Performance evaluation of GENTi™ Advanced Plant Kit with or without DNase I treatment using ginseng leaf

Introduction

Panax ginseng L. is a high-value medicinal plant widely used in functional food, nutraceutical, and pharmaceutical research. However, its tissue contains abundant secondary metabolites such as saponins, polysaccharides, and phenolic compounds, which often interfere with nucleic acid purification and reduce overall yield and purity. This makes it challenging to obtain high-quality DNA/RNA suitable for downstream genomic applications, particularly in high-throughput workflows where reproducibility and consistent performance are essential.

The GENTi™ Advanced Plant Kit is specifically designed for automated isolation of total nucleic acid (DNA/RNA) from plant tissues and is fully optimized for use with the GENTi™ 32 Advanced Automated Nucleic Acid Extraction System. By combining a magnetic bead–based workflow with pre-validated protocols, the system enables reliable and efficient processing of up to 32 samples simultaneously while minimizing inhibitor carryover.

In this Application Note, total nucleic acid was extracted from *Panax ginseng* leaf tissue using the GENTi™ Advanced Plant Kit, followed by a comparison of extracts with or without DNase I treatment. The quality of the isolated nucleic acid was assessed based on yield, purity, and electrophoretic integrity to evaluate the suitability of the automated workflow for ginseng samples.

Materials and Methods

Materials

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GENTi™ 32 Advanced Automated Nucleic Acid Extraction System (GTI032A)	GENTi™ Advanced Plant Kit (904-048A/904-096A)

Sample Information

Sample	 Ginseng leaf
Family	Araliaceae
Genus	*Panax*
Species	*Panax ginseng* L.

Extraction Conditions

Target	Total nucleic acid (DNA/RNA)
Sample amount	100 mg
Extraction system protocol	Plant-High
Operating time	28’ 26’’
Elution volume	Up to 200 µl

Preparation of DNase I Solution

To obtain a DNase I stock solution of 2 Kunitz units/µl, add 120 µl of Nuclease-free water (provided) to the tube containing lyophilized DNase I (240 Kunitz units), and mix carefully and gently to avoid foaming. The reconstituted enzyme should be stored at -20 ˚C.

The prepared DNase I stock solution is mixed with Buffer DRB (DNase I Reaction Buffer) at a 2:70 ratio immediately before use to prepare the **DNase I solution**, which is then used immediately.

Protocol

*** For more details and methods, please refer to the manual of GENTi™ Advanced Plant Kit.**

1. Place 100 mg of leaf tissue into a 2 ml microcentrifuge tube containing a 4 mm stainless steel bead.
2. Freeze the sample completely with liquid nitrogen (LN_2).
3. Grind the frozen tissue into a fine powder using a TissueLyser II (or an equivalent bead-beater) at 30 Hz for 1 min.
4. Add 500 µl of Buffer SQ1 to the tube and vortex thoroughly for 30 s.
5. Briefly centrifuge the lysate and incubate it for 30 min at room temperature.
6. Centrifuge the sample at 13,000 rpm for 5 min at 4 °C.
7. Carefully transfer 200 µl of the clarified supernatant to the 1st (or 7th) well of the cartridge, avoiding the fat and debris layer.
8. Load the fully prepared extraction cartridge into the GENTi™ 32 Advanced Automated Nucleic Acid Extraction System and run the “Plant-High” protocol.
9. After extraction, collect the eluate from the 5th (or 11th) well.
10. To obtain DNA-free RNA, half of the retrieved eluate (100 µl) is separated and treated with the DNase I solution at a 2:1 ratio (50 µl).

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Results

Ginseng leaf (*Panax ginseng* L.)	Mean (n=3)						
	Yield			Purity			
	Conc. (ng/µl)	Yield (µg)	CV	A_{260}/A_{280}	CV	A_{260}/A_{230}	CV
DNase I (–)	242.4	24.2	0.06	2.1	0.00	2.3	0.00
DNase I (+)	157.7	15.8	0.02	2.1	0.00	2.3	0.01

Table 1. Evaluation of nucleic acid yield and purity from ginseng leaf
Nucleic acid was extracted from 100 mg of ginseng leaf (n=3) using the GENTi™ Advanced Plant Kit in combination with the GENTi™ 32 Advanced Automated Nucleic Acid Extraction System, operated with the Plant-High protocol. The yield and purity of the extracted nucleic acids were assessed using a NanoDrop™ 2000 spectrophotometer.
To evaluate the effect of DNase I treatment, nucleic acid yield and purity were compared between samples processed without DNase I [DNase I (–)] and those subjected to DNase I digestion [DNase I (+)]. Following DNase I treatment, the total nucleic acid yield decreased by 8.4 µg (approximately 35%), indicating that the extracted nucleic acids consisted of roughly 35% DNA and 65% RNA.
Despite the reduction in yield, both conditions exhibited excellent purity, with A_{260}/A_{280} ratios of 2.1 and A_{260}/A_{230} ratios of ≥ 2.2, demonstrating minimal contamination from proteins or organic/chaotropic substances. The coefficients of variation (CV) for all yield and purity metrics were very low (≤ 0.06), highlighting the robustness and reproducibility of the extraction workflow.
Overall, these results demonstrate that the GENTi™ Advanced Plant Kit, used with the GENTi™ 32 Advanced Automated Nucleic Acid Extraction System, can reliably isolate high-quality nucleic acids from ginseng leaf. Furthermore, optional DNase I treatment can be applied to remove DNA without compromising the purity or consistency of the final RNA preparation.

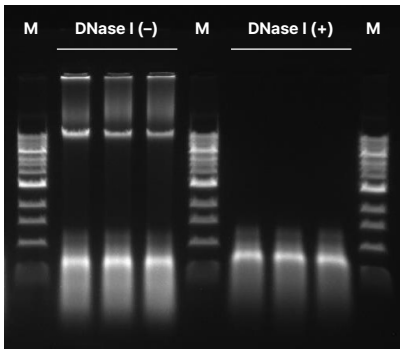

Figure 1. Agarose gel analysis of nucleic acids extracted from ginseng leaf with or without DNase I treatment
Extracted nucleic acids were separated on a 1% agarose gel in 0.5X TBE buffer at 100 V for 33 minutes. The sizes of the nucleic acid fragments were estimated using the GENESTA™ 1 kb DNA Ladder (GA-100), and the gel images were acquired using the SmartView Pro 1100 Imager System (UVCI-1100).
In the DNase I (–) lanes, strong high-molecular-weight genomic DNA bands are clearly visible, along with diffuse lower-molecular-weight RNA signals, indicating that both DNA and RNA were co-purified. In contrast, DNase I (+) lanes show the disappearance of the high-molecular-weight DNA band, leaving only RNA-derived smear patterns, demonstrating effective digestion and removal of DNA.
These results confirm that the DNase I treatment successfully removes genomic DNA while preserving RNA integrity in the extracted samples.

Conclusion

- The GENTi™ Advanced Plant Kit and GENTi™ 32 Advanced Nucleic Acid Extraction System extracted nucleic acids from ginseng leaf with high purity and excellent reproducibility.
- DNase I digestion effectively removed genomic DNA, reducing total nucleic acid yield about 35%.
- RNA purity remained high (A_{260}/A_{280} = 2.1; A_{260}/A_{230} ≥ 2.2) regardless of DNase I treatment.
- The workflow provides reliable, high-quality RNA suitable for downstream applications.

Ordering Information

Cat. No.	Product	Size
GTI032A	GENTi™ 32 Advanced Automated Nucleic Acid Extraction System	1 Unit
904-048A	GENTi™ Advanced Plant Kit (Tube Type)	48T
904-096A	GENTi™ Advanced Plant Kit (Plate Type)	96T