

RANDOX
FOOD DIAGNOSTICS

Honey Analysis



Better Science, Safer Food

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Providing a Full Testing Profile for the Honey Industry

Commitment to research and development is the driving force behind our innovative technology, allowing Radox Food Diagnostics to become global leaders in the screening for antibiotics and enzymatic testing within honey. With a comprehensive range of testing solutions and validations across multiple matrices, we are changing the face of food safety and quality worldwide.

Over 35 years, Radox Food Diagnostics has developed a specific product portfolio including ELISA and Radox's patented Biochip Array Technology to suit the needs of the honey industry, for the screening of drug residues. Due to the rise in fraudulent honey being sold to consumers worldwide, Radox Food Diagnostics also developed the RX misano, a table top sized spectrophotometer to test honey quality through enzymatic screening solutions.

Putting the food and agricultural industries at the forefront of what we do has allowed Radox Food to become the trusted supplier of the most innovative, multiplexing technology for honey producers. Biochip Array Technology allows users to save time, consolidate costs and gain accurate results.

We offer screening solutions in honey for the following:

- Antibiotics
- Pesticides
- Hydroxymethylfurfural (HMF)
- Diastase
- Glucose/fructose
- Honey colour

Biochip Array Technology

Randox's patented Biochip Array Technology (BAT) provides multiple results from a single, undivided sample with accurate and trusted results on a 9x9mm ceramic Biochip. Our unique technology is at the forefront of testing and provides a large number of results in less time when compared to other methods.

Randox's comprehensive test menus allow for the screening of multiple sample types, providing semi-quantitative results. These versatile arrays are ideal for the screening of multiple antimicrobials within honey, up to 48 samples in just 2 hours 30 minutes. This technology ultimately provides a more informed decision on confirmatory analysis required.

Benefits



Simultaneous Detection

Multiplex testing facilitates simultaneous screening of drug residues in honey samples.



Excellent Sensitivity

Unrivalled multi-analyte detection of contaminants to fulfil global regulatory requirements with qualitative and semi-quantitative formats available.



Higher Throughput

The Biochip can assess up to 48 samples in under three hours using the semi-automated Evidence Investigator.

Multiplex Explained

Randox's patented Biochip Array Technology (BAT) is based upon a competitive immunoassay format but provides multiple results from a single sample. BAT utilises a nano-spotting technique to create a versatile array which can accommodate 44 discrete test regions (DTRs).

Each DTR is coated with a single high quality, engineered antibody which is used to detect the presence of multiple compounds. Multiplex screening increases the throughput of testing, greatly reduces labour requirements and provides unrivalled test consolidation.

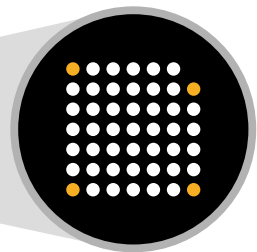
Key

○ Discrete test region

● Quality control spot



7x7 Biochip surface



44 discrete test regions on each biochip for individual analytes

Evidence Investigator

The Evidence Investigator is a compact, semi-automated benchtop analyser. Utilising the revolutionary Biochip Array Technology (BAT), the Evidence Investigator is a multi-analyte semi-quantitative analyser. Using BAT, the Evidence Investigator ensures screening honey for drug residues is accurate and efficient, offering laboratories comparable results to that of LC-MS/MS and other confirmatory methods.



Analyser Process

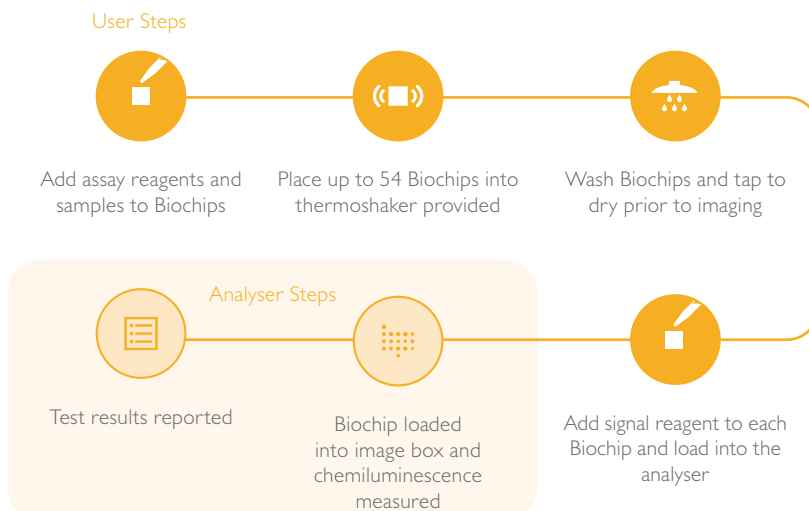




Image Processing

The analyser uses unique image processing software to translate the Relative Light Units (RLU) generated from the chemiluminescent reactions into a qualitative or semi-quantitative result.



On Board Data Analysis

No manipulation of results is required, reducing scope for operator error. The Evidence Investigator provides excellent sensitivity with either a semi-quantitative or qualitative result for each analyte.



Multiplex Technology

Using multiplex technology, the Evidence Investigator can provide simultaneous detection for a wide range of analytes from a single sample.



True Cost Reduction

Multiplex testing reduces the amount of time and labour spent on individual tests as well as associated laboratory costs.

Technical Snapshot

Analyser Description	Semi-automated Biochip Array analyser
Dimensions	750 (h) x 480 (d) x 420 (w) mm
Weight	24kg / 52.9lbs
Biochip Format	1 x Biochip carrier (Holds 9 individual Biochips)
Maximum Throughput	48 samples in 2 hours 30 minutes*
Accreditation	Internally accredited to full CE & UL certification
Measurement Principal	Competitive techniques with chemiluminescent reaction

*can be increased with multiple thermoshakers (Cat No. EV700-997)

Honey Biochip Arrays

Antimicrobial Array I Ultra

Available on Evidence Investigator

Catalogue No: EV3843

Samples Per Kit: 45

Results Type: Semi-Quantitative

Assay	LOD (ppb)	Compound	%CR
Sulphadimethoxine	5.00*	Sulphadimethoxine*	100
Sulphadiazine	5.00	Sulphadiazine*	100
Sulphadoxine	5.00	Sulphadoxine*	100
Sulphachlorpyridazine	5.00	Sulphachlorpyridazine*	100
Sulphamethoxypyridazine	5.00	Sulphamethoxypyridazine* Sulphaethoxypyridazine	100 56
Sulphamerazine	5.00	Sulphamerazine*	100
Sulphisoxazole	5.00	Sulphisoxazole*	100
Sulphathiazole	5.00	Sulphathiazole* Sulphadiazine	100 6.2
Sulphamethazine	5.00	Sulphamethazine*	100
Sulphaquinoxaline	5.00	Sulphaquinoxaline*	100
Sulphapyridine	8.00	Sulphapyridine* Sulphasalazine	100 12.9
Sulphamethoxazole	1.60	Sulphamethoxazole* Sulphamethizole Sulphachlorpyridazine	100 92 12.1
Sulphamonomethoxine	20.00	Sulphamonomethoxine*	100
Trimethoprim	9.00	Trimethoprim*	100
Dapsone	3.50	Dapsone*	100

*Each LOD (ppb) standardised to this compound

*A higher LOD of 10ppb is recommended for the screening of unprocessed raw honey samples

Antimicrobial Array II Plus

Available on Evidence Investigator

Catalogue No: EV4169 A/B

Samples Per Kit: 45

Results Type: Semi-Quantitative

Assay	LOD (ppb)	Compound	%CR
Quinolones	3.00	Norfloxacin*	100
		Pefloxacin	84
		Enrofloxacin	76
		Ciprofloxacin	59
		Ofloxacin	57
		Enoxacin	54
		Pipemidic Acid	36
		Fleroxacin	32
		Levofloxacin	32
		Nadifloxacin	27
		Orbifloxacin	23
		Danofloxacin	20
		Marbofloxacin	16
		Oxolinic Acid	12
		Difloxacin	8
		Pazufloxacin	7
		Sarafloxacin	6
Ceftiofur	2.00	Ceftiofur*	100
		Desfuroylceftiofur	92
Thiamphenicol	1.00	Florfenicol*	100
		Thiamphenicol	53
Streptomycin	3.00	Streptomycin*	100
		Dihydrostreptomycin	99
Tylosin	1.00	Tylosin*	100
		Tilmicosin	37
Tetracyclines	4.50	Tetracycline*	100
		4-epitetracycline	87
		Rolitetracycline	67
		4-epioxytetracycline	52
		Oxytetracycline	52
		Chlortetracycline	51
		Demeclocycline	41
		Doxycycline	23
		4-epichlortetracycline	20
		Methacycline	11

*Each LOD (ppb) standardised to this compound

Antimicrobial Array III

Available on Evidence Investigator

Catalogue No: EV3695

Samples Per Kit: 45

Results Type: Semi-Quantitative

Assay	LOD (ppb)	Compound	%CR
AOZ	0.30	4-NP-AOZ*	100
		Furazolidone	8.3
AMOX	0.08	4-NP-AMOX*	100
		Furaltadone	40.7
AHD	0.30	4-NP-AHD*	100
		Nitrofurantoin	41.9
SEM	0.50	4-NP-SEM*	100

*Each LOD (ppb) standardised to this compound

Antimicrobial Array III (CAP Only)

Available on Evidence Investigator

Catalogue No: EV3738

Samples Per Kit: 45

Results Type: Semi-Quantitative

Assay	LOD (ppb)	Compound	%CR
Chloramphenicol	0.14	Chloramphenicol*	100
		Chloramphenicol Glucuronide	75.1

*Each LOD (ppb) standardised to this compound

Antimicrobial Array IV

Available on Evidence Investigator

Catalogue No: EV3878 A/B

Samples Per Kit: 45

Results Type: Semi-Quantitative

Assay	LOD (ppb)	Compound	%CR
Spiramycin/Josamycin	2.00	Spiramycin*	100
		Kitasamycin	169
		Spiramycin I	79
		Acetylspiramycin	32
		Josamycin	27
Apramycin	2.00	Apramycin*	100
Bacitracin	1.20	Bacitracin*	100
Neomycin/Paromomycin	1.00	Neomycin*	100
		Paromomycin	182
		Framycetin	25
Tobramycin	4.00	Tobramycin*	100
		Kanamycin B	24
		Dibekacin	20
Tylosin B/Tilmicosin	1.00	Tylosin A	105
		Tylosin B*	100
		Tilmicosin	82
		Tylvalosin	48
Spectinomycin	2.60	Spectinomycin*	100
Amikacin/Kanamycin	6.00	Amikacin*	100
		Kanamycin A	260
		Kanamycin B	9
Lincosamides	8.00	Lincomycin*	100
		Clindamycin	160
		Pirlimycin	38
Erythromycin	2.50	Erythromycin*	100
		Clarithromycin	498
		Roxithromycin	334
		Gamithromycin	51
		Anhydroerythromycin A	20
		Tulathromycin	10
		Oleandomycin	3
Streptomycin/ Dihydrostreptomycin	4.00	Streptomycin*	100
		Dihydrostreptomycin	135
Virginiamycin	2.00	Virginiamycin M1*	100

*Each LOD (ppb) standardised to this compound

Antimicrobial Array V

Available on Evidence Investigator

Catalogue No: EV4027

Samples Per Kit: 45

Results Type: Semi-Quantitative

Assay	LOD (ppb)	Compound	%CR
Nitroimidazoles	0.90	Metronidazole*	100
		Ronidazole	310
		Hydroxy-Metronidazole	145
		Dimetridazole	90
		Ternidazole	85
		Ipronidazole	82
		HMMNI	56
		Hydroxy-Ipronidazole	7
		Carnidazole	3
		Secnidazole	2
Chloramphenicol	0.10	Chloramphenicol*	100
		Chloramphenicol Glucuronide	75

*Each LOD (ppb) standardised to this compound

Pesticides Array

Available on Evidence Investigator

Catalogue No: EV4395A

Samples Per Kit: 48

Results Type: Qualitative

Requires PAH1 diluent SPE (EV4395B)

Detectable Analytes	Assay Name (Abbreviation)	Decision Level (ppb)
Acetamiprid	Acetamiprid (AAP)	6.0
Amitraz (DMPF)	Amitraz (AMI)	10.0
Azoxystrobin	Azoxystrobin (AZX)	12.0
Bromopropylate	Bromopropylate (BRM)	40.0
Carbofuran	Carbofuran (CBF)	25.0
Carbaryl	Carbaryl (CBY)	10.0
Carbendazim	Carbendazim (CBZ)	250.0
Chlorpyrifos	Chlorpyrifos (CPY)	25.0
Clothianidin	Clothianidin (CLO)	25.0
Coumaphos	Coumaphos (COU)	8.0
Imidacloprid	Imidacloprid (IMI)	7.0
Thiamethoxam	Thiamethoxam (THM)	6.0
Fenpyroximate	Fenpyroximate (FNP)	10.0
Imazalil	Imazalil (IMZ)	6.0

Honey ELISA Kits

With extensive experience in food safety that stretches over 35 years, Randox Food Diagnostics has translated this knowledge into premium quality ELISA kits that combine confidence with convenience.

Chloramphenicol

Catalogue No: CNI1469

Samples Per Kit: 40

Results Type: Semi-Quantitative

Assay	LOD (ppb)	Compound	%CR
Chloramphenicol	1.50 (RS)	Chloramphenicol*	100
	0.07 (SE)	Chloramphenicol Glucuronide	100

*Each LOD (ppb) standardised to this compound

RS - Rapid Screen SE - Solvent Extraction

Chloramphenicol FAST

Catalogue No: CNI10171

Samples Per Kit: 40

Results Type: Semi-Quantitative

Assay	LOD (ppb)	Compound	%CR
Chloramphenicol	1.50 (RS)	Chloramphenicol*	100
	0.07 (SE)	Chloramphenicol Glucuronide	100

*Each LOD (ppb) standardised to this compound

RS - Rapid Screen SE - Solvent Extraction

Oxytetracycline Sensitive

Catalogue No: OXS10118A/B

Samples Per Kit: 40

Results Type: Semi-Quantitative

Assay	LOD (ppb)	Compound	%CR
Oxytetracycline	3.92	Oxytetracycline*	100
		4-epioxytetracycline	100
		Tetracycline	>100
		4-epitetracycline	>100
		Rolitetetracycline	>100
		Chlortetracycline	98
		Demeclocycline	79
		Doxycycline	44
		4-epichlortetracycline	38
		Methacycline	21

*Each LOD (ppb) standardised to this compound

Tetracycline Sensitive

Catalogue No: TCS10117A/B

Samples Per Kit: 40

Results Type: Semi-Quantitative

Assay	LOD (ppb)	Compound	%CR
Tetracycline	2.00	Tetracycline*	100
		4-epitetracycline	87
		Rolitetetracycline	67
		4-epioxytetracycline	52
		Oxytetracycline	52
		Chlortetracycline	51
		Demeclocycline	41
		Doxycycline	23
		4-epichlortetracycline	20
		Methacycline	11

*Each LOD (ppb) standardised to this compound

Honey Quality Testin

Glucose/Fructose Analysis

The carbohydrate composition of honey is responsible for some of its key functional properties. The ability to hold moisture and extend shelf-life, its microwave reactivity and its ability to promote colour and flavour development are all related to its carbohydrate composition.

The composition of glucose/fructose ratios are parameters which are also used to help predict the tendency of honey to crystallise.

Individual analysis of sugars can show valuable information about source and floral origin. Randox offer a simple and fast method for the determination of glucose/fructose content in honey.

HMF (Hydroxymethylfurfural)

Hydroxymethylfurfural (5-hydroxymethyl-2-furaldehyde, HMF) is an organic compound that is produced by acid-catalyzed dehydration of sugars, primarily fructose and its measurement is crucial to evaluate the conformity of honey for daily use according to government legislation. Elevated concentrations of HMF in honey provide an indication of overheating, poor storage conditions, possible adulteration with other sugars or syrups and/or higher age of the honey.

The use of the HMF value alone is enough to provide all of the information required to estimate the total heat exposure of all honey, making it one of the most common honey quality tests.



Phadebas® Honey Diastase

Diastase in honey converts starch to short-chain sugars and the enzyme activity hints at heating and / or poor storage conditions. Heating the honey degrades the enzyme, which is why restrictions are enforced by the EU. One official method of determining the Diastase Number (DN) in honey is the Phadebas® assay, *as recommended by the International Honey Commission*.

Phadebas® Honey Diastase Test is a method for the quantitative analysis of α -amylase in all honey types.

Honey Colour Test*

Colour grading has been used by the honey industry for many years. In natural condition honey can adopt a continuous range of colours related to mineral content and floral source. In addition, there is a connection with flavour as lighter coloured honey has a mild taste whereas darker types have a stronger taste.

*Included with the analyser and no kits required

RX misano

Honey naturally contains a small amount of enzymes which can vary widely by floral source and region. These enzymes play an important role by contributing to functional properties of honey, making it a unique ingredient that is far more complex than other sweeteners.

According to the EU Honey Directive 2001/110/EC, certain composition criteria must be determined for honeys intended for human consumption. In order to achieve this, the most modern enzymatic analyser in the industry, the RX misano, is now available for the analysis of diastase, total sugars (glucose/fructose), HMF and colouration.

Designed with the user in mind, the RX misano incorporates a responsive touch screen display, test menu personalisation and the ability to upload new parameters via USB. With an increase in automatic features, the RX misano also guarantees the precision and accuracy of results, improving the overall efficiency and versatility of enzymatic honey analysis.



Benefits at a Glance



User Friendly

7" responsive touch screen display, favourites menu, on screen prompts, the ability to export data into excel and import new menus.



Semi-Automated

With the ability to automatically calculate results, the RX misano leaves less chance for human error.



Customisable Test Menus

As the RX misano for honey test menu continues to grow, users can simply upload new parameters to the machine via USB.



Accurate

Results are quantitative and produced within +/- 1% of UKAS accredited reference materials, boasting increased accuracy compared to alternative methods.



Reduced Foot Print

With a smaller footprint than standard spectrophotometers, the RX misano is suitable for laboratories of all sizes.



Excellent Thermal Performance

The RX misano heats to 37°C in less than 30 seconds and cools from 37°C to 25°C in less than 1 minute.

Glucose/Fructose Analysis

Available on RX misano
Catalogue No: GF2635
Samples Per Kit: 149

Sample Preparation/Assay Protocol

Calculation of Result

Quality Analysis Kits

The sugar composition of honey is responsible for some of its key functional properties. The determination of glucose/fructose ratios are parameters which are used to help predict the tendency of honey to crystallise.

Individual analysis of sugars can show valuable information about source and floral origin. Randox offers a simple and fast method for the determination of glucose/fructose content in honey.



Fructose content = Total sugars – Glucose content (Work out second value as a percentage of total value)
Results are calculated in g/l (Grams per litre).

Optimum glucose/fructose content is > 70% of total honey constituents

Product	Time to result
Glucose	6 minutes
Fructose	22 minutes
Total Sugars	16 minutes

Linearity	Sensitivity	Precision	
		Intra Assay	Inter Assay
7.5g/l	0.3g/l	<5%	<7.5%

HMF (Hydroxymethylfurfural)

Available on RX misano

Catalogue No: HMF6000

Samples Per Kit: 100

Hydroxymethylfurfural (5-hydroxymethyl-2-furaldehyde, HMF) is an organic compound that is produced by acid-catalyzed dehydration of sugars, primarily fructose and its measurement is crucial to evaluate the conformity of honey for daily use according to government legislation. Elevated concentrations of HMF in honey provide an indication of overheating, poor storage conditions, possible adulteration with other sugars or syrups and/or higher age of the honey.

The use of the HMF value alone is enough to provide all of the information required to estimate the total heat exposure of all honey, making it one of the most common honey quality tests.

Sample Preparation/Assay Protocol



Calculation of Result

The test is linear to Hydroxymethylfurfural (HMF) concentration of 100 mg/kg. Dilute samples above this concentration, i.e. 1 + 3 with ddH₂O.

The Codex quotes the following: The HMF content of honey after processing and/or blending must not be higher than 80 mg/kg. The European Union (EU Directive 110/2001) has fixed a HMF limit in honey of 40 mg/kg with the following exceptions: 80 mg/kg for honey coming from Countries or Regions with tropical temperatures, 15 mg/kg for honey with low enzymatic level (8-3 Schade Units).

Product	Time to result	Sensitivity
HMF	<25 minutes	2mg/kg

*Quartz cuvette required for test (not included)

*R3 Additional extra - Sodium Bisulfite Solution - Honeywell Fluka (13438)

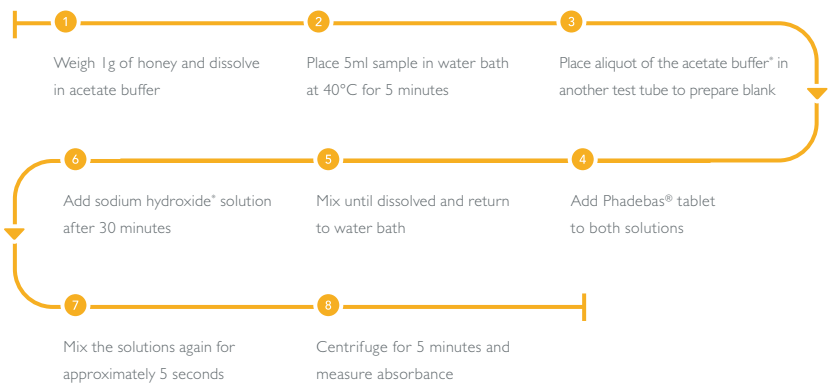
Phadebas® Honey Diastase Test

Available on RX misano
Catalogue No: I32I
Samples Per Kit: 25

Diastase in honey converts starch to short-chain sugars and the enzyme activity hints at heating and/ or poor storage conditions. Heating the honey degrades the enzyme, which is why restrictions are enforced by the EU. One official method of determining the Diastase Number (DN) in honey is the Phadebas® test, as recommended by the International Honey Commision.

Phadebas® Honey Diastase Test is a method for the quantitative analysis of α-amylase in all honey types.

Sample Preparation/Assay Protocol



Calculation of Result

The absorbance of the blank is subtracted from that of the sample solution (ΔA620). If the absorbance is higher than 1.0, dilute the sample with water and retest.

The Codex quotes the following: The diastase activity of honey, determined after processing and/or blending, in general not less than **8 Schade units** and in the case of honeys with low natural enzyme content not less than **3 Schade units**.

Product	Time to result
Diastase	40 minutes

*Additional extra - Sodium Hydroxide & Acetate Buffer

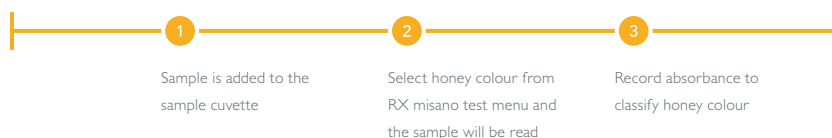
Honey Colour Test

Included with the analyser and no kits required

Colour grading has been used by the honey industry for many years.

In natural conditions honey can adopt a continuous range of colours related to mineral content and floral source. In addition, there is a connection with flavour as lighter coloured honey has a mild taste whereas darker types have a stronger taste.

Sample Preparation/Assay Protocol



Calculation of Result

A simple measurement of absorbance at 560nm* enables a colour classification for honey to be established, as indicated in the table below.

Colour Names (Honey)	Pfund Scale (mm)	Mid Range Absorbance
Water White	<8	0.0945
Extra White	9-17	0.189
White	18-34	0.378
Extra Light Amber	35-50	0.595
Light Amber	51-85	1.389
Amber	86-114	3.008
Dark Amber	>114	>3.1

*Instrument algorithm in place for 560nm determination



1,000+

laboratories using Randox
Food Diagnostics technology

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