Review and meta-analysis of the evidence for choosing between specific pyrethroids for programmatic purposes.

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|  |  |
| --- | --- |
| **Deltamethrin dose response curves** | |
| 1. CDC *An. albimanus* Teco   A close up of a map  Description automatically generated | 1. Cardiff *An. gambiae* G3   A close up of a map  Description automatically generated |
| 1. LIN *An. gambiae* G3   A screenshot of a cell phone  Description automatically generated | 1. Mali *An. gambiae* Mopti   A close up of a map  Description automatically generated |
| 1. CDC *An. stephensi* Delhi   A close up of a map  Description automatically generated | 1. Cardiff *An. stephensi* St   A close up of a map  Description automatically generated |
| 1. Cardiff *An. stephensi* Beech   A close up of a map  Description automatically generated | 1. LSHTM *An. stephensi* Beech   A screenshot of a cell phone  Description automatically generated |
| 1. Iran *An. stephensi* Beech   A screenshot of a cell phone  Description automatically generated | 1. Pooled *An. albimanus*   A close up of a map  Description automatically generated |
| 1. Pooled *An. gambiae*   A close up of a map  Description automatically generated | 1. Pooled *An. stephensi*   A close up of a map  Description automatically generated |
| 1. Deltamethrin pooled all data   A close up of a map  Description automatically generated | |
| **Permethrin dose response curves** | |
| 1. CDC *An. albimanus* Teco   A map with text  Description automatically generated | 1. CDC *An. gambiae* G3   A close up of a map  Description automatically generated |
| 1. LIN *An. gambiae* G3   A close up of a map  Description automatically generated | 1. LSHTM *An. gambiae* Kwa |
| 1. Mali *An. gambiae* Mopti   A close up of a map  Description automatically generated | 1. CDC *An. stephensi* Delhi   A close up of a map  Description automatically generated |
| 1. Cardiff *An. stephensi* Beech   A close up of a map  Description automatically generated | 1. LSHTM *An. stephensi* Beech   A close up of a map  Description automatically generated |
| 1. Pooled *An. albimanus* | 1. Pooled *An. gambiae* |
| 1. Pooled *An. stephensi*   A close up of a map  Description automatically generated | 1. Permethrin pooled all data   A close up of a map  Description automatically generated |

Figure S1. Dose response curves for deltamethrin (A – M) and permethrin (N – Y) using original raw data from the 1998 WHO multicentre study [1]

Table S1. Probit analysis of deltamethrin and permethrin using original raw data from the 1998 WHO multicentre study [1]. Analysis was conducted using PoloJR program within PoloSuite (Ver 2.1). The discriminating dose is twice the LD99. Abbreviations: LD = Lethal dose, DD = Discriminating dose.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Institute** | **Species** | **Strain** | **Insecticide** | **No. concentrations**  **test** | **Total**  **Mosquitoes exposed** | **LD95** | **LD95**  **95% CI** | **LD99** | **LD99**  **95% CI** | **DD** |
| **Deltamethrin** | | | | | | | | | | |
| CDC | *An. albimanus* | Teco | Deltamethrin | 5 | 500 | 0.04 | 0.017 - 0 | 0.07 | 0.025 - 0 | 0.14 |
| Cardiff | *An. albimanus* | Panama | Deltamethrin | 4 | 160 | LD matrix not calculated | - | - | - | - |
| LSHTM | *An. albimanus* | Mexico | Deltamethrin | 5 | 562 | LD matrix not calculated | - | - | - | - |
| CDC | *An. gambiae* | G3 | Deltamethrin | 5 | 500 | LD matrix not calculated | - | - | - | - |
| Cardiff | *An. gambiae* | G3 | Deltamethrin | 5 | 184 | 0.02 | ? | 0.04 | 0.013 - 0.001 | 0.08 |
| LIN | *An. gambiae* | G3 | Deltamethrin | 3 | 900 | 0 | ? | 0.01 | ? | 0.2 |
| LSHTM | *An. gambiae* | Kwa | Deltamethrin | 5 | 533 | LD matrix not calculated | - | - | - | - |
| Mali | *An. gambiae* | Mopti | Deltamethrin | 5 | 1525 | 0.02 | 0.013 - 0.061 | 0.08 | 0.038 -1.042 | 0.16 |
| LIN | *An. gambiae* | Kisumu | Deltamethrin | 4 | 1400 | LD matrix not calculated | - | - | - | - |
| CDC | *An. stephensi* | Delhi | Deltamethrin | 3 | 300 | 0.02 | ? | 0.03 | ? | 0.06 |
| Cardiff | *An. stephensi* | St | Deltamethrin | 3 | 120 | 0.06 | ? | 0.17 | ? | 0.34 |
| Cardiff | *An. stephensi* | Beech | Deltamethrin | 3 | 128 | 0.03 | ? | 0.04 | ? | 0.08 |
| LSHTM | *An. stephensi* | Beech | Deltamethrin | 3 | 317 | 1.72 | ? | 347.81 | 0.015 - 0.008 | 695.62 |
| Iran | *An. stephensi* | Beech | Deltamethrin | 3 | 604 | 0.01 | ? | 0.01 | ? | 0.02 |
| India | *An. stephensi* | Delhi | Deltamethrin | 2 | 525 | Excluded < 3 concentrations | - | - | - | - |
| *Species pooled* | | | | | | | | | | |
| Pooled | *An. albimanus* | Pooled | Deltamethrin | - | - | 0.03 | 0.013 -22.116 | 0.06 | 0.022 - 10109.5039 | 0.12 |
| Pooled | *An. gambiae* | Pooled | Deltamethrin | - | - | 0.01 | 0.001 - 0.015 | 0.03 | 0.016 - 7.617 | 0.06 |
| Pooled | *An. stephensi* | Pooled | Deltamethrin | - | - | 0.02 | 0.01 - 0.001 | 0.06 | 0.018 - 0 | 0.12 |
| *All pooled* | | | | | | | | | | |
| Pooled | Pooled | Pooled | Deltamethrin | - | - | 0.02 | 0.01 - 0.055 | 0.05 | 0.023 - 1.166 | 0.1 |
| **Permethrin** | | | | | | | | | | |
| CDC | *An. albimanus* | Teco | Permethrin | 5 | 500 | 0.46 | 0.167 - 0.059 | 0.69 | 0.265 - 0.015 | 1.38 |
| Cardiff | *An. albimanus* | Panama | Permethrin | 4 | 160 | LD matrix not calculated | - | - | - | - |
| LSHTM | *An. albimanus* | Mexico | Permethrin | 5 | 504 | LD matrix not calculated | - | - | - | - |
| CDC | *An. gambiae* | G3 | Permethrin | 5 | 500 | 0.34 | 0.275 - 0.457 | 0.5 | 0.38 - 0.76 | 1 |
| Cardiff | *An. gambiae* | G3 | Permethrin | 4 | 162 | 0.25 | 0.242 - 0.258 | 0.36 | 0.34 - 0.372 | 0.72 |
| LIN | *An. gambiae* | G3 | Permethrin | 4 | 1500 | 0.32 | 0.233 - 0.624 | 0.5 | 0.328 - 1.393 | 1 |
| LSHTM | *An. gambiae* | Kwa | Permethrin | 5 | 524 | 0.52 | ? | 1.96 | 0.333 - 0.06 | 3.92 |
| Mali | *An. gambiae* | Mopti | Permethrin | 5 | 1425 | 0.52 | ? | 0.04 | ? | 0.08 |
| LIN | *An. gambiae* | Kisumu | Permethrin | 4 | 1400 | LD matrix not calculated | - | - | - | - |
| CDC | *An. stephensi* | Delhi | Permethrin | 5 | 500 | 0.26 | 0.252 - 0.264 | 0.33 | 0.321 - 0.34 | 0.66 |
| Cardiff | *An. stephensi* | St | Permethrin | 4 | 160 | LD matrix not calculated | - | - | - | - |
| Cardiff | *An. stephensi* | Beech | Permethrin | 4 | 162 | 0.3 | 0.275 - 0.335 | 0.45 | 0.393 - 0.52 | 0.9 |
| LSHTM | *An. stephensi* | Beech | Permethrin | 5 | 522 | 0.42 | ? | 26.16 | ? | 52.32 |
| Iran | *An. stephensi* | Beech | Permethrin | 5 | 1063 | LD matrix not calculated | - | - | - | - |
| India | *An. stephensi* | Delhi | Permethrin | 2 | 500 | Excluded < 3 concentrations | - | - | - | - |
| *Species pooled* | | | | | | | | | | |
| Pooled | *An. albimanus* | Pooled | Permethrin | - | - | 0.33 | 0.161 - 0 | 0.62 | 0.271 - 0 | 1.24 |
| Pooled | *An. gambiae* | Pooled | Permethrin | - | - | 0.36 | 0.218 - 1.518 | 0.93 | 0.445 - 21.446 | 1.86 |
| Pooled | *An. stephensi* | Pooled | Permethrin | - | - | 0.24 | 0.155 - 1.478 | 0.47 | 0.255 - 21.446 | 0.94 |
| *All pooled* | | | | | | | | | | |
| Pooled | Pooled | Pooled | Permethrin | - | - | 0.32 | 0.233 - 0.544 | 0.73 | 0.452 - 2.067 | 1.46 |

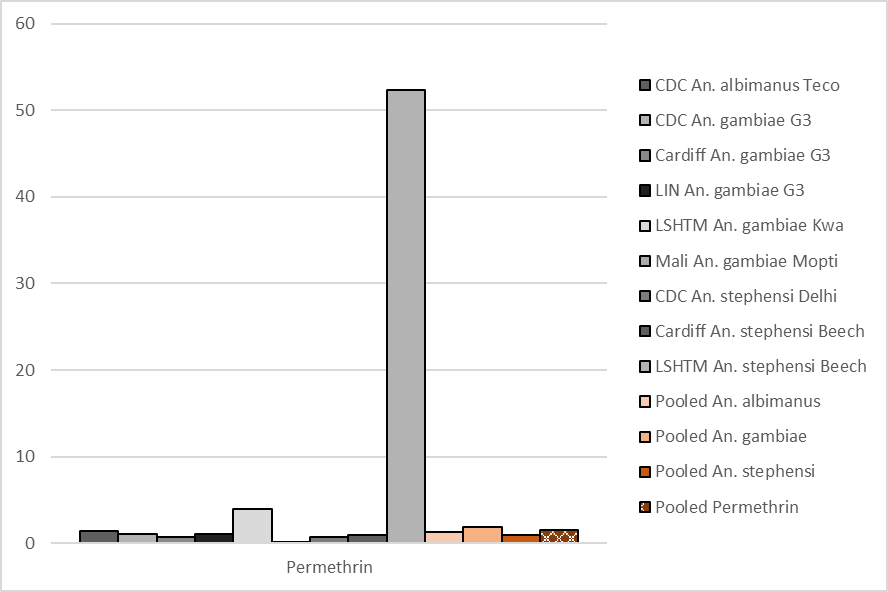
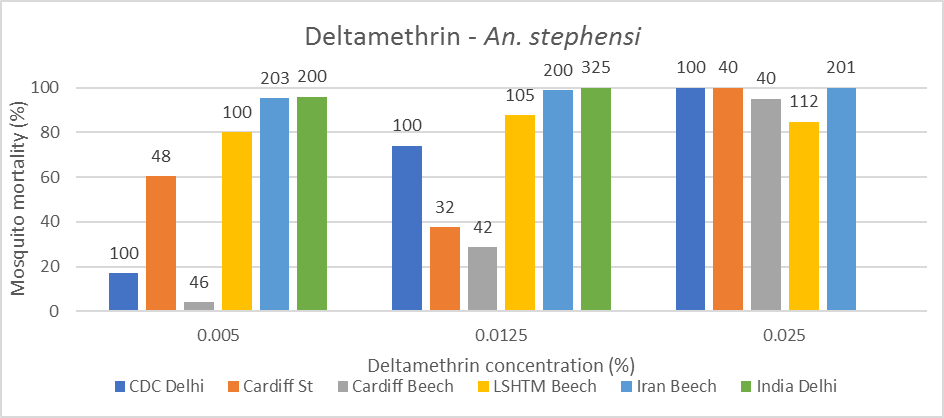
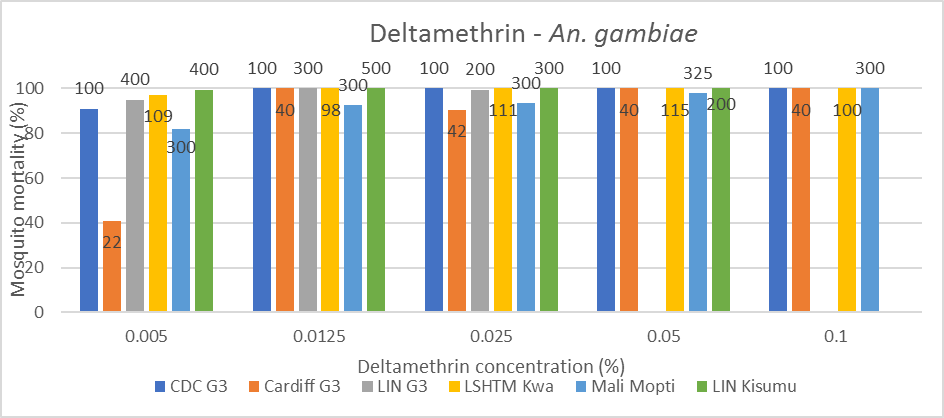
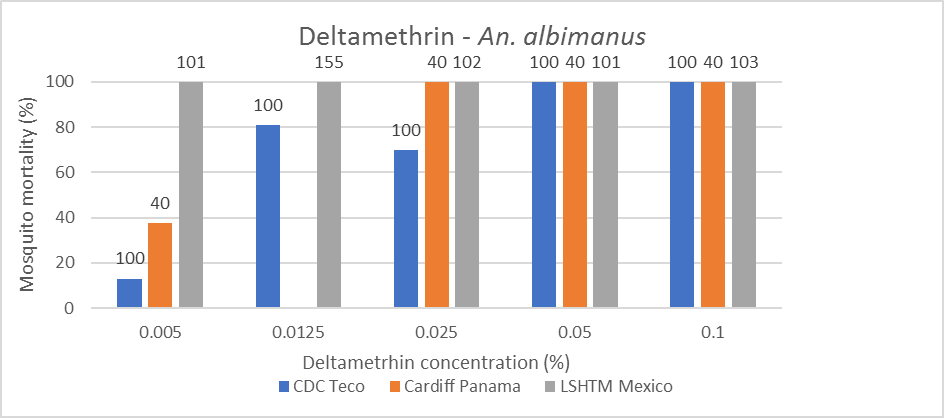


Figure S2. Calculated discriminating doses (%) for (A) deltamethrin and (B) permethrin. Points show individual sites/strain combinations, and data pooled by species or overall, by insecticide. Site/strain testing <3 concentrations of an insecticide and datasets not robust enough to calculate lethal dose matrixes are excluded. Discriminating doses are set at 2 x the calculated lethal dose at which 99% (LD99) of test mosquitoes were killed. LSHTM An. stephensi Beech data included.

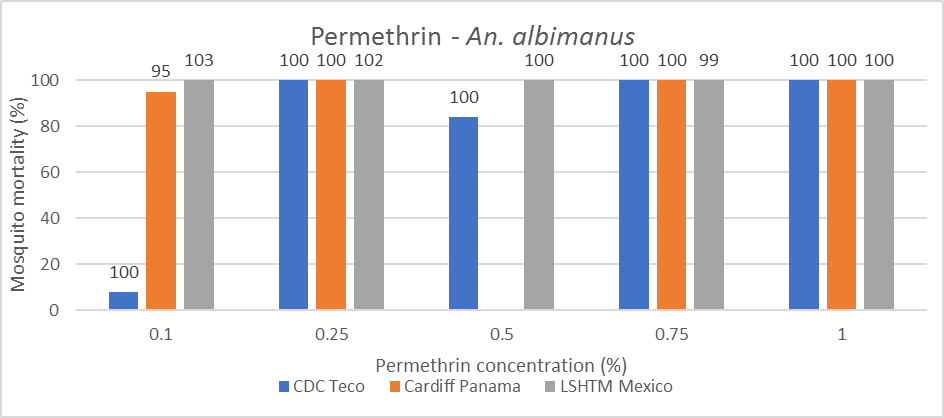
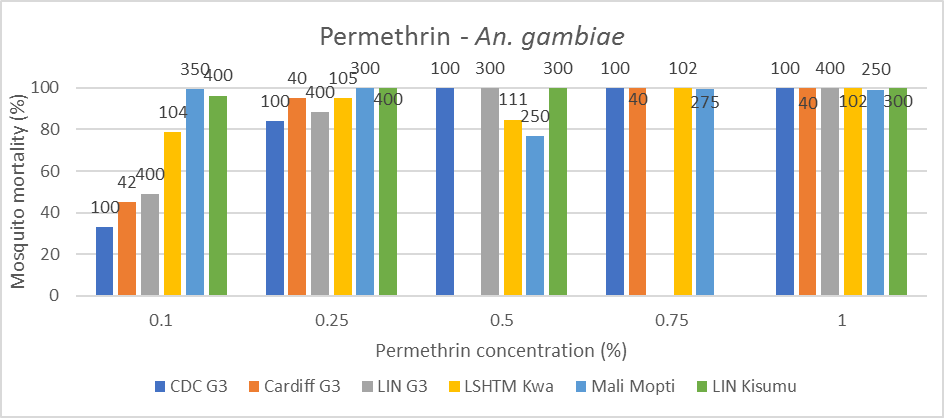
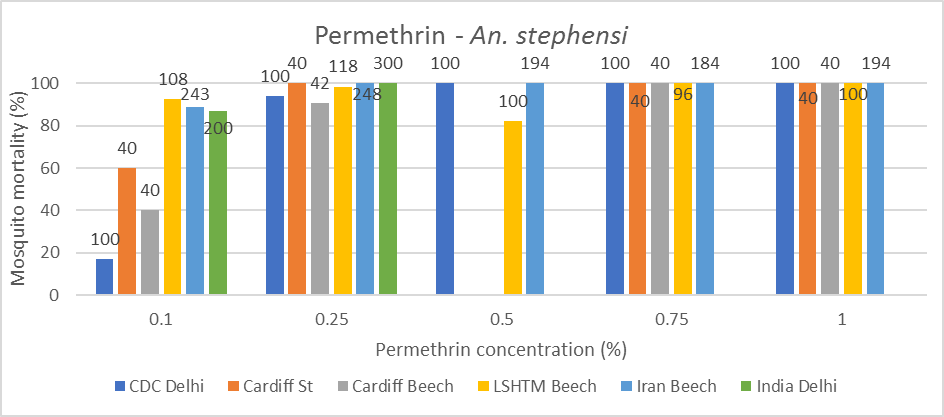


A

B

C

Figure S3. Mosquito mortality (%) following exposure to deltamethrin in WHO tube bioassays of site/strain combinations for (A) An. albimanus, (B) An. gambiae, and (C) An. stephensi. Numbers above bars show number of exposed mosquitoes.



A

B

C

Figure S4. Mosquito mortality (%) following exposure to permethrin in WHO tube bioassays of site/strain combinations for (A) An. albimanus, (B) An. gambiae, and (C) An. stephensi. Numbers above bars show number of exposed mosquitoes.

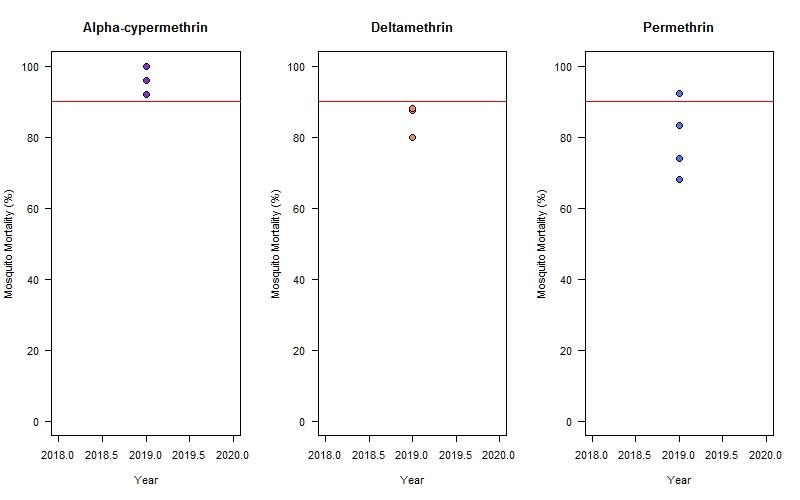
Table S2. Summary statistics of variability in mosquito mortality following exposure to pyrethroids in standard WHO tube or CDC bottle bioassays. Mosquitoes were exposed to insecticides following the recommended methods for each test and mortality in each replicate tube or bottle was recorded 24-hours post-exposure. The strains detailed here are those maintained by the Ranson Group or LITE at LSTM, UK. Abbreviations: R = Insecticide resistant mosquito strain, S = Insecticide susceptible mosquito strain, IKR = inter-quartile range.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Rearing group** | **Assay** | **Insecticide** | **Strain** | **R/S** | **Data points (replicate)** | **Lower range** | **Upper range** | **IKR** | **Mean** | **Median** | **Variance** | **Standard Deviation** |
| Ranson | Tube | α-cypermethrin | Kisumu  *An. gambiae* | S | 4 | 95.00 | 100.00 | 5.00 | 97.50 | 97.50 | 8.33 | 2.89 |
| Ranson | Tube | Deltamethrin | Kisumu  *An. gambiae* | S | 4 | 100.00 | 100.00 | 0.00 | 100.00 | 100.00 | 0.00 | 0.00 |
| Ranson | Tube | Permethrin | Kisumu  *An. gambiae* | S | 3 | 95.00 | 100.00 | 2.50 | 98.33 | 100.00 | 8.33 | 2.89 |
| Ranson | Tube | α-cypermethrin | N’gousso  *An. coluzzii* | S | 8 | 90.00 | 100.00 | 5.00 | 97.50 | 100.00 | 14.29 | 3.78 |
| Ranson | Tube | Deltamethrin | N’gousso  *An. coluzzii* | S | 4 | 100.00 | 100.00 | 0.00 | 100.00 | 100.00 | 0.00 | 0.00 |
| Ranson | Tube | Permethrin | N’gousso  *An. coluzzii* | S | 8 | 84.21 | 100.00 | 0.00 | 98.03 | 100.00 | 31.16 | 5.58 |
| Ranson | Tube | α-cypermethrin | Banfora-Sus  *An. coluzzii* | S | 4 | 92.00 | 100.00 | 5.00 | 95.00 | 94.00 | 14.67 | 3.83 |
| Ranson | Tube | Deltamethrin | Banfora-Sus  *An. coluzzii* | S | 4 | 80.00 | 88.00 | 7.63 | 83.88 | 83.75 | 20.06 | 4.48 |
| Ranson | Tube | Permethrin | Banfora-Sus  *An. coluzzii* | S | 4 | 68.00 | 92.31 | 13.14 | 79.39 | 78.62 | 114.05 | 10.68 |
| Ranson | Tube | α-cypermethrin | Banfora M  *An. coluzzii* | R | 3 | 0.00 | 30.00 | 15.00 | 13.33 | 10.00 | 233.33 | 15.28 |
| Ranson | Tube | Deltamethrin | Banfora M  *An. coluzzii* | R | 8 | 0.00 | 10.00 | 0.00 | 1.25 | 0.00 | 12.50 | 3.54 |
| Ranson | Tube | Permethrin | Banfora M  *An. coluzzii* | R | 12 | 0.00 | 24.00 | 9.00 | 6.74 | 4.08 | 57.33 | 7.57 |
| Ranson | Tube | α-cypermethrin | Bakaridjan  *An. gambiae* | R | 4 | 0.00 | 8.00 | 2.00 | 2.00 | 0.00 | 16.00 | 4.00 |
| Ranson | Tube | Deltamethrin | Bakaridjan  *An. gambiae* | R | 8 | 0.00 | 7.69 | 4.81 | 2.40 | 0.00 | 12.42 | 3.52 |
| Ranson | Tube | Permethrin | Bakaridjan  *An. gambiae* | R | 4 | 0.00 | 4.35 | 1.09 | 1.09 | 0.00 | 4.73 | 2.17 |
| Ranson | Tube | α-cypermethrin | Gaoura  *An. arabiensis* | R | 4 | 0.00 | 8.00 | 2.00 | 2.00 | 0.00 | 16.00 | 4.00 |
| Ranson | Tube | Deltamethrin | Gaoura  *An. arabiensis* | R | 8 | 0.00 | 4.00 | 4.00 | 2.00 | 2.00 | 4.57 | 2.14 |
| Ranson | Tube | Permethrin | Gaoura  *An. arabiensis* | R | 8 | 0.00 | 12.00 | 2.00 | 2.50 | 0.00 | 22.57 | 4.75 |
| Ranson | Tube | Deltamethrin | Tiefora  *An. coluzzii* | R | 8 | 0.00 | 7.69 | 4.00 | 2.46 | 2.00 | 8.39 | 2.90 |
| Ranson | Tube | Permethrin | Tiefora  *An. coluzzii* | R | 8 | 0.00 | 7.69 | 4.38 | 3.09 | 3.92 | 8.00 | 2.83 |
| Ranson | Tube | Deltamethrin | VK7 2014  *An. coluzzii* | R | 4 | 4.17 | 13.04 | 3.72 | 8.80 | 9.00 | 13.85 | 3.72 |
| Ranson | Tube | Permethrin | VK7 2014  *An. coluzzii* | R | 4 | 0.00 | 8.33 | 5.65 | 5.06 | 5.95 | 16.42 | 4.05 |
| Ranson | Tube | α-cypermethrin | Tiassale 13  *An. gambiae* | R | 7 | 0.00 | 30.00 | 2.50 | 8.00 | 5.00 | 99.67 | 9.98 |
| Ranson | Tube | Deltamethrin | Tiassale 13  *An. gambiae* | R | 3 | 45.00 | 55.00 | 5.00 | 48.33 | 45.00 | 33.33 | 5.77 |
| Ranson | Tube | Permethrin | Tiassale 13  *An. gambiae* | R | 3 | 10.00 | 15.00 | 2.50 | 11.67 | 10.00 | 8.33 | 2.89 |
| Ranson | Tube | α-cypermethrin | Fumoz  *An. funestus* | R | 4 | 0.00 | 4.00 | 1.00 | 3.00 | 4.00 | 4.00 | 2.00 |
| Ranson | Tube | Deltamethrin | Fumoz  *An. funestus* | R | 24 | 0.00 | 16.67 | 8.08 | 4.68 | 4.00 | 22.06 | 4.70 |
| Ranson | Tube | Permethrin | Fumoz  *An. funestus* | R | 6 | 0.00 | 28.00 | 3.07 | 6.62 | 3.85 | 113.40 | 10.65 |
| LITE | Tube | α-cypermethrin | Fumoz  *An. funestus* | R | 4 | 0.00 | 10.00 | 3.10 | 5.08 | 5.16 | 16.78 | 4.10 |
| LITE | Tube | Deltamethrin | Fumoz  *An. funestus* | R | 20 | 0.00 | 83.33 | 19.01 | 21.82 | 11.52 | 590.30 | 24.30 |
| LITE | Tube | Permethrin | Fumoz  *An. funestus* | R | 23 | 0.00 | 86.21 | 42.67 | 25.24 | 9.52 | 847.92 | 29.12 |
| LITE | Tube | α-cypermethrin | Kisumu  *An. gambiae* | S | 4 | 100.00 | 100.00 | 0.00 | 100.00 | 100.00 | 0.00 | 0.00 |
| LITE | Tube | Deltamethrin | Kisumu  *An. gambiae* | S | 12 | 95.24 | 100.00 | 1.04 | 98.89 | 100.00 | 4.02 | 2.01 |
| LITE | Tube | Permethrin | Kisumu  *An. gambiae* | S | 12 | 96.14 | 100.00 | 0.00 | 99.68 | 100.00 | 1.24 | 1.11 |
| LITE | Tube | α-cypermethrin | Moz  *An. arabiensis* | S | 4 | 88.00 | 100.00 | 6.26 | 95.91 | 97.83 | 32.03 | 5.66 |
| LITE | Tube | Deltamethrin | Moz  *An. arabiensis* | S | 12 | 83.33 | 100.00 | 13.00 | 93.19 | 96.00 | 46.13 | 6.79 |
| LITE | Tube | Permethrin | Moz  *An. arabiensis* | S | 12 | 92.00 | 100.00 | 4.00 | 97.67 | 100.00 | 10.06 | 3.17 |
| LITE | Tube | α-cypermethrin | Tiassale 13  *An. gambiae* | R | 8 | 4.00 | 12.50 | 5.13 | 8.13 | 7.42 | 10.61 | 3.26 |
| LITE | Tube | Deltamethrin | Tiassale 13  *An. gambiae* | R | 24 | 0.00 | 41.67 | 12.51 | 15.35 | 12.25 | 121.23 | 11.01 |
| LITE | Tube | Permethrin | Tiassale 13  *An. gambiae* | R | 25 | 0.00 | 62.50 | 25.00 | 15.97 | 12.00 | 256.38 | 16.01 |
| LITE | Tube | α-cypermethrin | VK7 2014  *An. coluzzii* | R | 4 | 0.00 | 8.00 | 2.11 | 3.89 | 3.78 | 10.69 | 3.27 |
| LITE | Tube | Deltamethrin | VK7 2014  *An. coluzzii* | R | 16 | 0.00 | 13.04 | 5.13 | 3.49 | 0.00 | 23.06 | 4.80 |
| LITE | Tube | Permethrin | VK7 2014  *An. coluzzii* | R | 27 | 0.00 | 8.33 | 0.00 | 1.38 | 0.00 | 7.98 | 2.83 |
| LITE | Bottle | Permethrin | Fumoz  *An. funestus* | R | 20 | 0.00 | 100.00 | 50.44 | 46.92 | 42.24 | 1121.92 | 33.50 |
| LITE | Bottle | Permethrin + PBO | Fumoz  *An. funestus* | R | 18 | 69.57 | 100.00 | 0.00 | 96.62 | 100.00 | 96.87 | 9.84 |
| LITE | Bottle | Permethrin | Kisumu  *An. gambiae* | S | 20 | 4.00 | 100.00 | 1.67 | 93.58 | 100.00 | 456.84 | 21.37 |
| LITE | Bottle | Permethrin + PBO | Kisumu  *An. gambiae* | S | 17 | 8.00 | 100.00 | 0.00 | 94.59 | 100.00 | 497.88 | 22.31 |
| LITE | Bottle | Permethrin | Tiassale 13  *An. gambiae* | R | 18 | 0.00 | 73.91 | 44.53 | 33.27 | 30.93 | 513.42 | 22.66 |
| LITE | Bottle | Permethrin + PBO | Tiassale 13  *An. gambiae* | R | 21 | 4.17 | 100.00 | 16.67 | 88.62 | 100.00 | 454.27 | 21.31 |
| LITE | Bottle | Permethrin | VK7 2014  *An. coluzzii* | R | 20 | 0.00 | 21.43 | 8.54 | 8.91 | 9.56 | 59.31 | 7.70 |
| LITE | Bottle | Permethrin + PBO | VK7 2014  *An. coluzzii* | R | 20 | 25.00 | 100.00 | 7.73 | 87.06 | 100.00 | 630.80 | 25.12 |

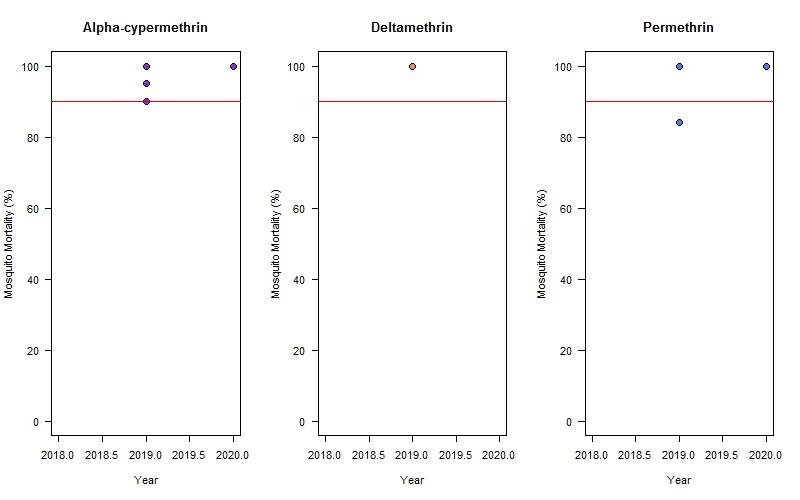
Table S3 P-values (Welch’s t-test) comparing mean mosquito mortality following exposure to α-cypermethrin 0.05%, deltamethrin 0.05%, or permethrin 0.75% in a standard WHO tube bioassay. Values significant at the 5% level (p = < 0.05) are highlighted in blue. Abbreviations; Delta = deltamethrin, Perm = permethrin, Alpha = α-cypermethrin.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Group | Strain | Delta v Perm | Delta v Alpha | Perm v Alpha | Delta v Perm + PBO | Perm v Perm + PBO | Alpha v Perm + PBO |
| Ranson | Banfora-Susceptible | 0.482 | 0.010 | 0.055 | - | - | - |
| Kisumu | 0.423 | 0.182 | 0.723 | - | - | - |
| N'gousso | 0.351 | 0.104 | 0.829 | - | - | - |
| Banfora M | 0.044 | 0.303 | 0.536 | - | - | - |
| Bakaridjan | 0.446 | 0.870 | 0.706 | - | - | - |
| FUMOZ-R | 0.680 | 0.254 | 0.451 | - | - | - |
| Gaoura | 0.792 | 1.000 | 0.854 | - | - | - |
| Tiassalé 13 | 0.002 | 0.000 | 0.401 | - | - | - |
| Tiefora | 0.668 | - | - | - | - | - |
| VK7 2014 | 0.223 | - | - | - | - | - |
| LITE | Kisumu | 0.251 | 0.082 | 0.339 | - | - | - |
| Moz | 0.055 | 0.458 | 0.590 | - | - | - |
| FUMOZ-R | 0.678 | 0.009 | 0.004 | 0.000 | 0.000 | 0.000 |
| Tiassalé 13 | 0.874 | 0.008 | 0.029 | 0.002 | 0.001 | 0.002 |
| VK7 2014 | 0.124 | 0.851 | 0.225 | 0.738 | 0.506 | 0.652 |

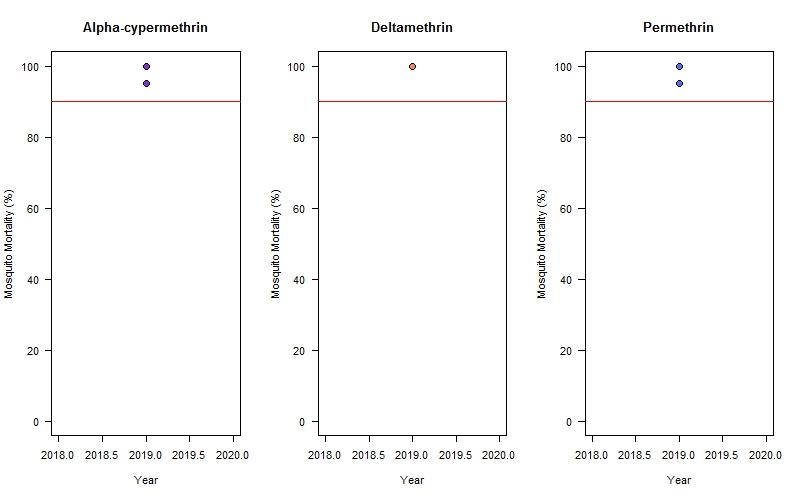
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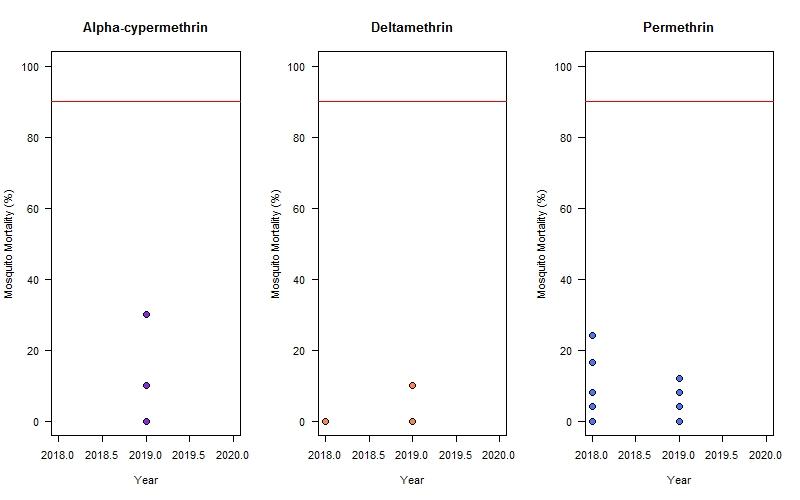
1. **Kisumu (Ranson group)**



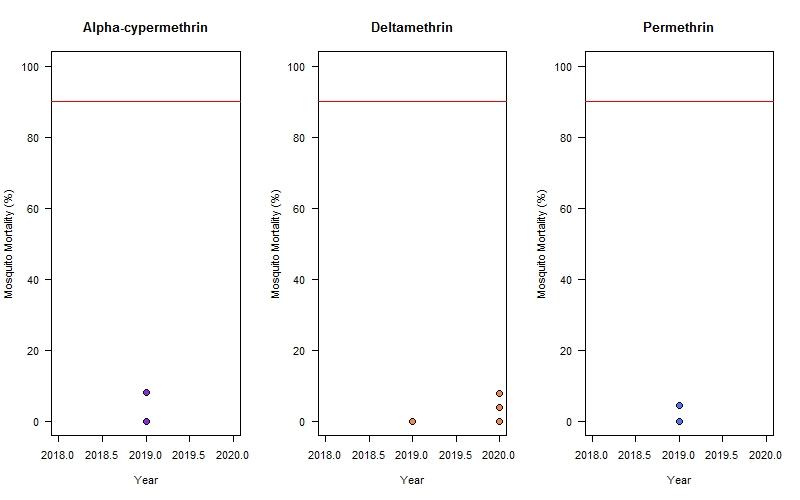
1. **N’gousso (Ranson group)**



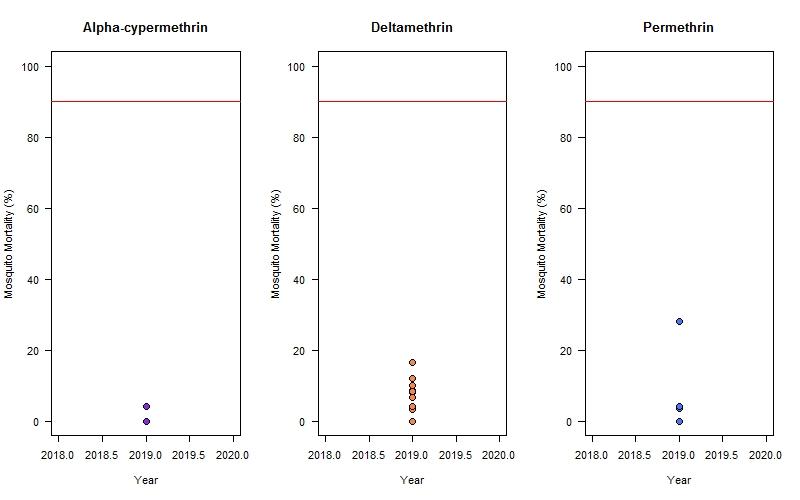
1. **Banfora M (Ranson group)**

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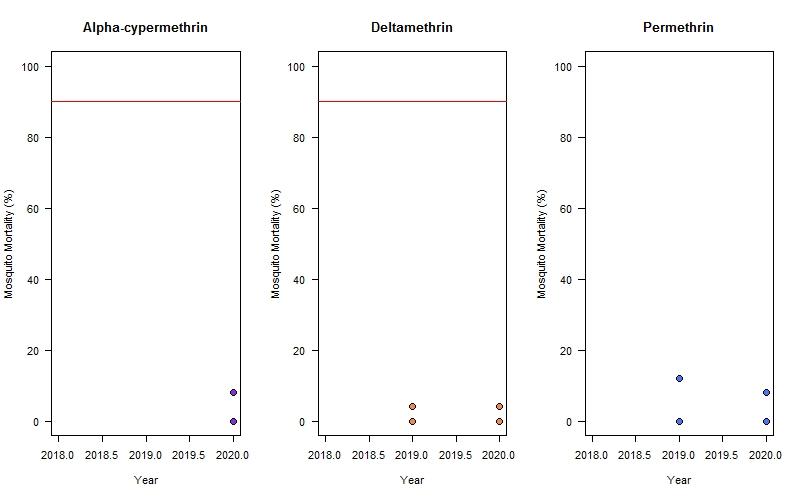
1. **Bakaridjan (Ranson group)**

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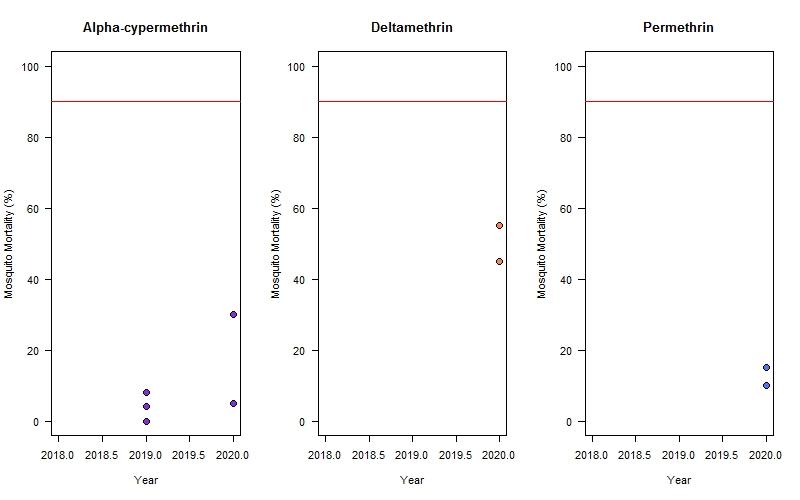
1. **FUMOZ-R (Ranson group)**

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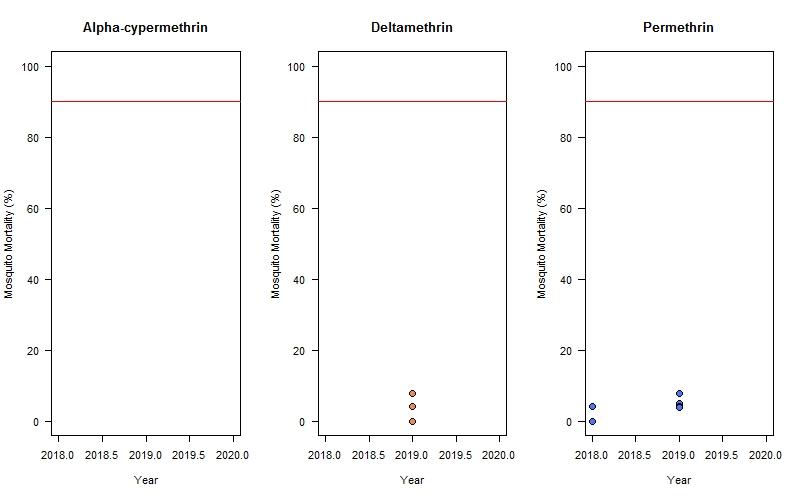
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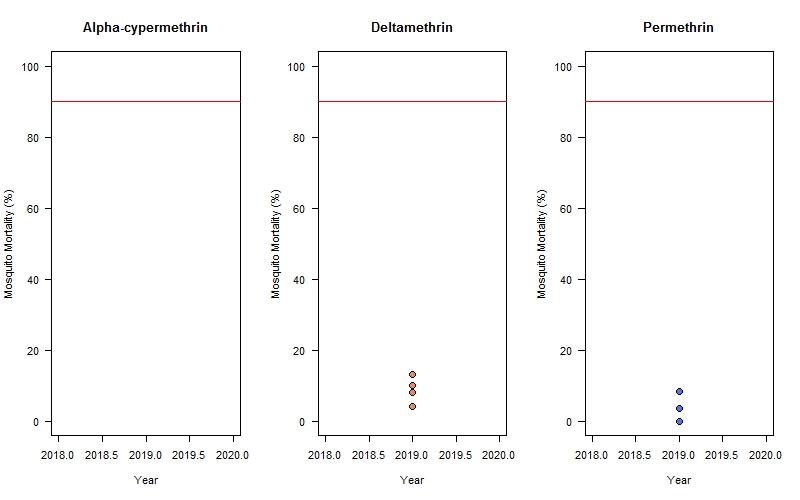
1. **Tiassalé 14 (Ranson group)**

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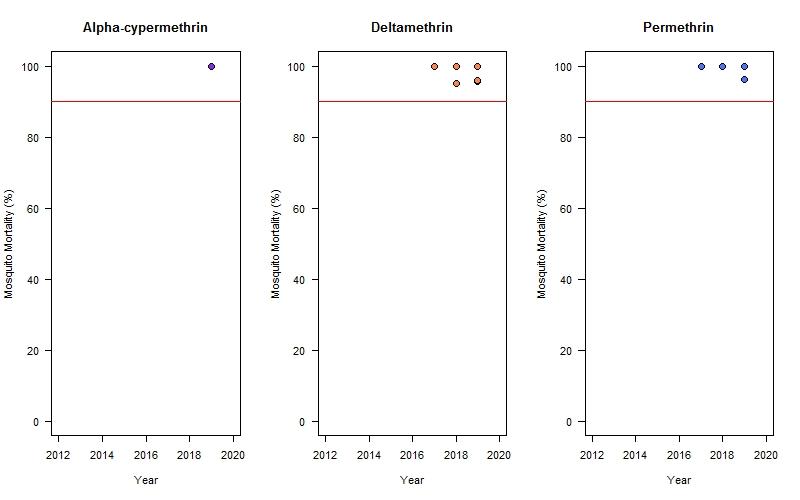
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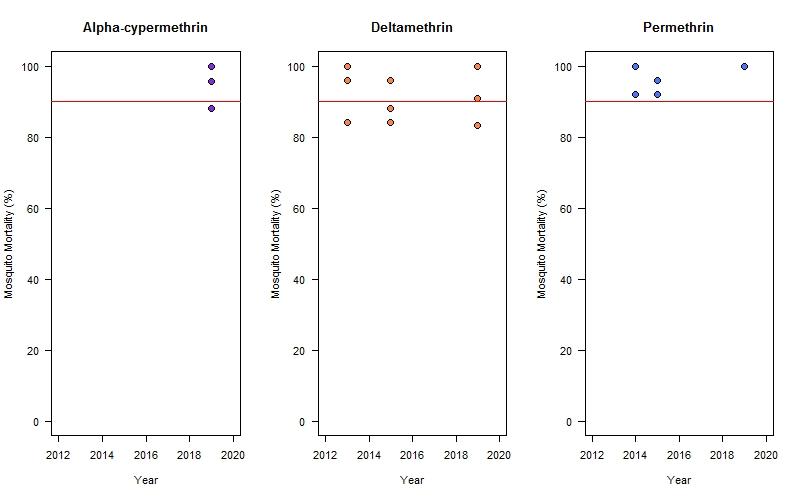
1. **VK7 2014 (Ranson group)**

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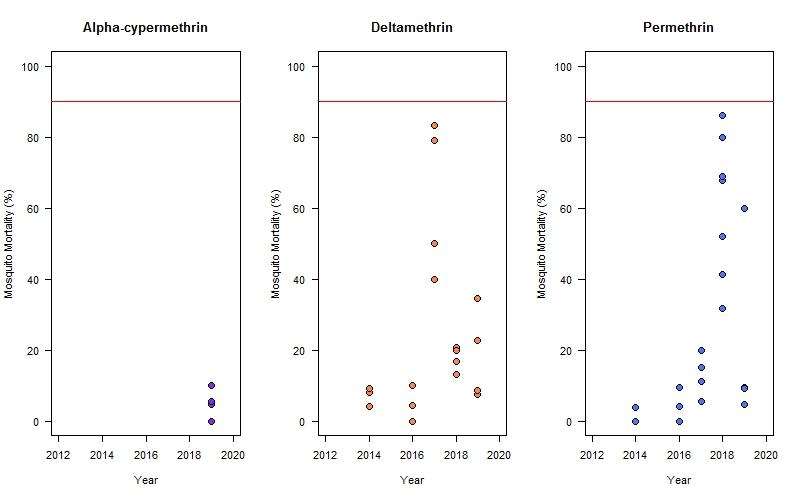
1. **Kisumu (LITE)**



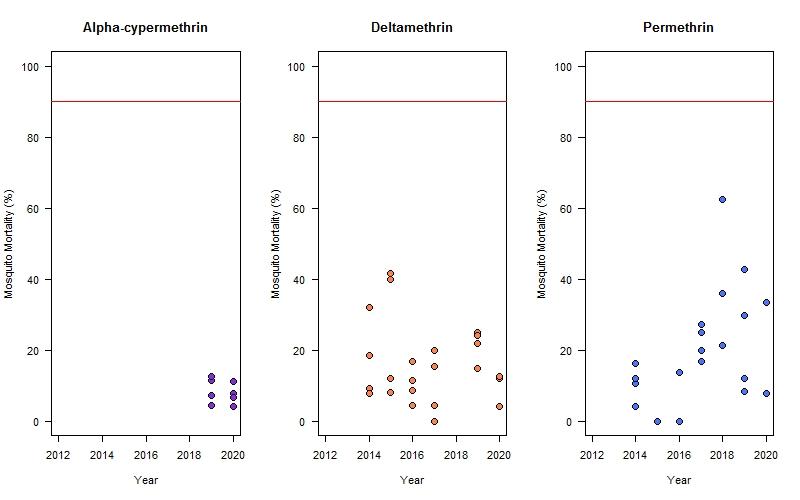
1. **Moz (LITE)**



1. **FUMOZ-R (LITE)**



1. **Tiassalé 13 (LITE)**



1. **VK7 2014 (LITE)**

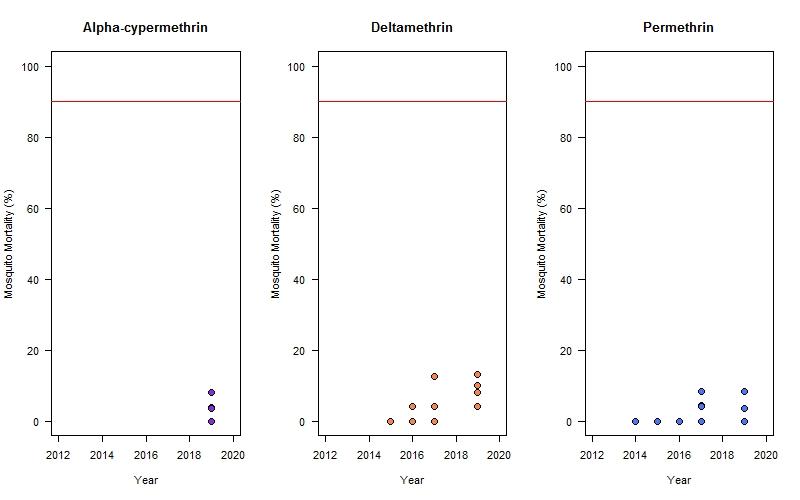
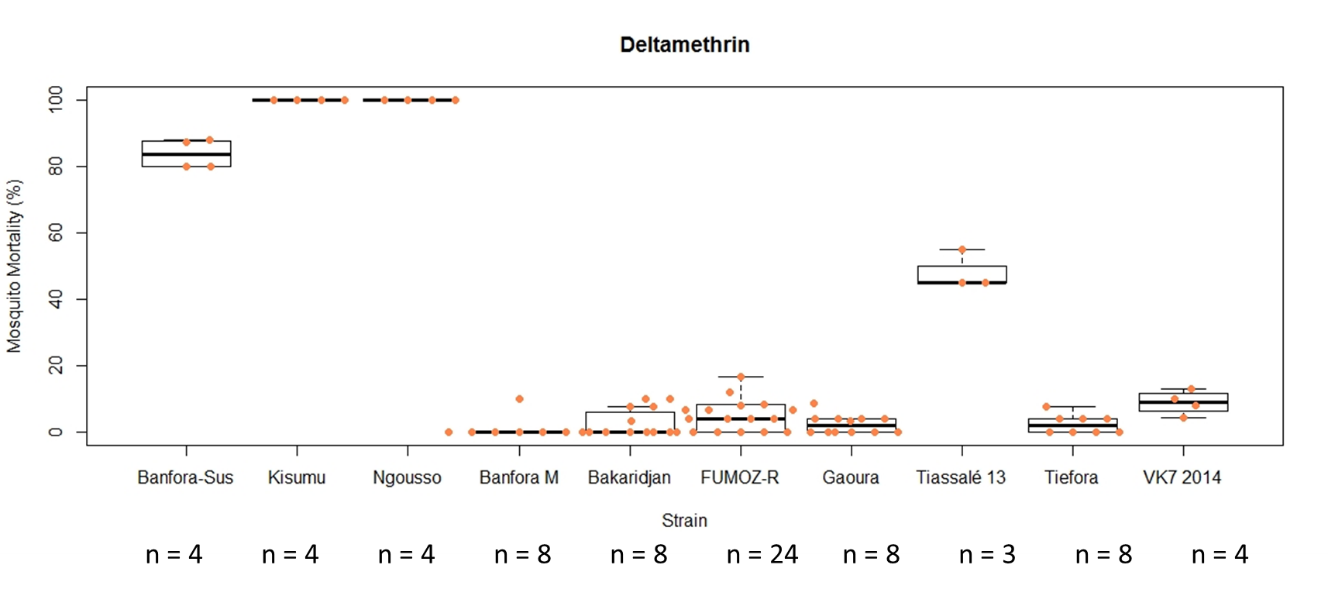
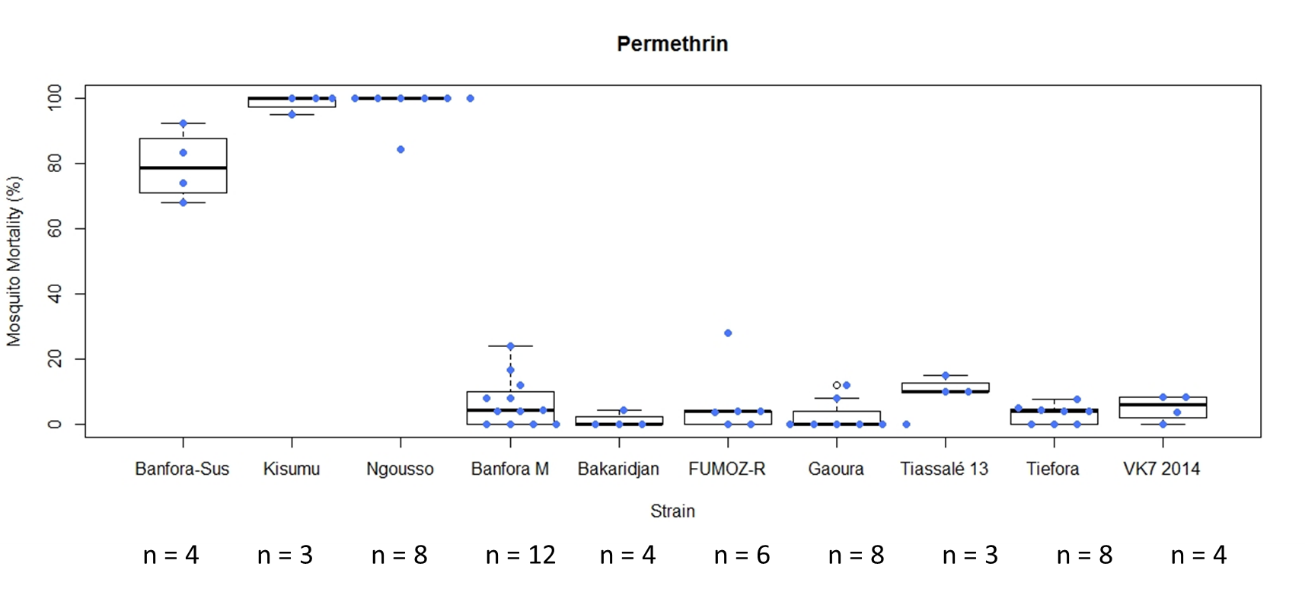


Figure S5. Mosquito mortality over time following exposure to pyrethroids in a standard WHO tube bioassay. Ranson group (A- J) and LITE (K – O) mosquito strains were exposed to deltamethrin 0.05%, permethrin 0.75% and α-cypermethrin 0.05% in a standard 1-hour WHO tube bioassay, and their 24-hour mortality was recorded. Coloured circles indicate each individual replicate tube.





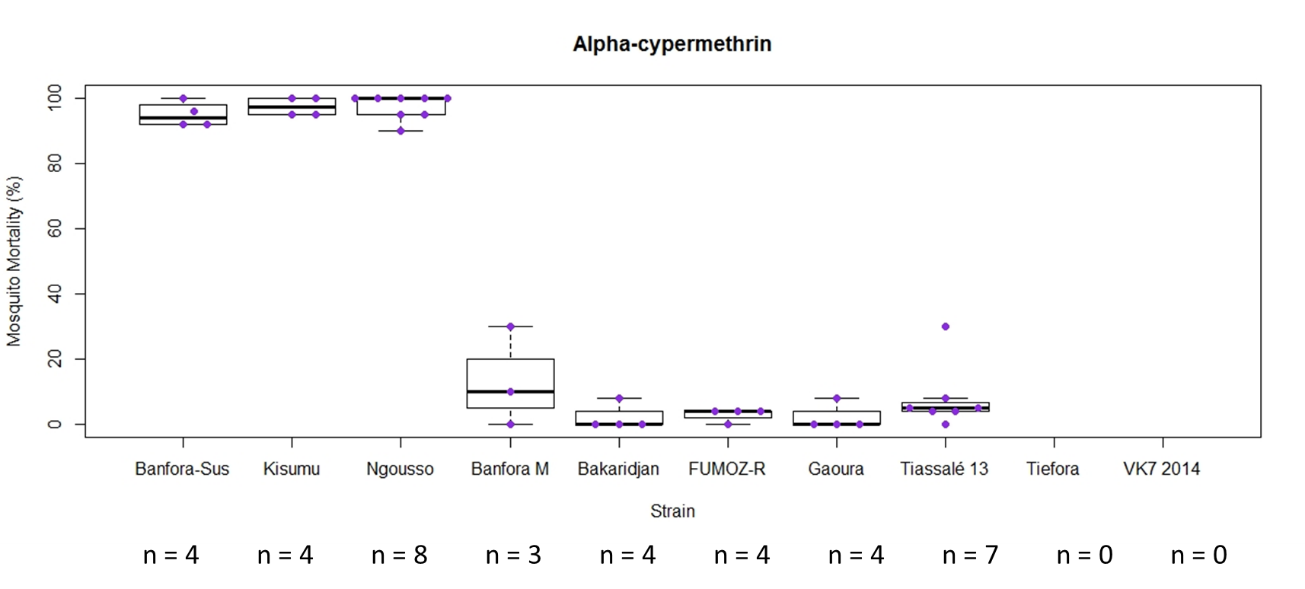
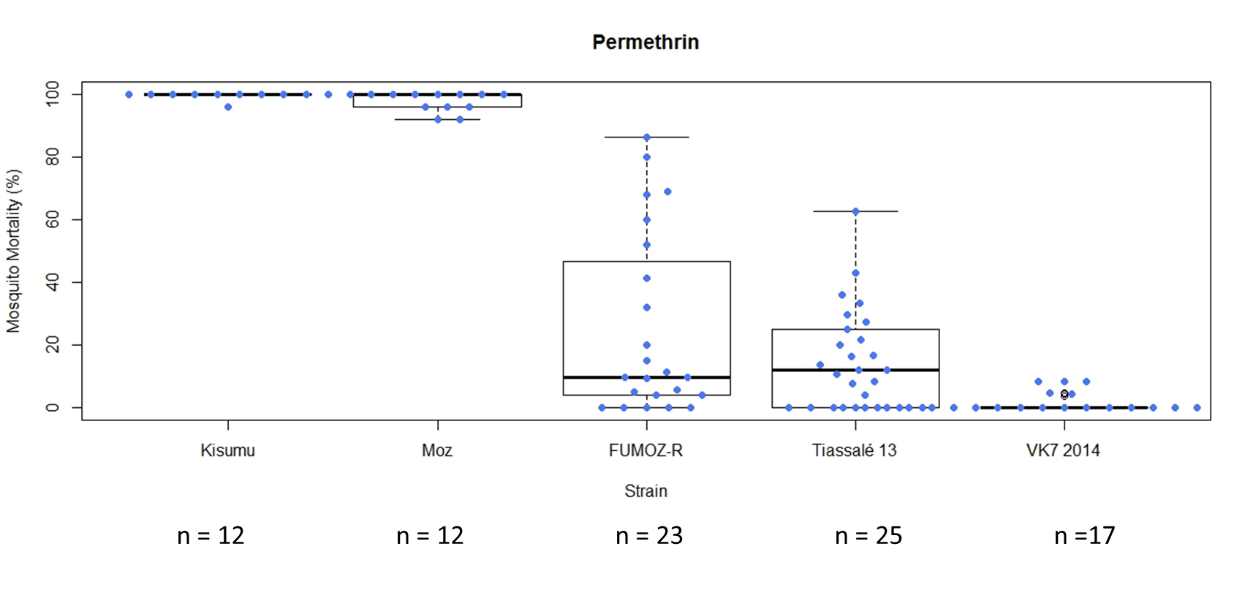
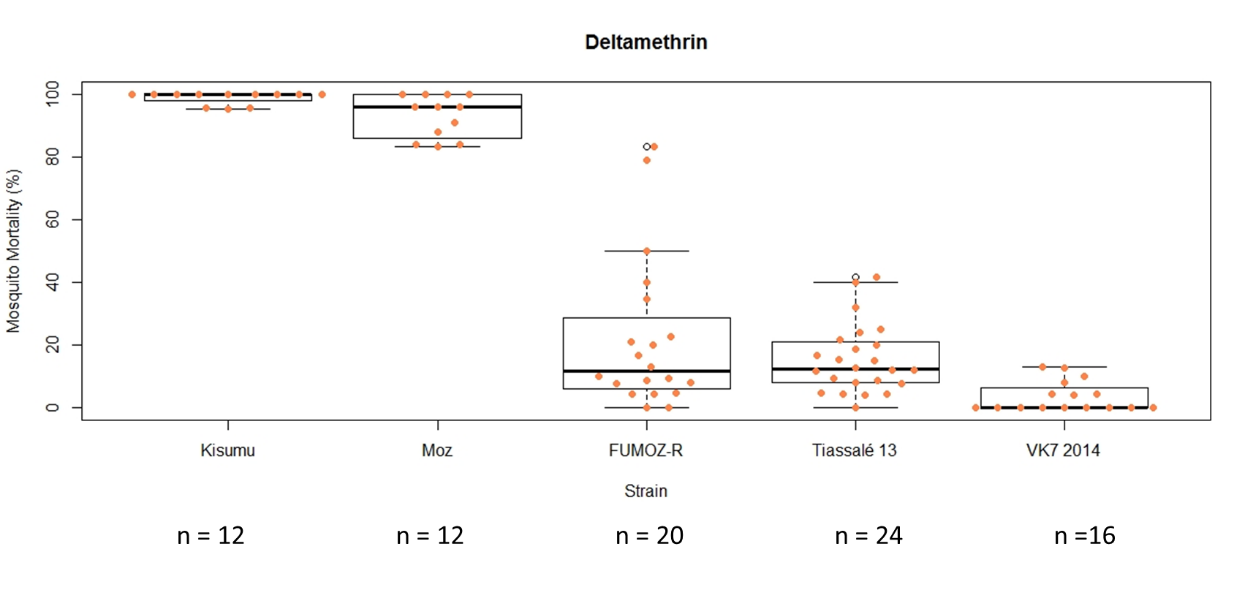


Figure S6. Box plot summarising mosquito mortality following exposure to deltamethrin 0.05% (top), permethrin 0.75% (middle), or α-cypermethrin 0.05% (bottom) in a standard WHO tube bioassay in Ranson group strains. Each box represents a different mosquito strain. Coloured circles and n-numbers indicate each individual tube replicate.

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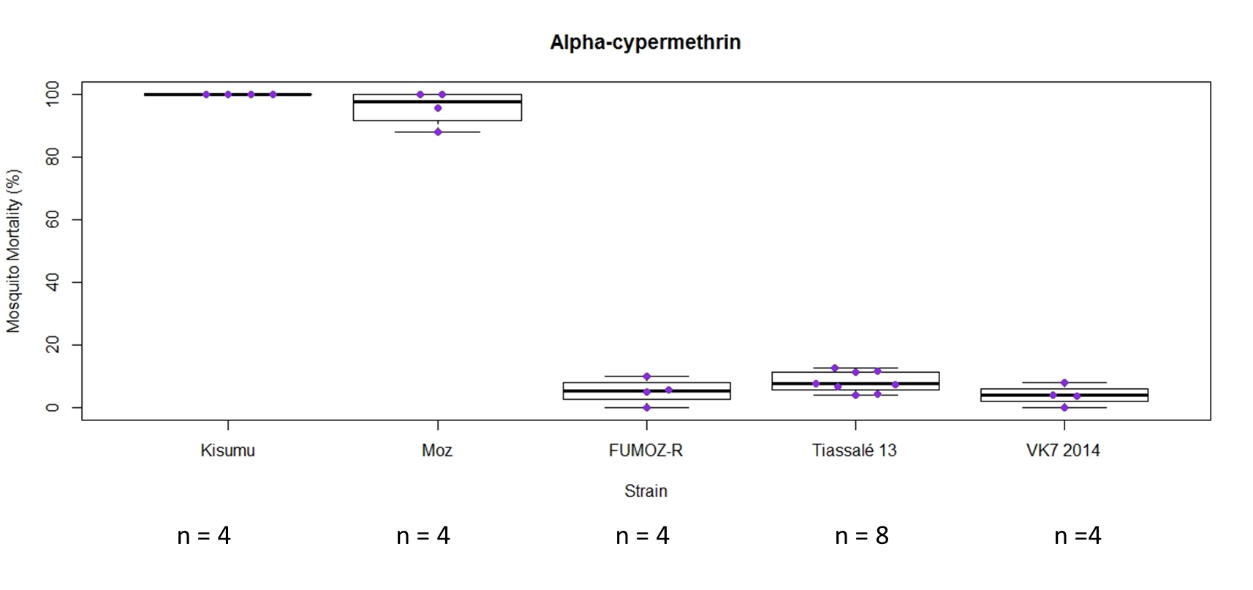
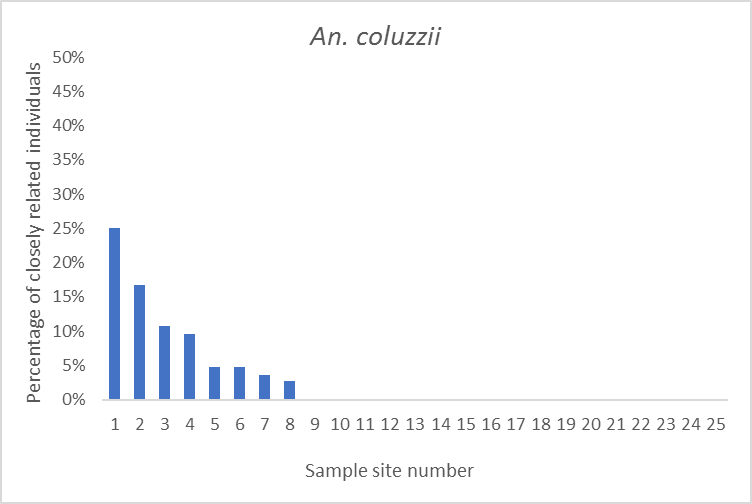
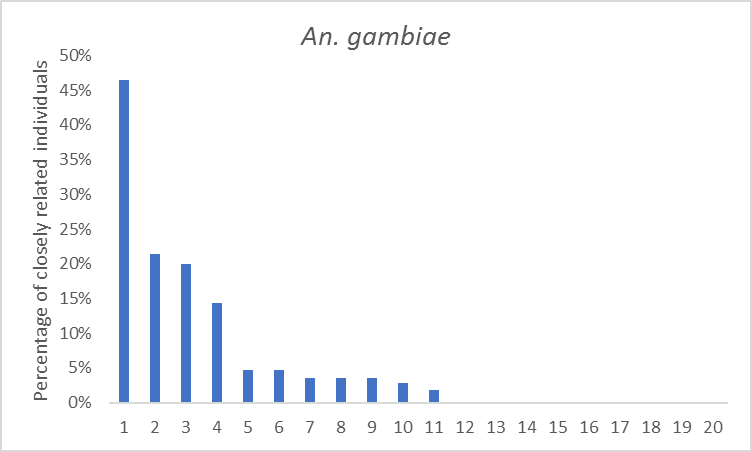
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Figure S7. Box plot summarising mosquito mortality following exposure to deltamethrin 0.05% (top), permethrin 0.75% (middle), or α-cypermethrin 0.05% (bottom) in a standard WHO tube bioassay in LITE strains. Each box represents a different mosquito strain. Coloured circles and n-numbers indicate each individual tube replicate.



B

A

A

Figure S8. Distribution of larval relatedness of (A) An. gambiae and (B) An. Coluzzii within breeding sites sampled across multiple locations in 2016 from southern Ghana. Individuals (median N=7 per site) were genotyped by reduced coverage whole genome sequencing and pairwise relatedness categories estimated from chromosome 3 data (2229 SNP markers) as siblings or unrelated using ML-Relate (Kalinowski 2006). The percentage of sibling relationships is shown. Sample site numbers are nominal and are not equivalent between plots.