Appendix A: Earthworm sampling sites & Soil characteristics

**Table A1.** Localisation of earthworm sampling sites in Paris (from 1 to 16) and in rural areas (from A to H), and chromium (Cr), copper (Cu), nickel (Ni), lead (Pb) and zinc (Zn) concentrations (in ppm) in the soils (0-30 cm). Concentrations per urban site are average concentrations between three locations less than 200 m apart.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Localisation** | **GPS coordinates** | **Cr** | **Cu** | **Ni** | **Pb** | **Zn** |
| 1/ Parc André Citroën | 48°50'30''N - 2°16'23''E | 21.0 | 21.8 | 15.1 | 39.9 | 61.7 |
| 2/ Square des Batignolles | 48°53'15''N - 2°19'02''E | 23.2 | 68.5 | 15.6 | 244.5 | 200.2 |
| 3/ Parc de Belleville | 48°52'16''N - 2°23'03''E | 22.8 | 28.7 | 14.8 | 60.7 | 89.7 |
| 4/ Parc des Buttes Chaumont | 48°52'54''N - 2°23'11''E | 20.3 | 111.3 | 19.5 | 261.3 | 229.2 |
| 5/ Square Dalpayrat | 48°50'18''N - 2°18'50''E | 23.7 | 20 | 14.3 | 43.1 | 58.7 |
| 6/ Jardins d’Eole | 48°53'13''N - 2°21'55''E | 21.4 | 22.5 | 13.9 | 45.0 | 79.8 |
| 7/ Parc Georges Brassens | 48°49'51''N - 2°17'49''E | 20.9 | 19.5 | 14.1 | 36.9 | 75.5 |
| 8/ Square Henri Galli | 48°51'03''N - 2°21'41''E | 23.4 | 55.7 | 15.1 | 144.6 | 167.3 |
| 9/ Parc Kellerman | 48°49'01''N - 2°21'22''E | 19.8 | 27.0 | 12.1 | 72.6 | 86.0 |
| 10/ Parc Louise Michel | 48°53'05''N - 2°20'41''E | 22.7 | 52.3 | 15.0 | 199.4 | 283.5 |
| 11/ Carré Marigny | 48°52'07"N - 2°18'54"E | 24.1 | 95.7 | 16.0 | 219.9 | 275.2 |
| 12/ Parc Monceau | 48°52'45''N - 2°18'30''E | 21.4 | 95.5 | 18.3 | 249.4 | 254.7 |
| 13/ Parc Montsouris | 48°49'14''N - 2°20'19''E | 24.6 | 58.8 | 15.4 | 185.7 | 193.2 |
| 14/ Place de la Nation | 48°50'55''N - 2°23'46''E | 25.4 | 53.3 | 16.8 | 126.9 | 160.3 |
| 15/ Jardin du Ranelagh | 48°51'30''N - 2°16'17''E | 34.1 | 34.3 | 15.7 | 136.9 | 140.5 |
| 16/ Square du Temple | 48°51'54''N - 2°21'37''E | 19.3 | 97.3 | 14.1 | 260.3 | 230.0 |
| A/ Châtenay – Le bourg | 46°17'29”N - 4°23’01''E | 38.2 | 43.5 | 15.3 | 60.9 | 203.5 |
| B/ Châtenay – Les Saignes | 46°17'29”N - 4°23’00''E | 24.7 | 16.5 | 11.0 | 45.9 | 78.0 |
| C/ Chevry  | 48°43'44"N - 2°39'53"E | 26.5 | 30.5 | 13.6 | 23.8 | 77.0 |
| D/ Emerainville – rue des Etats Généraux | 48°49'37''N - 2°36’15''E | 21.9 | 20.5 | 13.3 | 41.3 | 62.5 |
| E/ Emerainville – Square Le Camus | 48°48'40''N - 2°37’11''E | 24.0 | 31.5 | 16.9 | 107.5 | 133.0 |
| F/ Lésigny  | 48°43'52''N - 2°36’12''E | 29.3 | 19.5 | 19.0 | 45.0 | 72.5 |
| G/ Pontault-Combault | 48°47'01''N - 2°37’39''E  | 25.1 | 23.5 | 21.0 | 51.15 | 83.5 |
| H/ Roissy en brie  | 48°47'02''N - 2°38’55''E  | 35.4 | 353.5 | 22.05 | 57.0 | 104.5 |

**Table A2.** Physico-chemical parameters of artificial and natural soils.

|  |  |  |
| --- | --- | --- |
|  | **Artificial soils** | **Natural soils** |
|  | **M-** | **M+** | **M++** | ***Kruskal-Wallis*** | **rural** | **urban** | ***Lm*** |
| pH | 6.37 | 6.55 | 5.47 | 5.42 | 5.51 | 5.42 | *Χ²=3.60, P=0.165* | 7.73 ± 0.10 | 7.75 ± 0.06 | *F=0.04, P=0.848* |
| CO3 | 2 | 1 | 2 | 1 | 2 | 2 | *Χ²=1.25, P=0.535* | 57.13 ± 22.80 | 83.96 ± 15.36 | *F=2.03, P=0.169* |
| TOC | 14.06 | 22.68 | 16.56 | 18.78 | 21.16 | 18.56 | *Χ²=0.29, P=0.867* | 34.25 ± 5.26 | 39.82 ± 3.25 | *F=1.10, P=0.306* |
| OM | 24.24 | 39.10 | 28.55 | 32.38 | 36.48 | 32.00 | *Χ²=0.29, P=0.867* | 58.99 ± 9.08 | 68.65 ± 5.61 | *F=1.12, P=0.302* |
| Norg | 0.5 | 0.8 | 0.6 | 0.7 | 0.8 | 0.7 | *Χ²=0.98, P=0.611* | 3.08 ± 0.32 | 3.21 ± 0.21 | *F=0.12, P=0.732* |
| C:N | 28.1 | 28.4 | 27.6 | 26.8 | 26.5 | 26.5 | *Χ²=4.71, P=0.095* | 10.87 ± 1.08 | 12.20 ± 0.33 | *F=3.73, P=0.066* |
| ρ | 7246 | 4975 | 4717 | 3745 | 4184 | 4651 | *Χ²=3.43, P=0.180* | 7295.63 ± 364.69 | 7475.18 ± 279.19 | *F=0.15, P=0.707* |
| P205 | 0.055 | 0.102 | 0.041 | 0.026 | 0.02 | 0.017 | *Χ²=4.57, P=0.102* | 0.97 ± 0.65 | 0.52 ± 0.10 | *F=0.34, P=0.566* |

Exact (for artificial soils) and mean ± se (for natural soils) pH, total carbonates (CO3 in ‰), total organic carbon (TOC in ‰), organic matter (OM in ‰), organic nitrogen (Norg in ‰), carbon to nitrogen ratio (C/N), electrical resistivity (ρ in ohm.cm) and assimilable phosphorus (P205 in ‰) measured in artificial soils: MTE-less (M-; N=2), -poor (M+; N=2) and -rich soils (M++; N=2), and in rural (N=8) and urban soils (N=16) where earthworms used in the experiment originated from. Differences between artificial soils were tested with Kruskal-Wallis tests; differences between rural and urban natural soils were tested with linear models with the log-transferred soil characteristic as dependent variable and the origin as independent variable.

**Table A3.** Particle size of artificial and natural soils.

|  |  |  |
| --- | --- | --- |
|  | **Artificial soils** | **Natural soils** |
|  | **M-** | **M+** | **M++** | ***Kruskall-Wallis*** | **Rural** | **Urban** | ***Lm*** |
| > 10 mm | Ø | Ø | Ø |  | 6.44 ± 2.35 | 1.32 ± 0.27 | *F=9.20, P=0.006* |
| 6.3 – 10 mm | Ø | Ø | Ø |  | 2.56 ± 0.66 | 1.25 ± 0.16 | *F=7.53, P=0.012* |
| 3.13 – 6.3 mm | Ø | Ø | Ø |  | 3.88 ± 1.02 | 3.20 ± 1.07 | *F=1.57, P=0.220* |
| 2 – 3.13 mm | Ø | Ø | Ø |  | 2.94 ± 0.87 | 2.55 ± 0.84 | *F=0.66, P=0.425* |
| 1 – 2 mm | 0.5 ± 0.5 | Ø | 0.5 ± 0.5 | *Χ²=1.25, P=0.535* | 4.13 ± 1.21 | 3.04 ± 0.43 | *F=0.67, P=0.423* |
| 0.4 – 1 mm | 3.0 ± 0.0 | 1.5 ± 0.5 | 2.0 ± 0.0 | *Χ²=4.33, P=0.115* | 7.25 ± 0.98 | 9.34 ± 1.23 | *F=0.19, P=0.664* |
| 0.25 – 0.4 mm | 3.5 ± 0.5 | 2.0 ± 0.0 | 7.5 ± 0.5 | *Χ²=4.71, P=0.095* | 4.69 ± 0.42 | 6.42 ± 0.82 | *F=0.27, P=0.609* |
| 0.125 – 0.25 mm | 42.0 ± 0.0 | 42.5 ± 1.5 | 40.5 ± 0.5 | *Χ²=4.71, P=0.095* | 6.56 ± 0.82 | 10.01 ± 1.08 | *F=1.92, P=0.179* |
| 0.08 – 0.125 mm | 18.0 ± 0.0 | 18.5 ± 1.5 | 16.5 ± 0.5 | *Χ²=2.80, P=0.246* | 4.06 ± 0.36 | 4.75 ± 0.39 | *F=0.45, P=0.508* |
| 0.05 – 0.08 mm | 1.5 ± 0.5 | 1.5 ± 0.5 | 1.5 ± 0.5 | *Χ²=0, P=1* | 4.00 ± 0.37 | 3.53 ± 0.20 | *F=0.93, P=0.345* |
| < 0.05 mm | 31.0 ± 0.0 | 31.0 ± 0.0 | 31.5 ± 0.5 | *Χ²=0, P=1* | 53.00 ± 5.31 | 54.68 ± 3.31 | *F=0.179, P=0.676* |

Mean ± se relative percentage of particle size (mm) measured in artificial soils: MTE-less (M-; N=2), -poor (M+; N=2) and -rich soils (M++; N=2), and in rural (N=8) and urban soils (N=16) where earthworms used in the experiment originated from. Differences between artificial soils were tested with Kruskal-Wallis tests; differences between rural and urban natural soils were tested with linear models with the log-transferred soil characteristic as dependent variable and the origin as independent variable.