

Correlation of key agricultural plastic waste parameters with the quality of the resulting waste stream

Demetres Briassoulis¹, Epifania Babou¹, Miltiadis Hiskakis¹

¹Agricultural University of Athens, Department of Agricultural Engineering, Iera Odos 75, 11855, Athens, Greece Tel: +30 210 529 4022, Email: briassou@aua.gr

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Abstract

The mechanical and chemical degradation of the agricultural plastic as well as its soil/moisture contamination, affect its ability to be recycled and be used for energy recovery. These critical parameters were investigated in an effort to assess and control the quality of the agricultural plastic waste streams. Samples of agricultural plastics from greenhouses, low-medium tunnels, mulching films, bale wrapping films etc (from various cultivations, across Greece and Europe) were collected before and after their use. Samples were also collected from the plastic removed before and after its storage in the field. The samples were properly conditioned and tested in the laboratory for mechanical properties degradation and for moisture-soil contamination. The results of these tests are thoroughly presented and discussed.

The results obtained indicate that the degree of mechanical degradation of the agricultural plastic waste is highly dependent on a combination of application and material characteristics. Among the dominant factors affecting the quality of the agricultural plastic waste included are the thickness of the film versus the period of exposure, the material composition and additives, the use of agrochemicals and the exposure of the material to contamination by soil during use and handling after the removal (e.g. mulching films). Thus, plastic waste coming from LDPE greenhouse and low tunnel films seem to retain their mechanical strength while mulching films seem to have lost their mechanical strength to a high degree after their exposure in the fields for a period of 8 months. There are cases however, when mulching films of a different composition exhibit better resistance to weathering conditions. Solarization films lose faster their mechanical strength when compared with greenhouse and low tunnel films, and degrade more readily even than mulching films, due to their low thickness values combined with the weaker stabilization and high temperatures developed in the space covered by the film. Soil contamination and moisture were measured to high in cases of plastic waste coming from mulching films that was stored in the fields for a couple of months. The duration and conditions (location, exposure to the elements etc) of the storage affect greatly the contamination level.

The above tests are to be combined with chemical and thermal analysis tests in the framework of a European project Labelagriwaste ¹ to establish the technical requirements the agricultural plastic waste should fulfil to be disposed accordingly (mechanical recycling, energy recovery, composting etc).

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