**SUPPLEMENTARY MATERIAL**

**Table S1.** List of plastics used to produce secondary microplastics classified by shape and polymer type.

|  |  |  |  |
| --- | --- | --- | --- |
| **Shape** | **Polymer** | **ID** | **Details and provider** |
| Fibers | Polyester | PES | Rope Paraloc Mamutec polyester white item number, 8442172, Hornbach.de |
|  | Polyamide | PA | Connex, item number 10010166, Hornbach.de |
|  | Polypropylene | PP | Rope Paraloc Mamutec polypropylene orange, item number, 8442182, Hornbach.de |
| Films | Polyethylene | PE | Polyethylene low-density silo film black, folien-bernhardt.de |
|  | Polyethylene terephthalate | PET | Toppits / product: oven bag |
|  | Polypropylene | PP | Cast polypropylene. STYLEX / product: transparent folders |
| Foams | Polyurethane | PU | Grey foam sheet, item number, 3838930, Hornbach.de |
|  | Polyethylene | PE | Black low density closed cell ETHAFOAM polyethylene foam, Rugen, shrugen.en.alibaba.com |
|  | Polystyrene | PS | Expandable polystyrene. EPS70 Insulation Packing Board SLABS, Wellpack Europe. |
| Fragments | Polyethylene terephthalate | PET | VioStill, item number 41005958, vio.de |
|  | Polypropylene | PP | Black plastic pots, treppens.de |
|  | Polycarbonate | PC | CD-R Verbatim |
|  |  |  |  |

**Table S2**. Average values used to calculate the percentage changes between treatments and the control. Polyamide (PA); Polypropylene (PP); Polyester (PES); Polyethylene (PE); Polyethylene terephthalate (PET); Polyurethane (PU); Polystyrene (PS); Polycarbonate (PC).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Shape | | | Final germination | Germination Velocity | Germination Synchrony |
| Control | | | 41.78 | 3.42 | 0.30 |
| Fibers | | | 38.73 | 2.75 | 0.37 |
| Films | | | 43.60 | 2.91 | 0.37 |
| Foams | | | 44.53 | 3.36 | 0.36 |
| Fragments | | | 40.93 | 3.17 | 0.36 |
| Polymer type | | | Final germination | Germination Velocity | Germination Synchrony |
| Fibers |  | PA | 39 | 2.61 | 0.34 |
|  |  | PES | 40.2 | 2.98 | 0.42 |
|  |  | PP | 37 | 2.65 | 0.35 |
| Films |  | PE | 39.6 | 2.69 | 0.39 |
|  |  | PET | 46.2 | 3.14 | 0.36 |
|  |  | PP | 45 | 2.89 | 0.37 |
| Foams |  | PE | 39 | 2.62 | 0.40 |
|  |  | PS | 45.4 | 3.41 | 0.30 |
|  |  | PU | 49.2 | 4.05 | 0.38 |
| Fragments |  | PC | 42.8 | 3.16 | 0.38 |
|  |  | PET | 41.6 | 3.14 | 0.37 |
|  |  | PP | 38.4 | 3.23 | 0.33 |

**Table S3**. Polymer type effect on final germination percentage, germination velocity and on germination synchrony. Results of linear models and multiple comparisons by using the Dunnett test. Polyamide (PA); Polypropylene (PP); Polyester (PES); Polyethylene (PE); Polyethylene terephthalate (PET); Polyurethane (PU); Polystyrene (PS); Polycarbonate (PC). Values in bold indicate a strong effect (p<0.05) and in *italics* a moderate effect (p<0.1) of the polymer type on the dependent variable.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Linear model | |  | Finall Germination | | Germination Velocity | | Germination Synchrony | |
|  |  | df | F value | p value | F value | p value | F value | p value |
| Treatment | | 4 | 0.93 | 0.52 | 1.62 | *0.09* | 3.42 | **<0.01** |
|  |  |  |  |  |  |  |  |  |
| Multiple comparisons (Dunnett) | | | Final Germination | | Germination Velocity | | Germination Synchrony | |
| Treatment - control >= 0 | | | t value | p-value | t value | p-value | t value | p-value |
| Fibers |  | PA | -0.59 | 1.00 | -1.98 | 0.18 | 1.67 | 0.34 |
|  |  | PES | -0.33 | 1.00 | -1.07 | 0.61 | 3.24 | **<0.01** |
|  |  | PP | -1.02 | 0.96 | -1.86 | 0.22 | 2.40 | *0.07* |
| Films |  | PE | -0.46 | 1.00 | -1.78 | 0.26 | 2.08 | 0.16 |
|  |  | PET | 0.95 | 0.98 | -0.67 | 0.79 | 2.40 | *0.08* |
|  |  | PP | 0.69 | 0.99 | -1.29 | 0.50 | 2.68 | **0.03** |
| Foams |  | PE | -0.59 | 1.00 | -1.95 | 0.19 | 2.02 | 0.18 |
|  |  | PS | 0.77 | 0.99 | -0.02 | 0.95 | 0.04 | 0.98 |
|  |  | PU | 1.59 | 0.65 | 1.53 | 1.00 | 2.51 | *0.06* |
| Fragments |  | PC | 0.22 | 1.00 | -0.64 | 0.81 | 1.65 | 0.35 |
|  |  | PET | -0.03 | 1.00 | -0.68 | 0.79 | 2.41 | *0.07* |
|  |  | PP | -0.72 | 0.99 | -0.47 | 0.86 | 1.62 | 0.37 |

**Table S4**. Microplastic shape effect on seed germination. Results of linear model, and multiple comparisons by using the Dunnett test. Values in bold indicate a strong effect (p<0.05) of the treatment on the dependent variable.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Linear model |  | Day 7 | | Day 14 | | Day 21 | | Day 35 | | Day 42 | | Day 49 | |
|  | df | F value | p value | F value | p value | F value | p value | F value | p value | F value | p value | F value | p value |
| Shape | 4 | 7.38 | **<0.01** | 0.96 | 0.42 | 1.18 | 0.32 | 1.13 | 0.34 | 1.13 | 0.34 | 1.13 | 0.34 |
|  |  |  | |  |  |  | |  |  |  | |  |  |
| Multiple comparisons (Dunnett) | | Day 7 | | Day 14 | | Day 21 | | Day 35 | | Day 42 | | Day 49 | |
| Shape- control >= 0 | | t value | p-value | t value | p-value | t value | p-value | t value | p-value | t value | p-value | t value | p-value |
| Fibers | | -4.35 | **<0.01** | -0.53 | 0..94 | -0.10 | 1.00 | -0.87 | 0.75 | -0.87 | 0.75 | -0.87 | 0.75 |
| Films | | -4.71 | **<0.01** | -0.61 | 0.90 | 0.83 | 0.77 | 0.52 | 0.94 | 0.52 | 0.94 | 0.52 | 0.94 |
| Foams | | -2.22 | **0.04** | 0.54 | 0.93 | 1.60 | 0.28 | 0.78 | 0.81 | 0.78 | 0.81 | 0.78 | 0.81 |
| Fragments | | -2.45 | **0.02** | 0.69 | 0.86 | 0.59 | 0.91 | -0.24 | 0.99 | -0.24 | 0.99 | -0.24 | 0.99 |

**Table S5**. Polymer type effect on seed germination. Results of linear model, and multiple comparisons by using the Dunnett test. Polyamide (PA); Polyester (PES); Polypropylene (PP); Polyethylene (PE); Polyethylene terephthalate (PET); Polyurethane (PU); Polystyrene (PS); Polycarbonate (PC). Values in bold denote a significant effect (p<0.05) of the treatment on the dependent variable.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Linear model | |  | Day 7 | | Day 14 | | Day 21 | | Day 35 | | Day 42 | | Day 49 | |
|  |  | df | F value | p value | F value | p value | F value | p value | F value | p value | F value | p value | F value | p value |
| Polymer | | 12 | 4.39 | **<0.01** | 1.08 | 0.37 | 1.01 | 0.44 | 0.93 | 0.51 | 0.93 | 0.51 | 0.93 | 0.51 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Multiple comparisons (Dunnett) | | | Day 7 | | Day 14 | | Day 21 | | Day 35 | | Day 42 | | Day 49 | |
| Polymer - control >= 0 | | | z value | p-value | z value | p-value | z value | p-value | z value | p-value | z value | p-value | z value | p value |
| Fibers |  | PA | -5.04 | **<0.01** | -0.90 | 0.99 | -0.24 | 0.98 | -0.59 | 1.00 | -0.59 | 1.00 | -0.59 | 1.00 |
|  |  | PES | -2.11 | 0.12 | 0.04 | 1.00 | 0.20 | 0.93 | -0.33 | 1.00 | -0.33 | 1.00 | -0.33 | 1.00 |
|  |  | PP | -4.73 | **<0.01** | -0.94 | 0.98 | -0.20 | 0.98 | -1.02 | 0.96 | -1.02 | 0.96 | -1.02 | 0.96 |
| Films |  | PE | -3.62 | **<0.01** | -1.06 | 0.97 | 0.07 | 0.95 | -0.46 | 1.00 | -0.46 | 1.00 | -0.46 | 1.00 |
|  |  | PET | -2.89 | **0.01** | 0.006 | 1.00 | 0.80 | 0.74 | 0.95 | 0.98 | 0.95 | 0.98 | 0.95 | 0.98 |
|  |  | PP | -5.08 | **<0.01** | -0.55 | 1.00 | 1.02 | 0.64 | 0.69 | 0.99 | 0.69 | 0.99 | 0.69 | 0.99 |
| Foams |  | PE | -4.28 | **<0.01** | -1.46 | 0.79 | -0.20 | 0.98 | -0.59 | 1.00 | -0.59 | 1.00 | -0.59 | 1.00 |
|  |  | PS | -1.72 | 0.26 | 0.31 | 1.00 | 1.30 | 0.49 | 0.77 | 0.99 | 0.77 | 0.99 | 0.77 | 0.99 |
|  |  | PU | -0.02 | 0.94 | 1.68 | 0.62 | 2.53 | **0.05** | 1.59 | 0.65 | 1.59 | 0.65 | 1.59 | 0.65 |
| Fragments |  | PC | -2.19 | 0.10 | -0.11 | 1.00 | 0.75 | 0.76 | 0.22 | 1.00 | 0.22 | 1.00 | 0.22 | 1.00 |
|  |  | PET | -2.11 | 0.12 | 0.37 | 1.00 | 0.66 | 0.80 | -0.03 | 1.00 | -0.03 | 1.00 | -0.03 | 1.00 |
|  |  | PP | -1.05 | 0.59 | 1.44 | 0.80 | -0.06 | 0.96 | -0.72 | 0.99 | -0.72 | 0.99 | -0.72 | 0.99 |

**Figure S1.** Cumulative germination of seeds of *Daucus carota* after 49 days of exposition to different microplastic shapes.

