Composting pruning materials and testing of mulches and potting media under warm and dry conditions in Turkey

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Original Articles

Uptake of di-(2-ethylhexyl)phthalate from plastic mulch film by vegetable plants

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Abstract

The uptake of di-(2-ethylhexyl) phthalate (DEHP) from plastic mulch film used in field cultivation by 10 vegetable plants was investigated by experiments carried out in pots. The results showed that DEHP was transferred from the mulch film to all vegetable plants. Wax gourd (*Benincasa hispida*) showed the greatest capacity for uptake of DEHP, while cucumber (*Cucumis sativus*) and pumpkin (*Cucurbita moschata*) could also accumulate high levels. This implies that wax gourd, cucumber and pumpkin may be sources of DEHP contamination in the human diet. Moreover, Chinese cabbage (*Brassica parachinensis*) also accumulated a high level of DEHP from mulch plastic film giving dietary exposure close to the daily intake limit for DEHP.

Keywords: risk assessment, phthalates, plastic mulch, vegetables

Additional information

Acknowledgements

identify and quantify microplastics in heterogeneous samples like soil.

4.2. Phthalates

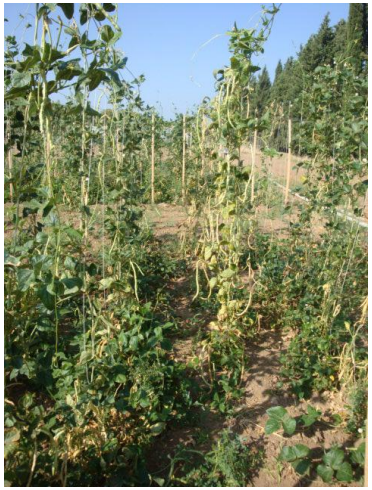
Among typical PE mulch additives, plasticising agents from the group of phthalic acid esters (PAE) with its model compound bis(2-ethylhexyl) phthalate (DEHP) belong to the most discussed soil contaminants (Fu and Du, 2011; Magdouli et al., 2013; Wang et al., 2013). Similar to other PAE, DEHP is suspected of being carcinogenic and endocrine-disrupting (Erkekoglu and Kocer-Gumusel, 2014). The fate of such compounds is highly relevant when assessing the risks potentially originating from plastic mulches. However, demonstrating a connection between plastic mulch application and elevated PAE concentrations in soil or plants is not trivial since agrochemicals, wastewater irrigation and atmospheric background concentrations represent further potential PAE sources (Hongjun et al., 2013; Wang et al., 2013; He et al., 2014). In PE mulches, PAE are only loosely incorporated in the polymer structure without covalent bonding and can therefore be leached out easily. Even PAE derivatives with low water solubility, low vapour pressure and high octanol–water partitioning coefficients such as DEHP (Magdouli et al., 2013), have been found ubiquitously in the environment (Fernández et al., 2011). While typical background concentrations of PAE in soil vary between 0.2 and 33.6 mg kg^{-1} (Zeng et al., 2008), PAE levels in plastic mulches were detected in ranges from 50 to 120 mg kg^{-1} (Wang et al., 2013). Plastic-mulched crop land revealed concentrations of six major PAE between 74 and 208% higher than in non-mulched farmlands in China (Kong et al., 2012). Most concentrations of DEHP and dibutyl phthalate (DBP) found in Chinese-grown vegetables and soil exceeded US and EU food security standards and environmental risk limits of 0.7 and 1.0 mg kg^{-1}, respectively (van Wezel et al., 2000; Wang et al., 2015).













Material	C:N Ratio
Sawdust	200-750
Peatmoss	50
Straw	50-150
Cow manure	20
Poultry manure	3-15
Horse manure	20-50
Leaves from oak	40-80
Sun-dried grass clippings	20
Fresh grass clippings	15
Fresh garden debris	20
Vegetable wastes	~12
Garbage (food waste)	~15
Hay from legumes	15-20
Hay-general	15-32
Corrugated cardboard	~560
Newsprint	~400-850

Aerobik Kompostlaşma
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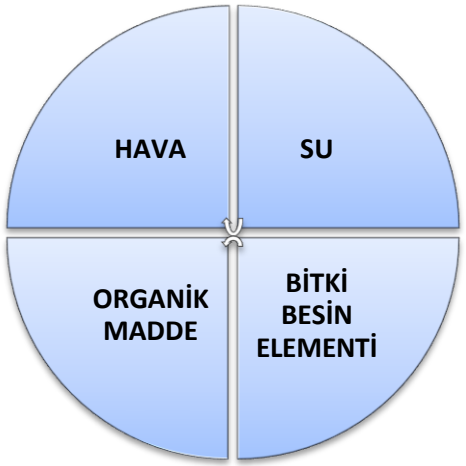



TARIM PARK VE BAHÇELER
DAİRE BAŞKANLIĞI
EYS

ETAE ve ZAE
KOMPOST YAPIM ÇALIŞMALARI





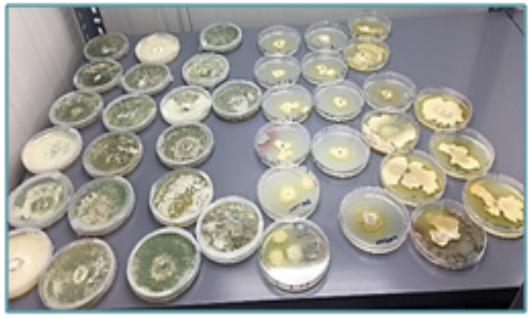


https://ec.europa.eu/eip/agriculture/en/find-connect/projects/organic-plus-pathways-phase-out-contentious-inputs

A quantitative publication and reports on composting procedures point out that cellulose rich raw material used for making compost at the beginning need up to two-year period during maturing process in anorganic waste stream. This long period is handicap for making compost in farm conditions. This period should has shortened and such innovative applications used in the WP5-Soil, peat replacement Task, H2020 project Organic-PLUS (GA774340) in 2018. These applications are not reach technology readiness, yet in commercial life but has great capacity to obtain quality compost in 8 months instead 2 year as a promising method.

Followed procedure is as follows.

Application 1 *Trichoderma citrinoviride* development in petri dishes (containing Potato Dextrose Agar Medium) in incubator 22-degree Celsius +-2 degree at the beginning of the April in 2019 when compost pile was made 2 months before.



Preparation of applied solution from *Trichoderma citrinoviride* (6 gram mycelium and conidiophores were taken from 40 petri dishes with the help of a sculpture and it mixed with 30 Liter water to 14 m^3 compost) The conidiophore density was approx. $1x10^7$ – $1x10^8$ according to Thoma Lam calculation

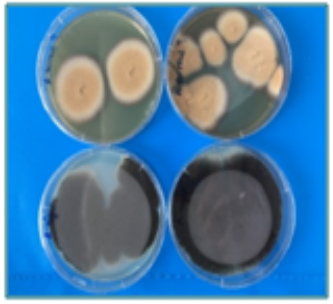
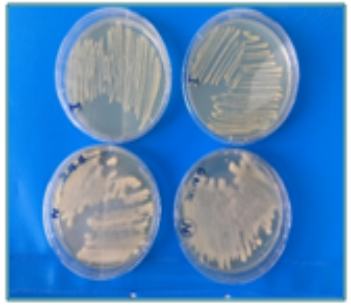
We made the application by using motorized back sprayer (1.2 mm drop diameter).

According to the observations that we made on 25thApril 2019, there were green mycelial *Tricoderma citrinoviride* fungal colony development on the compost. This showed us the inoculation was successful.

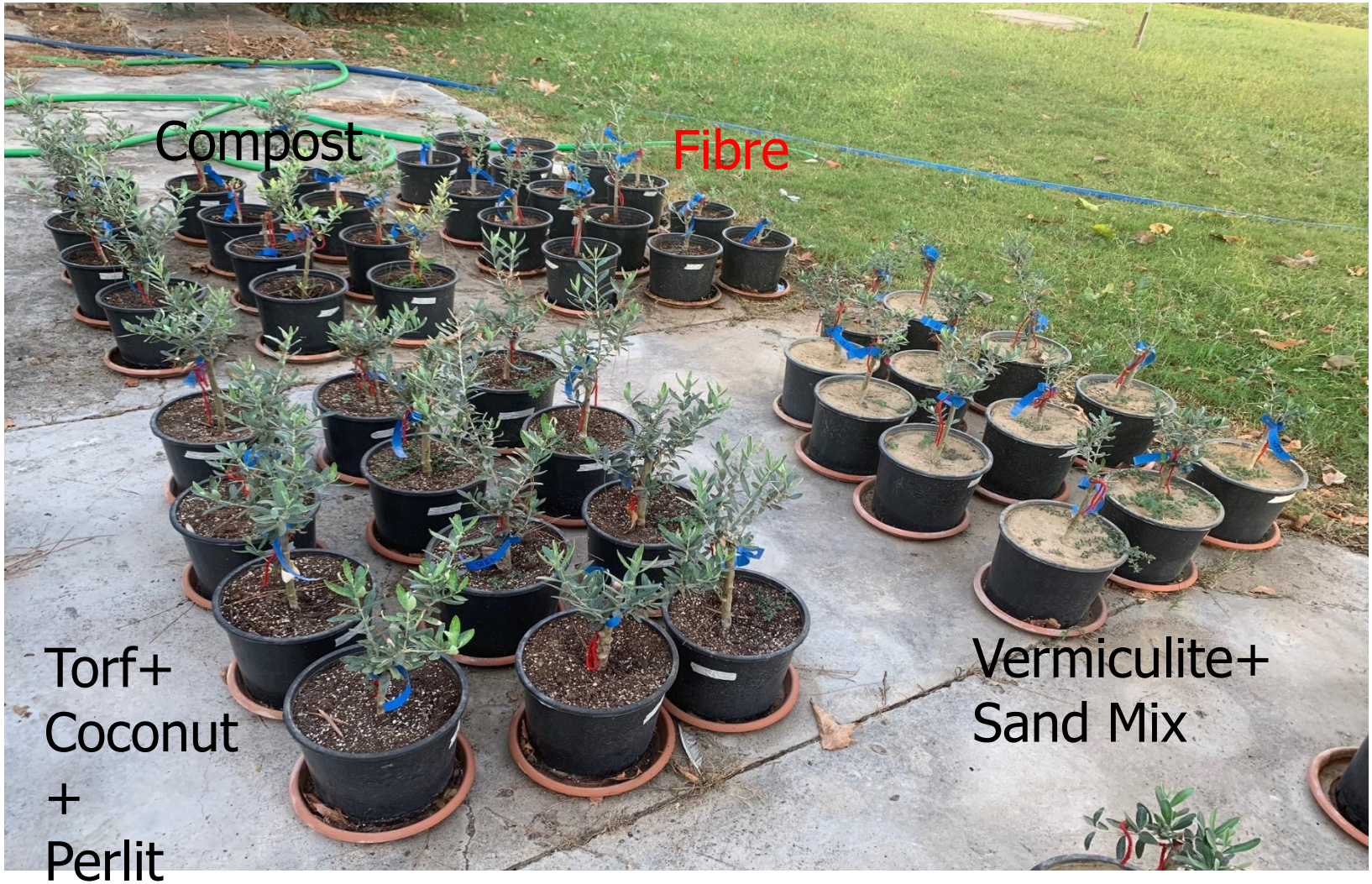
On 23rd May 2019, first *Coprinus* sp. Mushrooms begins to occur on the compost. *Coprinus* spp. Species are known as cellulose enzyme producing fungi.

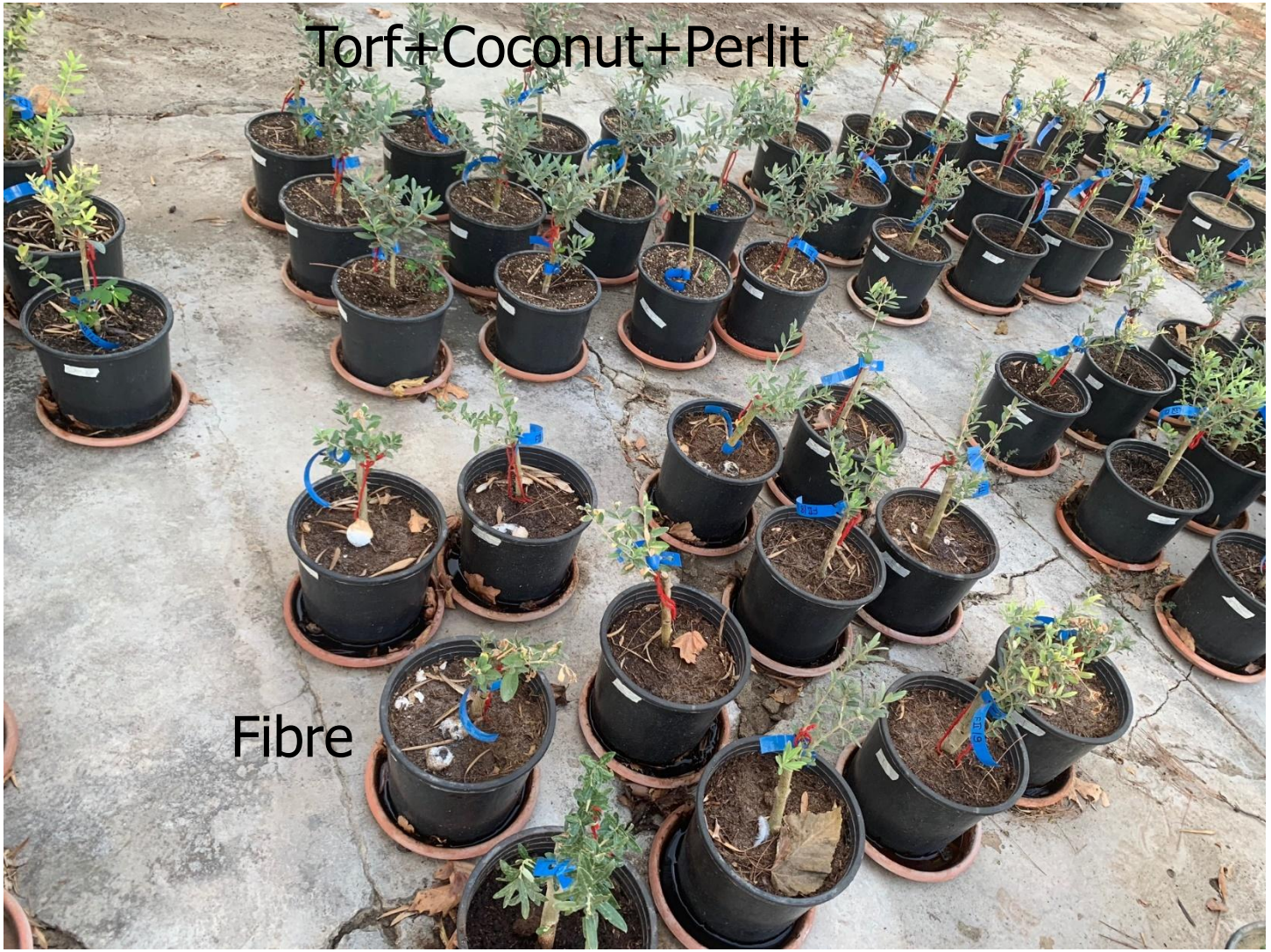
Application 2 On 24-27 September 2019, we prepared a mix by using bacteria, which had been isolated from **free-range goat** stomach. We had also isolated Aspergillus spp. However, because of the inhalation risk of the fungi they did't be used for the microbial cocktail. Bacteria species were incubated on Potato Dextrose Agar Medium in petri dishes under 22 C degree. After colony development, we rinsed them in petri dishes by using ddH_2O and a sculpture (10 petri dishes from Type A and 10 petri dishes from Type B were poured in to a sterile bottle). After the Bacterial cocktail application with 15-liter water + 400ml Type A +400 ml Type B microbial balance changed to the benefit of *Coprinus* spp. *againe*. We saw the growing *Coprinus* mushrooms on the compost similar to the *Trichoderma citrinoviride* application. According to our knowledge, goat stomach bacteria and *Trichoderma* species has cellulas enzymes. *Coprinus* spp. species can also produce cellulase enzymes which are responsible for the maturing of compost.

Finally, end product of compost's colour turned black and the smell turned to like humus which are precursor of maturing after 8 months.

O+ TR MFAL Growing Media Pot Trial (Olive Sapling)


Compost
Fibre
Torf+
Coconut
+
Perlit
Vermiculite+
Sand Mix


Torf+Coconut+Perlit
Fibre


Fibre


Fibre

Weed Status

Vermiculitte+Sand Mix

Torf+Coconut+Perlit

Compost

Fibre

Our Institute material 60% soil

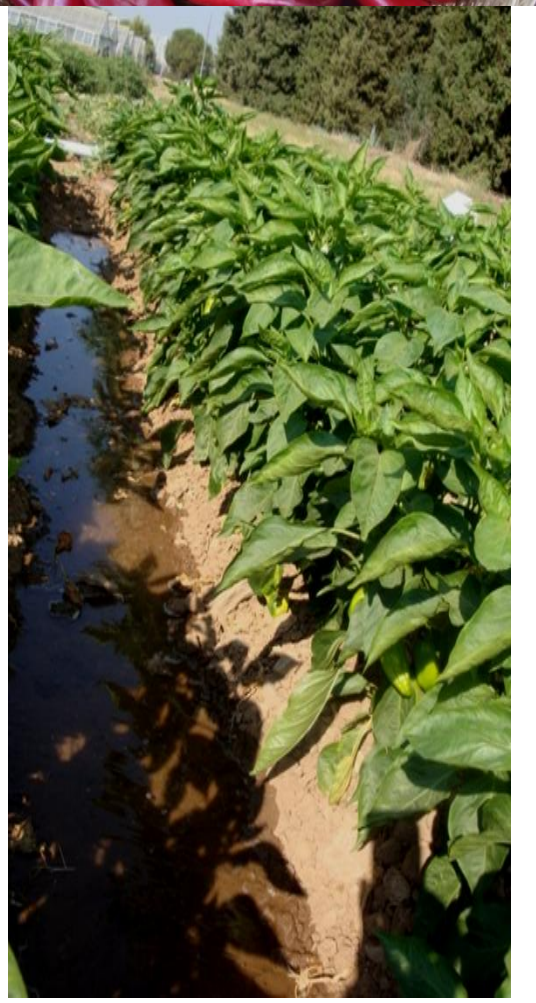







O+ TR MFAL Mulch Trial (pepper)

O+ TR MFAL Mulch Trial (pepper)



Thank You for your Attention!

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