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DI APICOLTURA
E BACHICOLTURA

REPORT

CHINESE HONEY 2016

Astragalus sinicus

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Introduction

This work was organized in order to strengthen the European knowledge of Chinese honeys, the technical competency of the palynologists in identification of foreign pollen and to harmonize the methodologies and the terminology.

Materials and methods

Samples were sent to 44 analysts, 36 of them (33 laboratories) reported back.

Countries	**n analysts**
Belgium	1
Croatia	5
France	4
Germany	5
Greece	4
Italy	9
Netherlands	1
Poland	3
Spain	2
Switzerland	1
Turkey	1

Table 1 - Countries and number of participants

Each laboratory received 4 samples of Chinese honey in a plastic container, labelled with a progressive number, analysts know just the geographical origin (China).

The analysts were recommended to analyze the samples as a routine sample, using the method that is regularly applied.

Each participant received by mail the Excel-form to fill out for the return of results.

Name	*XXXX*
Surname	*XXXXX*
Method	*XXXXX*
Nectar pollen	**Number**
Pollen name	*NNNN*
Pollen name	*p*
Nectarless pollen	***Number***
Pollen name	*NNNN*
Pollen name	*p*
Other elements	
Honeydew elements	*NNNN*
Other (yeast, starch etc.)	

Table 2 - Result form

Anlyst COD	**Method**
01	Louveaux, 1978
02	Louveaux, 1978
03	Von der Ohe, 2004
04	Harmonized method of melissopalnology (Apidology, 2004)
05	Louveaux, 1978
06	DIN 10760, 2002
07	§64 LFGB L40.00-11, mikroskopisch
08	Internal
09	Harmonized methods of melissopalynology (Apidologie, 2004) and DIN 10760:2002-05 (2002). Determination of relative pollen content of honey. Deutsches Institut für Normung
10	Louveaux, 1978
11	UNI 11299:2008
12	Louveaux, 1978
13	Harmonised methods of melissopalynology. Apidologie 35, S18-S21
14	Acetolysis according Erdtman (1969, Handbook of Palynology. Munksgaard, Copenhagen, 486p.)
15	Louveaux, 1978
16	Rozporządzenie MRiRW z dnia 14 stycznia 2009r.
17	Louveaux, 1978
18	DIN 10760: 2002-05
19	Internal
20	Louveaux, 1978
21	DIN 10760
22	UNI 11299:2008
23	Louveaux, 1978
24	UNI 11299 (2008)
25	DIN 10760, mod.
26	Louveaux 1978
27	Internal
28	Louveaux, 1978
29	Rozp. MRiRW z dnia 14 stycznia 2009r. Zał. do rozp. pkt. VI Dz.U. z 2009r. Nr 17 poz.94
30	Louveaux, 1978 and different german regulations
31	Louveaux, Maurizio & Vorwhol (1978)
32	UNI 11299:2008
33	Louveaux, 1978
34	Louveaux, DIN
35	Louveaux et al. (with changes)
36	Louveaux, 1978

Table 3 – Analysts' identification code and applied method

Analysts were asked to fill the form with all the pollens they recognized, eventually adding rows in the Excel-form. In particular analysts were asked to fill in the template with the names of counted pollens and their respective numbers. Participants were asked to count and identify 500 pollen grains and to fill in the form dividing pollens in nectariferous and nectarless. Furthermore they were asked to sort the list from most frequent to least frequent and to indicate with "p" (presence) *seen-but-not-counted* pollens.

Further details were asked to consider were the number of honeydew elements and the presence of other elements as yeast, starch etc.

Results

Results were not comparable with each other due to the different amount of counted pollens, assorted names given to pollen types, and dissimilar frequencies. Therefore give the entire results (Annex I Nomenclature) was the only way to allow analysts to compare their own results.

Sample	n palynologist	Min	Max	Mean	Std.dev	Median	CV
1	35	7	53	23.9	12.4	20.0	51.8
2	33	10	68	31.9	14.4	29.0	45.0
3	32	4	48	23.7	11.3	20.0	47.6
4	36	8	72	26.2	14.2	22.0	54.3

Table 4 - n palynologists who performed analysis, data about the amount of pollen types found by palynologists in each sample

Each name gave from analysts (n data) to each pollen type, clearly attributable at the same taxon (assigned pollen types), was grouped (assigned pollen type). Then the assigned pollen type was tried in "The plant list" (www.theplantlist.org) and was assigned to the belonging family.

Sample	n palynologist	n data	n assigned pollen type	n family
1	35	739	207	78
2	33	960	235	82
3	32	638	202	71
4	36	811	238	85

Table 5 – Variability of pollen name

Some pollens were selected in each sample to perform statistical analysis reported below.

Statistical analysis

Not all analysts counted the same amount of pollen then for each numerical value was calculated the percentage on total number of counted pollen, regardless if pollens were from nectariferous or nectarless plants.

The pollens were chosen on the basis of their median value, since median is a simple and highly outlier-resistant estimator of the population mean (UNI ISO 13528:2016), and on the basis of the number of analysts who identified the pollen.

Sample	High (Me>40%)	Medium (5%<Me<40%)		Low (Me<5)	
1	*Robinia* (Me=47.6)	Brassicaceae (Me=14.2)			
2	Cannabaceae (Me=45.7)	*Vitex* (Me=19.6)	Rhamnaceae (Me=5.7)	Caryophyllaceae (Me=1.6)	
3	*Vitex* (Me=65.2)	*Flueggea* (Me=11.4)		Brassicaceae (Me=2.4)	
4	Brassicaceae (Me=78.0)			*Astragalus sinicus* (Me=3.2)	Apiaceae (Me=2.6)

Table 6 – Chosen pollen and median (Me) (outlier included)

Analysts named the same pollen form with different names. All the different names have been identified and grouped under one heading. The correct attribution of family, genus and species was chosen using "The Plant List" references. In the elaboration each pollen will be identified with the widest genus or family (e.g. *Brassica napus*, *Sinapis* and Cruciferae were grouped under the heading Brassicaceae), instead if a pollen form was identified with different family denominations, it was grouped under the most frequent name used by analysts (e.g. Moraceae, Urticaceae, *Humulus*, *Corylus* were grouped under Cannabaceae).

Sample 1			
Robinia		**Brasssicaceae**	
Analyst	**Used name**	**Analyst**	**Used name**
01	Robinia pseudoacacia	*01*	Cruciferae
02	Robinia pseudoacacia	*02*	Cruciferae
03	Robinia	*03*	Cruciferae (Brassica type) + Cruciferae < 20 micron + Cruciferae
04	Robinia	*04*	Cruciferae
05	Robinia Pseudacacia	*05*	Brassicaceae
06	Robinia pseudoacacia	*06*	Brassica sp.
07	Fabaceae / Robinia pseudoacacia / false Acacia	*07*	Brassicaceae/Brassica napus/Rape
08	Robinia	*08*	Brassicaceae
09	Robinia pseudoacacia	*09*	Cruciferae/Brassica type
10	Robinia pseudacacia	*10*	Brassicaceae
11	Robinia	*11*	Cruciferae
12	Robinia	*12*	Brassicaceae
13	\	*13*	\
14	Robinia	*14*	Brassicaceae
15	Acacia	*15*	Brasssica + Brasssicaceae
16	Robinia Pseudoacacia	*16*	Brassicaceae
17	Robinia	*17*	Cruciferae
18	Robinia pseudoacacia	*18*	Brassica napus
19	Robinia	*19*	Brassicaceae
20	Robinia	*20*	Brassicaceae
21	Robinia	*21*	Brassicaceae
22	Robinia	*22*	Cruciferae
23	Fabaceae/Robinia	*23*	Brassicaceae + Brasicaceae (inaperturate type)
24	Robinia pseudoacacia L.	*24*	Brassicaceae
25	Robinia pseudoacacia	*25*	Brassicaceae
26	Robinia pseudoacacia	*26*	Brassicaceae, Brassica napus form
27	Robinia	*27*	Brassicaceae
28	Robinia	*28*	Cruciferae
29	Robinia	*29*	Cruciferae
30	Robinia pseudoacacia	*30*	Brassica-type + Brassicaceae
31	Robinia pseudoacacia	*31*	Brassica (B. napus var. oleifera)
32	Robinia	*32*	Cruciferae (Brassica f.) + Cruciferae ≤ 20 µm
33	Robinia	*33*	Cruciferae
34	Robinia	*34*	Brassica napus-type + Sinapis-type + Brassicaceae
35	Medicago type (Fabaceae but not sure about the genus)	*35*	Brassicaceae (Brassica but there are others)
36	Robinia type	*36*	Brassicaceae

Table 7 – Pollen type names used by analysts (without any correction) in sample 1 grouped under the heading *Robinia* and Brassicaceae.

Sample 2							
Cannabaceae		***Vitex***		**Rhamnaceae**		**Caryophyllaceae**	
Analyst	**Used name**	Analyst	**Used name**	Analyst	**Used name**	Analyst	**Used name**
01	Cannabaceae	01	Vitex	01	Rhamnaceae + Rhamnaceae small	01	Caryophyllaceae
02	Cannabaceae	02	Vitex	02	Rhamnaceae + Rhamnaceae small	02	Caryophyllaceae
03	Moraceae/ Cannabaceae	03	Vitex	03	Rhamnaceae + Rhamnaceae < 15 micron	03	Caryophyllaceae
04	Humulus	04	Vitex	04	Rhamnaceae	04	Caryophyllaceae
05	Cannabacea type (20-23µ) + Moraceae type	05	Unknown fabaceae type (tricolpate 20-25µ)	05	Rhamnaceae type	05	Carryophylaceae type
06	Cannabaceae (Humulus sp.)	06	\	06	\	06	Caryophylaceae
07	\	07	Lamiaceae/Vitex	07	Rhamnaceae/diff. Genera	07	Convolvulaceae/ Stellaria-type
08	Humulus	08	Vitex	08	Rhamnaceae	08	Caryophyllaceae
09	Humulus lupulus	09		09	Rhamnaceae/ Ziziphus jujuba	09	Caryophyllaceae
10	\	10	\	10	\	10	\
11	Cannabaceae	11	Vitex	11	Rhamnaceae	11	Caryophyllaceae
12	moraceae + urticacea type ?	12	vitex	12	rhamnus	12	caryophyllaceae
13	\	13	\	13	\	13	\
14	\	14	\	14	Rhamnaceae	14	Caryophyllaceae
15	Corylus avelana	15	Unknown	15	Rhamnaceae	15	Caryophyllaceae
16	Cannabaceae	16	\	16	\	16	Caryophyllaceae
17	Cannabaceae	17	\	17	Rhamnaceae	17	\
18	Corylus avellana + Humulus lupulus	18	\	18	Rhamnaceae	18	Caryophyllaceae
19	Humulus	19	Vitex	19	Rhamnaceae	19	Caryophyllaceae
20	Morus/ Urticaceae	20	\	20	Rhamnaceae	20	\
21	Cannabinaceae	21	Unidentified 1, Labiatae?	21	Rhamnaceae, Rhamus + Rhamnaceae, small, Indet2 + Paliurus	21	\
22	Moraceae	22	\	22	Rhamnaceae	22	Caryophyllaceae
23	Corylaceae/Corylus + Cannabaceae	23	\	23	Rhamnaceae	23	Caryophyllaceae
24	\	24	\	24	\	24	\
25	Corylaceae	25	Vitex-Type	25	Rhamnaceae	25	Caryophyllaceae
26	Humulus	26	23µm semiangular psilate / fine reticulate 3-colp(or)ate margo onci	26	Rhamnaceae	26	Caryophyllaceae
27	Humulus	27	Vitex	27	Rhamnaceae	27	Caryophyllaceae
28	Corylus	28	\	28	\	28	polline tipo Stellaria + Caryophyllaceae
29	Corylus	29	\	29	Rhamnaceae	29	Silene dioica
30	Moracae/Cannabis-type	30	Vitex	30	Rhamnaceae	30	Caryophyllaceae
31	Moraceae/Urticaceae (Morus)	31	\	31	\	31	Caryophyllaceae (Silene gallica f.)
32	Moraceae/Cannabaceae	32	Labiatae (Vitex type)	32	Rhamnaceae (Ziziphus type) + Rhamnus + Rhamnaceae altre	32	Caryophyllaceae
33	Corylaceae	33	\	33	Rhamnaceae + Frangula	33	Caryophyllaceae
34	Cannabaceae	34	Vitex	34	Rhamnaceae	34	Caryophyllaceae
35	Cannabaceae (Morus alba)	35	Unknown (circular, reticulate, 23 um diameter, wide colpi)	35	Ziziphus + Rhamnaceae (Ziziphus)	35	Caryophyllaceae
36	\	36	\	36	\	36	\

Table 8 - Pollen type names used by analysts (without any correction) in sample 2 grouped under the heading Cannabaceae, *Vitex*, Rhamnaceae, Caryophyllaceae.

Sample 3					
Vitex		***Flueggea***		**Brassicaceae**	
Analyst	**Used name**	Analyst	**Used name**	Analyst	**Used name**
01	Vitex	01	Flueggea	01	Cruciferae
02	Vitex	02	Flueggea	02	Cruciferae
03	Vitex + Vitex 25-30 micron	03	Securinega/Flueggea	03	Cruciferae (Brassica type) + Cruciferae
04	Vitex	4	Flueggea	04	Cruciferae
05	tricolpate pollen (Fabaceae type) ~ 25 µm	5	tricolporate pollen (Oleaceae type) ~ 22,5 µm	05	Brassicaceae
06	\	06	\	06	Brassica sp.
07	Lamiaceae/Vitex	07	Araliaceae/Schefflera-type	07	\
08	Vitex	08	Fluegga	08	Brassicaceae
09	\	09	\	09	Cruciferae / Brassica type
10	\	10	\	10	\
11	Vitex	11	\	11	Cruciferae
12	vitex	12	avicennia	12	brassicaceae
13	\	13	\	13	\
14	\	14	Tricolporate ?	14	Brassicaceae
15	\	15	\	15	Brassicaceae
16	\	16	\	16	Brassicaceae
17	\	17	\	17	Cruciferae
18	\	18	\	18	Brassicaceae
19	Vitex	19	Fluegga	19	Brassicaceae
20	\	20	\	20	Crucifearae
21	Unidentified 1, Labiatae?	21	Unidentified 2, reticulat, C3P3, 21 ny	21	Brassicaceae
22	\	22	\	22	CRUCIFERAE
23	\	23	\	23	\
24	Unidentified	24	\	24	\
25	Vitex-type	25	\	25	Brassicaceae
26	23 µm, semiangular, 3-colporate, colpi with sharp edges, split on pore, psilate (/ striate ?)	26	20-23 µm, circular, 3-colporate, costa, margo, slightly yellow (more or less Fraxinus form)	26	Brassica napus form
27	Vitex	27	Fluegga	27	Brassicaceae
28	\	28	\	28	Cruciferae
29	\	29	\	29	Crucifeaeae
30	Vitex-type	30	unknown	30	Brassicaceae
31	\	31	\	31	Brassica
32	Labiatae (Vitex type)	32	Flueggea/Securinega f.	32	Cruciferae (Brassica f.)
33	Labiatae	33	\	33	Brassicaceae
34	Vitex	34	Ixora-type (Rubiaceae)	34	Brassica napus-type + Brassicaceae
35	Unknown (circular, reticulate, 23 um diameter, wide colpi)	35	\	35	Brassica
36	\	36	\	36	\

Table 9 - Pollen type names used by analysts (without any correction) in sample 3 grouped under the heading *Vitex*, *Flueggea*, Brassicaceae.

Sample 4					
Brassicaceae		***Astragalus sinicus***		**Apiaceae**	
Analyst	**Used name**	**Analyst**	**Used name**	**Analyst**	**Used name**
01	Cruciferae	01	Astragalus sinicus	01	Umbelliferae
02	Cruciferae	02	Astragalus sinicus	02	Umbelliferae
03	Cruciferae (Brassica type)	03	Astragalus sinicus	03	Umbelliferae A + Umbelliferae other
04	Cruciferae	04	Astragalus	04	Foeniculum
05	Brassicaceae	05	\	05	Apiaceae
06	Brassica sp.	06	\	06	Apiaceae
07	Brassicaceae / Brassica napus / Rape	07	Fabaceae/Astragalus-type	07	Apiaceae / Anthriscus type
08	Brassiacaceae	08	Astragalus	08	Apiaceae
09	Cruciferae/Brassica type	09	Astragalus (chinese type)	09	Umbelliferae
10	Brassicaceae	10	Astragalus type	10	Daucus type
11	Cruciferae	11	Astragalus sinicus	11	Umbelliferae A
12	brassicaceae	12	astragalus sinicus	12	apiaceae
13	Cruciferae	13	\	13	Umbelliferae
14	Brassicaceae	14	\	14	Apiaceae
15	Brassica + Brassicaceae	15	Astragalus sinicus	15	Umbelliferae
16	Brassicacea	16	Chinese type	16	Anthriscus type
17	Cruciferae	17	\	17	Umbelliferae
18	Brassica napus	18	\	18	Apiaceae
19	Brassiacaceae	19	Astragalus	19	Apiaceae
20	Brassicaceae	20	\	20	Apiaceae
21	Brassicaceae, Brassica + Brassicaeae, 20 ny	21	Astragalus-Type, gr. + Astragalus sinicus	21	Apiaceae, Pastinaca?
22	CRUCIFERAE	22	Astragalus sinicus	22	Umbelliferae
23	Brassicaceae + Brassicaceae (inaperturate type)	23	\	23	Apiaceae A
24	Brassicaceae	24	\	24	Apiaceae
25	Brassica napus + Brassicaceae	25	Astralagus-Type	25	Anthriscus-Type
26	Brassicaceae: Brassica napus	26	Astragalus	26	Apiaceae
27	Brassiacaceae	27	Astragalus	27	Apiaceae
28	Cruciferae	28	Astragalus	28	Umbelliferae
29	Crucieferae (main: Brassica napus)	29	\	29	Anthriscus typ + Heracleum typ
30	Brassica-type + Brassicaceae	30	unknown small pollen	30	Apiaceae
31	Brassica (B. napus var. oleifera)	31	Astragalus sinicus	31	Umbelliferae (Conium maculatum f.) + Bupleurum
32	Cruciferae (Brassica f.)	32	Astragalus sinicus	32	Umbelliferae (Foeniculum type)
33	Brassica napus	33	Astragalus	33	Anthriscus f.
34	Brassicaceae + Brassica napus-type	34	Astragalus sinicus	34	Foeniculum
35	Brassica type	35	\	35	Umbelliferae
36	Brassicaceae	36	\	36	Daucus type

Table 10 - Pollen type names used by analysts (without any correction) in sample 4 grouped under the heading Brassicaceae, *Astragalus sinicus*, Apiaceae.

For each dataset of chosen pollen (*Robinia*, Brassicaceae, Cannabaceae, Rhamnaceae, *Vitex*, Caryophyllaceae, *Flueggea*, *Astragalus sinicus*, Apiaceae) normality was checked by Kolmogorov-Smirnov tests. Only Apiaceae was normally distributed, so for other pollen (not normally distributed) outlier were checked by Grubbs and Hampel tests.

The assigned value and z-score were calculated from the median value (outliers excluded).

The z-scores were considered satisfactory if $|z| \leq 2$.

-	Sample 1				Sample 2							
	Robinia *Assigned value 48.8*		Brassicaceae *Assigned value 13.7*		Cannabaceae *Assigned value 46.1*		*Vitex* *Assigned value 19.3*		Rhamnaceae *Assigned value 5.3*		Caryophyllaceae *Assigned value 1.6*	
Palynologist	**% T**	**Z score**	**% T**	**Z score**	**% T**	**Z score**	**% T**	**Z score**	**% T**	**Z score**	**% T**	**Z score**
01	48.8	0.1	16.7	0.5	46.4	0.3	16.7	-0.5	7.0	0.9	1.8	-0.1
02	39.8	-0.8	18.1	0.7	49.5	0.5	17.8	-0.3	7.4	1.1	1.9	0.0
03	37.6	-1.0	16.6	0.5	49.6	0.5	20.9	0.2	3.9	-0.6	2.3	0.3
04	38.2	-1.0	15.8	0.3	\	\	47.8[1,2,**]	4.3	9.4*	2.1	\	\
05	42.5	-0.5	20.5	1.1	50.9	0.6	15.7	-0.6	6.2	0.5	2.3	0.3
06	44.1	-0.4	15.5	0.3	35.7	-0.5	\	\	\	\	4	1.7
07	37.0	-1.1	12.0	-0.4	\	\	22.0	0.3	\	\	\	\
08	41.9	-0.6	13.3	-0.1	50.6	0.6	17.1	-0.4	3.0	-1.1	1.6	-0.3
09	43.7	-0.4	12.9	-0.2	48.0	0.4	\	\	5.7	0.2	0.6	-1.0
10	54.3	0.7	7.6	-1.1	\	\	\	\	\	\	\	\
11	51.7	0.5	12.1	-0.3	48.4	0.4	12.1	-1.2	5.1	-0.1	1.6	-0.2
12	55.9	0.9	10.1	-0.7	60.0	1.2	12.2	-1.1	3.6	-0.8	0.5	-1.1
13	\	\	\	\	\	\	\	\	\	\	\	\
14	8.7[1,**]	-4.1	27.8*	2.4	\	\	\	\	2.7	-1.3	1.5	-0.3
15	46.5	-0.1	22.6	1.5	55.9	0.9	12.1	-1.2	6.3	0.6	2.5	0.4
16	42.0	-0.6	18.0	0.7	71.4[2,*]	2.1	\	\	\	\	1.6	-0.3
17	54.8	0.8	4.4	-1.7	33.8	-0.6	\	\	4.2	-0.5	\	\
18	53.7	0.7	16.9	0.5	17.7	-1.8	\	\	21.6[1,**]	8.2	4.6*	2.1
19	43.9	-0.4	12.7	-0.2	48.6	0.4	19.3	-0.1	4.7	-0.2	2.4	0.4
20	40.4	-0.7	12.5	-0.3	26.4	-1.2	\	\	17.4[1,**]	6.1	\	\
21	49.6	0.2	14.2	0.0	38.2	-0.3	23.8	0.6	5.4	0.1	\	\
22	31.7	-1.7	26.2*	2.1	42.4	0.0	\	\	9.1	2.0	0.4	-1.2
23	60.6	1.4	17.1	0.5	41.6	-0.1	\	\	2.7	-1.3	1.0	-0.7
24	24.0*	-2.5	3.0	-1.9	\	\	\	\	\	\	\	\
25	39.8	-0.8	11	-0.5	51.0	0.6	19.6	0.0	1.2	-2.0	1.4	-0.4
26	70.8*	2.5	10.1	-0.7	56.5	1.0	14.2	-0.8	5.8	0.3	1.7	-0.1
27	54.4	0.7	14.7	0.1	41.4	-0.1	29.5	1.5	4.9	-0.2	1.3	-0.5
28	51.4	0.4	11.7	-0.4	53.8	0.8	\	\	\	\	8.9[1,3,**]	5.5
29	56.5	1.0	17.7	0.6	4.3 [2,*]	-2.7	\	\	13.8[1,**]	4.3	6.5[1,3**]	4.6
30	8.1[1,2,**]	-4.2	72.9[1,3,**]	10.3	12.4*	-2.2	46.5[1,**]	4.1	6.2	0.5	0.8	-0.9
31	53.0	0.6	4.9	-1.6	43.1	0.0	\	\	\	\	1.5	-0.3
32	49.0	0.2	9.4	-0.8	32.5	-0.7	28.6	1.3	5.3	0.0	2.0	0.0
33	54.7	0.8	6.5	-1.3	12.3*	-2.2	\	\	35.0[1,3,**]	14.8	4.3	1.8
34	57.6	1.1	15.8	0.3	34.0	-0.6	34.2*	2.2	4.8	-0.2	1.6	-0.3
35	47.6	0.0	15.3	0.2	47.5	0.2	19.6	0.0	8.0	1.3	0.5	-1.2
36	59.5	1.3	10.3	-0.6	\	\	\	\	\	\	\	\

Table 11 - Assigned value=median value; 1:outlier detected by Hampel's test (NADi>3.5); 2: detected by Grubb's test (p=0.05) furthest from the rest, but not a significant outlier (P > 0.05); 3: significant outlier (P < 0.05) detected by Grubb's test (p=0.05); *z-score value 2< |z| <3; ** z-score value |z|>3

-	Sample 3						Sample 4					
	Vitex Assigned value 67.3		*Flueggea* Assigned value 11.4		Brassicaceae Assigned value 1.8		Brassicaceae Assigned value 78.0		*Astragalus sinicus* Assigned value 3.2		Apiaceae Assigned value 2.6	
Palynologist	**% T**	**Z score**	**% T**	**Z score**	**% T**	**Z score**	**% T**	**Z score**	**% T**	**Z score**	**% T**	**Z score**
01	67.3	0.1	13.1	0.6	1.7	-0.6	79.2	0.3	4.3	0.1	2.7	0.1
02	69.0	0.3	13.4	0.8	1.8	-0.6	80.9	0.6	1.8	-1.0	2.9	0.3
03	63.2	-0.3	10.7	-0.7	3.1	0.1	71.6	-1.1	3.8	-0.1	2.3	-0.3
04	85.6*	2.1	14.4	1.4	\	\	80.2	0.5	3	-0.4	2.6	0.0
05	54.3	-1.3	12.8	0.5	1.4	-0.7	81.7	0.8	\	\	1.7	-0.8
06	\	\	\	\	8.4*	2.6	69.5	-1.5	\	\	2.5	-0.1
07	60.0	-0.7	11.0	-0.6	\	\	78.0	0.1	\	\	\	\
08	55.3	-1.2	11.0	-0.6	4.0	0.5	78.9	0.2	\	\	3.4	0.7
09	\	\	\	\	1.5	-0.7	73.3	-0.8	1.8	-1.0	2.9	0.3
10	\	\	\	\	\	\	73.0	-0.9	9.7[2,*]	2.5	2.6	0.0
11	71.7	0.6	\	\	2.2	-0.3	81.8	0.8	3.4	-0.2	1.3	-1.2
12	59.9	-0.7	22.5[1,3,**]	6.1	1.6	-0.6	74.3	-0.6	5.8	0.8	3.2	0.5
13	\	\	\	\	\	\	83.6	1.1	\	\	3.3	0.6
14	\	\	10.3	-1.0	3.2	0.1	80.4	0.5	\	\	3.8	1.0
15	\	\	\	\	13.2[1,**]	5.0	77.8	0.0	8	1.8	1.8	-0.7
16	\	\	\	\	24.4[1,**]	10.3	86.2	1.6	5.6	0.7	1.8	-0.7
17	\	\	\	\	1.8	-0.5	76.2	-0.3	\	\	2.2	-0.4
18	\	\	\	\	7.4*	2.2	64.2*	-2.5	\	\	5.1*	2.2
19	58.3	-1.0	11.4	-0.4	3.3	0.2	78.9	-0.3	2.8	-0.5	2.8	0.1
20	\	\	\	\	5.8	1.4	69.5	-1.5	\	\	4.2	1.4
21	56.0	-1.1	14.5	1.5	1.6	-0.6	76.5	-0.2	2.8	-0.5	2.2	-0.4
22	\	\	\	\	32.5[1,3,**]	14.3	78.8	0.2	2.4	-0.7	2.4	-0.2
23	\	\	\	\	\	\	78.0	0.1	\	\	0.0[2,*]	-2.3
24	68.5	0.3	\	\	\	\	84.9	1.4	\	\	2.4	-0.2
25	69.8	0.4	\	\	1.8	-0.5	81.7	0.8	1.6	-1.0	1.2	-1.3
26	57.4	-0.9	14.5	1.5	1.3	-0.8	84.3	1.3	1.8	-0.9	0.5	-1.9
27	57.9	-0.9	11.3	-0.4	5.5	1.2	80.2	0.5	2.3	-1.7	3.4	0.6
28	\	\	\	\	1.2	-0.8	80.2	0.5	2.5	-0.6	1.7	-0.8
29	\	\	\	\	26.3[1,**]	11.3	70.5	-1.4	\	\	5.2*	2.3
30	82.0	1.7	8.6	-1.9	0.3	-1.2	85	1.4	3.9	0.0	2.3	-0.3
31	\	\	\	\	1.3	-0.8	67.7	-1.9	6.4	1.1	3.0	0.3
32	70.3	0.5	11.4	-0.4	2.7	-0.1	75.0	-0.5	3.3	-0.3	2.0	-0.6
33	26.9[1,3,**]	-4.2	\	\	5.0	1.0	55.9[1,3,**]	-4.1	6.0	0.9	3.3	0.6
34	74.6	0.9	11.4	-0.3	2.4	-0.3	73.9	-0.7	1.2	-1.2	4.2	1.4
35	71.4	0.6	\	\	1.2	-0.1	76.0	-0.3	\	\	3.6	0.8
36	\	\	\	\	\	\	74.6	-0.6	\	\	1.7	-0.8

Table 12 - Assigned value=median value; 1:outlier detected by Hampel's test (NADi>3.5); 2: detected by Grubb's test (p=0.05) furthest from the rest, but not a significant outlier (P > 0.05); 3: significant outlier (P < 0.05) detected by Grubb's test (p=0.05); *z-score value 2< |z| <3; ** z-score value |z|>3

Z - scores

Sample 1: Z scores

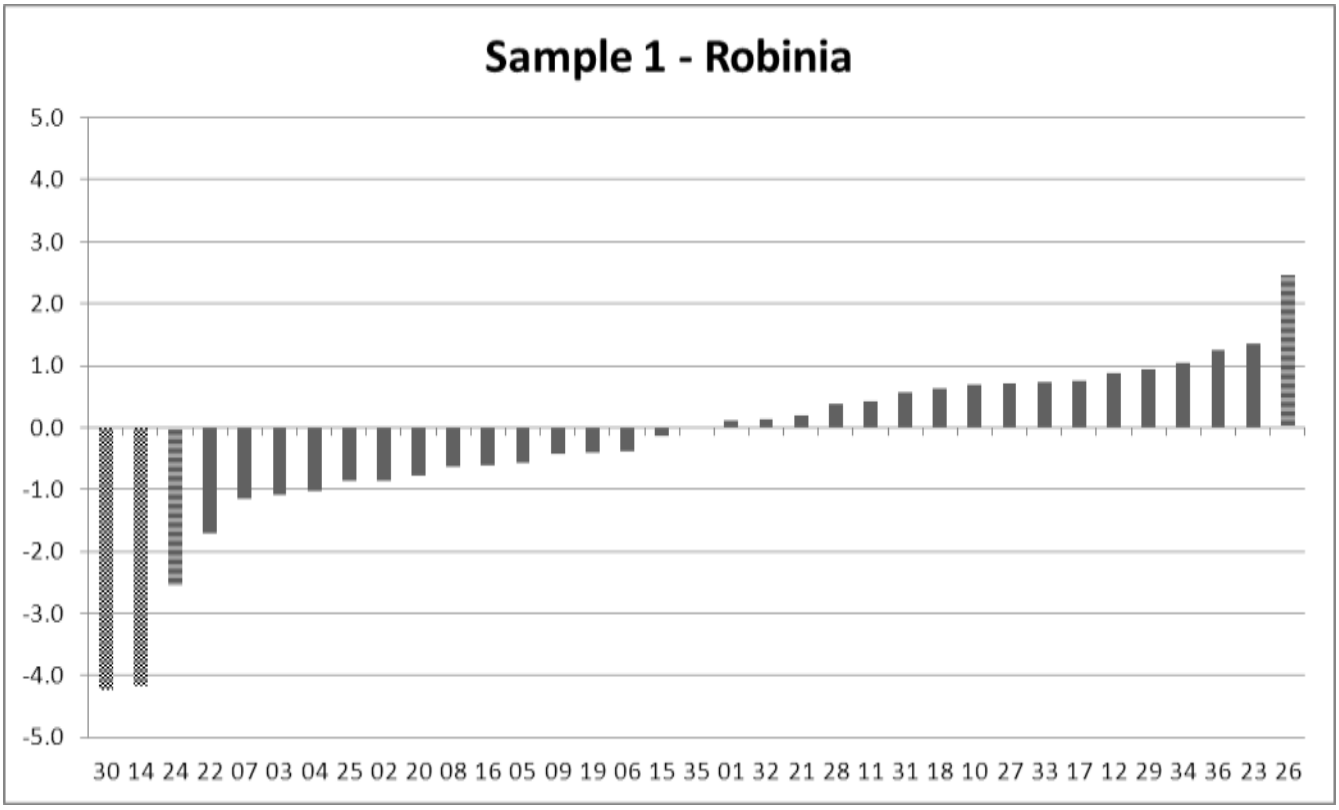

Figure 1 - Z-Score histogram of the qualitative pollen analysis of *Robinia* in Sample 1; z-scores were considered satisfactory if |z| < 2

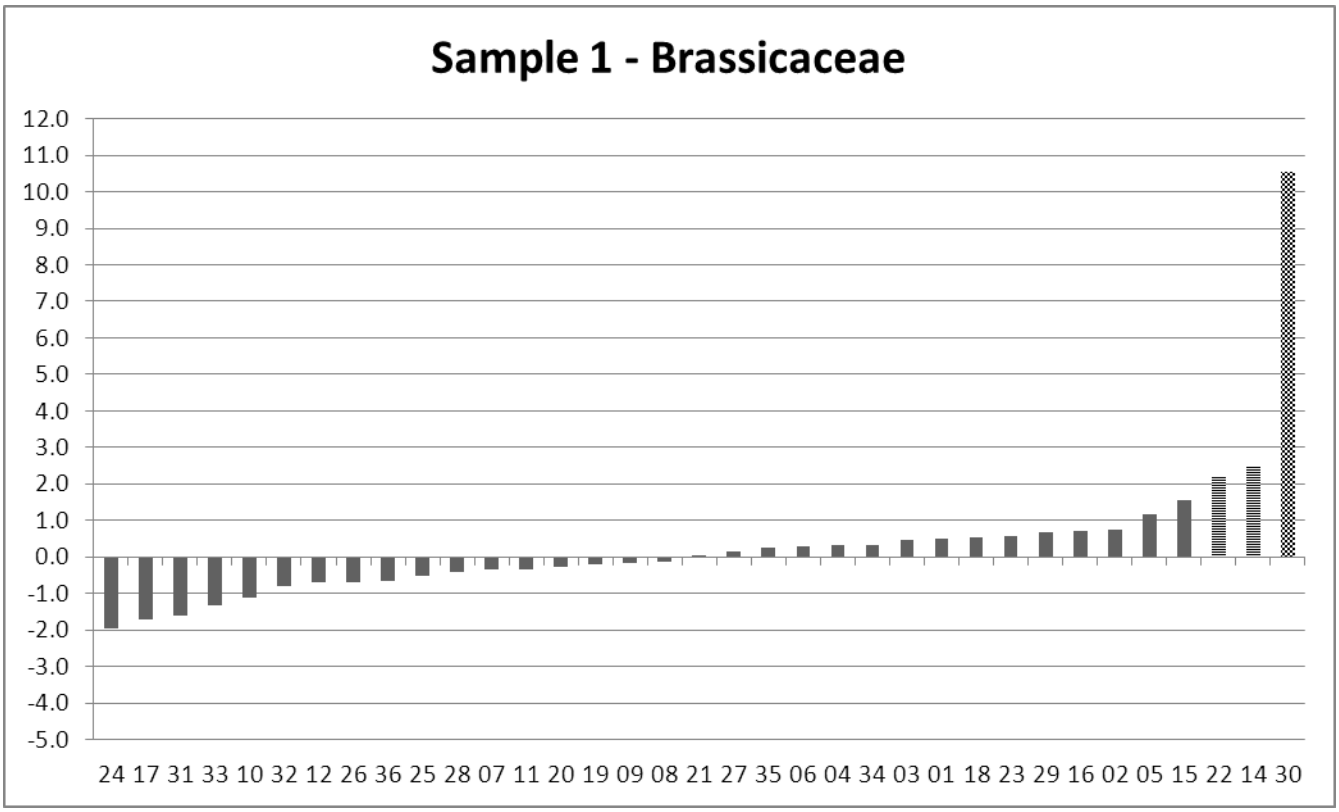

Figure 2 – Z-Score histogram of the qualitative pollen analysis of Brassicaceae in Sample 1; z-scores were considered satisfactory if |z| < 2

Sample 2: Z scores

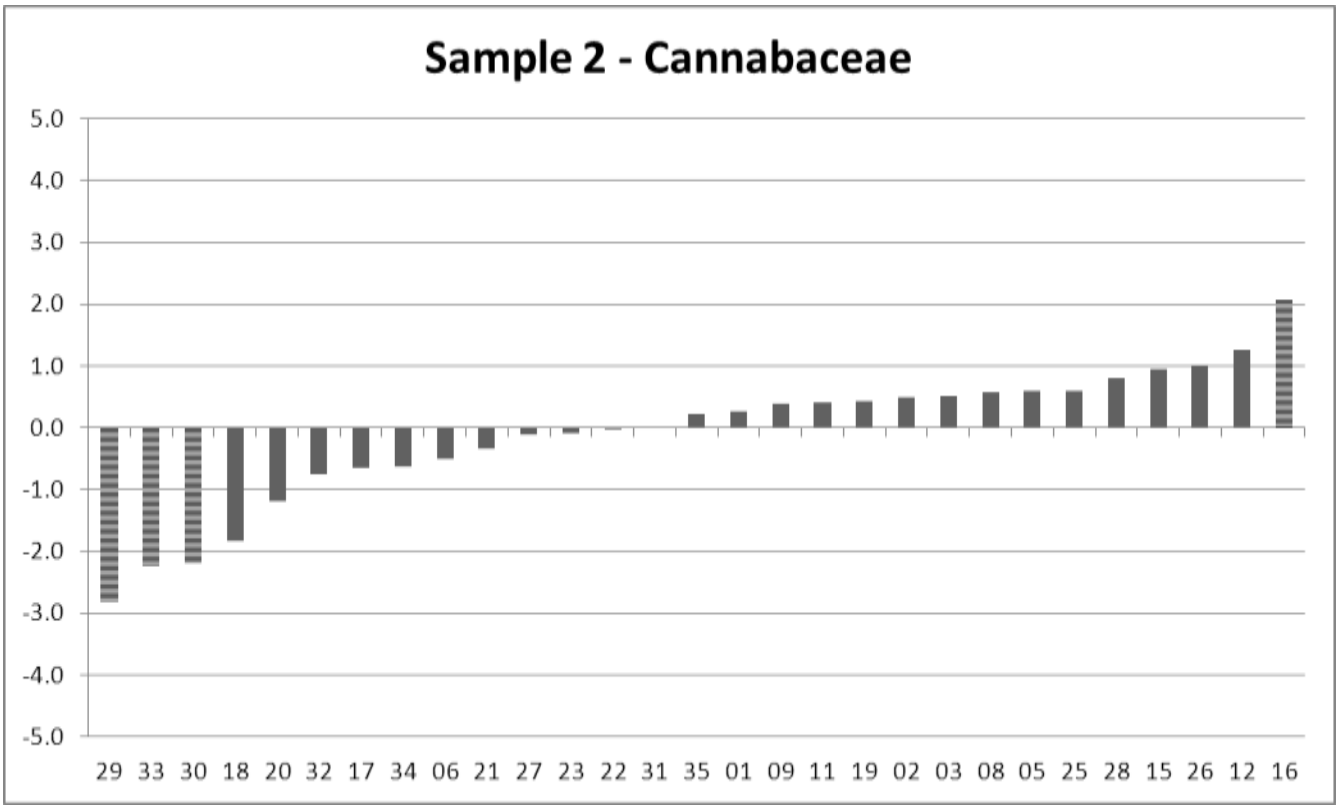

Figure 3 - Z--Score histogram of the qualitative pollen analysis of Cannabaceae in Sample 2; z-scores were considered satisfactory if |z| < 2

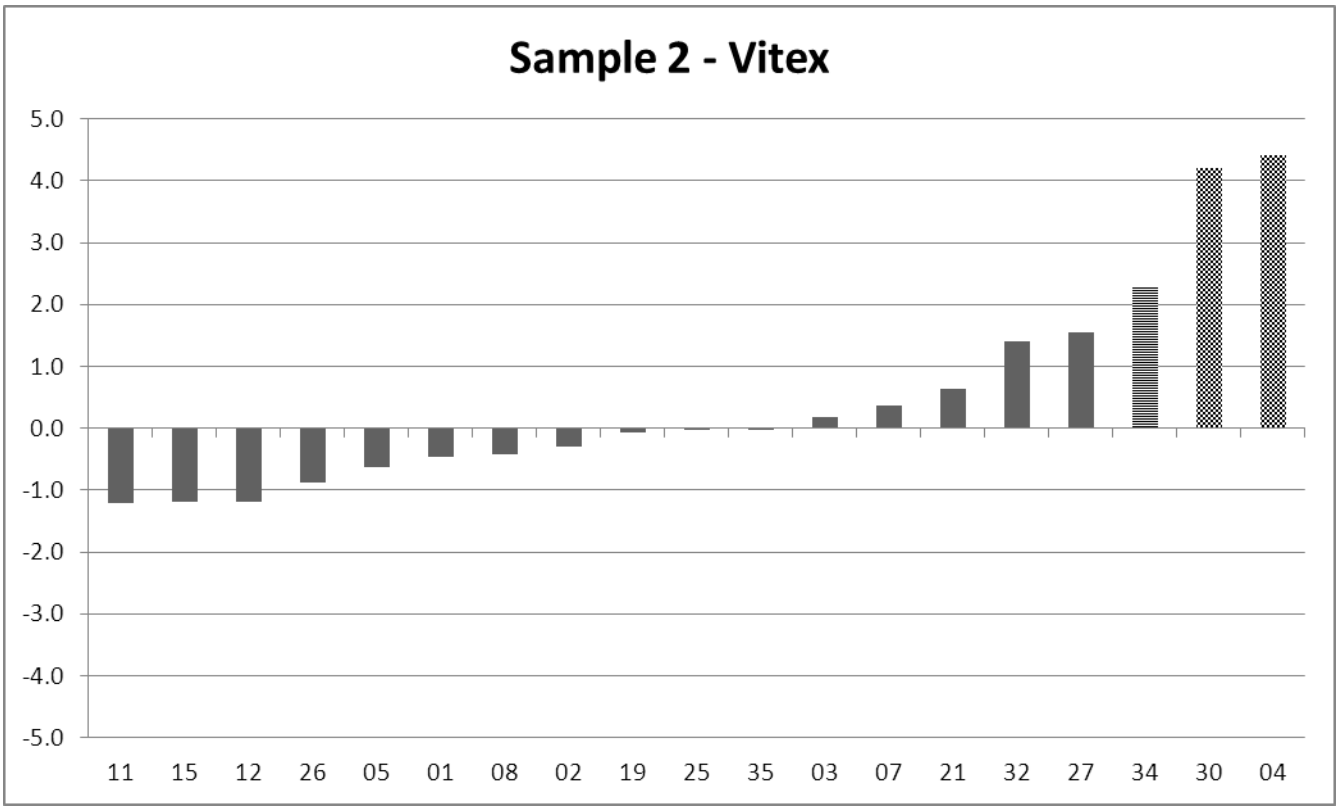

Figure 4 – Z-Score histogram of the qualitative pollen analysis of *Vitex* in Sample 2; z-scores were considered satisfactory if

|z| < 2

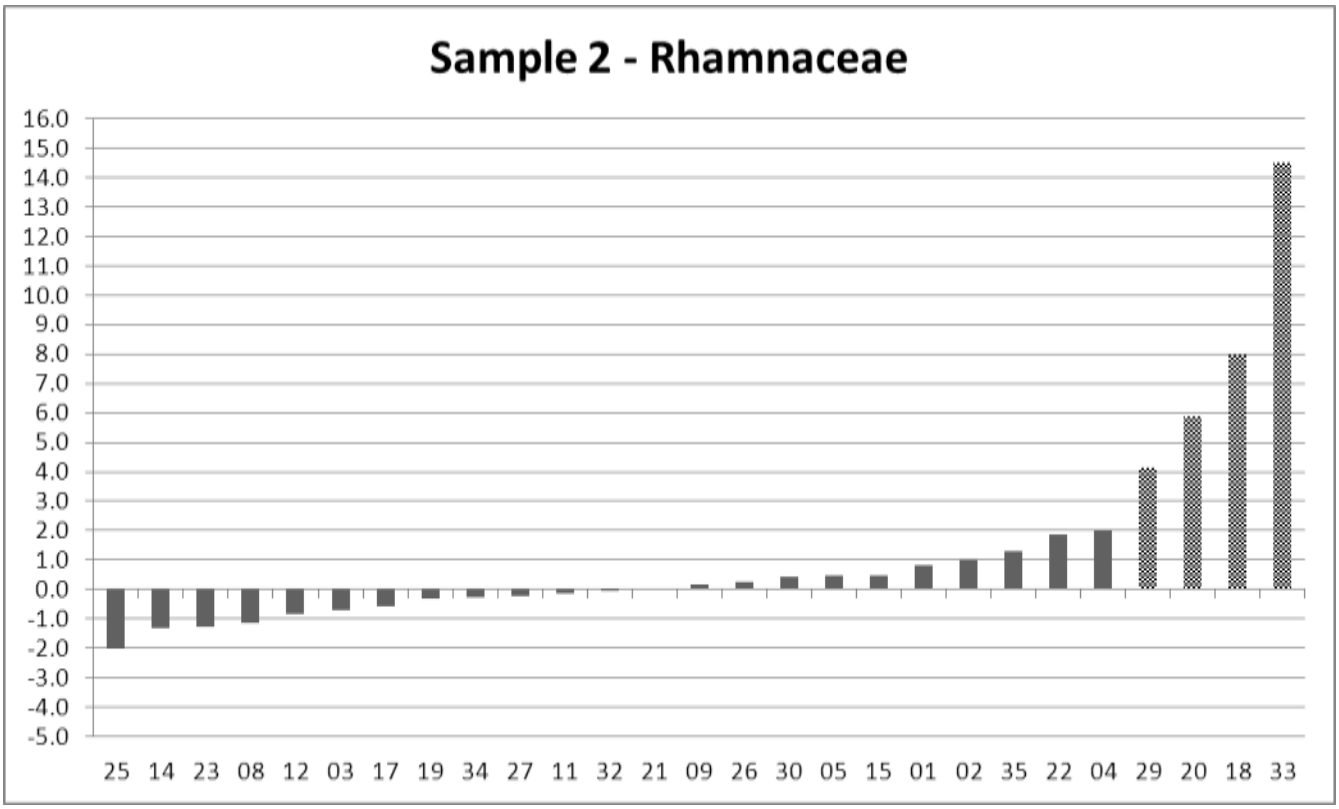

Figure 5 – Z-Score histogram of the qualitative pollen analysis of Rhamnaceae in Sample 2; z-scores were considered satisfactory if |z| < 2

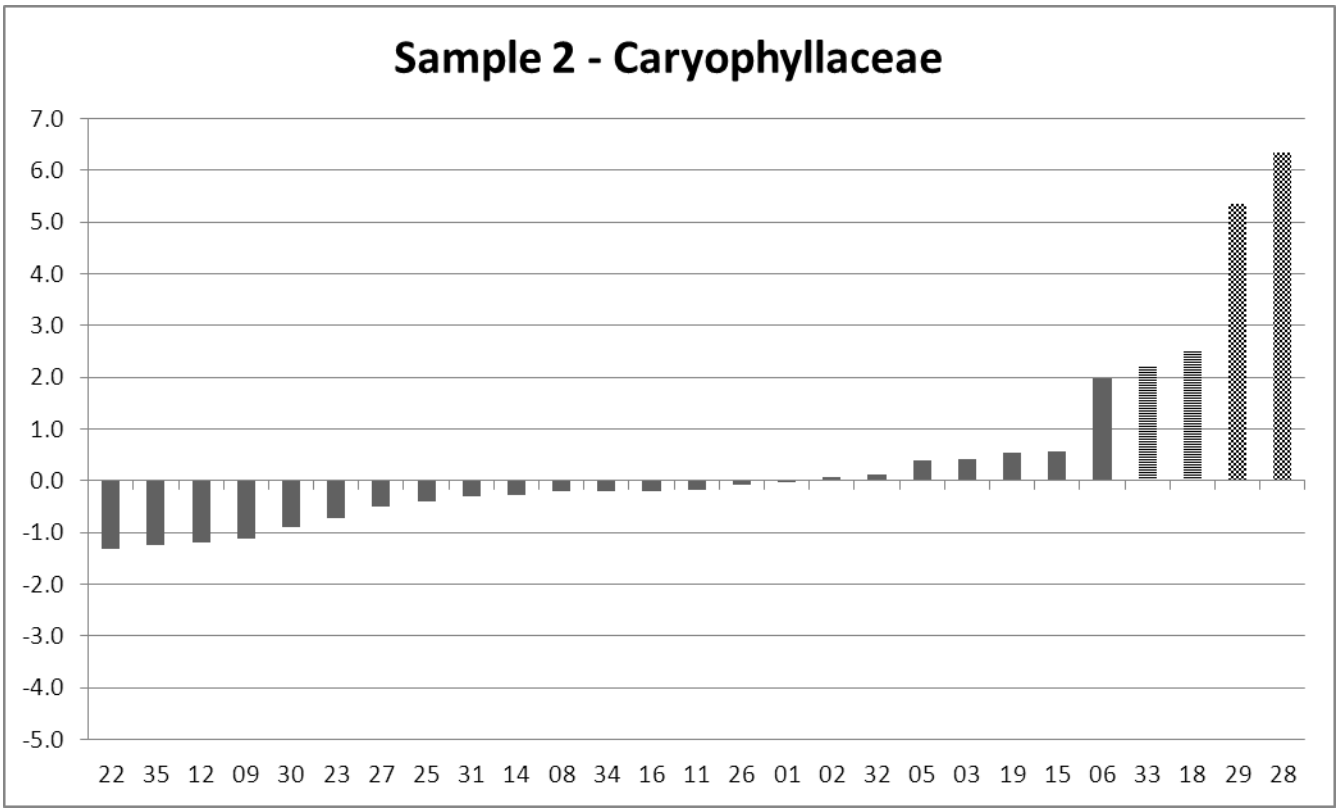

Figure 6 – Z-Score histogram of the qualitative pollen analysis of Caryophyllaceae in Sample 2; z-scores were considered satisfactory if |z| < 2

Sample 3: Z scores

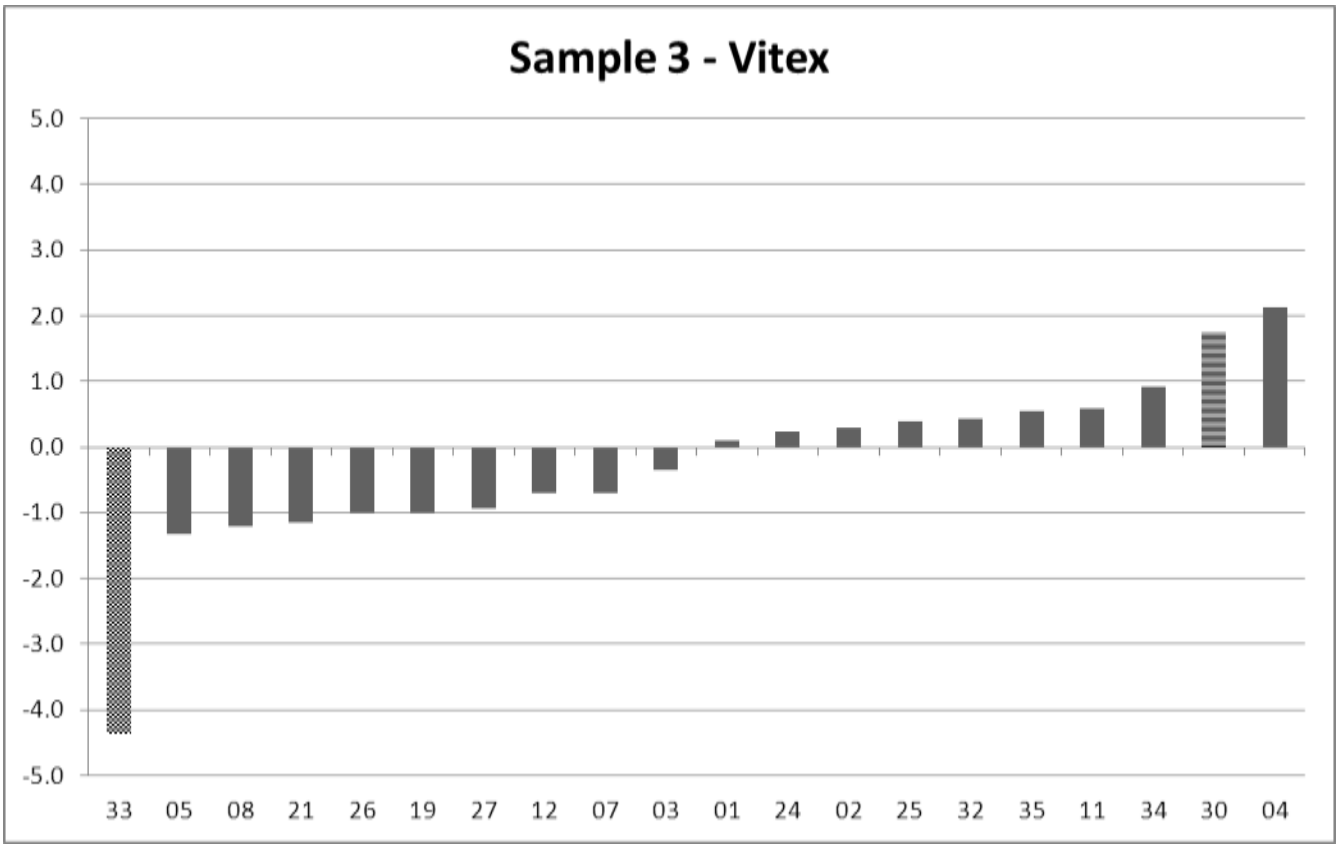

Figure 7 - Z-Score histogram of the qualitative pollen analysis of Vitex in Sample 3; z-scores were considered satisfactory if |z| < 2

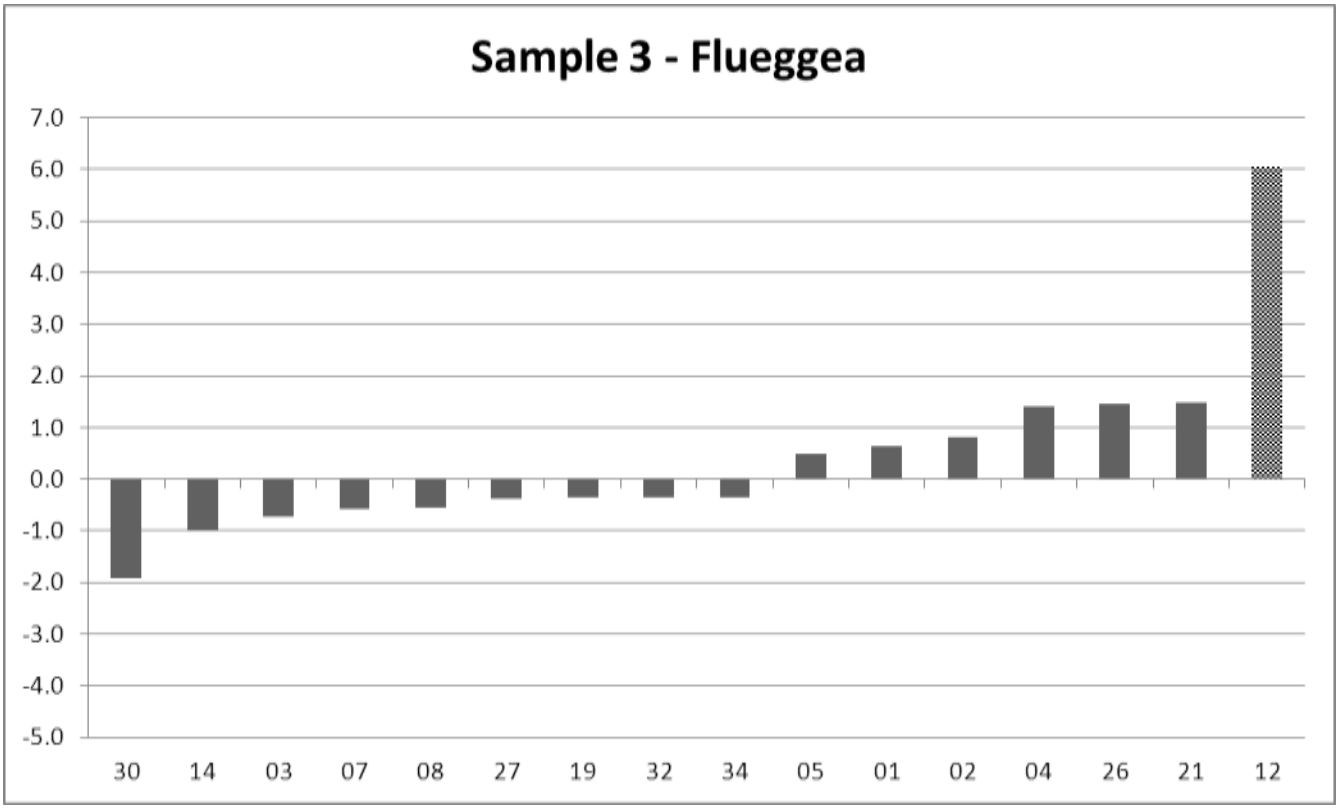

Figure 8 – Z-Score histogram of the qualitative pollen analysis of *Flueggea* in Sample 3; z-scores were considered satisfactory if |z| < 2

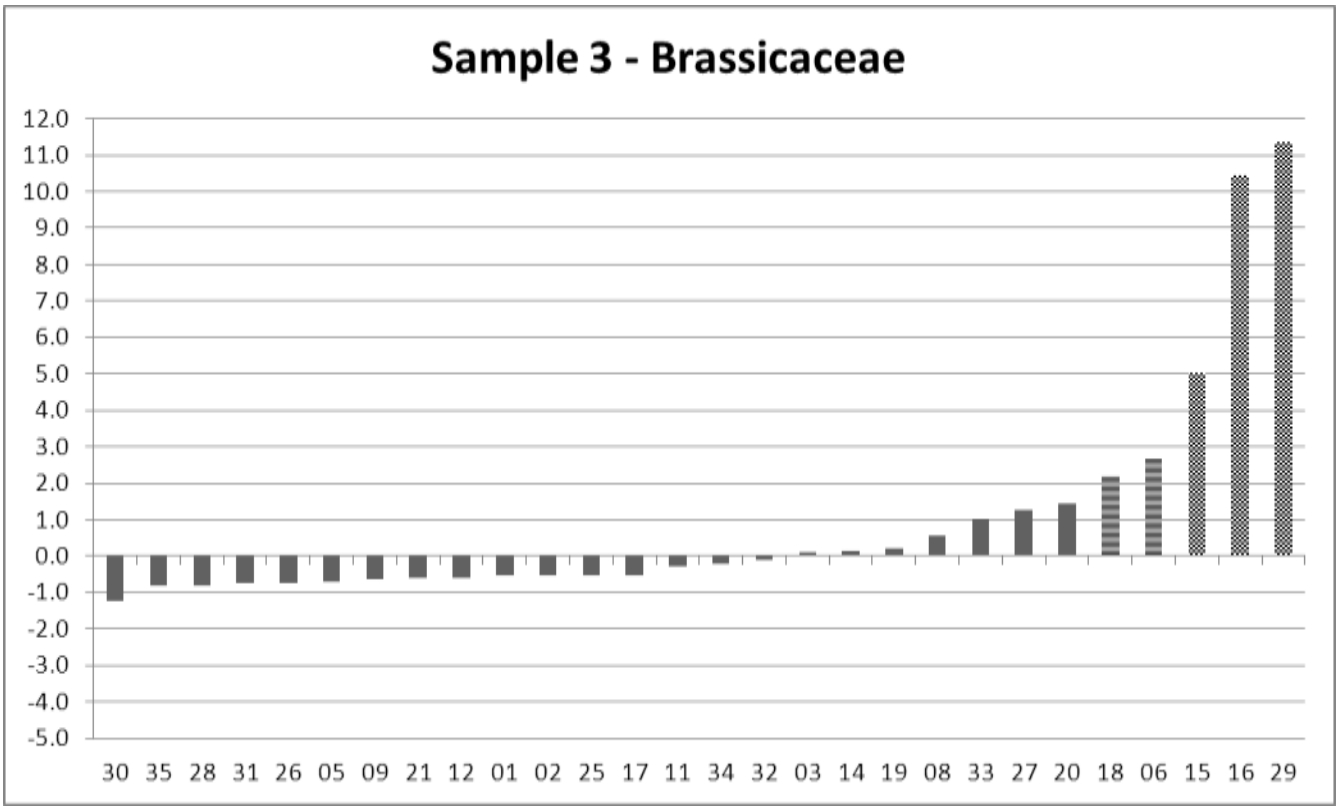

Figure 9 – Z- Score histogram of the qualitative pollen analysis of Brassicaceae in Sample 3; z-scores were considered satisfactory if |z| < 2

Sample 4: Z scores

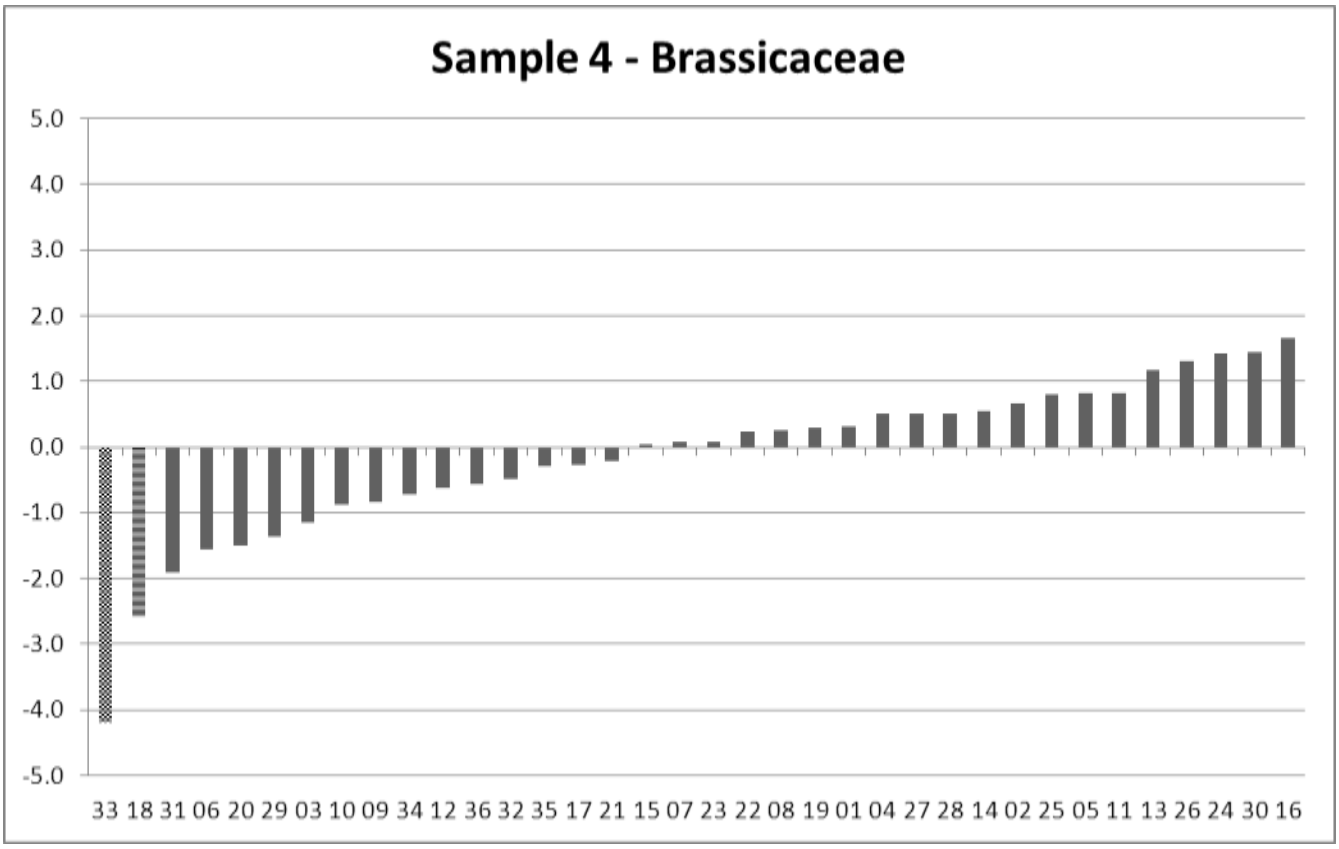

Figure 10 – Z-score histogram of the qualitative pollen analysis of Brassicaceae in Sample 4; z-scores were considered satisfactory if |z| < 2

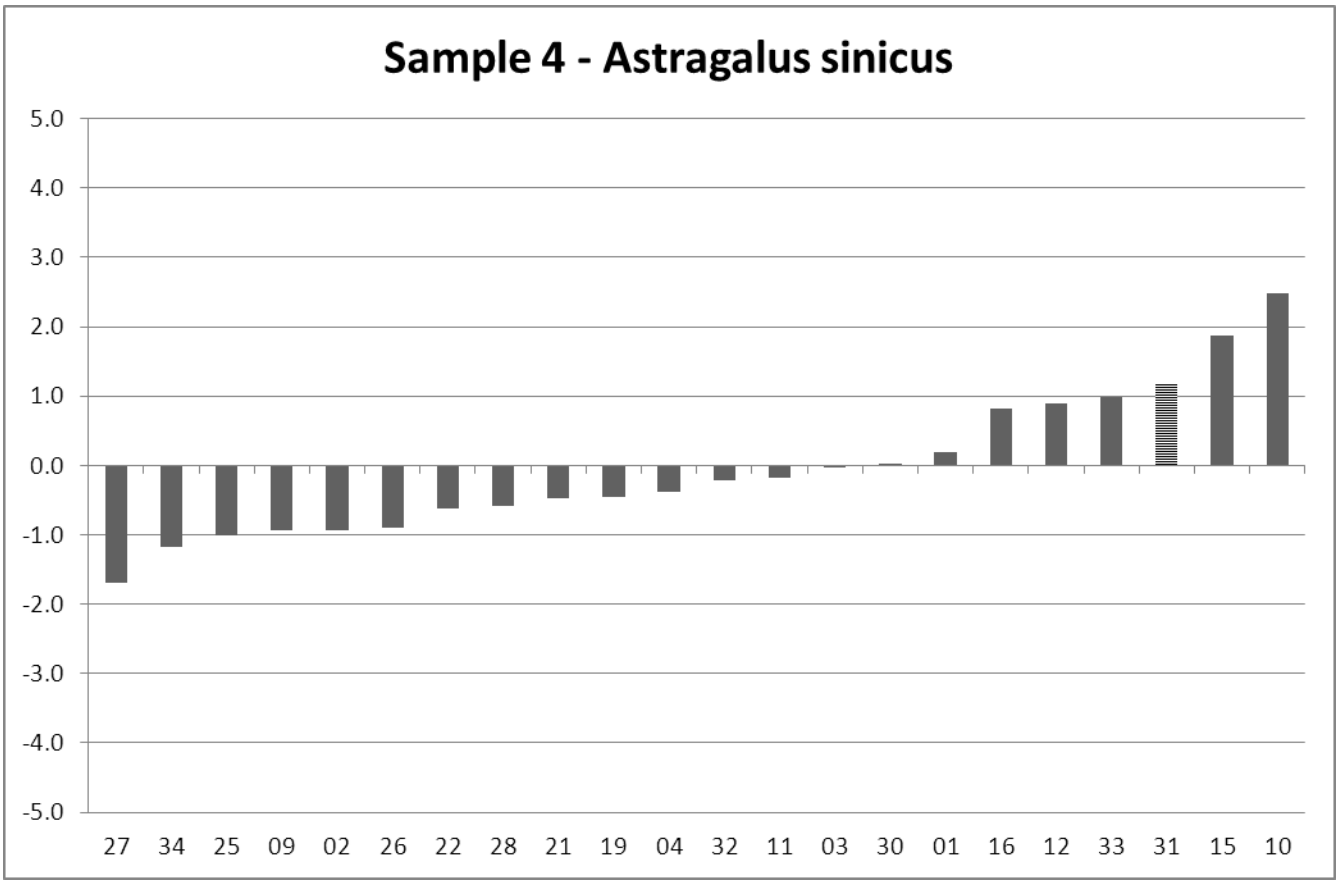

Figure 11 – Z- Score histogram of the qualitative pollen analysis of *Astragalus sinicus* in Sample 4; z-scores were considered satisfactory if |z| < 2

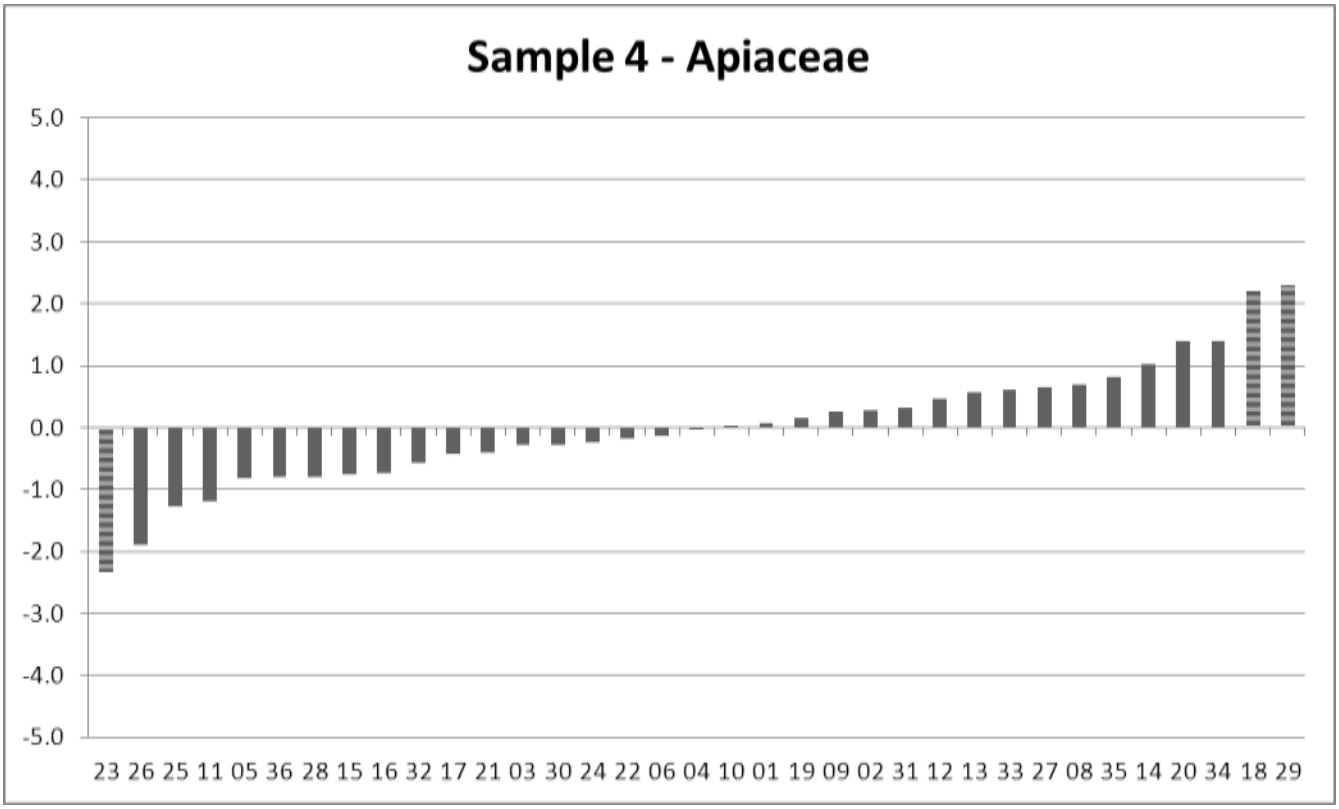

Figure 12 – Z-score histogram of the qualitative pollen analysis of Apiaceae in Sample 4; z-scores were considered satisfactory if |z| < 2

Coefficient of variation (CV) is a standardized measure of dispersion of distribution expressed as a percentage, is useful for comparison between data sets with widely different means.

Sample	Pollen	Outlier included				Outlier excluded				
		n analysts	Mean	Standard deviation	Median	n analysts	Mean	Standard deviation	Median	CV
4	Brassicaceae	36	76.7	6.3	78.0	35	77.3	5.3	78.0	**6.8**
3	*Vitex*	20	64.0	12.4	65.2	19	65.9	9.0	67.3	**13.6**
1	*Robinia*	35	45.5	13.0	47.6	33	47.8	9.4	48.8	**19.6**
2	Cannabaceae	29	41.5	15.2	45.7	28	42.8	13.7	46.1	**32.1**
2	*Vitex*	19	22.6	10.5	19.6	17	19.7	6.4	19.3	**32.2**
1	Brassicaceae	35	15.6	11.4	14.2	34	13.9	5.6	13.7	**40.1**
3	*Flueggea*	16	12.6	3.1	11.4	15	12.0	1.7	11.4	**14.4**
2	Rhamnaceae	27	7.8	7.0	5.7	23	5.3	2.0	5.3	**38.3**
3	Brassicaceae	29	5.8	8.1	2.4	25	2.9	2.1	1.8	**72.1**
4	*Astragalus sinicus*	22	3.8	2.2	3.2	22	3.8	2.2	3.2	**58.2**
4	Apiaceae	35	2.6	1.1	2.6	35	2.6	1.1	2.6	**42.6**
2	Caryophyllaceae	27	2.3	2.0	1.6	25	1.8	1.1	1.6	**60.7**

Table 13 – RDS: relative standard deviation; CV%: coefficient of variation %, outlier excluded

Coefficient of variation decreases with increasing of mean/median value. Mainly this is due to small counting variations that are more significant in pollens which are low recurring than in frequent ones.

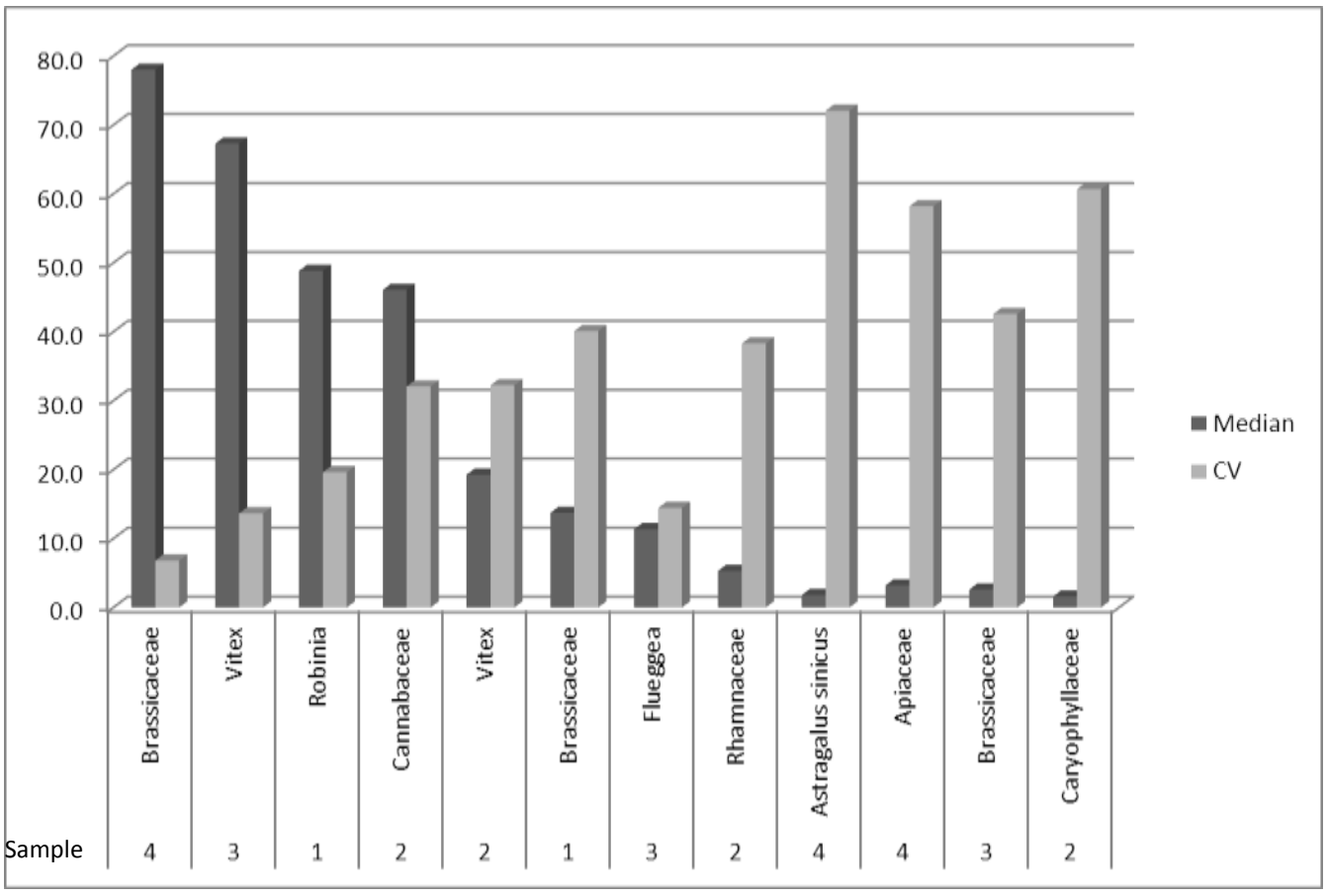

Figure 13 - Coefficient of variation decreases with increasing of median value

This is confirmed by the results of previous trials, as shown in table 14.

% pollen	CV% Von der Ohe 2004	CV% IHC ring trial 2014 and 2015	CV% Chinese honey 2016
>70%	3,6%	-	6,8%
40-50%	-	13%	19,6-32,1%
10-15%	26,3%	31-34%	14,4-40,1%
1-5%	37,0-53,0%	90%	38,3-72,1

Table 14 - Coefficient of variation in four ring test: von der Ohe 2004, IHC ring trial in 2014 and in 2015, Chinese honey (trials performed differently).

Moreover the pollen knowledge, the ability to discriminate it from others with similar characteristics, and the different use of nomenclature are others possible causes.

Annex I - Nomenclature

"Annex I - Nomenclature" contains the list of each identified/unknown pollen (Nectar pollen), its percentage (% T), the sample (Sample) in which it was been found by analysts (Palynologist) and the family (The plant list www.theplantlist.org) which it belongs according to "The plant list".

Assigned pollen type	Family www.theplantlist.org	% T	Palynologist	Data	Sample

Table 15 - Table header of columns in "Annex I Nomenclature"

Annex II –Report from Pollen & Cores

Report of Célia Beaudoin (Pollen & Cores) who analyzed samples with acetolysis method.

To receive "Annex I – Nomenclature" and/or and "Annex II –Report from Pollen & Cores" please send an email to coordinators.

Reference

- www.theplantlist.org
- UNI ISO 13528:2016 Statistical methods for use in proficiency testing by interlaboratory comparison.
- Von der Ohe W., Persano Oddo L., Piana M.L., Morlot M., Martin P., Harmonized methods of melissopalynology, 2004, Apidologie 35:18-25.