Supplementary Data

# Assessment of Pesticide Contamination of Groundwater from Titu-Sarata Plain, Romania

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**Table S1:** The parameters values used for the health risk assessment for each age group

| Parameter | Sign | Unit | Infants | Children | Adults | References |
|---|---|---|---|---|---|---|
| Age | - | year | 2 | 11 | 70 | [35] |
| The body weight | BW | kg | 7* | 20** | 70** | [31, 37] |
| The oral intake rate | IR | L/day | 0.75 | 1 | 2 | [36] |
| The exposure frequency | EF | day/year | 365 | 365 | 365 | [31] |
| The exposure duration | ED | year | 2 | 11 | 70 | [31] |
| The average contact time | AT (ED×EF) | day | 2×365 | 11×365 | 70×365 | [31] |

**Table S2:** The OPs concentration (μg/l) values in collected water samples

| Location | Bentazon μg/l | Dichlorprop μg/l | Aldicarb sulfoxide μg/l | Phosdrin μg/l | Carbaryl μg/l | Simazine μg/l | Atrazine μg/l | Thionazine μg/l | Phorate μg/l | Total μg/l |
|---|---|---|---|---|---|---|---|---|---|---|
| Brezoaia | 0.245 | 0.008 | 0.003 | 0.017 | 0.105 | 0.105 | 0.464 | 0.011 | 0.195 | 1.276 |
| Crovu | 0.001 | 0.043 | 0.002 | 0.174 | 0.002 | 0.002 | 0.008 | 0.006 | 0.042 | 0.283 |
| Gageni | 0.001 | 0.017 | 0.004 | 0.045 | 0.001 | 0.001 | 0.007 | 0.041 | 0.399 | 0.520 |
| Niculesti | 0.000 | 0.022 | 0.003 | 0.015 | 0.000 | 0.000 | 0.003 | 0.002 | 0.694 | 0.745 |
| Palanca | 0.001 | 0.004 | 0.143 | 0.003 | 0.001 | 0.001 | 0.000 | 0.003 | 0.014 | 0.172 |
| Romanesti | 0.001 | 0.151 | 0.045 | 0.003 | 0.000 | 0.000 | 0.000 | 0.001 | 0.005 | 0.209 |
| Spataru | 0.001 | 0.031 | 0.131 | 0.010 | 0.002 | 0.002 | 0.001 | 0.003 | 0.008 | 0.189 |
| Suseni Bilciuresti | 0.001 | 0.017 | 0.005 | 0.163 | 0.004 | 0.004 | 0.005 | 0.002 | 0.068 | 0.303 |
| Sicrita | 0.014 | 0.011 | 0.001 | 0.126 | 0.000 | 0.000 | 0.005 | nd* | 0.360 | 0.891 |

*not detected

**Table S3:** OCPs concentration (μg/l) values in collected water samples

| Location | Aldrin μg/l | pp'DDE μg/l | Dieldrin μg/l | Alfa endosulfan μg/l | Total OCPs μg/l |
|---|---|---|---|---|---|
| Baba Ana | 0.0518 | nd* | nd* | nd* | 0.0518 |
| Brezoaia | 0.0779 | nd* | nd* | nd* | 0.0779 |
| Baraitaru | 0.0555 | 0.0357 | nd* | nd* | 0,0912 |
| Ciocanesti | 0.0353 | 0.0106 | nd* | nd* | 0.0459 |
| Cosereni | 0.0551 | nd* | 0.3566 | 0.0319 | 0.4436 |
| Fanari | 0.0541 | nd* | nd* | nd* | 0.0541 |
| Jilavele | nd* | 0.0363 | nd* | nd* | 0.0363 |
| Lunguletu | nd* | 0.0384 | nd* | nd* | 0.0384 |
| Niculesti | nd* | 0.0379 | nd* | nd* | 0.0379 |
| Odaia Turcului | nd* | 0.05 | nd* | nd* | 0.05 |
| Olarii Vechi | nd* | 0.0545 | nd* | nd* | 0.0545 |
| Predesti | nd* | 0.0514 | nd* | nd* | 0.0514 |
| Palanca | nd* | 0.0304 | nd* | nd* | 0.0304 |
| Romanesti | nd* | 0.0271 | nd* | nd* | 0.0271 |
| Suseni Bilciuresti | nd* | 0.0469 | nd* | nd* | 0.0469 |
| Salcuta | nd* | 0.0449 | nd* | nd* | 0.0449 |

*not detected

**Table S4:** Descriptive statistics of the measured concentrations (μg/l) of pesticides in groundwaters samples

| | Bentazon | Dichlorprop | 3,5-Dichlorobenzoic acid | Aldicarb sulfoxide | Phosdrin | Carbaryl | Simazine | Atrazine | Thionazine | Prometin | Phorate | Aldrin | alfa-endosulfan | pp'DDE | Dieldrin |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Min $X10^3$ (μg/l) | 0.045 | nd | 0.243 | nd | 2.590 | 0.147 | 0.147 | 0.264 | nd | nd | 3.000 | na | na | na | na |
| Q1 $X10^3$ | 0.227 | 8.410 | 0.536 | 3.073 | 12.836 | 0.380 | 0.380 | 3.347 | 2.317 | 1.970 | 8.022 | na | na | na | na |
| Median $X10^3$ (μg/l) | 0.747 | 11.864 | 1.040 | 3.731 | 16.868 | 0.611 | 0.611 | 4.545 | 5.175 | 2.500 | 17.55 | na | na | na | na |
| Q3 | 0.001 | 0.021 | 0.002 | 0.006 | 0.039 | 0.001 | 0.001 | 0.006 | 0.009 | 0.003 | 0.055 | na | na | 0.037 | na |
| Max (μg/l) | 0.245 | 0.151 | 0.369 | 0.143 | 0.174 | 0.105 | 0.105 | 0.464 | 0.041 | 0.123 | 0.694 | 0.078 | 0.032 | 0.055 | 0.357 |
| SK | 4.319 | 4.322 | 5.151 | 2.600 | 2.157 | 5.152 | 5.152 | 5.188 | 2.200 | 5.144 | 2.911 | 1.655 | 5.196 | 0.586 | 5.196 |
| K | 19.410 | 20.608 | 26.656 | 5.739 | 3.822 | 26.676 | 26.676 | 26.942 | 4.903 | 26.613 | 8.690 | 1.241 | 27.000 | -1.483 | 27.000 |

Min-minimum, Max-maximum, Q1-first quartile 1, Q3-third quartile, Sk-Skewness, K-Kurtosi, nd- not detectable, na – non aplicable

**Table S5:** The HQ values obtained and used to estimate non-carcinogenic risk for OPs

| Location | Aldicarb sulfoxide | | | Carbaryl | | | Simazine | | | Atrazine | | | Phorate | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Infants | Children | Adults | Infants | Children | Adults | Infants | Children | Adults | Infants | Children | Adults | Infants | Children | Adults |
| | HQ | HQ | HQ | HQ | HQ | HQ | HQ | HQ | HQ | HQ | HQ | HQ | HQ | HQ | HQ |
| Brezoaia | $3.2 \times 10^{-7}$ | $1.5 \times 10^{-7}$ | $8.5 \times 10^{-8}$ | $1.1 \times 10^{-7}$ | $5.2 \times 10^{-8}$ | $3 \times 10^{-8}$ | $2.2 \times 10^{-6}$ | $1 \times 10^{-6}$ | $6 \times 10^{-7}$ | $1.4 \times 10^{-6}$ | $6.6 \times 10^{-7}$ | $3.7 \times 10^{-7}$ | $1 \times 10^{-4}$ | $4.8 \times 10^{-5}$ | $2.7 \times 10^{-5}$ |
| Crovu | $2.1 \times 10^{-7}$ | $1 \times 10^{-7}$ | $5.7 \times 10^{-8}$ | $2.1 \times 10^{-9}$ | $1 \times 10^{-9}$ | $5.7 \times 10^{-10}$ | $4.2 \times 10^{-8}$ | $2 \times 10^{-8}$ | $1.1 \times 10^{-8}$ | $2.4 \times 10^{-8}$ | $1.1 \times 10^{-8}$ | $6.5 \times 10^{-9}$ | $2.2 \times 10^{-5}$ | $1 \times 10^{-5}$ | $6 \times 10^{-6}$ |
| Gageni | $4.2 \times 10^{-7}$ | $2 \times 10^{-7}$ | $1.1 \times 10^{-7}$ | $1.0 \times 10^{-9}$ | $5 \times 10^{-10}$ | $2.8 \times 10^{-10}$ | $2.1 \times 10^{-8}$ | $1 \times 10^{-8}$ | $5.7 \times 10^{-9}$ | $2.1 \times 10^{-8}$ | $1 \times 10^{-8}$ | $5.7 \times 10^{-9}$ | $2.1 \times 10^{-4}$ | $9.9 \times 10^{-5}$ | $5.7 \times 10^{-6}$ |
| Niculesti | $3.2 \times 10^{-7}$ | $1.5 \times 10^{-7}$ | $8.5 \times 10^{-8}$ | 0 | 0 | 0 | 0 | 0 | 0 | $9.1 \times 10^{-9}$ | $4.2 \times 10^{-9}$ | $2.4 \times 10^{-9}$ | $3.7 \times 10^{-4}$ | $1.7 \times 10^{-4}$ | $9.9 \times 10^{-5}$ |
| Palanca | $1.5 \times 10^{-5}$ | $7.1 \times 10^{-6}$ | $4.0 \times 10^{-6}$ | $1.0 \times 10^{-9}$ | $5 \times 10^{-10}$ | $2.8 \times 10^{-10}$ | $2.1 \times 10^{-8}$ | $1 \times 10^{-8}$ | $5.7 \times 10^{-9}$ | 0 | 0 | 0 | $7.5 \times 10^{-6}$ | $3.5 \times 10^{-6}$ | $2 \times 10^{-6}$ |
| Romanesti | $4.8 \times 10^{-6}$ | $2.2 \times 10^{-6}$ | $1.2 \times 10^{-6}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | $2.6 \times 10^{-6}$ | $1.2 \times 10^{-6}$ | $7.1 \times 10^{-7}$ |
| Spataru | $1.4 \times 10^{-5}$ | $6.5 \times 10^{-6}$ | $3.7 \times 10^{-6}$ | $2.1 \times 10^{-9}$ | $1 \times 10^{-9}$ | $5.7 \times 10^{-10}$ | $4.2 \times 10^{-8}$ | $2 \times 10^{-8}$ | $1.1 \times 10^{-8}$ | $3.0 \times 10^{-9}$ | $1.4 \times 10^{-9}$ | $8.1 \times 10^{-10}$ | $4.2 \times 10^{-6}$ | $2 \times 10^{-6}$ | $1.1 \times 10^{-6}$ |
| Suseni | | | | | | | | | | | | | | | |
| Bilciuresti | $5.3 \times 10^{-7}$ | $2.5 \times 10^{-7}$ | $1.4 \times 10^{-7}$ | $4.2 \times 10^{-9}$ | $2 \times 10^{-9}$ | $1.1 \times 10^{-9}$ | $8.5 \times 10^{-8}$ | $4 \times 10^{-8}$ | $2.2 \times 10^{-8}$ | $1.5 \times 10^{-8}$ | $7.1 \times 10^{-9}$ | $4.0 \times 10^{-9}$ | $3.6 \times 10^{-5}$ | $1.7 \times 10^{-5}$ | $9.7 \times 10^{-6}$ |
| Sicrita | $1.0 \times 10^{-7}$ | $5.0 \times 10^{-8}$ | $2.8 \times 10^{-8}$ | 0 | 0 | 0 | 0 | 0 | 0 | $1.5 \times 10^{-8}$ | $7.1 \times 10^{-9}$ | $4.0 \times 10^{-9}$ | $1.9 \times 10^{-4}$ | $9 \times 10^{-5}$ | $5.1 \times 10^{-5}$ |

**Table S6:** The HQ values obtained and used to estimate non-carcinogenic risks for aldrin and pp'DDE

| **Location** | Aldrin | | | pp'DDE | | |
|---|---|---|---|---|---|---|
| | Infants | Children | Adults | Infants | Children | Adults |
| | HQ | HQ | HQ | HQ | HQ | HQ |
| Baba Ana | $1.8 \times 10^{-4}$ | $8.6 \times 10^{-5}$ | $4.9 \times 10^{-5}$ | 0 | 0 | 0 |
| Brezoaia | $2.7 \times 10^{-4}$ | $1.2 \times 10^{-4}$ | $7.4 \times 10^{-5}$ | 0 | 0 | 0 |
| Baraitaru | $2 \times 10^{-4}$ | $9.2 \times 10^{-5}$ | $5.2 \times 10^{-5}$ | $7.6 \times 10^{-6}$ | $3.5 \times 10^{-6}$ | $2 \times 10^{-6}$ |
| Ciocanesti | $1.2 \times 10^{-4}$ | $5.8 \times 10^{-5}$ | $3.3 \times 10^{-5}$ | $2.2 \times 10^{-6}$ | $1 \times 10^{-6}$ | $6 \times 10^{-7}$ |
| Cosereni | $1.9 \times 10^{-4}$ | $9.2 \times 10^{-5}$ | $5.2 \times 10^{-5}$ | 0 | 0 | 0 |
| Fanari | $1.9 \times 10^{-4}$ | $9 \times 10^{-5}$ | $5.1 \times 10^{-5}$ | 0 | 0 | 0 |
| Jilavele | 0 | 0 | 0 | $7.7 \times 10^{-6}$ | $3.6 \times 10^{-6}$ | $2 \times 10^{-6}$ |
| Lunguletu | 0 | 0 | 0 | $8.2 \times 10^{-6}$ | $3.8 \times 10^{-6}$ | $2.2 \times 10^{-6}$ |
| Niculesti | 0 | 0 | 0 | $8.1 \times 10^{-6}$ | $3.7 \times 10^{-6}$ | $2.2 \times 10^{-6}$ |
| Odaia Turcului | 0 | 0 | 0 | $1 \times 10^{-5}$ | $5 \times 10^{-6}$ | $2.8 \times 10^{-6}$ |
| Olarii Vechi | 0 | 0 | 0 | $1.1 \times 10^{-5}$ | $5.4 \times 10^{-6}$ | $3.1 \times 10^{-6}$ |
| Predesti | 0 | 0 | 0 | $1.1 \times 10^{-5}$ | $5.1 \times 10^{-6}$ | $2.9 \times 10^{-6}$ |
| Palanca | 0 | 0 | 0 | $6.5 \times 10^{-6}$ | $3 \times 10^{-6}$ | $1.7 \times 10^{-6}$ |
| Romanesti | 0 | 0 | 0 | $5.8 \times 10^{-6}$ | $2.7 \times 10^{-6}$ | $1.5 \times 10^{-6}$ |
| Suseni Bilciuresti | 0 | 0 | 0 | $1 \times 10^{-5}$ | $4.6 \times 10^{-6}$ | $2.6 \times 10^{-6}$ |
| Salcuta | 0 | 0 | 0 | $9.6 \times 10^{-6}$ | $4.5 \times 10^{-6}$ | $2.5 \times 10^{-6}$ |

**Table S7:** The obtained ILCR values for aldrin and pp'DDE in the analyzed groundwater samples

| Location | Aldrin | | | pp'DDE | | |
|---|---|---|---|---|---|---|
| | ILCR infants | ILCR children | ILCR adults | ILCR infants | ILCR children | ILCR adults |
| Baba Ana | $9.4 \times 10^{-5}$ | $4.4 \times 10^{-5}$ | $2.5 \times 10^{-5}$ | 0 | 0 | 0 |
| Brezoaia | $1.4 \times 10^{-4}$ | $6.6 \times 10^{-5}$ | $3.7 \times 10^{-5}$ | 0 | 0 | 0 |
| Baraitaru | $1 \times 10^{-4}$ | $4.7 \times 10^{-5}$ | $2.6 \times 10^{-5}$ | $1.3 \times 10^{-6}$ | $6.1 \times 10^{-7}$ | $3.5 \times 10^{-7}$ |
| Ciocanesti | $6.4 \times 10^{-5}$ | $3 \times 10^{-5}$ | $1.7 \times 10^{-5}$ | $3.9 \times 10^{-7}$ | $1.8 \times 10^{-7}$ | $1 \times 10^{-7}$ |
| Cosereni | $1 \times 10^{-4}$ | $4.6 \times 10^{-5}$ | $2.6 \times 10^{-5}$ | 0 | 0 | 0 |
| Fanari | $9.8 \times 10^{-5}$ | $4.5 \times 10^{-5}$ | $2.6 \times 10^{-5}$ | 0 | 0 | 0 |
| Jilavele | 0 | 0 | 0 | $1.3 \times 10^{-6}$ | $6.2 \times 10^{-7}$ | $3.5 \times 10^{-7}$ |
| Lunguletu | 0 | 0 | 0 | $1.4 \times 10^{-6}$ | $6.5 \times 10^{-7}$ | $3.7 \times 10^{-7}$ |
| Niculesti | 0 | 0 | 0 | $1.3 \times 10^{-6}$ | $6.4 \times 10^{-7}$ | $3.7 \times 10^{-7}$ |
| Odaia Turcului | 0 | 0 | 0 | $1.8 \times 10^{-6}$ | $8.5 \times 10^{-7}$ | $4.9 \times 10^{-7}$ |
| Olarii Vechi | 0 | 0 | 0 | $1.9 \times 10^{-6}$ | $9.3 \times 10^{-7}$ | $5.3 \times 10^{-7}$ |
| Predesti | 0 | 0 | 0 | $1.8 \times 10^{-6}$ | $8.7 \times 10^{-7}$ | $5 \times 10^{-7}$ |
| Palanca | 0 | 0 | 0 | $1.1 \times 10^{-6}$ | $5.2 \times 10^{-7}$ | $3 \times 10^{-7}$ |
| Romanesti | 0 | 0 | 0 | $9.9 \times 10^{-7}$ | $4.6 \times 10^{-7}$ | $2.6 \times 10^{-7}$ |
| Suseni Bilciuresti | 0 | 0 | 0 | $1.7 \times 10^{-6}$ | $8 \times 10^{-7}$ | $4.6 \times 10^{-7}$ |
| Salcuta | 0 | 0 | 0 | $1.6 \times 10^{-6}$ | $7.6 \times 10^{-7}$ | $4.4 \times 10^{-7}$ |


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