



Wool Fibres Readily Biodegrade in Marine Environments, Study Confirms

BRUSSELS, 27 MARCH 2020 – What happens to textile fibres once they enter freshwater systems and the sea? It's a question that received scant attention until the recent rise of concern over microfibres.

A substantial body of research firmly establishes how wool biodegrades on land, but far less was understood of its behaviour in the aquatic environment – until now.

Findings released by New Zealand research institute AgResearch now reveal the biodegradation rates of various textile fibres in the marine environment. The research, led by Dr Stewart Collie, followed the path of the fibres released by domestic laundry processes, examining how the breakdown process occurs.

Key Findings

- **Both untreated wool and machine-washable wool were found to biodegrade readily in the marine environment, as did the cellulose-based viscose rayon. Synthetic fibres showed little or no biodegradation.**
- **Machine-washable wool – wool with a thin film applied to the surface to prevent felting– biodegraded even more quickly than untreated wool. Researchers believe that this is due to the loss of some of the wool fibre's cuticle layer during the treatment process, rendering it more susceptible to microbial degradation.**
- **There was no evidence to support the idea that the polyamide resin used as part of the machine-washable treatment caused microfibre pollution.**

Initial research on how wool biodegrades in marine environments was released in 1994, providing evidence for the theory that natural fibres are not harmful to our marine life and that they will naturally biodegrade, becoming part of the aquatic surroundings without causing any harm.

However, the actual process of biodegradation and the fate of textile finishes on the wool fibre remained a mystery, leading to the present research.

Method

To measure the biodegradation, residues were examined using scanning electron microscopy and energy-dispersive X-ray spectroscopy. The samples were comparable lightweight base layer fabrics made from two types of Merino wool, viscose rayon, polyester, nylon (polyamide), and polypropylene which had been shredded to remove interference from fabric structure effects.

The fabrics were washed repeatedly before testing to simulate a partial garment lifetime. Researchers then measured the average biodegradation of three samples for each fibre type relative to a control, namely readily biodegradable paper pulp.

Fibre Type	Relative Biodegradation
Control (paper pulp)	100
Untreated Wool	20.3
Machine-washable Wool	67.3
Viscose rayon	64.5
Polyester	6.3
Nylon	0.8
Polypropylene	1.8

Table 1: Relative biodegradation of fibre types.



Table 1. The amount of biodegradation of the fibres is expressed relative to a 'positive control', i.e. a sample known to biodegrade readily. In this study, kraft paper pulp was used. The average biodegradation of three samples for each fibre type relative to the control was measured.

Distinguishing Polyamides

"It is important to note that the crosslinked polyamide resin used in the machine-wash treatment for wool is very different from common commercial polyamides," lead scientist Dr Collie noted.

The resin used in the machine-wash treatment is initially water soluble when applied to the wool surface, where its light crosslinking prevents re-resolution. In this form the resin is able to swell significantly in water so that it more effectively masks the wool fibre scales, enhancing machine-washability. This swelling potentially means that it presents a much-reduced barrier to microbial access, Dr Collie explained.

A Natural Solution to Microfibre Pollution

"IWTO members passionately believe that wool textiles offer our challenged world a better alternative to man-made alternatives," says Dalena White, Secretary General of the International Wool Textile Organisation (IWTO).

"A renewable, natural source of fibre remains the best solution to the current microfibre pollution crisis we find ourselves in."

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Members of the IWTO's Sustainable Practices Working Group have invested more than €550,000 during the past six years in wool research, establishing wool's sustainability credentials and publishing numerous studies in peer-reviewed journals.

Download the AgResearch bulletin, *Microfibre Pollution and the Marine Biodegradation of Wool*, from www.iwto.org/news/wool-in-water

About IWTO

With a worldwide membership encompassing the wool pipeline from farm to retail, the IWTO represents the interests of the global wool trade. By facilitating research and development and maintaining textile industry standards, IWTO ensures a sustainable future for wool. To learn more about IWTO and its activities, visit www.iwto.org.



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