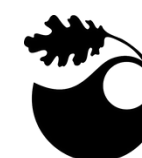


MATE the Label Product Chemistry Hotspot Analysis to Reduce Human Health & Ecological Impacts

The textile industry is responsible for air and water pollution caused by chemicals used in the production of raw materials and textile manufacturing. Cradle to MATE was designed to help an LA-based clothing company, MATE the Label, understand the human and environmental toxicological impacts of the fibers they use in their products (organic cotton, TENCEL(TM) Lyocell, linen, & spandex) and rank them with common fibers used in apparel (conventional cotton & polyester).

AUTHORS: Sarah Hamilton, Magaret Hammond, Carleigh Osen, Alexandra Setmajer, and Caroline Shepherd

AFFILIATION: Bren School of Environmental Science & Management



INTRODUCTION

This report contains eight sections. **Section 1** comprises this introduction. **Section 2** summarizes the project's key objectives. **Section 3** discusses the project's significance and why it was of value to pursue. **Section 4** contains background information essential in the development of our project, including a summary of key data sources and a literature review. **Section 5** describes the methodology developed using R and ToxPi to analyze and rank fiber chemistry data. **Section 6** discusses the results and **Section 7** provides a discussion of the project's recommendations and opportunities to improve this analysis in the future. Finally, **Section 8** provides the project conclusion. References and appendices are provided at the end of this report.

See our full report at <https://bren.ucsb.edu/projects>.

RESULTS

Key findings include the following fiber ranking of chemical hazard, from most concerning to least concerning:

- 1) conventional cotton,
- 2) linen,
- 3) polyester,
- 4) organic cotton,
- 5) spandex, and
- 6) lyocell

The most concerning supply chain processes by fiber are: farming (fertilizers, pesticides and insecticides) for organic and conventional cotton and linen; production of pre-polymer solution for spandex; yarn spinning process for polyester; and fabric knitting process for lyocell.

The five most concerning chemicals in our analysis across all fibers are the following pesticides and insecticides: 1) phorate, 2) chlorpyrifos, 3) lambda-cyhalothrin, 4) alpha-endosulfan, and 5) monocrotophos

Close up of cotton fabric from MATE



ACKNOWLEDGEMENTS

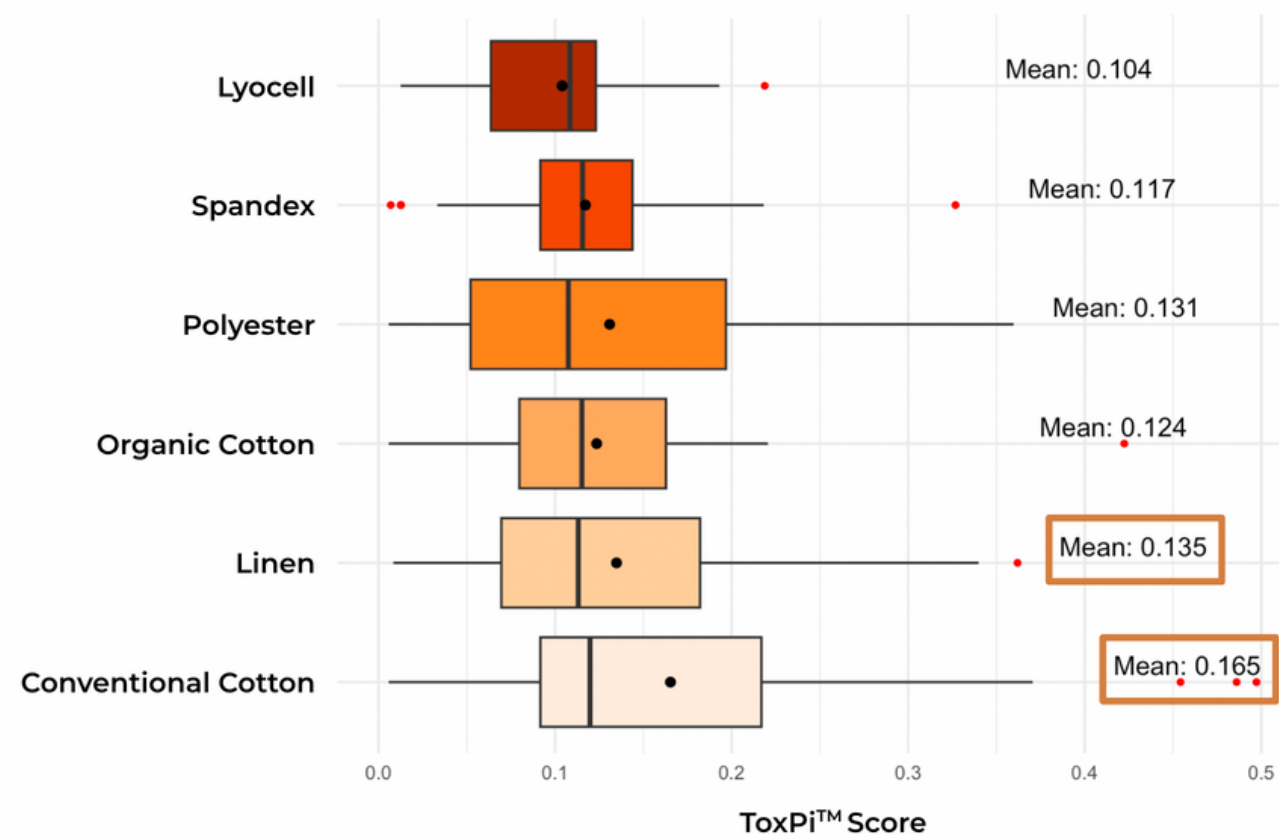
This project would not be possible without help from our advisors, who we thank for their continuous support, resources, and feedback. This includes our faculty advisor, Professor Patricia Holden PhD (Bren), and our external advisors: Professor Arturo Keller PhD (Bren), Professor David Volz PhD (University of California Riverside), Professor Ronald Tjeerdema PhD (University of California Davis), and Todd Copeland (Industry Expert).

Many thanks to our project client, MATE the Label, for their willingness to participate in this project. In particular, we would like to thank Tyler Cobian (MESM '20), Sustainability Manager at MATE, for the resources and guidance he provided.

MATE the Label products pictured: Organic cotton loungewear



Total ToxPi™ Score Distribution



We used ToxPi, a tool supported by the EPA, to analyze the chemicals used in fiber production. Results (left) show the potential harmfulness of each fabric using all data points available (n= 83).

Conventional cotton and linen were most concerning based on their mean ToxPi scores. Conventional cotton was statistically significantly more concerning than spandex and Lyocell, but all other pairs of fabrics did not have significantly different means.

RECOMMENDATIONS

We recommend that MATE work with its farmers and supply chain partners to gain better visibility into which chemicals and practices are actually being used in the furthest step of its supply chain. Additionally, the project team hopes that this research can help move the apparel towards more transparency in its production processes by identifying existing data and information gaps. Our chemical ranking assessment can be used as a tool for other apparel companies to determine chemical hotspots in their clothing manufacturing processes.

Finally, the project team would like to thank the following resources for their help in providing additional information integral to this project: Sean Kerr, Satie Airame, Aleah Van Woert, Mike Schaadt, Renee Hackenmiller-Paradis; ToxNot, Bluesign, & MADESAFE representatives; MATE's suppliers: Laguna Fabrics, Harry's Dye & Wash Inc., and MOLA Inc.; and Daniel Rosen, CFO of MATE the Label, who assisted the project's summer internship.