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# Feed supplementation with molybdenum complexes improves honey bee health

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# *Supporting Information*

## Part I

## Molybdenum in honey bees

# Molybdenum in honey bees

Samples of honey bee workers were collected in different areas and environments to assess natural levels of molybdenum in France (see map, Figure SI-1), in Nea Moudania, Thessaloniki and Polygyros region of Greece (respectively urban/, industrial and natural environments) and in Moldova (forest environments in the region of Chisinau).

Bees are collected in accordance with standard method X43-909 on "active environmental biomonitoring using honey bees." The bees collected are foraging bees returning from their flight. These are the oldest bees in the colony and therefore those that have been exposed to external contaminants/metals for the longest period of time.

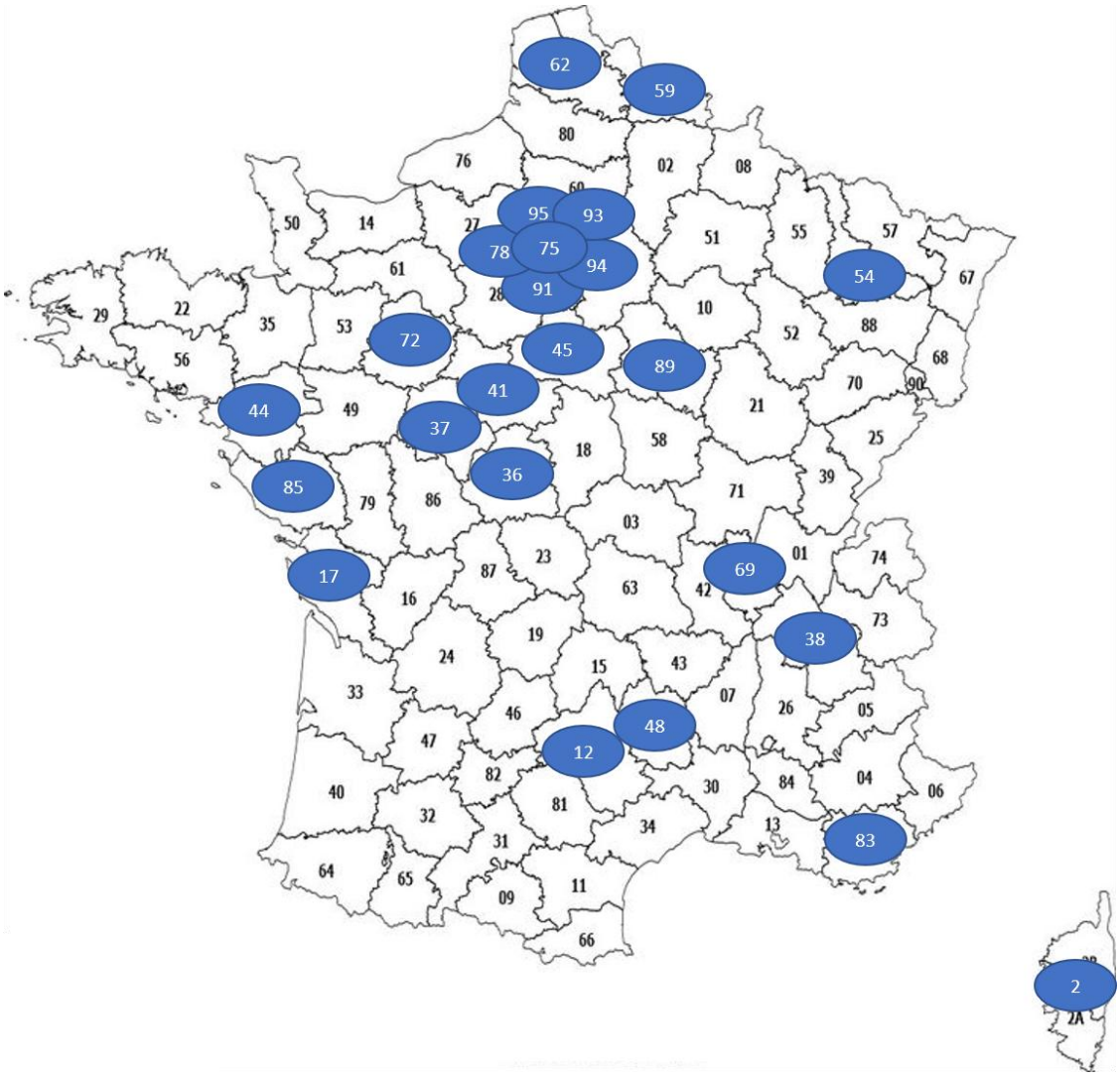


*Figure SI-1. Map of the areas in France, where the bees were collected. Numbers correspond to the administrative numbers given to each department in France. The samples collected cover different type of environments and climates.*

According to the standard method X43-909, bee samples (30-50 bees/sample) correspond to a group of foraging bees taken from at least three hives in the same apiary in order to obtain a representative sample of the target apiary. The bee samples were frozen at -20°C after collection.

The bee samples were then dehydrated, mineralized and analyzed as follows :

Dehydration : collected honeybee (*Apis mellifera*) specimens were subjected to desiccation to remove moisture content and stabilize the samples for mineral analysis. Bees were first rinsed with deionized water to eliminate surface contaminants and then placed in clean, inert drying containers. Dessiccation was performed in a ventilated drying oven at a controlled temperature of 60 ± 5 °C for 24 to 48 hours, or until constant weight was achieved, indicating complete dehydration. The dried specimens were then cooled in a desiccator containing silica gel to prevent moisture reabsorption prior to mineralization and then ground in a mortar.

Mineralization : Mineralization is carried out in a closed microwave system (CEM MARS-6) with an iPREP reactor. The protocol consists of dissolving 0.25 g of sample in 8 mL of 70% nitric acid (JT Baker instra analyzed) - heating to 200°C for 20 minutes, then stabilizing at 200°C for 20 minutes and cooling for 20 minutes. The extract collected is perfectly clear and diluted to 50 mL with ultra-pure water (Merck - MillQ).

Analysis by ICP-MS : The standard method EN 13805 was then used to determine the molybdenum content by inductively coupled plasma mass spectrometry (ICP-MS).

The analyses of the molybdenum content by ICP-MS were performed by LEAV (Laboratoire de l'Environnement et d'Analyses de Vendée), La Roche-sur-Yon, France. The results found for Mo contents in ppm in dehydrated bee samples are gathered in Table SI-1. The uncertainty is estimated to ± 0.02 ppm (µg/g).

*Table SI-1. Mo content in ppm (µg/g of dried bee) as a function of sampling areas, month and year of sampling and environment. NAT, AGRI, URB, INDUS are given for Natural, Agricultural, Urban or Industrial environments, respectively.*

| N° | Sampling Area | Month | Year | Environment[a] | Mo content (ppm) |
|---|---|---|---|---|---|
| 1 | France (12) | 4 | 2021 | AGRI | 0.31 |
| 2 | France (12) | 7 | 2021 | AGRI | 0.34 |
| 3 | France (12) | 9 | 2021 | AGRI | 0.36 |
| 4 | France (17) | 4 | 2013 | AGRI | 0.39 |
| 5 | France (17) | 4 | 2014 | AGRI | 1.19 |
| 6 | France (17) | 7 | 2014 | AGRI | 0.25 |
| 7 | France (17) | 9 | 2014 | AGRI | 0.22 |
| 8 | France (17) | 5 | 2015 | AGRI | 0.25 |
| 9 | France (17) | 7 | 2015 | AGRI | 0.34 |
| 10 | France (17) | 9 | 2015 | AGRI | 0.29 |
| 11 | France (17) | 5 | 2022 | AGRI | 0.37 |
| 12 | France (17) | 5 | 2022 | AGRI | 0.36 |

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|---|---|---|---|---|---|
| 13 | France (17) | 5 | 2022 | AGRI | 0.49 |
| 14 | France (17) | 5 | 2022 | AGRI | 0.30 |
| 15 | France (17) | 5 | 2022 | AGRI | 0.41 |
| 16 | France (17) | 5 | 2022 | AGRI | 0.30 |
| 17 | France (17) | 5 | 2022 | AGRI | 0.35 |
| 18 | France (17) | 5 | 2022 | AGRI | 0.38 |
| 19 | France (17) | 5 | 2022 | AGRI | 0.27 |
| 20 | France (17) | 5 | 2022 | AGRI | 0.28 |
| 21 | France (17) | 5 | 2022 | AGRI | 0.42 |
| 22 | France (17) | 5 | 2022 | AGRI | 0.75 |
| 23 | France (17) | 5 | 2022 | AGRI | 0.26 |
| 24 | France (17) | 5 | 2022 | AGRI | 0.30 |
| 25 | France (17) | 5 | 2022 | AGRI | 0.42 |
| 26 | France (17) | 5 | 2022 | AGRI | 0.24 |
| 27 | France (17) | 6 | 2022 | AGRI | 0.33 |
| 28 | France (17) | 6 | 2022 | AGRI | 0.29 |
| 29 | France (17) | 6 | 2022 | AGRI | 0.39 |
| 30 | France (17) | 6 | 2022 | AGRI | 0.34 |
| 31 | France (17) | 6 | 2022 | AGRI | 0.23 |
| 32 | France (17) | 6 | 2022 | AGRI | 0.28 |
| 33 | France (17) | 6 | 2022 | AGRI | 0.34 |
| 34 | France (17) | 6 | 2022 | AGRI | 0.27 |
| 35 | France (17) | 7 | 2022 | AGRI | 0.22 |
| 36 | France (17) | 7 | 2022 | AGRI | 0.26 |
| 37 | France (17) | 7 | 2022 | AGRI | 0.36 |
| 38 | France (17) | 7 | 2022 | AGRI | 0.30 |
| 39 | France (17) | 7 | 2022 | AGRI | 0.23 |
| 40 | France (17) | 7 | 2022 | AGRI | 0.21 |
| 41 | France (17) | 7 | 2022 | AGRI | 0.16 |
| 42 | France (17) | 7 | 2022 | AGRI | 0.18 |
| 43 | France (2) | 4 | 2013 | AGRI | 1.35 |
| 44 | France (2) | 4 | 2013 | AGRI | 0.68 |
| 45 | France (2) | 6 | 2013 | AGRI | 0.43 |
| 46 | France (2) | 6 | 2013 | AGRI | 0.46 |
| 47 | France (36) | 4 | 2019 | AGRI | 0.09 |
| 48 | France (36) | 7 | 2019 | AGRI | 0.19 |
| 49 | France (36) | 9 | 2019 | AGRI | 0.21 |
| 50 | France (36) | 4 | 2020 | AGRI | 0.33 |
| 51 | France (36) | 7 | 2020 | AGRI | 0.35 |
| 52 | France (36) | 9 | 2020 | AGRI | 0.36 |
| 53 | France (36) | 4 | 2021 | AGRI | 0.4 |
| 54 | France (36) | 6 | 2021 | AGRI | 0.59 |
| 55 | France (36) | 9 | 2021 | AGRI | 0.48 |
| 56 | France (37) | 7 | 2014 | NAT | 0.31 |
| 57 | France (37) | 9 | 2014 | NAT | 0.47 |
| 58 | France (37) | 4 | 2015 | NAT | 0.21 |

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|---|---|---|---|---|---|
| 59 | France (37) | 7 | 2015 | NAT | 0.16 |
| 60 | France (37) | 9 | 2015 | NAT | 0.20 |
| 61 | France (37) | 3 | 2016 | NAT | 0.17 |
| 62 | France (37) | 7 | 2016 | NAT | 0.23 |
| 63 | France (37) | 9 | 2016 | NAT | 0.29 |
| 64 | France (37) | 3 | 2017 | NAT | 0.41 |
| 65 | France (37) | 7 | 2017 | NAT | 0.21 |
| 66 | France (37) | 9 | 2017 | NAT | 0.21 |
| 67 | France (37) | 4 | 2018 | NAT | 0.33 |
| 68 | France (37) | 7 | 2018 | NAT | 0.298 |
| 69 | France (37) | 9 | 2018 | NAT | 0.234 |
| 70 | France (37) | 4 | 2019 | NAT | 0.08 |
| 71 | France (37) | 7 | 2019 | NAT | 0.21 |
| 72 | France (37) | 9 | 2019 | NAT | 0.59 |
| 73 | France (37) | 4 | 2020 | NAT | 0.025 |
| 74 | France (37) | 7 | 2020 | NAT | 0.15 |
| 75 | France (37) | 9 | 2020 | NAT | 0.36 |
| 76 | France (37) | 4 | 2021 | NAT | 0.2 |
| 77 | France (37) | 6 | 2021 | NAT | 0.35 |
| 78 | France (37) | 9 | 2021 | NAT | 0.38 |
| 79 | France (38) | 8 | 2016 | URB | 0.82 |
| 80 | France (38) | 8 | 2016 | AGRI | 0.44 |
| 81 | France (38) | 9 | 2016 | URB | 0.435 |
| 82 | France (38) | 9 | 2016 | AGRI | 0.34 |
| 83 | France (41) | 6 | 2013 | AGRI | 0.45 |
| 84 | France (41) | 4 | 2014 | AGRI | 1.31 |
| 85 | France (41) | 7 | 2014 | AGRI | 0.39 |
| 86 | France (41) | 9 | 2014 | AGRI | 0.37 |
| 87 | France (41) | 4 | 2015 | AGRI | 0.23 |
| 88 | France (41) | 7 | 2015 | AGRI | 0.19 |
| 89 | France (41) | 9 | 2015 | AGRI | 0.24 |
| 90 | France (41) | 3 | 2016 | AGRI | 0.28 |
| 91 | France (41) | 7 | 2016 | AGRI | 0.37 |
| 92 | France (41) | 9 | 2016 | AGRI | 0.33 |
| 93 | France (41) | 3 | 2017 | AGRI | 0.38 |
| 94 | France (41) | 7 | 2017 | AGRI | 0.28 |
| 95 | France (41) | 9 | 2017 | AGRI | 0.54 |
| 96 | France (41) | 4 | 2018 | AGRI | 0.29 |
| 97 | France (41) | 7 | 2018 | AGRI | 0.45 |
| 98 | France (41) | 9 | 2018 | AGRI | 0.40 |
| 99 | France (41) | 4 | 2019 | AGRI | 0.08 |
| 100 | France (41) | 7 | 2019 | AGRI | 0.23 |
| 101 | France (41) | 9 | 2019 | AGRI | 0.24 |
| 102 | France (41) | 4 | 2020 | AGRI | 0.025 |
| 103 | France (41) | 7 | 2020 | AGRI | 0.35 |
| 104 | France (41) | 9 | 2020 | AGRI | 0.34 |

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|---|---|---|---|---|---|
| 105 | France (41) | 4 | 2021 | AGRI | 0.20 |
| 106 | France (41) | 6 | 2021 | AGRI | 0.31 |
| 107 | France (41) | 9 | 2021 | AGRI | 0.33 |
| 108 | France (44) | 6 | 2014 | AGRI | 0.35 |
| 109 | France (44) | 7 | 2014 | AGRI | 0.41 |
| 110 | France (44) | 10 | 2014 | AGRI | 0.22 |
| 111 | France (44) | 4 | 2015 | AGRI | 0.3 |
| 112 | France (44) | 7 | 2015 | AGRI | 0.34 |
| 113 | France (44) | 9 | 2015 | AGRI | 0.34 |
| 114 | France (44) | 4 | 2016 | AGRI | 0.35 |
| 115 | France (44) | 7 | 2016 | AGRI | 0.25 |
| 116 | France (44) | 9 | 2016 | AGRI | 0.395 |
| 117 | France (45) | 4 | 2013 | AGRI | 0.34 |
| 118 | France (45) | 6 | 2013 | AGRI | 0.28 |
| 119 | France (45) | 4 | 2014 | AGRI | 1.19 |
| 120 | France (45) | 7 | 2014 | AGRI | 0.48 |
| 121 | France (45) | 9 | 2014 | AGRI | 0.33 |
| 122 | France (45) | 5 | 2015 | AGRI | 0.18 |
| 123 | France (45) | 7 | 2015 | AGRI | 0.26 |
| 124 | France (45) | 9 | 2015 | AGRI | 0.41 |
| 125 | France (45) | 3 | 2016 | AGRI | 0.36 |
| 126 | France (45) | 7 | 2016 | AGRI | 0.48 |
| 127 | France (45) | 9 | 2016 | AGRI | 0.535 |
| 128 | France (45) | 3 | 2017 | AGRI | 0.44 |
| 129 | France (45) | 7 | 2017 | AGRI | 0.41 |
| 130 | France (45) | 9 | 2017 | AGRI | 0.47 |
| 131 | France (45) | 4 | 2018 | AGRI | 0.58 |
| 132 | France (45) | 7 | 2018 | AGRI | 0.62 |
| 133 | France (45) | 9 | 2018 | AGRI | 0.395 |
| 134 | France (45) | 4 | 2019 | AGRI | 0.19 |
| 135 | France (45) | 7 | 2019 | AGRI | 0.42 |
| 136 | France (45) | 9 | 2019 | AGRI | 0.44 |
| 137 | France (45) | 4 | 2020 | AGRI | 0.025 |
| 138 | France (45) | 7 | 2020 | AGRI | 0.28 |
| 139 | France (45) | 9 | 2020 | AGRI | 0.49 |
| 140 | France (45) | 4 | 2021 | AGRI | 0.35 |
| 141 | France (45) | 6 | 2021 | AGRI | 0.69 |
| 142 | France (45) | 9 | 2021 | AGRI | 0.36 |
| 143 | France (48) | 4 | 2021 | NAT | 0.45 |
| 144 | France (48) | 7 | 2021 | NAT | 0.38 |
| 145 | France (48) | 9 | 2021 | NAT | 0.35 |
| 146 | France (54) | 6 | 2019 | AGRI | 0.35 |
| 147 | France (54) | 6 | 2019 | AGRI | 0.29 |
| 148 | France (54) | 7 | 2019 | AGRI | 0.35 |
| 149 | France (54) | 7 | 2019 | AGRI | 0.21 |
| 150 | France (54) | 9 | 2019 | AGRI | 0.22 |

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|---|---|---|---|---|---|
| 151 | France (54) | 9 | 2019 | AGRI | 0.24 |
| 152 | France (54) | 6 | 2020 | AGRI | 0.30 |
| 153 | France (54) | 6 | 2020 | AGRI | 0.28 |
| 154 | France (54) | 8 | 2020 | AGRI | 0.31 |
| 155 | France (54) | 8 | 2020 | AGRI | 0.24 |
| 156 | France (54) | 9 | 2020 | AGRI | 0.28 |
| 157 | France (54) | 9 | 2020 | AGRI | 0.29 |
| 158 | France (59) | 9 | 2020 | AGRI | 0.52 |
| 159 | France (59) | 9 | 2020 | AGRI | 0.57 |
| 160 | France (59) | 9 | 2020 | AGRI | 0.63 |
| 161 | France (59) | 6 | 2021 | AGRI | 0.43 |
| 162 | France (59) | 6 | 2021 | AGRI | 0.42 |
| 163 | France (59) | 6 | 2021 | AGRI | 0.41 |
| 164 | France (59) | 6 | 2021 | AGRI | 0.44 |
| 165 | France (59) | 8 | 2021 | AGRI | 0.39 |
| 166 | France (59) | 8 | 2021 | AGRI | 0.52 |
| 167 | France (59) | 8 | 2021 | AGRI | 0.47 |
| 168 | France (59) | 8 | 2021 | AGRI | 0.46 |
| 169 | France (62) | 5 | 2016 | AGRI | 0.64 |
| 170 | France (62) | 7 | 2016 | AGRI | 0.57 |
| 171 | France (62) | 9 | 2016 | AGRI | 0.37 |
| 172 | France (62) | 5 | 2017 | AGRI | 0.71 |
| 173 | France (62) | 7 | 2017 | AGRI | 1.48 |
| 174 | France (62) | 9 | 2017 | AGRI | 0.78 |
| 175 | France (69) | 9 | 2021 | URB | 0.42 |
| 176 | France (72) | 7 | 2017 | NAT | 0.41 |
| 177 | France (72) | 7 | 2017 | NAT | 0.24 |
| 178 | France (72) | 9 | 2017 | NAT | 0.43 |
| 179 | France (72) | 9 | 2017 | NAT | 0.27 |
| 180 | France (72) | 5 | 2018 | NAT | 0.43 |
| 181 | France (72) | 5 | 2018 | NAT | 0.395 |
| 182 | France (75) | 9 | 2015 | URB | 0.68 |
| 183 | France (75) | 4 | 2019 | URB | 0.27 |
| 184 | France (75) | 4 | 2019 | URB | 0.30 |
| 185 | France (75) | 7 | 2019 | NAT | 2.31 |
| 186 | France (75) | 7 | 2019 | NAT | 0.69 |
| 187 | France (75) | 9 | 2019 | AGRI | 0.49 |
| 188 | France (75) | 9 | 2019 | AGRI | 0.51 |
| 189 | France (75) | 4 | 2020 | URB | 0.36 |
| 190 | France (75) | 7 | 2020 | NAT | 0.64 |
| 191 | France (75) | 9 | 2020 | AGRI | 0.77 |
| 192 | France (78) | 4 | 2013 | URB | 0.35 |
| 193 | France (78) | 6 | 2013 | URB | 0.47 |
| 194 | France (78) | 4 | 2014 | URB | 1.12 |
| 195 | France (78) | 7 | 2014 | URB | 0.46 |
| 196 | France (78) | 9 | 2014 | URB | 0.39 |

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|---|---|---|---|---|---|
| 197 | France (78) | 4 | 2015 | URB | 0.26 |
| 198 | France (78) | 7 | 2015 | URB | 0.49 |
| 199 | France (78) | 9 | 2015 | URB | 0.40 |
| 200 | France (83) | 4 | 2013 | NAT | 0.45 |
| 201 | France (83) | 4 | 2013 | NAT | 0.42 |
| 202 | France (83) | 4 | 2013 | NAT | 0.35 |
| 203 | France (83) | 4 | 2014 | NAT | 0.53 |
| 204 | France (83) | 7 | 2014 | NAT | 0.36 |
| 205 | France (83) | 9 | 2014 | NAT | 0.35 |
| 206 | France (85) | 3 | 2022 | NAT | 0.23 |
| 207 | France (85) | 4 | 2022 | NAT | 0.11 |
| 208 | France (85) | 5 | 2022 | NAT | 0.10 |
| 209 | France (85) | 5 | 2022 | NAT | 0.09 |
| 210 | France (85) | 6 | 2022 | NAT | 0.07 |
| 211 | France (85) | 6 | 2022 | NAT | 0.23 |
| 212 | France (85) | 6 | 2022 | NAT | 0.14 |
| 213 | France (85) | 6 | 2022 | AGRI | 0.23 |
| 214 | France (85) | 6 | 2022 | AGRI | 0.14 |
| 215 | France (85) | 7 | 2022 | NAT | 0.31 |
| 216 | France (85) | 7 | 2022 | NAT | 0.21 |
| 217 | France (85) | 7 | 2022 | AGRI | 0.31 |
| 218 | France (85) | 7 | 2022 | AGRI | 0.25 |
| 219 | France (85) | 8 | 2022 | NAT | 0.25 |
| 220 | France (85) | 8 | 2022 | AGRI | 0.25 |
| 221 | France (85) | 9 | 2022 | NAT | 0.27 |
| 222 | France (85) | 9 | 2022 | AGRI | 0.27 |
| 223 | France (89) | 4 | 2020 | URB | 0.37 |
| 224 | France (89) | 4 | 2020 | AGRI | 0.41 |
| 225 | France (89) | 4 | 2021 | URB | 0.39 |
| 226 | France (89) | 4 | 2021 | AGRI | 0.26 |
| 227 | France (89) | 6 | 2021 | URB | 0.72 |
| 228 | France (89) | 6 | 2021 | AGRI | 0.46 |
| 229 | France (89) | 9 | 2021 | URB | 0.59 |
| 230 | France (89) | 9 | 2021 | AGRI | 0.48 |
| 231 | France (91) | 6 | 2013 | AGRI | 0.23 |
| 232 | France (91) | 5 | 2015 | AGRI | 0.2 |
| 233 | France (91) | 7 | 2015 | AGRI | 0.19 |
| 234 | France (91) | 9 | 2015 | AGRI | 0.27 |
| 235 | France (91) | 4 | 2019 | AGRI | 0.13 |
| 236 | France (91) | 7 | 2019 | AGRI | 0.35 |
| 237 | France (91) | 9 | 2019 | AGRI | 0.42 |
| 238 | France (91) | 4 | 2020 | AGRI | 0.025 |
| 239 | France (91) | 7 | 2020 | AGRI | 0.32 |
| 240 | France (91) | 9 | 2020 | AGRI | 0.31 |
| 241 | France (91) | 4 | 2021 | AGRI | 0.21 |
| 242 | France (91) | 6 | 2021 | AGRI | 0.29 |

| | | | | | |
|---|---|---|---|---|---|
| 243 | France (91) | 9 | 2021 | AGRI | 0.38 |
| 244 | France (91) | 3 | 2022 | AGRI | 0.82 |
| 245 | France (91) | 4 | 2022 | AGRI | 0.49 |
| 246 | France (91) | 5 | 2022 | AGRI | 0.45 |
| 247 | France (91) | 5 | 2022 | AGRI | 0.46 |
| 248 | France (91) | 6 | 2022 | AGRI | 0.50 |
| 249 | France (91) | 6 | 2022 | AGRI | 0.39 |
| 250 | France (91) | 7 | 2022 | AGRI | 0.35 |
| 251 | France (91) | 7 | 2022 | AGRI | 0.41 |
| 252 | France (91) | 8 | 2022 | AGRI | 0.40 |
| 253 | France (91) | 8 | 2022 | AGRI | 0.42 |
| 254 | France (91) | 9 | 2022 | AGRI | 0.44 |
| 255 | France (91) | 9 | 2022 | AGRI | 0.49 |
| 256 | France (91) | 10 | 2022 | AGRI | 0.48 |
| 257 | France (93) | 4 | 2019 | URB | 0.28 |
| 258 | France (93) | 7 | 2019 | NAT | 0.55 |
| 259 | France (93) | 9 | 2019 | AGRI | 0.25 |
| 260 | France (94) | 4 | 2019 | URB | 0.40 |
| 261 | France (94) | 7 | 2019 | NAT | 0.67 |
| 262 | France (94) | 9 | 2019 | AGRI | 0.66 |
| 263 | France (94) | 4 | 2020 | URB | 0.46 |
| 264 | France (94) | 7 | 2020 | NAT | 0.54 |
| 265 | France (94) | 9 | 2020 | AGRI | 0.68 |
| 266 | France (95) | 4 | 2015 | URB | 0.35 |
| 267 | France (95) | 4 | 2015 | NAT | 0.37 |
| 268 | France (95) | 7 | 2015 | URB | 0.46 |
| 269 | France (95) | 7 | 2015 | NAT | 0.27 |
| 270 | France (95) | 9 | 2015 | URB | 0.51 |
| 271 | France (95) | 9 | 2015 | NAT | 0.26 |
| 272 | France (95) | 3 | 2016 | URB | 0.35 |
| 273 | France (95) | 7 | 2016 | URB | 0.40 |
| 274 | France (95) | 9 | 2016 | URB | 0.385 |
| 275 | Greece | 4 | 2022 | URB | 0.48 |
| 276 | Greece | 4 | 2022 | URB | 0.32 |
| 277 | Greece | 4 | 2022 | INDUS | 0.34 |
| 278 | Greece | 4 | 2022 | INDUS | 0.52 |
| 279 | Greece | 4 | 2022 | NAT | 0.21 |
| 280 | Greece | 4 | 2022 | NAT | 0.22 |
| 281 | Greece | 5 | 2022 | URB | 0.61 |
| 282 | Greece | 5 | 2022 | URB | 0.56 |
| 283 | Greece | 5 | 2022 | INDUS | 0.53 |
| 284 | Greece | 5 | 2022 | INDUS | 0.46 |
| 285 | Greece | 5 | 2022 | NAT | 0.32 |
| 286 | Greece | 5 | 2022 | NAT | 0.26 |
| 287 | Greece | 6 | 2022 | INDUS | 0.23 |
| 288 | Greece | 6 | 2022 | INDUS | 0.38 |

| | | | | | |
|---|---|---|---|---|---|
| 289 | Greece | 6 | 2022 | URB | 0.53 |
| 290 | Greece | 6 | 2022 | URB | 0.34 |
| 291 | Greece | 6 | 2022 | NAT | 0.23 |
| 292 | Greece | 6 | 2022 | NAT | 0.38 |
| 293 | Greece | 7 | 2022 | INDUS | 0.28 |
| 294 | Greece | 7 | 2022 | INDUS | 0.29 |
| 295 | Greece | 7 | 2022 | URB | 0.50 |
| 296 | Greece | 7 | 2022 | URB | 0.47 |
| 297 | Greece | 7 | 2022 | NAT | 0.28 |
| 298 | Greece | 7 | 2022 | NAT | 0.29 |
| 299 | Greece | 8 | 2022 | INDUS | 0.32 |
| 300 | Greece | 8 | 2022 | INDUS | 0.32 |
| 301 | Greece | 8 | 2022 | URB | 0.38 |
| 302 | Greece | 8 | 2022 | URB | 0.35 |
| 303 | Greece | 8 | 2022 | NAT | 0.32 |
| 304 | Greece | 8 | 2022 | NAT | 0.32 |
| 305 | Greece | 9 | 2022 | INDUS | 0.43 |
| 306 | Greece | 9 | 2022 | INDUS | 0.25 |
| 307 | Greece | 9 | 2022 | URB | 0.53 |
| 308 | Greece | 9 | 2022 | URB | 0.55 |
| 309 | Greece | 9 | 2022 | NAT | 0.43 |
| 310 | Greece | 9 | 2022 | NAT | 0.25 |
| 311 | Moldova | 3 | 2022 | NAT | 0.50 |
| 312 | Moldova | 4 | 2022 | NAT | 0.67 |
| 313 | Moldova | 5 | 2022 | NAT | 1.20 |
| 314 | Moldova | 6 | 2022 | NAT | 0.93 |
| 315 | Moldova | 7 | 2022 | NAT | 0.53 |
| 316 | Moldova | 8 | 2022 | NAT | 0.30 |
| 317 | Moldova | 9 | 2022 | NAT | 0.26 |
| 318 | Moldova | 10 | 2022 | NAT | 0.30 |

The analysis of the 318 samples shown in the table SI-1 gives an overall **average value of <u>0.39 ppm for Mo in honey bees</u>.** The distribution of Mo-content within these 318 bee samples are represented in the Figure SI.2. 75% of the bees analyzed display a Mo content in the 0.2-0.5 ppm range.

As shown in Table SI.2, this average content varies according to the environment but the standard deviation is rather high, especially in natural environment. It remains around 0.39 ppm in agricultural environment, slightly decreases to 0.36 ppm in natural environment, but rises slightly to 0.44 ppm in urban or industrial environments, suggesting an anthropogenic contribution in this case.

**Table SI.2.** Average values found for Mo content in bees as a function of their environment.

| | NAT | AGRI | URB | INDUS |
|---|---|---|---|---|
| Nb of samples | 78 | 188 | 40 | 12 |
| Mean Mo (ppm) | 0.364 | 0.386 | 0.463 | 0.363 |
| Standard Deviation SD | 0.291 | 0.207 | 0.162 | 0.102 |

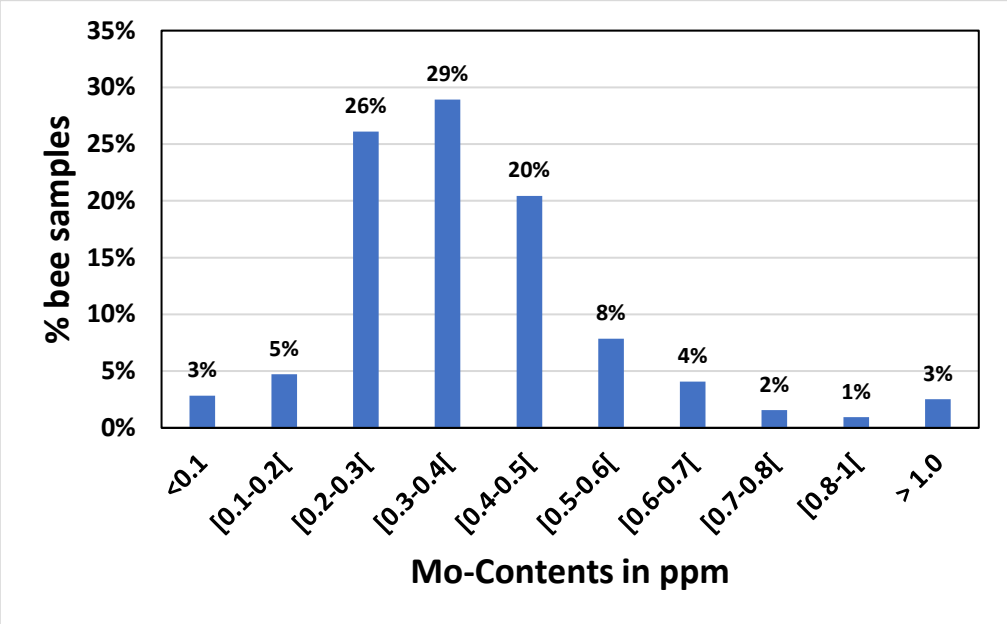


**Figure SI-2.** Representation of the distribution of Mo-content in the 318 bee samples analyzed. The main part, 75%, are found between 0.2 and 0.5 ppm.