Artificial ageing experiments completed

Milestone no. 5

Christina Pyromali[1] , Demetres Briassoulis[1*], Anastasios Giannoulis[1], Antonis Mistriotis[1]

[1] Department of Natural Resources & Agricultural Engineering, Agricultural University of Athens, 75, Iera Odos Str, 11855 Athens, Greece

Document Information

Work Package	WP1: MNP properties and sources to farm soil
Lead beneficiary	Agricultural University of Athens (AUA)
Due date	M40- 30.09.2024
Delivered	19.05.2025

Summary report

Artificial ageing experiments were conducted under controlled laboratory conditions to simulate prolonged exposure of agricultural plastics (AP) to environmental stressors (i.e. sunlight). The activities involved selecting representative commercial virgin plastic films, including both conventional and biodegradable materials, and subjecting them to accelerated ageing using UVA340 radiation in temperature-controlled chambers. The ageing conditions were standardized at a radiation intensity of 38.5 ± 1 W/m² and a temperature of approximately 50°C.

The first phase included ageing of two mulching films (one biodegradable and one conventional), with systematic monitoring through mechanical and spectroscopic analyses to determine the degradation threshold based on changes in elongation at break and chemical structure. Subsequently, a second series of tests was performed on six additional AP items representing common agricultural uses (Irrigation Tape: I116-PEEL-200-BLACK-O, Fertilizer sack: K1-PEEL-150-WHITE-O, Olive fruit fly trap: O1-PEEL-100-YELLOW-O, Plant branch hand tie: O1-PEEL-150-RED-O, Protection Fleece: C3-PPDE-50-WHITE-O, Biodegradable tubes: R-BIO2IT-400-BEIGE-O)

Regular tensile testing and material inspections were carried out to document the progression of degradation across different polymer types and formulations. The artificially aged mulching films were used in subsequent field testing and analysis.

Photographic documentation (if applicable)

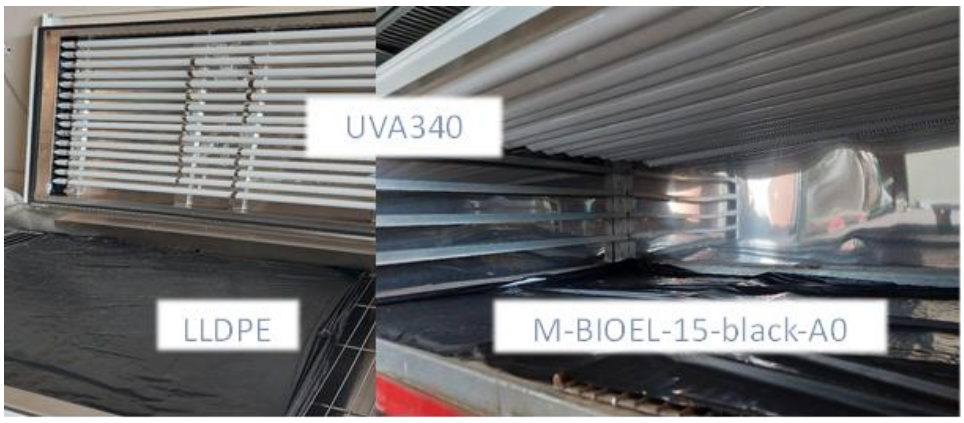

Figure 1. The UVA340 lamps chambers and b) Spectrum of the UVA340 lamps compared to sunlight spectrum

Figure 2. Artificial ageing of selected AP samples.