Supplementary material

Table S1. Minimum, maximum and mean values of the isotope and elemental determinations identified as significant markers for differentiating samples originating from Transylvania from the ones produced in other Romanian regions.

	value	δ^2H	Mg	Ca	B	Mn	Sr	Pd	Pb	V	As	Nb	In	La	Ce	Pr	Nd	Tm	Pt	Tl
		‰	(mg/kg)							(µg/kg)										
Transylvania	min	-39.9	4.10	6.26	2.73	0.06	0.005	0.0001	0.0015	0.10	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.15
	max	2.4	69.72	1000.01	23.35	10.76	0.52	0.12	0.22	31.62	16.91	11.47	5.49	9.85	20.76	24.56	2.12	0.32	23.29	26.56
	mean	-15.1	16.41	113.75	8.60	1.60	0.11	0.01	0.04	8.66	4.71	2.44	0.30	1.15	2.27	2.09	0.51	0.12	4.77	6.03
Other Romanian Regions	min	-48.5	4.41	11.99	2.78	0.08	0.001	0.0001	0.0001	0.30	0.26	0.10	0.10	0.15	0.10	0.10	0.10	0.10	0.28	0.92
	max	-0.2	76.00	2312.86	28.69	5.30	2.31	0.16	0.14	53.17	30.33	9.84	0.61	18.57	13.00	14.55	2.84	0.15	53.44	35.43
	mean	-19.5	23.05	267.44	11.05	1.29	0.17	0.02	0.03	14.16	7.33	3.89	0.12	1.75	3.34	1.08	0.89	0.11	12.30	7.55

Table S2. Minimum, maximum and mean values of the isotope and elemental determinations identified as significant markers for the differentiation of Romanian honey samples from the ones produced in other EU countries.

	value	δ^2H	δ^{18}O	K	B	Mn	Rb	Ba	V	Ce
		‰		(mg/kg)					(µg/kg)	
Romania	min	-48.5	-5.4	53.59	2.73	0.06	0.07	0.02	0.10	0.10
	max	9.1	4.8	4431.82	28.69	10.76	7.00	1.06	79.71	20.76
	mean	-17.0	0.4	733.83	9.50	1.54	0.78	0.14	11.45	2.57
Other EU countries	min	-33.2	-0.8	214.74	1.56	0.12	0.06	0.04	6.05	0.57
	max	29.3	8.6	3718.75	12.79	22.34	11.08	0.87	36.57	3.71
	mean	-5.7	2.5	1579.74	5.11	3.90	2.81	0.25	18.52	1.86

Table S3. Configuration of Artificial Neural Networks models, corresponding to each type of classification and input space.

Classification type	Input space dimensionality (number of variables)	Number of neurons on the first hidden layer	Learning rate	Dropout rate	Number of iterations

	54	30	0.1	0.5	500
Inter-country	10	5	0.1	0.2	1000
	9	20	0.01	0.3	1000
	54	40	0.001	0.4	250
Intra-country	10	20	0.1	0.4	250
	19	10	0.001	0.5	1000

Table S4. Selected values for the hyperparameters of the developed Support Vector Machines models, corresponding to each type of classification and input space.

Classification type	Input space dimensionality (number of variables)	Kernel	C	Gamma	Degree
	54	radial basis function	2^{3}	2^{-2}	-
Inter-country	10	radial basis function	2^{2}	2^{3}	-
	9	radial basis function	2^{2}	2^{2}	-
	54	radial basis function	2^{4}	2^{-6}	-
Intra-country	10	radial basis function	2^{11}	2^{-8}	-
	19	radial basis function	2^{8}	2^{-5}	-

Table S5. Number of neighbors, weight function and distance metric used for the development of the final inter- and intra- country differentiation models based on the K-Nearest Neighbors algorithm, as function of the input data.

Classification type	Input space dimensionality (number of variables)	Number of neighbors	Weight function	Distance
	54	5	uniform	Manhattan
Inter-country	10	13	uniform	Euclidean
	9	1	uniform	Manhattan
	54	1	uniform	Euclidean
Intra-country	10	15	uniform	Euclidean
	19	5	uniform	Manhattan