Nucleic acid extraction solutions

LGC Genomics

Extraction solutions customised to any application

Biological samples can vary considerably in both consistency and content. Variables such as sugar, protein and fat composition can affect the quality and purity of the extracted nucleic acid, the total yield and, subsequently, the performance of downstream applications. To provide the most efficient and effective extraction method, we offer not only a range of different extraction technologies but also the capability to develop tailor-made kit systems for a particular application

Our range of technologies allows delivery of optimised extraction from an unrivalled array of matrices including: plant tissue material, blood, mammalian tissue, forensic samples, bacteria and other prokaryotes as well as plasmid preparations. We develop the most suitable solution dependent on requirements for downstream processing, sample matrix challenges and throughput or automation requirements.

To complement our extraction kits and instruments, we also offer nucleic acid extraction services.

Content

Kits

Our range of proprietary and tailor-made kits for nucleic acid extraction enables the delivery of DNA for virtually any application. Extraction solutions include the patented sbeadex® technology (surface coated superparamagnetic beads) alongside our Kleargene™ (spin columns) products.

The table below describes a number of the key features of each of our extraction technologies. For a full description of the features and applications of each kit, please visit our web site: www.lgcgenomics.com/nucleic-acid-extraction-kits.

Kit features	sbeadex® (1)	Kleargene spin
Mechanism of action	• Surface-modified superparamagnetic particles • Novel two-step binding mechanism	• Glass fibre solid support inserted to microtitre plate
Optimised matrices	• Plant tissue, tissue and cells, plasmids, forensic samples	• Plant leaf and seed tissue
Automation potential	• Full automation possible	• Semi-automation possible
Instruments	• oKtopure™	• Genespin™
Scalability	• Customised kits adapted to any throughput and sample material	• 96-well format; maximum yield 5 µg • 384-well format; maximum yield 1.5 µg
Customised option examples	• Adaptation to any sample material	• Adaptation of buffer composition
Key features	• No organic solvents or chaotrophic salts in final wash buffer • No drying of beads for evaporation of alcohols • High flexibilty of all extraction parameters • High yields	• Suitable for manual or semi-automated extraction solutions • 96 or 384-well format

(1) Our surface-coated superparamagnetic particles do not require the use of vacuum filtration or centrifugation steps, hence they are well-suited to automation.



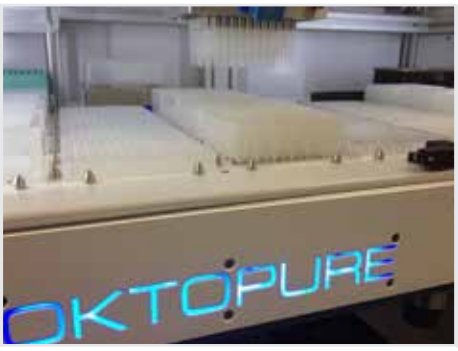
Instrumentation

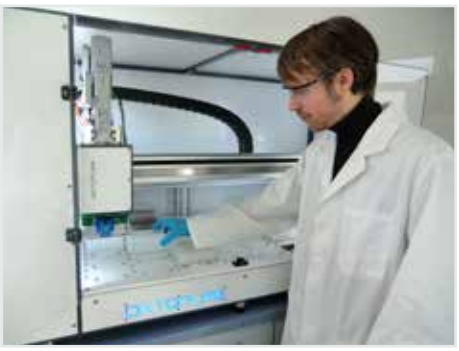
The oKtopure - Automated nucleic acid extraction from leaf and seed samples

Significant advances in plant breeding have been facilitated by the rapid and continued advancement of molecular biology-based technologies. Using these technologies, breeders are able to analyse plant populations at an earlier stage of their development and hence accelerate plant breeding programs. This is driving the need for new automated extraction platforms that combine higher sample throughput with the delivery of highly purified DNA that is suitable for a wide range of downstream applications. The oKtopure platform has been developed to deliver automated DNA extraction from 8 x 96-well microtitre plates in parallel, utilising the proprietary sbeadex® magnetic bead-based chemistry.
The instrument delivers standardised, high throughput extractions and results in purification of high quality DNA suitable for all downstream applications including sequencing (NGS, Sanger) and SNP genotyping (e.g. KASP). The platform is equipped with a 96- tip head and 8 magnetic devices that can be positioned to fix the beads in the bottoms of the microtitre plates during buffer transfer steps.

Why choose the oKtopure platform

- Enables higher throughput and full automation of sbeadex® based plant extractions
  - 8 x 96 plates/ 1 - 1.5 hour for sbeadex® mini extractions (20-30 mg starting material)
  - 8 x 96 plates/ 2.5 hours for sbeadex® maxi extractions (80-100 mg starting material)
- Drives increased and efficiency of extraction using sbeadex® chemistry (mini and maxi format)
- Efficient use of laboratory space
  - Small footprint: 170 cm x 68.5 cm x 65 cm
- Offline tip washing option drives reduced consumable costs through reuse of tips
  - Savings of up to 50%
- Compatible with existing SNPline installations
- Customised or preset protocols to suit a wide variety of sample materials.





Kits

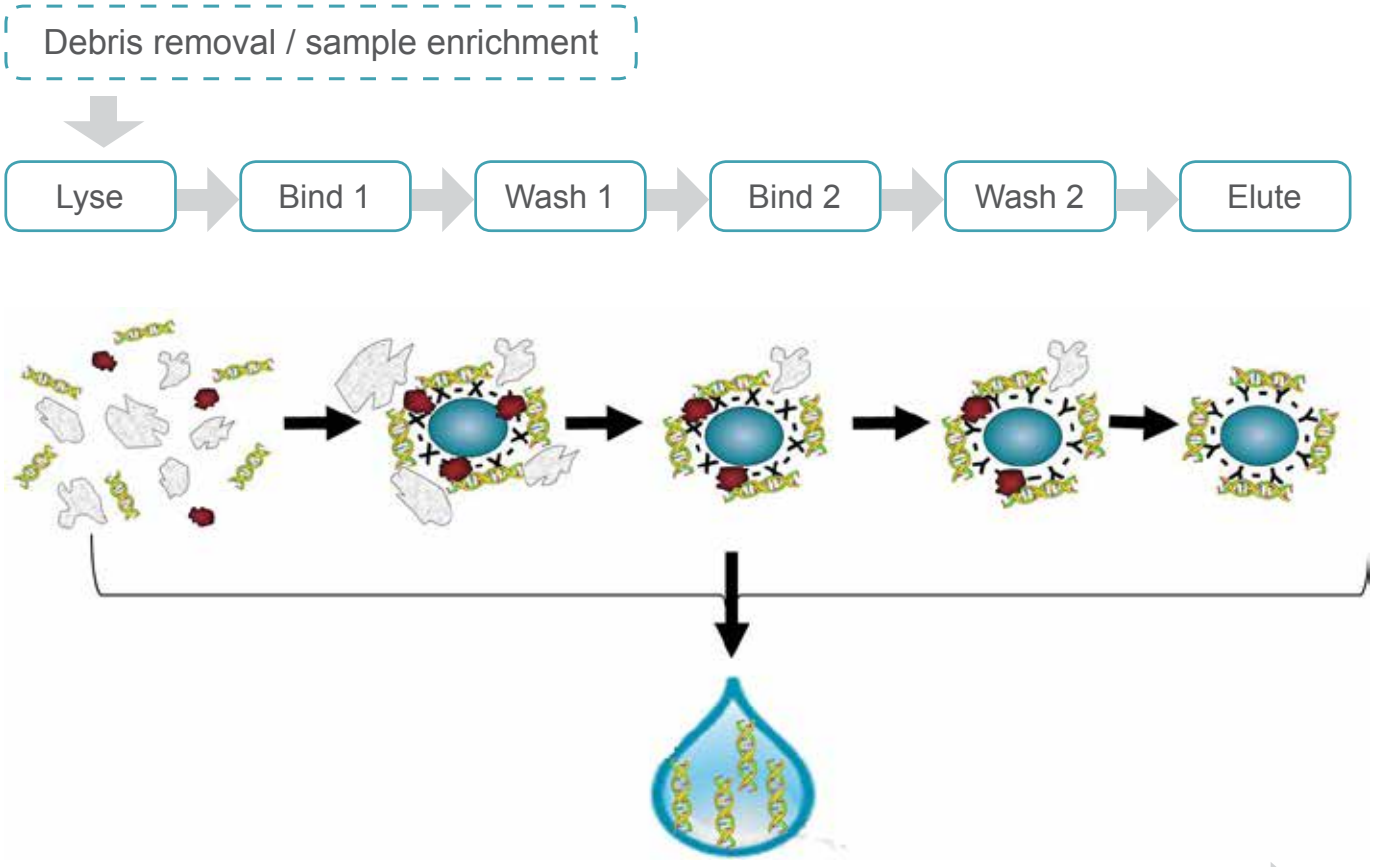
sbeadex® kits – magnetic particle novel two-step binding mechanism

The sbeadex® kits use surface modified superparamagnetic particles that bind nucleic acids via a novel two-step binding mechanism. Nucleic acids affix to the sbeadex® surface chemistry via polar interactions during the first binding step and via an affinity-driven mediator during the second binding step.

The sbeadex® two-step binding mechanism means that higher purity nucleic acids can be extracted from sample material as the switch between binding mechanisms allows more impurities to be removed during the extraction process.

The advantage of sbeadex®

- Lysis conditions and other extraction specifications can be tailored to customer requirements
- Extraction speed optimisation - quicker results
- High flexibility in batch sizes and kit volumes
- Suitable for most popular robotic platforms
- No organic solvents in final wash buffer results in high purity
- No salts in eluates (high OD_{260} / OD_{230})
- DNA concentration normalisation capability



Automation solution on oKtopure - total time: 8 plates in 1 - 2 hours

Instrumentation

The Genespin – high throughput DNA extractions

Speed is of the essence when it comes to DNA analysis of plant breeding populations; whole generations must be analysed for the presence or absence of desired biomarkers in time to enable the correct plants to be used in the next generation of breeding. This creates a demand for high-throughput DNA extraction from plant tissues, with resultant purified DNA of a suitable quality for PCR-based applications.
To date, there has been no instrument available on the market that is capable of performing high-throughput DNA extractions from plant tissues. We have launched the Genespin platform that has been developed to deliver semi- automated DNA extractions in 96- or 384-well formats. The Genespin is optimised to work with our proprietary Kleargene chemistry, and offers Replicator options, too (e.g. DNA stamping and dilution plate preparation).

The instrument provides standardised, semi-automated high throughput DNA extractions for downstream PCR-based applications.

Why choose Genespin?

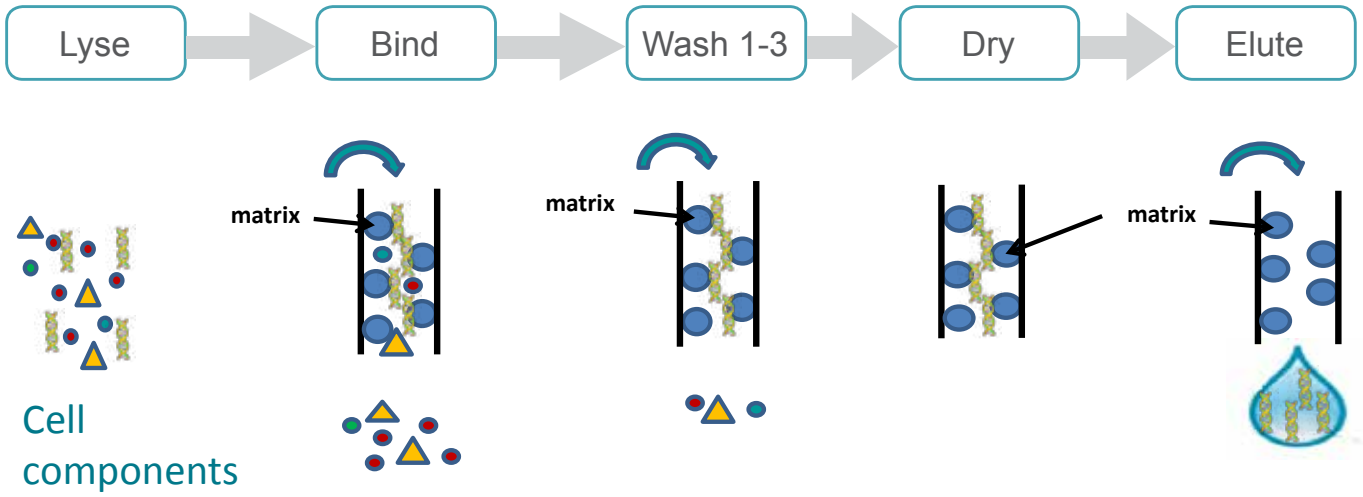
- Enables highest throughput: 8 x 96 plates/ hour
  - 96 spin plates: up to 5,500 samples per day
  - 384 spin plates: up to 20,000 samples per day
- Minimise consumable costs: in-built tip wash station ensures that only one set of tips is required per run
- Replicator function: the Genespin instrument can be used to prepare DNA dilution plates (96- and 384-well) and to stamp DNA into PCR plates
- Efficient use of laboratory space
  - Small footprint: 170 cm x 68.5 cm x 65 cm
- Compatible with SNP line installations

Kits

Kleargene spin plate kits – glass fibre based

The Kleargene spin plate utilises a glass fibre solid support and is suited for manual or automated DNA extraction from small samples such as plant tissue. This kit is available in both 96- and 384-well formats. The technology is suitable for nucleic acid extractions of 100 ng to 10 µg for samples such as plant tissue and rodent tails.

- High throughput in manual and semi-automated setting (Genespin)
- High yield and quality DNA
- Broad range of tissue types



Automation solution on Genespin - total time: 1 plate in ~1 hour; up to 96 plates in 4 hours

Kit examples

Kit	Application areas	Amount of starting material	Yield[1]	SNP's[3]
sbeadex® mini plant	Plant leaves and seeds	30 - 60 mg	2 µg	up to 500
sbeadex® maxi plant		100 - 150 mg	10 µg	1000 and more
Customised sbeadex® kit		on demand[2]	on demand	on demand
Kleargene spin 96-well plates	Plant and animal tissue	6 leaf punches	5 µg	> 1000
Kleargene spin 384-well plates		2-3 leaf punches	1 µg	< 300

[1] Yield strongly depends on species and amount of sample. Numbers are given based on maximum capacity of DNA binding surface / extraction.
[2] The sbeadex chemistry can be adapted to particular challenging sample material, extraction scales and other requirements like ultra quick protocol, normalised DNA in eluate.
[3] Depending on genome size (larger genomes require more DNA per SNP to be genotyped).

oKtopure vs Genespin

Based upon sample throughput capabilities, the quality of extracted DNA and the possible grades of automation, both robotic platforms offer significant benefits to our customers. The choice of instrumentation is dependent upon the specifics of the project e.g. sample type, desired throughput, and downstream applications. The table below provides an overview of both platforms..

Kit features	oKtopure	Genespin
Grade of automation	• Fully automated	• Semi automated
Throughput	• Up to 3,500 samples / day	• <up to 20,000 samples / day
Chemistry	• sbeadex® (mag beads)	• Kleargene (spin plates; columns)
Format	• 96-well	• 96- and 384-well
Applications	• All plant samples	• Leaf and seed tissue
Downstream applications	• All genomics based technologies	• PCR based technologies
Replicator functions	• 96 only	• Other formats possible: 96 and 384
Size	• 170 x 65 x 68.5	• 170 x 65 x 68.5
Requirements	• Air pressure	• Centrifuge with plate adaptors

Deck overview - oKtopure vs Genespin

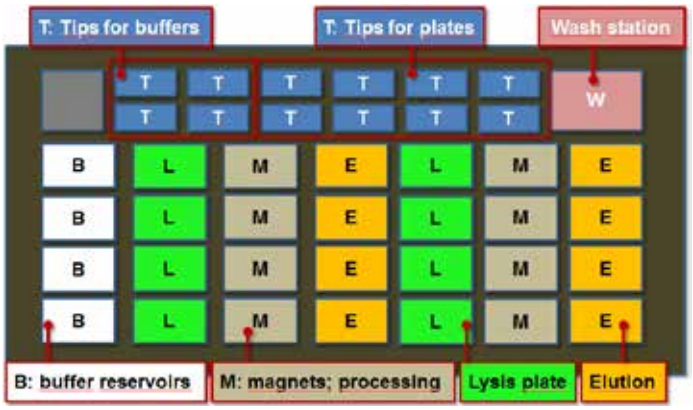


Figure 1: Deck overview of the oKtopure system

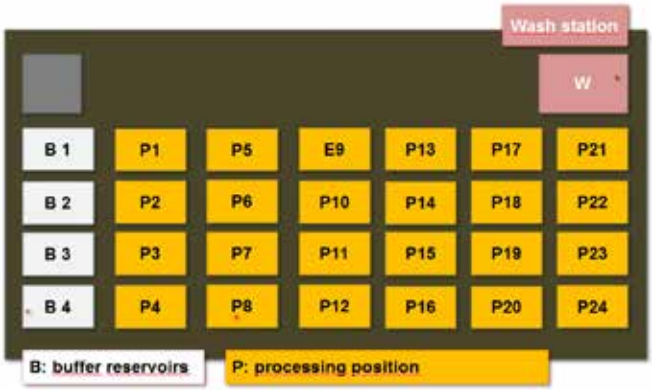


Figure 2: Deck overview of the Genespin system

Previously validated protocol examples

We have performed extractions from a wide range of plant species. Species-specific extraction protocols can be created where required. We offer pilot studies in case of non-tested plant materials.
Please contact us for more details via Email extraction@lgcgenomics.com

1. Aphid, soybean (Aphis glycines)
2. Aubergine (Solanum melongena)
3. Barley (Hordeum vulgare)
4. Bean, Common (Phaseolus vulgaris)
5. Beet (Beta vulgaris)
6. Beet, sugar (Beta vulgaris)
7. Begonia conchifolia
8. Cabbage (Brassica oleracea)
9. Carrot (Daucus carota)
10. Cassava (Manihot esculenta)
11. Cauliflower (Brassica oleracea)
12. Chickpea (Cicer arietinum)
13. Chicory, Common (Cichorium intybus)
14. Clover, Red (Trifolium pratense)
15. Corn (Zea mays)
16. Cowpea (Vigna unguiculata)
17. Cucumber (Cucumis sativus)
18. Fir, Silver (Abies alba)
19. Flax (Linum usitatissimum)
20. Grape (Vitis vinifera)
21. Leek (Allium Porrum)
22. Lettuce (Lactuca sativa)
23. Lotus (Lotus japonicus)
24. Millet, pearl (Pennisetum glaucum)
25. Muskmelon (Cucumis melo)
26. Mycosphaerella graminicola
27. Oat, Common (Avena sativa)
28. Onion (Allium cepa)
29. Orange (Citrus sinensis)
30. Peach (Prunus persica)
31. Pepper (Capsicum annuum)
32. Perch, Yellow (Perca flavescens)
33. Pigeon pea (Cajanus caja)
34. Pine, Swiss or Arolla (Pinus cembra)
35. Potato (Solanum tuberosum)
36. Ragwort (Jacobaea vulgaris/Senecio jacobaea)
37. Rapeseed/Canola/Oilseed (Brassica napus)
38. Rice, Asian (Oryza sativa)
39. Rubber (Hevea brasiliensis)
40. Ryegrass (Lolium perenne)
41. Soybean (U.S.) soya bean (UK) (Glycine max)
42. Spinach (Spinacia oleracea)
43. Sunflower (Helianthus annuus)
44. Switchgrass (Panicum virgatum)
45. Tomato (Solanum lycopersicum)
46. Tobacco leaves (Nicotiana tabacum)



Nucleic acid extraction services

Our range of genomics services includes optimised high quality DNA and RNA extraction solutions. Depending on project size, biological background of the project and downstream processing requirements, we can implement an extraction solution customised to a particular application using any combination of our well proven technologies.

Nucleic acid extraction services include

- Extraction of genomic DNA
- Quantification by UV measurement and / or PicoGreen®
- Concentration normalisation of extracts
- Quality check with SNP analysis
- Gel electrophoresis analysis (0.8 % standard agarose gel)
- Extraction from any sample type including frozen sample material
- Back up of extracted DNA

RNA extraction services include

- RNAlater® preserved material
- PAXgene® samples
- Quality check of RNA with Agilent 2100 Bioanalyzer

We run our own service laboratories in Berlin, London and Boston and have a complete understanding of the impact of the need for specialised downstream processing applications for purified DNA. We perform sequencing and genotyping projects every day in our own laboratories and we use the technologies we have developed to provide the extracted DNA to drive each project.

Ordering information

	Part number	Description	Unit
oKtopure	KBS-0009-001	oKtopure high throughput DNA extraction robot	1
	KBS-0009-002	oKtowash™, concentrated wash buffer (500 mL)	1
	KBS-0009-003	oKtopure off line tip wash option	1
	KBS-0009-004	oKtopure mix plates (Thermo 1.2 mL deep well plate)	1
	KBS-0009-005	Wash buffer bulk reservoirs (pack of 4)	1
	KBS-0009-999	Extended 12 month on-site fully inclusive service contract	1
	NAP41610	sbeadex® mini plant (960 tests)	1
	NAP41620	sbeadex® maxi plant (960 tests)	1
	Please enquire	sbeadex® mini / maxi (5000; 10.000; 20.000; 40.000 tests)	1
sbeadex® kits	GEN41131	sbeadex® particle suspension (1 mL)	1
	GEN41132	sbeadex® particle suspension (10 mL)	1
	GEN41133	sbeadex® particle suspension (100 mL)	1
	GEN41301	sebeadex® plasmid (96 tests)	1
	GEN41310	sbeadex® plasmid (960 tests)	1
	GEN41403	sbeadex® blood (96 tests)	1
	GEN41405	sbeadex® tissue (96 tests)	1
	GEN41430	sbeadex® blood (960 tests)	1
	GEN41450	sbeadex® tissue (96 tests)	1
	GEN41501	sbeadex® forensic (96 tests)	1
	GEN41510	sbeadex® forensic (960 tests)	1
Genespin	KBS-0010-001	96 Head Genespin high throughput Kleargene prep robot	1
	KBS-0010-002	384 Head Genespin high throughput Kleargene prep robot	1
	KBS-0900-023	Genespin 12 month on-site fully inclusive service contract	1
	KBS-1012-201	Kleargene 1x96 spin plate plant	1
	KBS-1012-202	Kleargene 4x96 spin plate plant	1
	KBS-1012-210	Kleargene 16x96 spin plate plant	1
	KBS-1012-211	Kleargene 64x96 spin plate plant	1
	KBS-1012-204	Kleargene 1x384 spin plate plant	1
	KBS-1012-205	Kleargene 4x384 spin plate plant	1
	KBS-1012-212	Kleargene 16x384 spin plate plant	1
	KBS-1012-213	Kleargene 80x384 spin plate plant (Buffer supplied in 5 L jerrican)	1
	KBS-1012-214	Kleargene 400x384 spin plate plant (Buffer supplied in 25 L jerrican)	1
Kleargene kits	KBS-1012-005	Kleargene 8 blood prep kit (up to 10 mLs)	1
	KBS-1012-006	Kleargene 32 blood prep kit (up to 10 mLs)	1
	KBS-1012-007	Kleargene 160 blood Prep Kit (up to 10 mLs)	1
	KBS-1012-400	Kleargene 1x96 spin plate tissue	1
	KBS-1012-401	Kleargene 4x96 spin plate tissue	1
	KBS-1012-442	Kleargene 16x96 spin plate tissue	1
	KBS-1012-443	Kleargene 64x96 spin plate tissue	1
	KBS-1012-450	1 L L1 Buffer	1
	KBS-1012-451	5 L L1 Buffer (Buffer supplied in 5 L jerrican)	1
	KBS-1012-452	25 L L1 Buffer (Buffer supplied in 25 L jerrican)	1

LGC Genomics products and services overview

- **Genotyping**
  - KASP™ genotyping reagents and services
  - SNPline™ high throughput PCR workflow instrumentation
- **Extraction**
  - DNA and RNA extraction services
  - DNA extraction products (sbeadex®, Kleargene™ and mag™ kits)
  - Extraction automation instruments (oKtopure™)
- **Sequencing**
  - Sanger sequencing
  - NextGen sequencing services (Roche 454, Illumina HiSeq & MiSeq)
- **Other valuable tools**
  - Enzymes and PCR reagents (KlearKall™, KlearTaq™, KlearTaq™ HiFi)
  - Whole Genome Amplification (WGA) kits and services
  - DNA shearing instruments (Covaris)
  - Heat and laser sealing films (96, 384 & 1536-well plates)

For more details please contact your local representative or visit our website.

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