



[Technical White Paper](#)

Performance evaluation of HigherPurity™ PCR Clean-Up Magnetic Beads

Comparable performance to widely used SPRI-based systems for routine PCR clean-up workflows (no protocol optimization required).

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HigherPurity™ PCR Clean-Up Magnetic Beads demonstrate comparable performance to widely used SPRI-based purification systems. Key results include >99% fragment recovery in the 300–500 bp range, consistent fragment size (~390 bp), and comparable DNA yield (43–45 ng/μl). These beads provide a reliable and cost-effective alternative for routine PCR clean-up workflows without requiring protocol modifications.

KEY FINDINGS: >99% fragment recovery (300–500 bp), consistent fragment size (~390 bp), comparable DNA yield (43–45 ng/μl), and reproducible performance across replicates.



1. Introduction

PCR purification is a critical step in many molecular biology workflows including cloning, sequencing, library preparation, and genotyping. Efficient removal of primers, dNTPs, enzymes, and reaction buffers is essential to obtain DNA fragments with the purity and size distribution required for downstream applications.

Magnetic bead-based purification has become a widely adopted method due to its simplicity, scalability, and compatibility with automation. These systems typically rely on reversible binding of nucleic acids to paramagnetic beads under optimized salt and polyethylene glycol (PEG) conditions. After binding, contaminants are removed through washing steps and purified DNA is subsequently eluted in a suitable buffer.

HigherPurity™ PCR Clean-Up Magnetic Beads from Canvax are designed to provide reliable PCR product purification with performance comparable to widely used bead-based systems currently available in the market. This white paper presents an **analytical comparison of PCR clean-up performance between HigherPurity™ beads and other commercially available bead-based purification systems, demonstrating comparable fragment recovery, size distribution, and DNA concentration.**

2. Magnetic Bead-Based PCR Clean-Up Principle

Magnetic bead purification relies on the selective binding of nucleic acids to paramagnetic beads under specific buffer conditions (**SPRI**). By adjusting the bead-to-sample ratio, it is possible to selectively retain DNA fragments within a defined size range while removing smaller contaminants such as primers and nucleotides.

The general workflow includes:

1. Addition of magnetic beads to the PCR product.
2. DNA binding to the paramagnetic bead surface.
3. Magnetic separation and removal of supernatant containing impurities.
4. Ethanol washing to eliminate residual contaminants.
5. Elution of purified DNA in water or low-salt buffer.



3. Experimental Design

The performance of HigherPurity™ PCR Clean-Up Magnetic Beads was evaluated and compared with **several commercially available bead-based purification systems commonly used in molecular biology laboratories.**

PCR products were purified using different bead systems and subsequently analyzed using a fragment analysis platform capable of determining DNA fragment size distribution, molarity, and concentration.

Key analytical parameters included:

- DNA fragment size distribution
- Average fragment size
- DNA concentration
- Fragment recovery consistency
- Electropherogram peak quality

4. Results

Across all tested bead-based purification systems, PCR products were consistently recovered within the expected fragment size range of approximately 300–500 base pairs. The majority of DNA fragments fell within this range with distributions close to ~99%, demonstrating efficient removal of smaller contaminants while preserving the target amplicon population.

Average fragment sizes observed across all purification systems were highly consistent, with values centered around approximately **387–393 bp**. DNA concentrations measured after **purification ranged between 38 and 49 ng/μl** depending on the sample and system used.

HigherPurity™ PCR Clean-Up Magnetic Beads produced DNA fragments with an average size of approximately 387–388 bp and concentrations around 43–45 ng/μl, values that fall well within the same performance range observed for other leading bead-based purification systems.

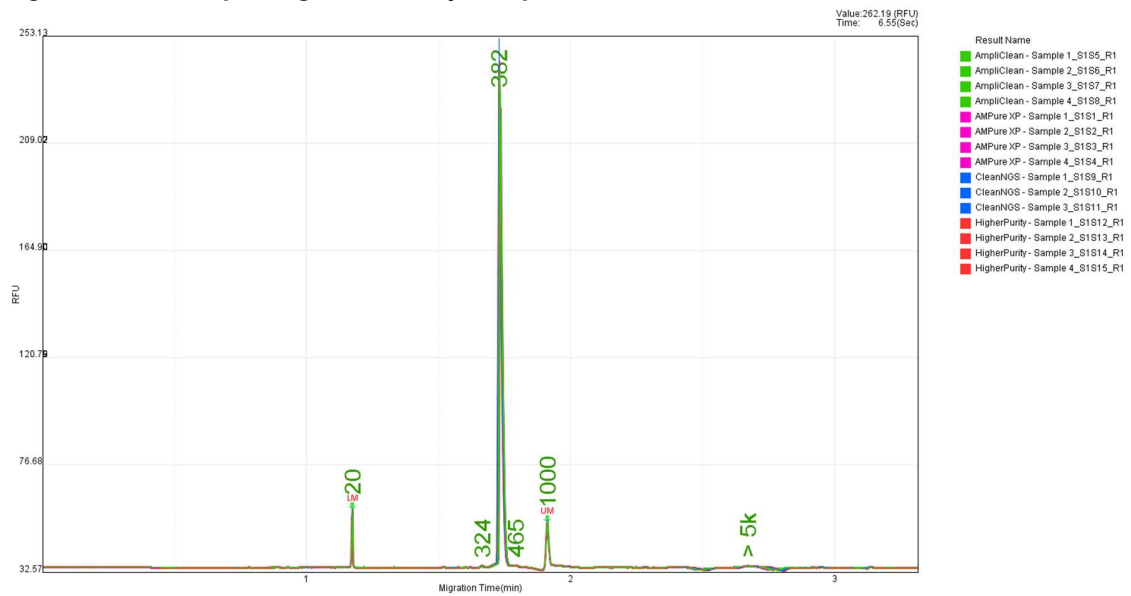


Figure 1 – Electrophoretic comparison of purified PCR products



The electrophoretic profiles demonstrate consistent fragment recovery and clean peak distribution across all tested purification systems.

Figure 2 – Electropherogram overlay comparison





The electropherogram comparison highlights the overlapping fragment size distribution obtained after purification with different bead systems. The similarity of peak profiles indicates comparable performance in terms of fragment recovery and size selectivity.

5. Discussion

The analytical comparison demonstrates that HigherPurity™ PCR Clean-Up Magnetic Beads deliver DNA purification results comparable to widely adopted bead-based purification systems. Fragment size distributions, electropherogram peak profiles, and DNA recovery values fall within the same performance ranges observed with other commercial systems.

These results confirm that HigherPurity™ beads provide reliable purification performance for typical PCR clean-up workflows. **The reproducibility observed across multiple samples indicates consistent DNA binding and recovery efficiency.**

6. Applications

HigherPurity™ PCR Clean-Up Magnetic Beads are suitable for a wide range of molecular biology applications including:

- PCR product purification
- Next-generation sequencing library preparation
- Amplicon sequencing workflows
- DNA fragment clean-up prior to cloning
- High-throughput automated workflows

7. Conclusion

The results presented in this study demonstrate that HigherPurity™ PCR Clean-Up Magnetic Beads provide purification performance comparable to leading bead-based PCR purification systems widely used in molecular biology laboratories.

With consistent fragment recovery, clean size distribution, and reproducible DNA yields, **HigherPurity™ beads represent a robust and cost-effective alternative for PCR clean-up applications. Their compatibility with standard magnetic bead workflows allows seamless integration into existing laboratory protocols while offering laboratories an efficient and economical purification solution.**