REPORT

Honey Metagenomic DNA Analysis (MDA)

SAMPLE DATA

Sample ID: A000H

Label: ER234N, LOT 23456

Origin: Estonia

Description: NA

Arrival date: 2024-08-16

CUSTOMER DATA

Name: NA

E-mail: NA

Phone: NA

Order date: 2024-08-16

RESULTS

Type of analysis	Value	Result
HMF (mg/kg)	<10	PASSED
Moisture (%)	<20	PASSED
DNA quantity and quality		PASSED
DNA profile authenticity model 1 score	1.00	Typical
DNA profile authenticity model 2 score	1.00	Typical
DNA profile authenticity model 3 score	0.99	Typical
DNA profile geographical model 4 score	1.00	Typical

PLANTS IN HONEY

The file describes the honey's sample DNA botanical composition: A000H_krona_streptophyta.html
Comparison with honey samples in the honey DNA profile database: Table 1.

HONEYBEE PATHOGENS AND PARASITES

Comparison with honey samples in the honey DNA profile database: Table 2.

ESTIMATION OF HONEY AUTHENTICITY

The quantity and quality of the extracted honey DNA is high. The DNA profile is consistent with the DNA profile of typical authentic honey.

ESTIMATION OF HONEY GEOGRAPHIC ORIGIN

Based on the DNA profile of the honey, it is honey of Estonian origin.

Table 1. Comparison with honey samples in the honey DNA profile database.

Plants

150 selected plants

Species (Latin)	Species (English)	Relative quantity[1]	
Salix triandra	almond willow, almond-leaved willow	98.2%	
Vicia faba	broad bean, faba bean, field bean	97.8%	
Trifolium hybridum	alsike clover	96.8%	
Populus tremula	(European) aspen	94.0%	
Centaurea cyanus	cornflower, bachelor's button	92.9%	
Salix acutifolia	sharp-leaf willow, long-leaved violet willow	92.9%	
Salix alba	white willow	92.9%	
Populus alba	silver poplar, silverleaf poplar	91.1%	
Salix pentandra	bay willow	89.3%	
Trifolium repens	white clover	88.5%	
Pisum sativum	cultivated pea	88.3%	
Lythrum salicaria	purple loosestrife	87.7%	
Phacelia tanacetifolia	lacy phacelia (tansy-leaf phacelia, blue tansy)	87.7%	
Fragaria x ananassa	garden strawberry	86.1%	
Anemone nemorosa	wood anemone	85.7%	
Fragaria vesca	wild strawberry	84.9%	
Prunus padus	bird cherry (hackberry, hagberry)	84.9%	
Salix dasyclados	water willow	83.9%	

[1] The value characterizes the relative DNA quantity of the species compared to the honey samples in the reference database.

Plants

150 selected plants

Species (Latin)	Species (English)	Relative quantity[1]
Trifolium pratense	red clover	83.3%
Rhamnus cathartica	(European) buckthorn	82.5%
Valeriana officinalis	valerian	82.1%
Convallaria majalis	Lily of the valley, May bells	81.7%
Syringa vulgaris	(common) lilac	81.7%
Salix purpurea	purple willow	81.0%
Pyrus communis	common pear	80.8%
Carduus crispus	curly plumeless thistle, welted thistle	80.6%
Salix viminalis	basket willow, osier	80.0%
Brassica napus	rapeseed, Russian kale, rutabaga, yellow turnip etc	79.8%
Brassica rapa	turnip, turnup rape, keblock, field mustard etc	79.6%
Ribes alpinum	mountain currant, alpine currant	79.2%
Geum urbanum	wood avens	78.8%
Prunus cerasus	sour cherry, tart cherry, dwarf cherry	78.8%
Prunus avium	wild cherry, sweet cherry	78.4%
Betula pendula	silver birch (warty birch, European white birch)	78.2%
Betula pubescens	downy birch (moor birch, white birch)	78.2%
Lupinus polyphyllus	large-leaved lupine, many-leaved lupine	77.6%

[1] The value characterizes the relative DNA quantity of the species compared to the honey samples in the reference database.

Plants

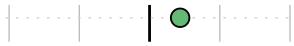
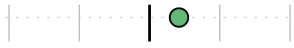
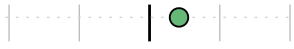
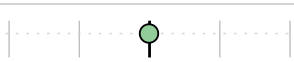
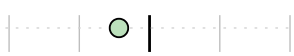
150 selected plants

Species (Latin)	Species (English)	Relative quantity[1]
Aegopodium podagraria	ground elder	76.6%
Frangula alnus	alder buckthorn, glossy buckthorn	74.8%
Fagopyrum esculentum	buckwheat	73.0%
Potentilla anserina	silverweed, silver cinquefoil	72.8%
Bunias orientalis	Turkish wartycabbage (warty-cabbage, hill mustard)	72.6%
Melilotus albus	honey clover (white melilot, white sweetclover)	72.2%
Prunus domestica	plum	71.8%
Chelidonium majus	greater celandine	69.0%
Lamium purpureum	red dead-nettle (purple dead-nettle, purple archangel)	68.8%
Rubus idaeus	raspberry, (European) red raspberry	68.8%
Rumex acetosa	common sorrel, garden sorrel	67.5%
Lonicera xylosteum	(European) fly honeysuckle	66.9%
Solidago gigantea	tall goldenrod, giant goldenrod	66.9%
Ribes uva-crispa	(European) gooseberry	66.1%
Anchusa officinalis	common bugloss, common alkanet	65.7%
Helianthus annuus	common sunflower	65.3%
Cirsium palustre	marsh thistle, European swamp thistle	64.1%
Picea abies	Norway spruce, European spruce	63.5%

[1] The value characterizes the relative DNA quantity of the species compared to the honey samples in the reference database.

Plants

150 selected plants

Species (Latin)	Species (English)	Relative quantity[1]	
Papaver somniferum	opium poppy, breadseed poppy	60.9%	
Medicago lupulina	black medick (nonesuch, hop clover)	60.7%	
Cannabis sativa	cultivated cannabis	60.5%	
Ribes spicatum	downy currant, Nordic currant	60.5%	
Fraxinus excelsior	ash, European ash	57.9%	
Malus domestica	apple tree (domestic apple, orchard apple)	57.7%	
Prunus mahaleb	mahaleb cherry	57.7%	
Sinapis arvensis	charlock mustard (field mustard, wild mustard, charlock)	57.3%	
Epilobium palustre	willowherb, marsh willowherb	55.8%	
Plantago major	broadleaf plantain, greater plantain	55.0%	
Rubus caesius	European dewberry	54.2%	
Acer platanoides	Norway maple	52.2%	
Primula veris	cowslip, cowslip primrose	51.4%	
Quercus robur	pedunculate oak	49.8%	
Ribes nigrum	black currant, cassis	46.8%	
Sorbus aucuparia	rowan, mountain-ash	45.4%	
Thymus vulgaris	(common) thyme, garden thyme	42.7%	
Tilia cordata	small-leaved linden	41.1%	
Tilia platyphyllos	large-leaved linden	39.1%	
Filipendula ulmaria	meadowsweet, mead wort	33.5%	

[1] The value characterizes the relative DNA quantity of the species compared to the honey samples in the reference database.

Plants

150 selected plants

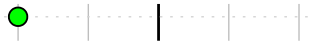
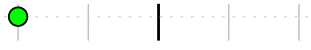
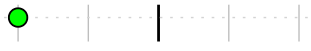
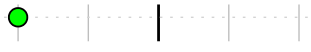
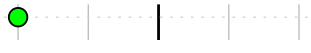
Species (Latin)	Species (English)	Relative quantity[1]
Allium cepa	onion (bulb onion, common onion)	32.9% 

[1] The value characterizes the relative DNA quantity of the species compared to the honey samples in the reference database.

Table 2. Comparison with honey samples in the honey DNA profile database.

Honeybee pathogens and parasites

20 selected species

Species (Latin)	Description		Relative quantity[1]
Galleria mellonella	greater wax moth, honeycomb moth	86.3%	
Paenibacillus larvae	American Foulbrood	76.2%	
Nosema ceranae	microsporidian parasites, Nosematosis	71.6%	
Spiroplasma apis	May disease, Spiroplasmosis	50.8%	
Varroa destructor	parasitic honeybee mite, Varroatosis	47.6%	
Spiroplasma melliferum	May disease, Spiroplasmosis	28.6%	
Acarapis woodi	parasitic honeybee mite, Acarapiosis	0.0%	
Acarus siro	flour mite, grain mite	0.0%	
Achroia grisella	lesser wax moth	0.0%	
Aethina tumida	small hive beetle, Aethinosis	0.0%	
Ascosphaera apis	fungus, Chalkbrood	0.0%	
Bettsia alvei	pollen mold	0.0%	
Braula coeca	Braula fly, bee louse	0.0%	
Forficula auricularia	European earwig	0.0%	
Melissococcus plutonius	European Foulbrood	0.0%	
Nosema apis	microsporidian parasites, Nosematosis	0.0%	
Oplostomus fuligineus	large African hive beetle	0.0%	
Senotainia tricuspis	fly, Senotainiosis	0.0%	

[1] The value characterizes the relative DNA quantity of the species compared to the honey samples in the reference database.

Honeybee pathogens and parasites

20 selected species

Species (Latin)	Description	Relative quantity[1]	
Tropilaelaps clareae	parasitic honeybee mite, Tropilaelapsosis	0.0%	
Tropilaelaps mercedesae	parasitic honeybee mite, Tropilaelapsosis	0.0%	

[1] The value characterizes the relative DNA quantity of the species compared to the honey samples in the reference database.

IMPORTANT INFORMATION

Honey Metagenomic DNA Analysis (MDA) describes the honey's composition, authenticity, and geographic origin. The DNA profile is compared to the different types of honey DNA profiles in the honey DNA profile database created by Celvia CC. MDA is an untargeted analysis of all DNA sequences in honey. Therefore, the results may differ from those of other studies, such as pollen analysis, PCR-based DNA metabarcoding, NMR, etc. All results solely refer to the tested sample as provided by the customer. Celvia CC takes no responsibility for any interpretations, conclusions, or actions based on our analysis results. Reverse engineering of the analysis process or methodology is strictly prohibited. In the case of any disputes, all matters will be governed and resolved by the laws of Estonia. The definition of honey's authenticity in this report is following:

Authentic: The DNA profile of the analyzed honey sample is similar to the DNA profiles of Celvia CC's authentic honey reference database. Non-authentic: The DNA profile of the analyzed honey sample is dissimilar to the DNA profiles of Celvia CC's authentic honey reference database.

Estonian: The DNA profile of the analyzed honey sample is similar to the DNA profiles of Celvia CC's Estonian honey reference database. Unknown: The DNA profile of the analyzed honey sample is dissimilar to the DNA profiles of Celvia CC's Estonian honey reference database.

Read more about the MDA test here: https://mda-test.com/

Plants in honey

Interactive chart (HTML)

The MDA result reflects all the plants detected in the honey sample and their quantities through the number of DNA sequences. The results are presented in an HTML file that opens in the browser. An interactive chart shows the identified plants and the percentages of their DNA sequences. The size of the sector in the chart reflects the plant's share.

Comparison with honey samples in the honey DNA profile database (Table 1)

The MDA result in Table 1 describes the relative quantity of DNA from 150 selected plant species compared to the honey samples in the database. A value of zero means that DNA from a particular plant was not found in the analyzed samples or the quantity of DNA detected was lower than the honey samples in the database. The value 50 represents a situation where the analyzed sample contains more DNA from a particular plant species than half (50 percent) of the honey samples in the database. A value of 100 means that compared to the honey samples in the database, the analyzed sample had the highest number of DNA sequences from a particular plant species. The table does not show plant species whose DNA was not detected from the honey samples.

Honeybee pathogens and parasites

Comparison with honey samples in the honey DNA profile database (Table 2)

The MDA result in Table 1 describes the relative quantity of DNA from 20 selected honeybee pathogens and parasites compared to the honey samples in the database. A value of zero means that DNA from a particular pathogen and parasite was not found in the analyzed samples or the quantity of DNA detected was lower than the honey samples in the database. The value 50 represents a situation where the analyzed sample contains more DNA from a particular pathogen and parasite species than half (50 percent) of the honey samples in the database. A value of 100 means that compared to the honey samples in the database, the analyzed sample had the highest number of DNA sequences from

a particular pathogen and parasite species. A non-zero value could mean the hive has an active pest attack or a recent infection lesion. In the case of pest DNA findings identified in the honey DNA analysis, it is advisable to inspect hives and honeycombs and, if necessary, carry out a diagnostic test or take the necessary sanitary measures.

Estimation of honey authenticity and geographic origin

The MDA assesses the honey's authenticity based on the DNA's quality and profile. For the assessment, the DNA profile of the honey is compared with the DNA profiles in the database using analytical models. The origin of the honey is assessed by comparing the DNA profile of the honey against the profiles of Estonian and foreign honey samples in the database. Celvia CC created the DNA profile database in 2020-2023. The development of the methods and the establishment of the databases has been funded from measure 16.2, "support for the development of new products, practices, processes and technologies," coordinated by PRIA, Estonian Agricultural Registers, and Information Board.

Read more about MDA test here: https://mda-test.com/