3v, f4r, f4v, f5r, f5v, and f6r, all of which had pictures of plants. Based on the constructed alphabet set (See Table 1), and updated rules of omissions, the pages were transcribed and underwent the complicated algorithmic omissions in colorcells (See Appendices), then the pages were examined for Persian and Arabic words with help of Dehkhoda and Abadis Dictionaries.

Table 1. Alphabets

VL	EDVL	Phonetics	PDVL
	A	/æ/, /ɑ/, /ʌ/	آ،ا،ع، ـَ
	A’		
	D	/d/, /z/	د، ذ، ز، ض، ظ
	G	/q/	ق، غ
	GA	/qɑ/	قا، غا
	H	/h/, /x/	ه، ح، خ
	J	/ʤ/	ج
	K	/k/	ک
	M	/m/, /n/	م، ن
	P	/b/, /p/, /f/	ب، پ، ف
	P’		
	PA	/bɑ/, /pɑ/, /fɑ/	با، پا، فا
	P’A		

	R	/r/	ر
	RI	/rɪ/	ری
	RIA	/rɪɑ/	ریا
	S	/s/, /ʃ/	س، ص، ث، ش
	T	/t/, /ɵ/	ت، ط، ث
	T’		
	T’’		
	V	/v/, /u/, /ʊ/	و، او، ـُ

Abbreviations. VL; Voynich Letters, EDVL; English Decoded Voynich Letters, PDVL; Persian Decoded Voynich Letters.

2.1. Rules

For each type of repetitive sequence, three parts were considered; domain of effect, observed patterns, and rule of omission. The order of deletions was according to the number of the rules in such a way that first the repetitions of type 1 were reduced to one, then frequent repetitions of type 2 were removed. Finally, type 3 repetitions were removed from the remaining text. This order of removing repetitions continued until no form of repetition remained.

2.1.1. Repetition Type one

Domain of effect: Within 1 to 2 words
Observed Pattern:

- Within a word, A(n), an element, B, is repeated: S.RI.J.T.T.V (B=B*=T); P.D.D.R (B=B*=D), A’.D.T’.D.T’ H (B=B*=D.T’)
- Within two words, A(n) and A(n+1), The final element at the end of word A(n); C(n), is same as beginning element of word A(n +1); B(n+1): PA.T.V, V RI.D.T (C(n)=B(n+1)=V); RI.V.S.A.M.V, V.P'.A'.D.T' (C(n)=B(n+1)=V)

Rule of omission:

1.If B(n) = B*(n) => Remove B(n) or B*(n)

2.If C(n) = B(n+1) => Remove B(n) or B(n+1), and join the words

2.1.2. Repetition Type two

Domain of effect: From 2 to n words

Observed Pattern:

- The initial element of the word A(n); B(n), is same as the initial element of the next word A(n+1); B(n+1):A'.D.T', A'.D.RI.T.D.S.V (B(n)=B(n+1)=A'.D)
- The final element of the word A(n); C(n), is same as the final element of the next word A(n+1); C(n+1): A'.T.V, P.D.S.V (C(n)=C(n+1)=V); A'.T.D.T', S.D.T', PA.T.V.RI.D.T', S.D.T' (C(n)=C(n+1)=D.T')
- Both previous patterns of type 2 can be observed in a sequence:The initial element of the word A(n); B(n), is same as the initial element of the next word A(n+1); B(n+1) & The final element of the word A(n); C(n), is same as the final element of the next word A(n+1); C(n+1): A'.D.T'', A'.T.V.RI.A.T'' (B(n)=B(n+1)=A'; C(n)=C(n+1)=T'') ; K.D.RI.A'.V, K.D.PA.V (B(n)=B(n+1)=K.D; C(n)=C(n+1)=V)

Rule of omission:

1.If B(n) = B(n+1) => Remove B(n) and B(n+1)

2.If C(n) = C(n+1) => Remove C(n) and C(n+1)

3.If 1 & 2 => Remove B(n), C(n), B(n+1), and C(n+1)

2.1.3. Repetition Type three

Domain of effect: Within 1 or 3 words

Observed Pattern:

- The initial element of the word A(n-1); B(n-1), is same as the initial element of the word A(n+1); B(n+1): PA.D.T', S.A.M, PA.D.T" (B(n-1)=B(n+1)=PA.D)
- The final element of the word A(n-1); C(n-1), is same as the final element of the word A(n+1); C(n+1): B(n+1):S.A.M, D.P.A'.A.T', V.P'.A'.A.M (C(n-1)=C(n+1)=A.M)
- The initial element of the word A(n-1); B(n-1), is same as the final element of the word A(n+1); C(n+1):D.T'.M, A'.D.R, PA.D.T' (B(n-1)=C(n+1)=D.T')
- The final element of the word A(n-1); C(n-1), is same as the initial element of the word A(n+1); B(n+1):S.J, PA, J.P.A'.V(C(n-1)=B(n+1)=J)
- Within a word, two elements B and B* are same surrounding a specific region: RI.D.P.A'.D.S (B=B'=D); A'.T.A.R.T.M (B=B*=T)

Rule of omission:

1.If B(n-1) = B(n+1) => Remove B(n-1) and B(n+1)

2.If C(n-1) = C(n+1) => Remove C(n-1) and C(n+1)

3.If B(n-1) = C(n+1) => Remove B(n-1) and C(n+1)

4.If C(n-1) = B(n+1) => Remove B(n-1) and C(n+1)

5. If B(n) = B*(n) => Remove B(n) and B*(n)

3. Results

Obtained nouns in the botanical category could indicate perfumes (ATR, ATARIAT), herbalist (ATAR), plant (MPAT), plant organs and structures (SAMR, VARITA, RISA, RIDM, DAM) and medicine (DARV). About astronomical vocabulary, Ursa major (DPAT) and minor (DPAM), Pleiades (TRIA), Taurus (TVR), Pisces (SAMK) and words in meaning of goat (SAPTT, PVJ, PJ) were having equivalents in Dehkhoda lexicon. A number of words that could not be categorized included Sea (DRIA), Degrees (DRJ), Direction (SAMT) and Descent (TPAR).

Table 2. Coded Words and their Dictionary Equivalents

Type	Coded English	Coded Persian	Dictionary Equivalent*	Definition
Botanical	ATR	عطر	عطر	Attar
	ATAR	عطار	عطار	Herbalist
	ATARIAT	عطاریات	عطریات	Attars
	DARV	دارو	دارو	Medicine, Drug, Cure
	MPAT	نبات	نبات	Plant
	RIDM	ریدم	ریزوم	Rhizome
	RISA	ریشا	ریشه	Root
	SAMR	ثامر	ثمر/ثامر	Fruit, Result / Tree with ripe fruits
	VRITA/VARITA	وریتا	ورتا	Flower
Astronomical	DP	دب	دب	Bear
	DPAT	دبات	دبة	Female Bear
	DPAM	دبام	دبم	Bear cub
	MAJ/MJ	ماج/مج	ماج/مج	Moon

	PADR	بادر	بدر/بادر	Full moon
	PVJ/PJ	بوج/بج	بُج/بز	Goat
	SAMK	سامک	سمک	Fish, Pisces
	SPATT/SPAPT	سبتت/سبت	سبتة	Goat
	TRIA	ثریا	ثریا	Pleiades
	TVR	تور	ثور/تورا	Taurus
Other	DRIA	دریا	دریا	Sea
	DRJ	درج	درج	Degrees
	SAMT	سامت	سمت	Direction
	TPAR	تبار	تبار	Descent, Race

***:** The dictionary entry links have been attached to the words in this column.

4. Discussion

In these ten botanical pages, it was observed that a number of words were repeated in more than one paragraph, and this cannot be denied that presence of botanical vocabulary in plant pages is related to the Voynich figures; plant parts such as fruit (SAMR in F3r-P4, F4r-P2, F5v-P1, F6r-P1) and root (RISA in F1v-P1, F2r-P1, F2r-P2, and F3v-P1) along with word in meaning of plant itself (MPAT in F1v-P1, F2r-P1, and F2r-P2).

But what could be the reason behind the presence of astronomical vocabulary in botanical pages? The next following pages of the mysterious manuscript, contains astronomical figures and illustrates celestial animals of different constellations (folio 67r -73v); the appearance of words related to celestial animals, reminds of a possible connection of plants and constellations, recalling the coherence of the entire text of the Voynich manuscript.

Interestingly the DP, DPAT, and DPAM will match with bear, female bear and little bear found in dictionary results. And in bear constellations of the night sky, there are only two bears, Ursa Major or Mother bear alongside the Ursa Minor or Little bear [6].

Some of the combinations that appear, are two related words, for example, on F4v-P2, why should the word “BADR” (= full moon) come right after the word “MAJ” (= moon), or why on

F2r-P2, the coded word “MPAT” (= plant) is emerging right after the word “RISA” (= root). These emerging results might be the linguistic compounds like what we see as *ezāfe* construction and adjectival phrases in Persian languages [5]; a language branch considered a possibility in a recent study [3].

On the other hand, the code aspects can bring ambiguity; one cannot be certain whether slightly different forms of a word, with the same consonants and different vowels, have actually created the same word to make decoding difficult or these combinations encode another definition (example: "VARIAT"=? vs "VARITA"=Flower).

Further, the different phonetic forms are questionable; why is a letter such as "D", pronounced /d/ in one place and /z/ in another place? or why is the letter "S" pronounced /s/ in one place and /ʃ/ elsewhere? Letting aside, the presence of old methods of writing and pronunciation of letters in old Persian writings [8], There is also a possibility of the existence of multi-letter codes, here we can think the letter "S" in combination with specific letters always has the sound of /s/ creating the specific meaning (example: "SAMR"=Fruit), and if it is combined with other letters, it takes the sound of /ʃ/ which gives a word in other definition (example: "RISA"= Root). Undoubtedly, such a difficult code will not be easily understood unless by examining all the paragraphs in the Voynich manuscript.

5. Conclusion

In general, it can be concluded that this method of deciphering has been able to produce a number of repeated words with a remarkable resemblance to the vocabulary about botany and celestial animals. Future research is required to expand the possible vocabulary and bring more lights to the accuracy of the Iteration Theory.

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