Table S1. Average brood cell production, cluster size (interframe spaces), and adult bee mortality (number of dead bees counted over four-week treatment period) for all treatment groups pre- and post-treatment.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Weekly OA dose (g)** |  | **Brood cells** | **Cluster size** | **Adult bee mortality** |
| 0 g OA | Pre-treatment | 11409 ± 1997 | 6.5 ± 0.2  | 166 ± 23a |
| Post-treatment | 11254 ± 2444 | 9.3 ± 0.3 |
| 5 g OA | Pre-treatment | 10803 ± 1927 | 6.6 ± 0.3 | 253 ± 33ab |
| Post-treatment | 9359 ± 3369 | 8.1 ± 0.4 |
| 10 g OA | Pre-treatment | 11593 ± 2848 | 6.5 ± 0.2 | 244 ± 32ab |
| Post-treatment | 10149 ± 2857 | 8.7 ± 0.3 |
| 20 g OA | Pre-treatment | 10848 ± 1970 | 6.8 ± 0.2 | 314 ± 26b |
| Post-treatment | 8239 ± 2180 | 8 ± 0.8 |

The data are mean ± SE (n=7, 6, 8 and 7, for 0, 5, 10 and 20g OA, respectively). For adult bee mortality, means with different letters are statistically different at α=0.05 (one-way ANOVA)

Table S2. Average sperm viability and total sperm count of newly-mated queens raised in control and OA-treated colonies, for all treatment groups.

|  |  |  |
| --- | --- | --- |
| **Queens raised in colonies exposed to OA (g)** | **Sperm viability (%)** | **Total sperm count** |
| 0 g OA | 65.3 ± 7 | 399012 ± 76677 |
| 5 g OA | 64.8 ± 13.4 | 372450 ± 25685 |
| 10 g OA | 58.5 ± 8 | 355275 ± 53220 |
| 20 g OA | 57.2 ± 15.4 | 459942 ± 33845 |
|  |  |  |

The data are mean ± SE (n=6, 5, 8 and 5, for 0, 5, 10 and 20g OA, respectively).

Table S3. Average brood cells and inter-frame spaces produced after 40 days of experiment in nucleus for all treatment groups, together with the sperm viability and the sperm total count of the queens that were expose to OA.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Nucs with queen exposed to OA dose (g)** | **Brood cells** | **Inter-frame spaces** | **Sperm Viability (%)** | **Sperm Total count** |
| 0 g OA | 4035 ± 584 | 3.5 ± 0.3 | 76.8 ± 3.5 | 2187840 ± 368200 |
| 5 g OA | 3728 ± 184 | 3.2 ± 0.3 | 75.75 ± 5.5 | 2835025 ± 668681 |
| 10 g OA | 4391 ± 256 | 3.7 ± 0.4 | 63.2 ± 8.9 | 2151720 ± 752993 |
| 20 g OA | 4804 ± 1001 | 4 ± 0.4 | 77.75 ± 1.2 | 1901500 ± 643940 |

The data are mean ± SE (n=5, 4, 5 and 4, for 0, 5, 10 and 20g OA, respectively).