

APPLICATION OVERVIEW

SOIL

Sample Overview

The challenge with extractions from soil is isolating DNA or RNA without contamination by humic acids or other PCR inhibitors. The **FastDNA Spin Kit for Soil** and **FastRNA Pro Soil Kits** used in combination with the **FastPrep** instrument will help overcome any difficulties with complete lysis of all soil organisms including historically difficult sources such as eubacterial spores and endospores, gram positive bacteria, yeast, algae, nematodes and fungi, and isolation of pure DNA and RNA.

Effective, efficient sample preparation is critical to successful downstream results.

DNA Extraction From Andisol, a Volcanic Ash Soil

DNA extraction from Andisol, a volcanic ash soil, is known to be very difficult because this soil has a complex matrix, including allophane as a clay mineral. Soil properties such as high clay content contribute to high adsorption of DNA to soil particles. The combination of the FastPrep instrument and the FastDNA SPIN Kit for Soil used together with skim milk have demonstrated successful extraction of PCR-suitable DNA from recalcitrant soil samples like volcanic ash soil.

Materials

- FastPrep instrument
- FastDNA Spin Kit for Soil
- Skim milk (carrier minimizing adsorption of nucleic acids to soil)
- Sample: Andisol, volcanic ash soils

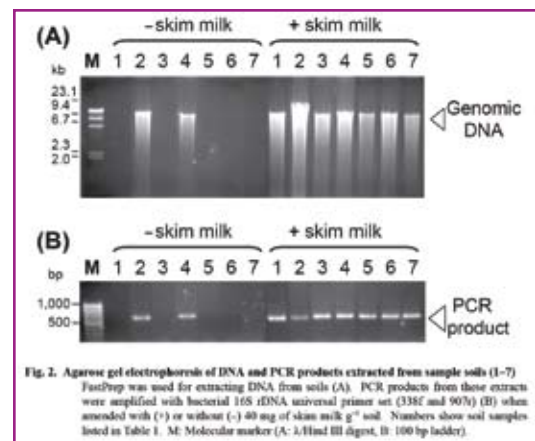
Protocol and parameters

1. Add the soil sample together with or without 40 mg skim milk per gram of soil to a Lysing Matrix E tube.
2. Add 978 μ l sodium phosphate buffer to the sample in the Lysing Matrix E tube.
3. Add 122 μ l MT Buffer.
4. Homogenize in the FastPrep instrument for 40 seconds at a speed setting of 6.0.
5. Centrifuge at 14,000 x g for 5-10 minutes to pellet debris.
6. Follow the FastDNA Spin Kit for Soil protocol for DNA purification from the homogenate.

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Soil no.	Origin	Soil taxonomy ^a	Soil texture	pH (H ₂ O)	Organic C content (g kg ⁻¹)	P retention (%)
1	Spinach field, Ibaraki	Dystric-Silic Andisol	light clay	5.46	83.419	83
2	Conserved forest, Ibaraki	Dystric-Silic Andisol	light clay	4.84	149.43	84
3	Apple orchard, Asomori	Silic-Eutrisilic Andisol (Dystric)	sandy clay loam	6.08	122.893	75
4	Vegetable field 1, Fukushima	Dystric-Silic Andisol	light clay	6.20	78.795	71
5	Vegetable field 2, Fukushima	Haplic-Dystric Cambisol	clay loam	6.02	23.239	65
6	Upland crop field, Kumamoto	Dystric-Silic Andisol	heavy clay	5.59	117.283	82
7	Paddy field, Kumamoto	Silic-Eutrisilic Andisol (Dystric)	heavy clay	6.38	119.425	91

a): According to the world reference base (WRB) for soil resources classification.



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Results

DNA could successfully be extracted from Andisol soil samples with the FastDNA Spin Kit for Soil and the addition of 40 mg of skim milk per gram of soil sample. PCR products of the expected size were amplified from all extracts with skim milk. Resultant extracts were suitable for PCR and no other purification procedures were needed.

Reference: Takada Y, Matsumoto N. Skim milk drastically improves the efficacy of DNA extraction from Andisol, a volcanic ash soil. Japan Agricultural Research Quarterly. 2005;39(4):247-52.

Product Overview

The **FastDNA Spin Kit for Soil** is designed to efficiently isolate bacteria, fungal, plant, and animal genomic DNA from soil and other environmental samples.

The **FastRNA Pro Soil Kits** are designed to efficiently isolate total RNA from organic material found in soil samples and soil sample supernatants.



RT-PCR of fungal gene from total RNA isolated from soil samples with the FastRNA Pro Soil-Direct Kit. Approximately 40% of the RT-PCR reaction was loaded on to a 0.8% agarose gel. Lane 1: 150 bp–2 kb marker, Lane 2: Soil #1, Lane 3: Soil #5, Lane 4: Soil #10, Lane 5: Soil #11.

Kit Components: RNApro™ Soil Lysis Solution, Lysing Matrix E, Phenol:Chloroform (1:1), Inhibitor Removal Solution, DEPC-treated H₂O, RNAMATRIX® Binding Solution, RNAMATRIX® Slurry, RNAMATRIX® Wash Solution Concentrate, Quick-Clean Spin Filters



DNA from various soil samples extracted with the FastDNA Spin Kit for Soil. 20% of the DNA isolated from 500 mg soil was loaded on a 1.2%

agarose gel (0.5X TAE). Soil was taken from: Lane 1: tomato pot; Lane 2: sludge; Lane 3: sandy soil; Lane 4: under pine tree; Lane 5: under palm tree; Lane 6: green garden; Lane 7: Nile Lilly pot; Lane 8: lawn grass; Lane 9: citrus tree; Lane 10: avocado tree. DNA ranges from approximately 4–20 kb.

Typical Soil Settings

Sample Name	Sample Type	Quantity	Lysing Matrix	FastPrep Speed	FastPrep Time
Sediment	Soil/Rock	50 mg	E	5.5	2 x 30 sec
Soil	Sandy Sample	50 mg	E	4.0	4 x 30 sec
Soil	Litter	50 mg	E	5.5	30 sec
Soil	Brunisol - Dark Gray Luvisol	500 mg	E	5.5	40 sec
Soil	Soil from Grassland	500 mg	E	5.5	2 x 30 sec
Soil	Rhizosphere	500 mg	E	6.0	40 sec
Sediment	Marine Sediment	500 mg	E	5.5	2 x 40 sec
Soil	Asphalt-permeated Soil	500 mg	E	6.0	40 sec

References

Successful sample preparation using the MP Biomedicals product line has been highlighted in hundreds of scientific articles. **To access articles and other educational materials, visit www.mpSamplePrep.com.**