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.(Walling et al., 2008)

(Fingerprinting)

.(Lal,2001)

(Juracek and

Ziegler, 2009)

.(Walling, 2006)

.(Morgan, 2005)

.(Walling et al., 2008)

elhaam_alidoost@yahoo.com :

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Collins et al.

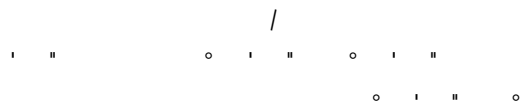
Hughes et al. (2012) Wilkinson et al. (2010b, 2012)

Hakimkhani (2010) Martinez-Carreras et al. (2009)

(2010)

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(Walling et al., 2008)

Pb Ni Mn Fe Cu Co)

(Zn

(Na Mg K Ca)

(Mn Fe)

¹³⁷Cs

K

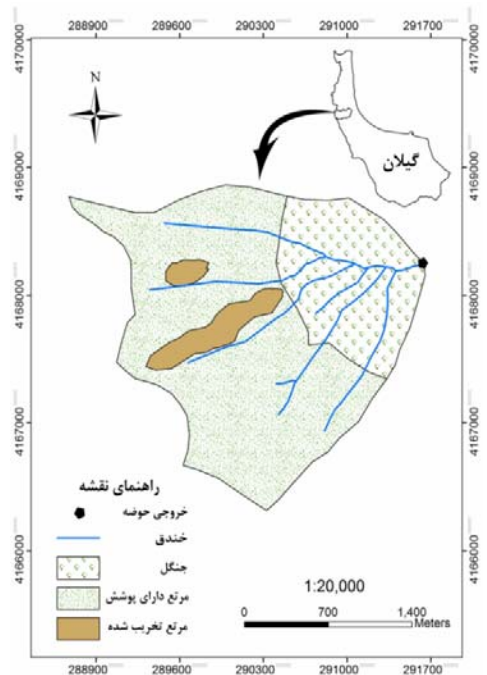
Mg Ca

Na

(Sparks, 1996)

(Gee and

.Or, 2002)



Press's Q

(Hair et al., 1998)

Median ± 3MAD

$$\frac{MD^2}{df}$$

(Hair et al., 1998)

$$R = \sum_{i=1}^m \left[\frac{x_i - (\sum_{j=1}^n a_{ij} b_j z_j)}{x_i} \right] w_i \quad ()$$

X_i

R

H

a_{ij}

i

b_j (j = ... n) j

i

m

n j

W_i

Z_j

(Discriminant Analysis)

(Collins et al., 2010b)

$$(0 \leq b \leq 1)$$

(Collins et al., 2010a) ($\sum_{j=1}^n b_j = 1$)

(Z_j)

Box's M

(Collins et al., 2010a)

R^2

(R^2)

$$\frac{6}{p_b d} \frac{[4 + 2(\frac{a}{h})]}{p_b d}$$

p_b

d

h (

)

(Hair et al., 1998)

(Skopp, 2000)

Wilk's lambda

Wilk's lambda

(W_i)

, ()

/ /

(Wi)

.(Walling, 2005)

(/)

(/)

()

/

(R)

(bj)

R

/

Excel

Solver

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Fe Cu ¹³⁷Cs Co Ca

Zn Pb P Ni N Mn_{Pyrophosphate} Mn Fe_{Pyrophosphate}

Median±3MAD

/

Wilk's lambda

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/ / /

H

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Box'sM

(/)

Tolerance		F		Wilk's lambda	
/	/	/	/	Pb	
/	/	/	/	Fe	
/	/	/	/	MnPyr.	
/	/	/	/	¹³⁷ Cs	
/	/	/	/	Ni	
/	/	/	/	N	

() Hakimkhani

$$\left(\frac{100}{4} \times 1.25 \right)$$

Press's

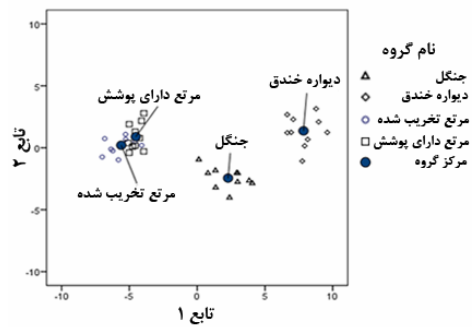
Q

Wilk's lambda							
/	/	/	/	/	/	/	/
/	/	/	/	/	/	/	/
/	/	/	/	/	/	/	/

*eigen value

()

(2002)Walling Collins



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(/)

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/	/	/
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/	/	/
/	/	/

Ni ¹³⁷Cs Mn_{pyr}. Fe Pb

N

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