Eco-Mesh™ Tree Guard
Technical Bulletin

What are the Eco-Mesh tree guards made from?
The Eco-Mesh guards are made from a mix of PLA (Polylactic acid) and PBAT (Polybutylene Adipate Terephthalate). The material is mixed and formed into a mesh which is then sized into different heights and widths to suit varying browsing protection situations.

What is PLA?
PLA (Polylactic acid) is a thermoplastic monomer derived from renewable, organic sources such as corn starch or sugar cane. Whilst technically still a 'plastic', it is made from renewable sources and is generally considered compostable in an industrial composting facility. PLA biodegrades through a process of hydrolysis leading to the formation of lactic acid, which can then be metabolized by microorganisms.

If left in the natural environment, PLA will break down to carbon dioxide, water, and biomass, with the rate of breakdown heavily dependent on the climate it is in. Increased temperature will make PLA warp, increased UV exposure will make PLA brittle, and increased moisture will accelerate hydrolysis. In essence, a hot, sunny, humid environment will result in faster breakdown, whilst a cool, shady, dry environment will slow the breakdown.

What is PBAT?
PBAT (Polybutylene Adipate Terephthalate) is a biodegradable and compostable polymer partly derived from petrochemicals. It is not made from renewable sources but is generally considered compostable in an industrial composting facility and is engineered to break down significantly faster than typical plastics, which are engineered to last as long as they can. PBAT biodegrades through a process of hydrolysis leading to the formation of adipic acid, terephthalic acid, and butanediol, which is also able to be metabolized by microorganisms.

If left in the natural environment, PBAT will also break down to carbon dioxide, water, and biomass, with the rate of breakdown similarly dependent on the climate. It has a lower melting point than PLA but a higher flexibility, so UV light will not make PBAT as brittle as quickly as PLA. However, increased temperature and increased moisture will accelerate breakdown and hydrolysis. A hot, sunny, humid environment will result in faster breakdown, whilst a cool, shady, dry environment will slow the breakdown.

What are the benefits of combining them?
PLA and PBAT have quite different properties in their flexibility, strength, and cost. PLA is more brittle but has a higher melting temperature, whilst PBAT is more flexible but with a lower melting temperature. PBAT is also more resistant to stress cracking than PLA.

Blending the two materials together can provide a material that retains enough flexibility and strength at an economically viable cost to form into a mesh suitable for tree guards. The table below shows the respective properties of each material.

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Property	PBAT	PLA
Flexibility	High	Low (brittle)
Compostability	Industrial & Some Home	Industrial only
Strength	Moderate	High
Cost	Moderate	Lower

What does this mean for your Eco-Mesh guards?
Given that climatic conditions impact the rate of breakdown so significantly, the rate that the guards will break down is going to vary from site to site. During testing, when the guards were put in an accelerated QUV tester on a cycle of 8 hours at 60°C followed by 4 hours at 50°C with condensation, cycled continuously for 40 days, the 60°C temperature turned the guards brittle and they began fragmenting. When the test was run at 50°C only, the guards retained their flexibility and durability for the same timeframe. Eco-Mesh guards that were put out in the field in a Mediterranean climate were unchanged over the course of a year, retaining their flexibility and appearance, with minor discolouration.

Given both materials used for the blend are ultimately broken down by microorganisms in the soil and this is accelerated by appropriate heat and moisture, the best way to dispose of these guards is in an industrial composting solution and this is our recommended disposal method. However, if the Eco-Mesh guards are left onsite, they will eventually fragment and come into contact with the soil, allowing them to be broken down into carbon dioxide, water, and biomass, which will be metabolized by microorganisms. The timeframe that this will occur over will vary from site to site, with material likely persisting for longer timeframes the cooler and drier the site remains.

// Important Note on Use
The Eco-Mesh tree guards are designed to give reliable protection for young trees under normal planting conditions. Because weather, soil, and site conditions vary, the way the guards perform and how quickly they break down will also vary.

For best results, we recommend Eco-Mesh guards are recollected after use and sent for recycling or industrial composting where facilities are available.

Arborgreen cannot guarantee the same outcome in all environments and is not responsible for how Eco-Mesh guards are used or disposed of once supplied.

References
https://www.chembroad.com/pla-and-pbat-understanding-the-differences-and-benefits/
https://europlas.com.vn/en-US/blog-1/what-is-pbat-plastic-pros-and-cons-of-pbat

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