Improved Extraction of Biomolecules from Plants, Animals, and Fungi with The PCT Shredder

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ABSTRACT

The high content of fibrous material in many plant samples, as well as the presence of sturdy cell walls, complicates the extraction of DNA and other biomolecules from plant tissues. To release target analytes, plant samples often require extensive and time-consuming sample disruption, often accomplished by grinding with a mortar and pestle or by homogenizing with glass or metal beads. Such methods are often inefficient and may even be deleterious to the biomolecules. Here we describe a system for the efficient extraction of biomolecules from plants, animals, and fungi using The PCT Shredder and the Pressure Cycling Technology Sample Preparation System (PCT SPS). Initial disruption of plant tissue with The PCT Shredder followed by DNA extraction by pressure cycling technology (PCT) are carried out in the same processing container (PCT Shredder PULSE Tube). This method of extraction is safe, convenient, and efficient. Furthermore, the extracted DNA was far less sheared as compared to DNA extracted by bead beating. In addition to releasing longer DNA from plants, The PCT Shredder alone or in combination with PCT SPS has proven to effectively release RNA, DNA, and proteins from fungi and C. elegans. The PCT Shredder is also an effective tool for pre-processing tissues such as cardiac muscle, liver, and lung. The PCT Shredder is powerful enough to release organelles and yet still gentle enough to preserve the intact structure of mitochondria released from tissues.

METHOD 1: The “FAST” or “Frozen Abrasive Shredder Technique” uses Silicon Carbide (SiC) and snap freezing, followed by shredding. This method is recommended for small organisms, such as C. elegans (Reference 2 and 3).

METHOD 2: Shredding with Silicon Carbide (SiC) Abrasive. SiC may be used with The PCT Shredder without flash freezing the sample. This method is recommended for tough animal and plant tissue.

METHOD 3: No Abrasive/Shredder only. Softer tissue, such as liver, brain, and leaves, may be processed without SiC using The PCT Shredder alone.

RESULTS

Protein Extracted from C. elegans

RNA Extracted from Soil

Approximately 4-9 fold more RNA was extracted from “Newfoundland” soil using a MO BIO RNA PowerSoilTM Total RNA Isolation Kit with the addition of a “shredding” step using The PCT Shredder™ from PBI than the MO BIO protocol alone (used as directed by the manufacturer).

FEATURES AND BENEFITS Of THE PCT SHREDDER

- Gentle, mechanical homogenization system
- Small
- Portable
- Affordable
- Safely and rapidly breaks apart tough, fibrous, and other difficult samples, such as:
  - Plant and animal tissue
  - Arthropod exoskeletons
  - Cuticle of nematodes
- Increase yields of high quality nucleic acids, proteins, lipids, and small molecules
- Single-use processing containers
  - Inexpensive
  - Self-contained
  - No sample transfer required
- Excellent for collection, storage, transport, and processing of samples
- Use less aggressive buffers & reagents

REFERENCES

1) The PCT Shredder Manual: PBI
2) ProteoSolve-CE Native Manual: PBI
3) ProteoSolve-CE Stringent Manual: PBI
5) Application Note: “Improved DNA Recovery from Spinach Leaves Using The PCT Shredder™ and Pressure Cycling Technology (PCT)”: PBI