NucleoMag® Plant

Automated purification of plant DNA on the NucleoMag® X32 automation device

Application benefits

The integration of the well-established NucleoMag® Plant technology and the NucleoMag® X32 system offers multiple benefits, optimizing molecular genomic workflows in modern plant research, agrigenomics or plant breeding laboratories:

- Verified automation method for genomic DNA isolation from various plant sample materials
- Simultaneous processing of up to 32 samples in parallel
- Consistent and reliable results
- No programming required: Verified and pre-installed methods available

Keywords

Genomic DNA, plant breeding, agrigenomics, plant samples, NucleoMag®, magnetic beads, magnetic rod system, NucleoMag® X32

Introduction

Molecular analytics using DNA plays a crucial role in plant science and breeding by providing insights into the genetic makeup of plants. It allows researchers to identify specific genes associated with desirable traits, such as disease resistance or increased yield, facilitating targeted breeding programs. By harnessing the power of molecular analytics, scientists can accelerate the development of new plant varieties with improved characteristics, leading to enhanced agricultural productivity and sustainable food production.

The release of polyphenolic compounds and complex polysaccharides during nucleic acid extraction from plant samples presents a significant challenge in achieving reliable high-throughput processing. These compounds have considerable implications for subsequent biomolecular applications as they can intercalate with nucleic acids or impact DNA polymerase activity. MACHEREY-NAGEL has addressed these obstacles by introducing the NucleoMag® Plant Kit, a rapid and automated solution for purifying genomic DNA from plant specimens. The resulting DNA is of excellent quality and can be directly utilized as a template for various applications including qPCR or NGS.

This application note showcases the automated extraction of genomic plant DNA using the NucleoMag® Plant kit on the NucleoMag® X32 system, which is a compact nucleic acid extraction platform based on magnetic bead technology. With the capacity to process up to 32 samples simultaneously, this user-friendly instrument offers pre-installed verified scripts and detailed protocol information, streamlining the mixing, magnetic bead transfer, washing, and elution steps and saving valuable hands-on time. For more information on the NucleoMag® X32 and additional application notes, please visit https://*www.mn-net.com/de/NucleoMag-X32*.

NucleoMag® Plant	
Technology	Magnetic beads
Sample material	20 – 50 mg wet weight
Elution volume	50 – 200 µL
Fragment size	300 bp – approx- 50 kbp
Max. sample number on the NucleoMag® X32	32 samples

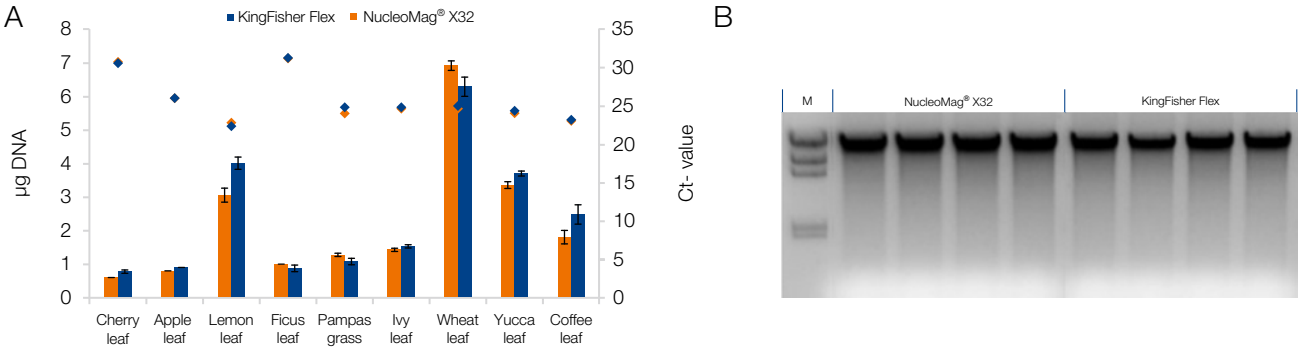
NucleoMag® X32	
Technology	Automated magnetic rod system
Display	7 inch-color touch screen
Capacity / volume per well	1 – 32 samples / 50 µL to 1000 µL
Dimensions	417 x 410 x 426 mm
Weight	30 kg
Contamination control	UV lamp, internal filter system
Website	*www.mn-net.com/de/NucleoMag-X32*

Material and Methods

The NucleoMag® Plant kit utilizes reversible adsorption of nucleic acids to paramagnetic NucleoMag® C-Beads, facilitated by appropriate buffer conditions, as the basis for its isolation procedure. Plant samples were homogenized using either MACHEREY-NAGEL's MN Bead Tubes Type G in a Retsch mill (30 Hz, 5 min) for seeds or liquid nitrogen for leave material and subsequently lysed in presence of lysis buffer MC1. Following centrifugation and transfer of cleared supernatant, binding of DNA to the NucleoMag® C-Beads was achieved by the addition of Binding Buffer MC2, followed by three subsequent washing steps using Wash Buffers MC3, MC4 and 80% ethanol to remove further contaminants and salts. After a short rinsing step in Wash Buffer MC5, pure DNA was finally eluted under low ionic strength conditions in slightly alkaline Elution Buffer MC6. RNA removal can be optionally accomplished by incorporating RNase during the lysis step.

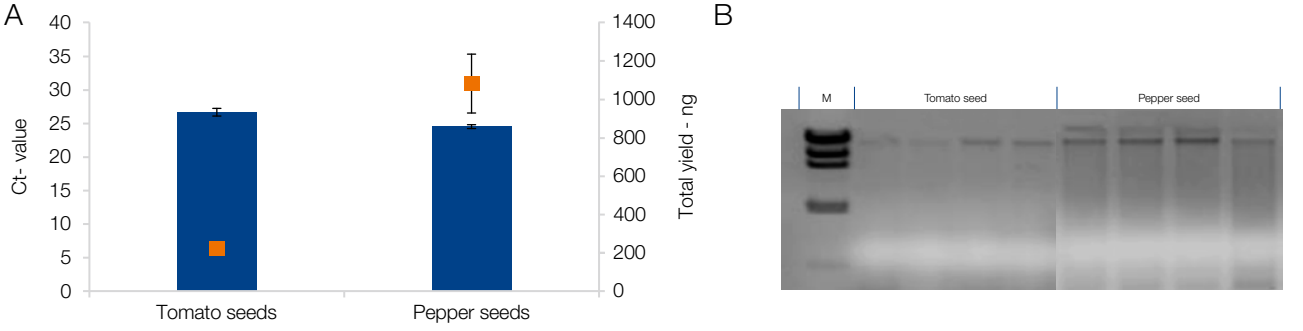
All binding, washing, and magnetic bead separation steps were carried out by the NucleoMag® X32 magnetic rod device.

Application data



Isolation of genomic DNA from diverse plant leaf materials

The NucleoMag® Plant kit automated on either the NucleoMag® X32 extraction robot or on the KingFisher Flex system were used to isolate genomic DNA from 20 mg fresh leaf material of various plant species. Both platforms yielded similar amounts of DNA (represented by bars on the left axis) and exhibited comparable performance in a downstream qPCR assay (represented by squares on the right axis). The qPCR analysis were performed with a Taqman® Probe for a 103 bp actin amplicon using the SensiFast™ Probe Lo-ROX kit from Bioline on an Applied Biosystems® 7500 Real-Time PCR System (Figure A). Figure B) displays a gel electrophoresis image of purified DNA from wheat leaves, obtained using a 1% TAE agarose gel (13 µL per eluate, M: Lambda DNA/Hind II –Thermo Scientific).



Isolation of genomic DNA from plant seeds

Genomic DNA from tamato and pepper seeds was isolated using the NucleoMag® Plant kit, which was automated on the NucleoMag® X32 system. The total DNA yield was determined using UV spectrometry and is represented by orange squares. A subsequent qPCR analysis (dark blue bars) was performed with a Tagman® Probe for a 103 bp actin amplicon using the SensiFast™ Probe Lo-ROX kit from Bioline an an Applied Biosystems® 7500 Real-Time PCR System (Figure A). The integrity of the DNA was assessed through gel electrophoresis (Figure B), with each eluate loaded at 13 µL per well on a 1 % TAE gel. The molecular weight marker used was Lambda DNA/Hind II from Thermo Scientific.

Ordering information

Product	Specifications	Quantity	REF
NucleoMag® Plant	Magnetic bead-based kit for the isolation of genomic DNA from plant samples including NucleoMag® C-Beads, buffers, lyophilized RNase	1 x 96 preps 4 x 96 preps	744400.1 744400.4
NucleoMag® X32	Magnetic rod system for automated nucleic acid extraction using MACHEREY-NAGEL NucleoMag® kits, parallel processing of up to 32 samples	1	747020
96 Deep-well plates	96 deep-well plates for NucleoMag® X32	25	744955
Tip combs	8-place magnetic tip combs for NucleoMag® X32	50	744960