

Biodegradable geotextiles – The use of biopolymers in short-lived soil protections

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Why short-lived geotextiles?



- Geotextiles protect the seeds during plant growth
- After establishment of vegetation → geotextile becomes redundant
- Erosion control by a wire-polymer geotextile system
- Currently in use: Polypropylene (PP)
→ Synthetic polymer, non-degradable



Picture credits: Geobrugg AG





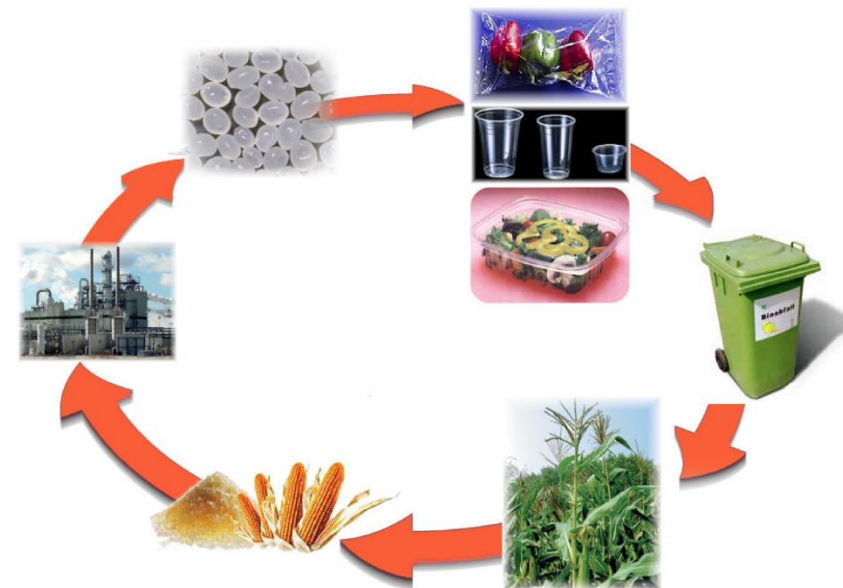
Short-lived geotextiles - biopolymers

- **Alternative:** bio-degradable polymers, which degrade after a certain time period, e.g.:

- Polylactic acid (PLA)
- Polybutylene succinate (PBS)
- Polybutylene adipate terephthalate (PBAT)

→ No re-collection of material necessary

→ No environmental pollution



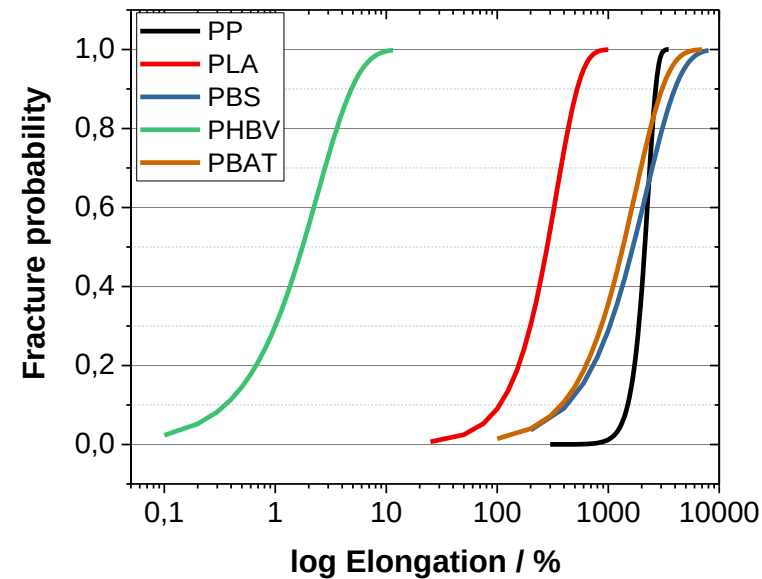
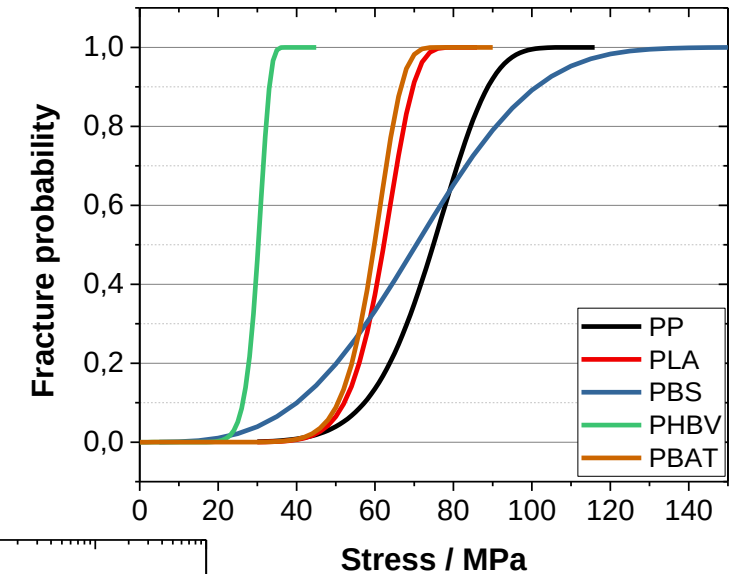
<https://www.alchemia-nova.net/de/naturebased/bioplastics/>





Short-lived geotextiles - biopolymers

- Production of different biopolymer fibers and blend fibers
- Characterization by fiber tensile testing
- Varying property profile depending on the material





Material development



- Biopolymer fibers should degrade after a certain time period, but must be stable during the critical growing phase

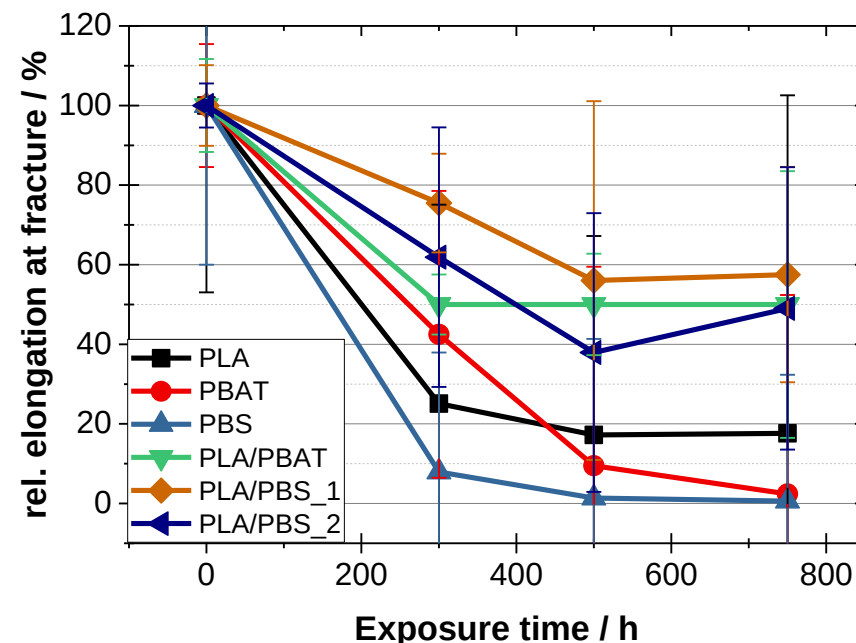
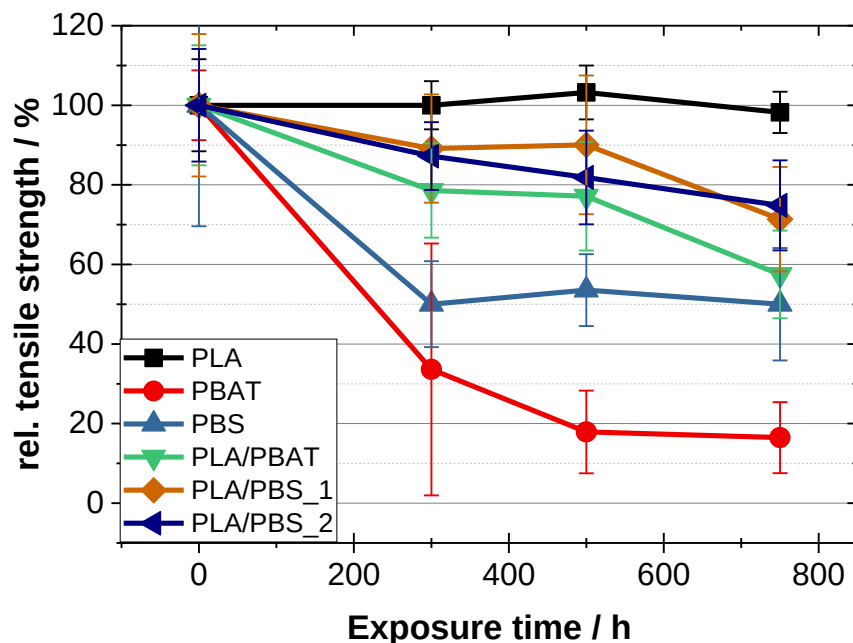
→ Materials should be stable for 1-2 year

→ Investigation by artificial weathering up to 750 h exposure time





Material development

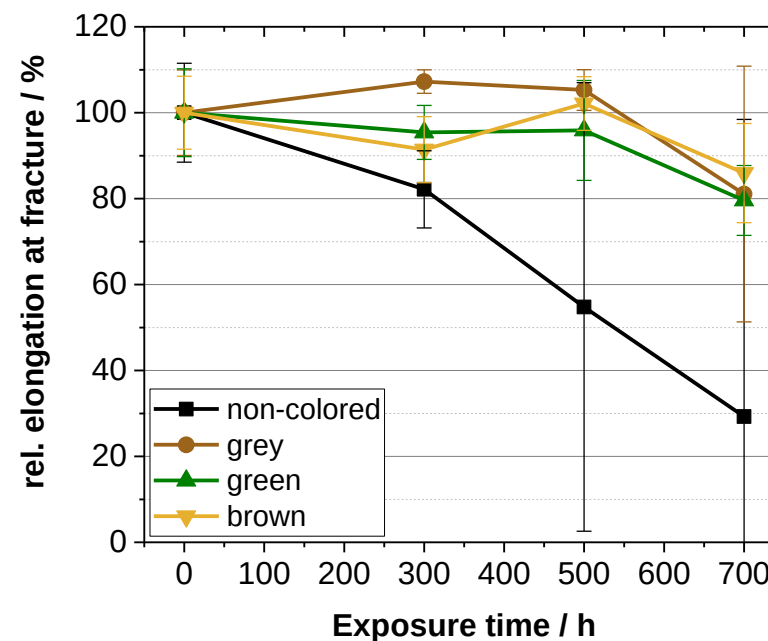
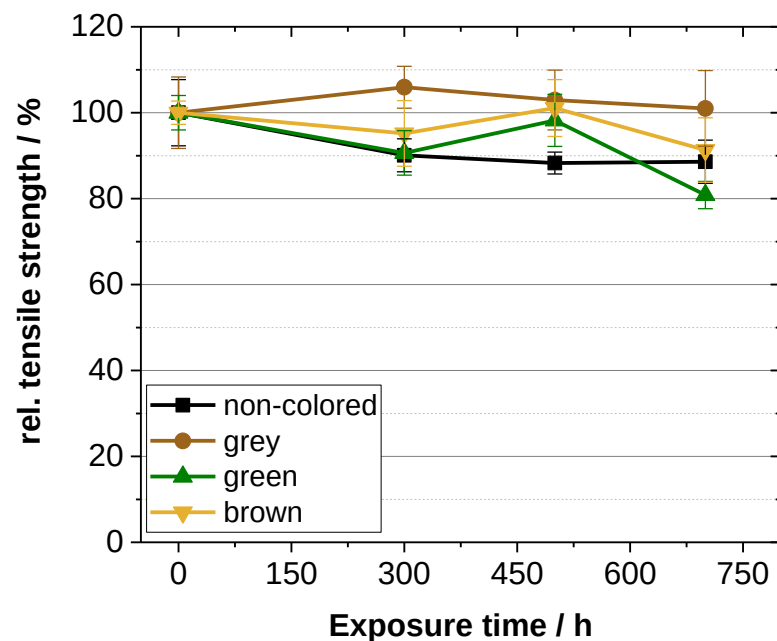


- Reduction of tensile strength for most polymers and blends, high stability for PLA
- Significant decrease of elongation at fracture → fibers become more brittle



Effect of colouring

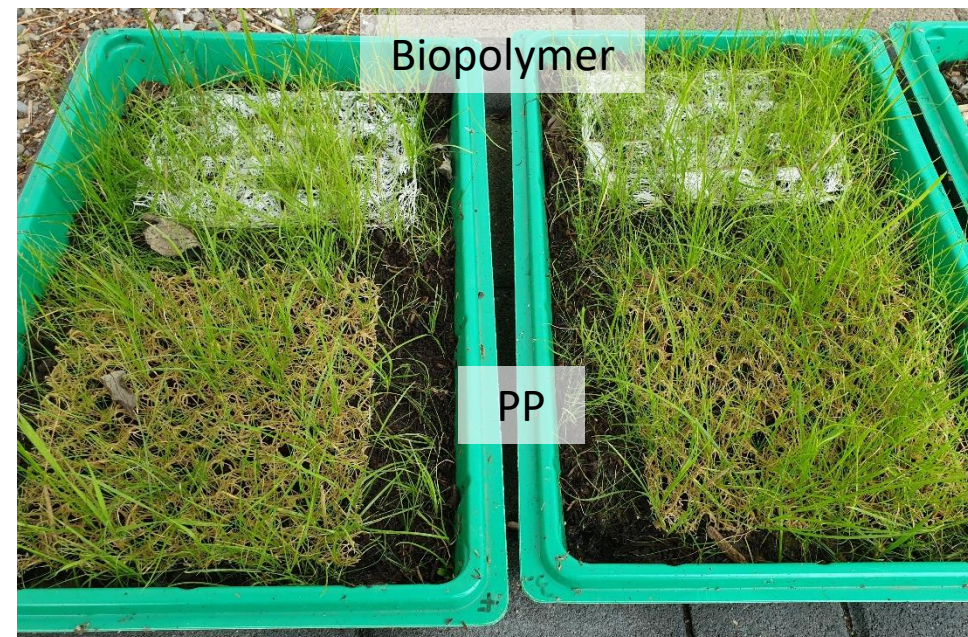
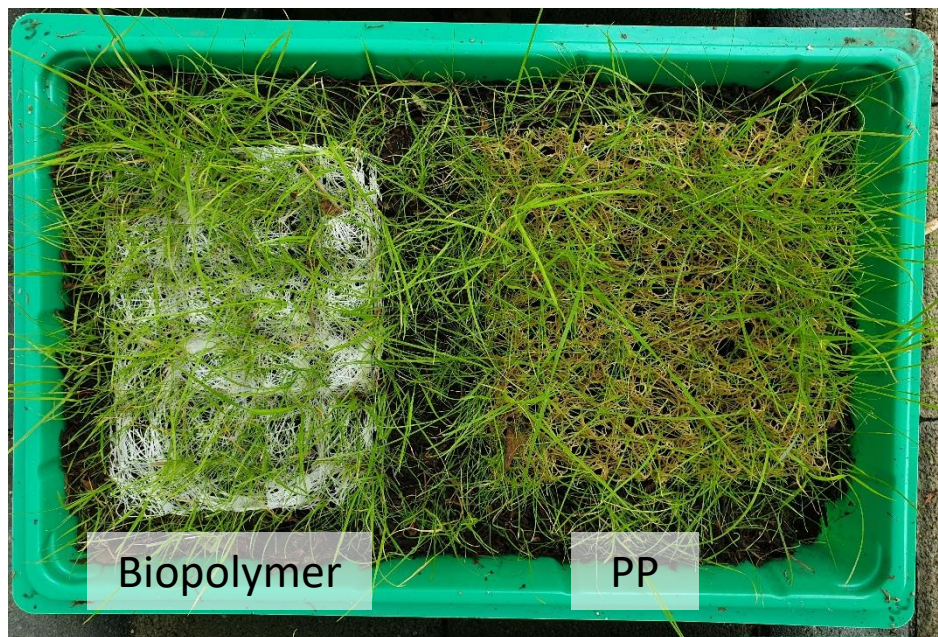
- Coloured fibres show improved mechanical properties
- Good colourability was observed





Germination experiments

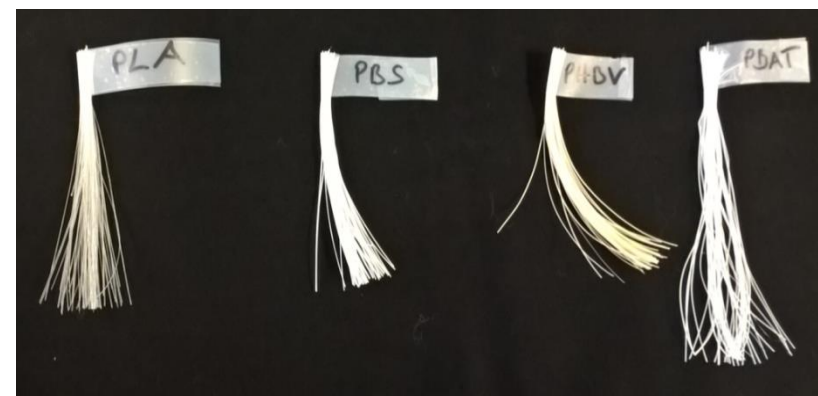
- Comparison of PP and biopolymer fiber mesh
- Successful plant growth observed





Conclusion and Outlook

- PLA based polymer blends are suitable for manufacturing short-lived geotextiles:
 - High mechanical properties
 - Bio-degradable materials
 - Easy to process (similar to synthetic fiber materials)
 - UV-light stability (short-time stability)
- Further challenges:
 - Evaluation of outdoor stability
 - Scale-up of the production process





Acknowledgment

tccv



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Thank you for your attention!

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