**Table S1. Mean values of sunflower accessions for all the traits under study**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Genotypes** | **GP** | **PH** | **ST** | **DFI** | **DFP** | **HD** | **AYP** | **DTM** | **HAW** | **NLP** | **OC** | **PC** | **LA** | **OA** |  |
| **Hybrids** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **A-20 × R-39** | 95 | 147 | 3 | 71 | 76 | 19.4 | 61.2 | 106.3 | 5.3 | 29.7 | 35.7 | 18 | 20.9 | 63.4 |  |
| **A-20 × R-86** | 95 | 149.3 | 3.2 | 71.3 | 77.3 | 20.3 | 63 | 108.7 | 5.4 | 30 | 36.5 | 17.7 | 20.6 | 65.6 |  |
| **A-20 × R-114** | 93.3 | 168.3 | 3.5 | 71 | 75.7 | 22.8 | 62.4 | 110.3 | 5.5 | 31 | 36.8 | 17.3 | 23.2 | 63.3 |  |
| **A-42 × R-39** | 95 | 155.7 | 3.5 | 86.3 | 91.3 | 24.2 | 70.5 | 120.7 | 5.3 | 33.3 | 36.4 | 16.9 | 23.6 | 60.6 |  |
| **A-42 × R-86** | 95 | 166.7 | 3.7 | 85.3 | 91.3 | 26.7 | 72.1 | 120.7 | 5.7 | 34.3 | 36.7 | 17.3 | 24.8 | 60.6 |  |
| **A-42 × R-114** | 95 | 174.3 | 3.8 | 85 | 91.3 | 24.4 | 71.1 | 122.7 | 5.7 | 34.7 | 36.8 | 16.8 | 25.1 | 60 |  |
| **A-47 × R-39** | 91.7 | 143 | 4.1 | 74.3 | 79.3 | 19.7 | 55.3 | 109.7 | 5.3 | 29 | 37 | 16.6 | 19.5 | 66 |  |
| **A-47 × R-86** | 91.7 | 160.7 | 4.2 | 72.3 | 77 | 20.1 | 59.8 | 108.3 | 5.4 | 27 | 37.3 | 16.6 | 21.1 | 63.8 |  |
| **A-47 × R-114** | 91.7 | 176.3 | 4.2 | 76.3 | 82 | 23.1 | 61.8 | 112.3 | 5.4 | 27.7 | 37.7 | 15.9 | 22.8 | 62 |  |
| **A-51 × R-39** | 95 | 149.7 | 4.2 | 72.3 | 77.3 | 28.2 | 58.7 | 107.3 | 4.7 | 30.7 | 38.3 | 15.5 | 22.1 | 62.3 |  |
| **A-51 × R-86** | 91.7 | 166.3 | 4.3 | 72.3 | 77.7 | 29.1 | 59.5 | 107.7 | 4.9 | 28.3 | 37.9 | 15.6 | 21.5 | 64.4 |  |
| **A-51 × R-114** | 90 | 171.7 | 4.2 | 75.7 | 82.7 | 24.1 | 67.8 | 113.7 | 4.9 | 31 | 38.4 | 15 | 26.9 | 59 |  |
| **A-90 × R-39** | 91.7 | 146.3 | 2.9 | 71.7 | 77 | 22.2 | 55.7 | 106 | 6.5 | 25.7 | 36.5 | 16.6 | 25.7 | 61.5 |  |
| **A-90 × R-86** | 93.3 | 162.7 | 2.9 | 69.7 | 74.7 | 22.9 | 59 | 106 | 6.4 | 26.7 | 37 | 16 | 22.3 | 64.8 |  |
| **A-90 × R-114** | 93.3 | 168.3 | 3.3 | 71.7 | 78.7 | 24.2 | 65.3 | 109.3 | 6.3 | 29.7 | 38.3 | 15.7 | 28.8 | 57.3 |  |
| **A-92 × R-39** | 95 | 151.7 | 3.7 | 83.7 | 90 | 21.1 | 68.3 | 119.7 | 6.5 | 30.3 | 36.5 | 16.8 | 22 | 64 |  |
| **A-92 × R-86** | 95 | 158.3 | 4 | 84 | 90.7 | 22.7 | 77.1 | 120.7 | 6.5 | 33.7 | 35.7 | 16.8 | 26.1 | 60.7 |  |
| **A-92 × R-114** | 95 | 165 | 4 | 85 | 91.3 | 23.9 | 75 | 123 | 6.5 | 34.7 | 36.4 | 16.2 | 27.8 | 58.7 |  |
| **A-106 × R-39** | 91.7 | 149.3 | 3.4 | 69 | 74 | 24.2 | 50.8 | 105.7 | 5.5 | 26.7 | 35.5 | 16.3 | 20.8 | 65.7 |  |
| **A-106 × R-86** | 90 | 160 | 3.6 | 69 | 73.7 | 24.2 | 64.2 | 104 | 5.4 | 28.3 | 35.4 | 16.3 | 26.7 | 59.1 |  |
| **A-106 × R-114** | 93.3 | 167 | 3.5 | 71.3 | 77.3 | 24 | 59.2 | 107.7 | 5.4 | 27.7 | 36.5 | 15.3 | 22.2 | 64.3 |  |
| **A-Lines** | | | | | | | | | | | | | | | |
| **A-20** | 93.3 | 124.3 | 2.7 | 65 | 68.7 | 16.8 | 18.5 | 96 | 4.7 | 24.3 | 34 | 17.1 | 13.5 | 72.8 |  |
| **A-42** | 88.3 | 132.3 | 3 | 76.3 | 81.7 | 19.2 | 20.4 | 110 | 4.9 | 26.7 | 33.6 | 18 | 11.9 | 74.4 |  |
| **A-47** | 91.7 | 137 | 3.3 | 68.3 | 69.7 | 17.5 | 17.8 | 96.7 | 4.4 | 24.3 | 34.9 | 17.7 | 14.3 | 71.3 |  |
| **A-51** | 88.3 | 132.7 | 3.5 | 66.3 | 71.7 | 22.4 | 18 | 98.7 | 3.8 | 23 | 33.7 | 16.9 | 13.5 | 71.9 |  |
| **A-90** | 90 | 125.7 | 2.8 | 67.7 | 72.3 | 17 | 18.3 | 99.7 | 5.6 | 22 | 33 | 17.9 | 12.7 | 72.9 |  |
| **A-92** | 93.3 | 127.3 | 3.3 | 71.3 | 76 | 18.4 | 20.3 | 104.7 | 5.4 | 25 | 32.6 | 17.4 | 12.8 | 74.6 |  |
| **A-106** | 91.7 | 126.7 | 2.9 | 66.7 | 71.7 | 19.6 | 17.7 | 98.7 | 4.5 | 22.3 | 33 | 17.4 | 12.5 | 72.7 |  |
| **R-Lines** | | | | | | | | | | | | | | | |
| **R-39** | 95 | 131.3 | 2.5 | 65.7 | 70.3 | 16 | 14.3 | 97.3 | 2.8 | 22.3 | 31 | 18.1 | 63.4 | 21.4 |  |
| **R-86** | 91.7 | 133.3 | 2.3 | 69.3 | 74.3 | 10.4 | 9.7 | 101.3 | 2.3 | 26.8 | 31.3 | 18.2 | 66.2 | 17.8 |  |
| **R-114** | 93.3 | 138.3 | 2.6 | 70.3 | 75.3 | 9.3 | 9.6 | 102.3 | 2.4 | 27.9 | 32 | 18.1 | 67.9 | 16.4 |  |
| **Averages** | | | | | | | | | | | | | | | |
| **Hybrids** | 93.3 | 159.9 | 3.7 | 75.6 | 81.3 | 23.4 | 63.7 | 111.9 | 5.6 | 30 | 36.8 | 16.4 | 23.5 | 62.2 |  |
| **A-Lines** | 91 | 129.4 | 3.1 | 68.8 | 73.1 | 18.7 | 18.7 | 100.6 | 4.8 | 24 | 33.6 | 17.5 | 13 | 72.9 |  |
| **R-Lines** | 93.3 | 134.3 | 2.4 | 68.4 | 73.3 | 11.9 | 11.2 | 100.3 | 2.5 | 25.7 | 31.4 | 18.1 | 65.8 | 18.5 |  |
| **Total** | 92.7 | 150.5 | 3.4 | 73.4 | 78.6 | 21.2 | 48.5 | 108.2 | 5.1 | 28.2 | 35.6 | 16.8 | 25.3 | 60.4 |  |

Note: GP= germination %, Ph=Plant Height, ST= stem thickness, DFI= days flower initiation, DFP= days 50% flowering, HD= head diameter, AYP= achene yield per plant, DTM= days taken to mature, HAW= hundred achene weight, NLP= No. of leaves/plant, OC=oil contents, PC= protein contents, LA=linoleic acid, OA= oleic acid.

**Table S2. Assessment of SCA for yield and related traits**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Crosses** | **GP** | **PH** | **ST** | **DFI** | **DFP** | **HD** | **AYP** | **DTM** | **HSW** | **NLP** | **OC** | **PC** | **LA** | **OA** |
| **A-20 × R-39** | 0.24 | 1.11 | -0.08 | -0.54 \* | -0.83 \*\* | -0.80 \* | 3.66 \*\* | -1.48 \*\* | 50.40\*\* | 0.05 | -0.16 | 0.02 | 0.004 | 0.32 |
| **A-20 × R-86** | 0.71 | -1.6 | -0.05 | 0.94 \*\* | 1.41 \*\* | -0.33 | -0.97 \*\* | 1.00 \*\* | 68.34\*\* | 0.38 | 0.26 \* | 0.01 | 0.11 | 0.14 |
| **A-20 × R-14** | -0.95 | 0.49 | 0.14 | -0.4 | -0.59 \* | 1.13 \*\* | -2.69 \*\* | 0.48 | 59.44\*\* | -0.43 | -0.1 | -0.03 | -0.11 | -0.46 \* |
| **A-42 × R-39** | -0.32 | 2.67 \*\* | -0.03 | 0.46 | -0.16 | 0.03 | 1.98 \*\* | 0.3 | 56.26\*\* | 0.16 | 0.12 | -0.03 | -0.43 \* | 0.18 |
| **A-42 × R-86** | 0.16 | -0.71 | 0 | -0.06 | 0.08 | 0.27 | 0.05 | -0.56 | 70.93\*\* | -0.51 | -0.14 | 0.07 \* | 0.15 | 0.3 |
| **A-42 × R-114** | 0.16 | -1.95 \* | 0.03 | -0.4 | 0.08 | -0.3 | -2.03 \*\* | 0.25 | 64.82\*\* | 0.35 | 0.03 | -0.04 | 0.27 | -0.48 \* |
| **A-47 × R-39** | -0.32 | -1.22 | 0.1 | 0.24 | 0.51 | -0.76 \* | 0.29 | 1.41 \*\* | 54.52\*\* | -0.4 | -0.19 | 0.07 \*\* | 0.18 | 0.01 |
| **A-47 × R-86** | 0.16 | 1.4 | 0.02 | -0.29 | -0.92 \*\* | -0.95 \* | -1.40 \*\* | -0.78 \* | 70.49\*\* | -0.06 | 0.03 | -0.03 | 0.02 | -0.13 |
| **A-47 × R-114** | 0.16 | -0.17 | -0.12 | 0.05 | 0.41 | 1.71 \*\* | 1.11 \*\* | -0.63 | 63.54\*\* | 0.46 | 0.16 | -0.04 | -0.2 | 0.12 |
| **A-51 × R-39** | 2.46 \* | 0.11 | 0.11 | 0.24 | 0.06 | 1.46 \*\* | 1.23 \*\* | 0.75 \* | 51.38\*\* | 0.38 | 0.12 | -0.12 \*\* | 0.24 | -0.13 |
| **A-51 × R-86** | -0.4 | 0.06 | 0.06 | -0.62 \* | -0.37 | 1.66 \*\* | -4.96 \*\* | -0.11 | 75.52\*\* | 0.38 | -0.12 | 0.08 \*\* | -0.17 | -0.27 |
| **A-51 × R-114** | -2.06 | -0.17 | -0.17 \* | 0.38 | 0.3 | -3.13 \*\* | 3.73 \*\* | -0.63 | 64.51\*\* | -0.76 \*\* | 0.01 | 0.04 | -0.07 | 0.41 \* |
| **A-90 × R-39** | -1.43 | -0.56 | 0.06 | -0.43 | -0.27 | -0.25 | -2.35 \*\* | -0.25 | 56.68\*\* | -0.17 | 0.05 | 0.01 | -0.03 | 0.14 |
| **A-90 × R-86** | 0.71 | -0.27 | -0.20 \*\* | 0.38 | 0.63 \* | -0.33 | 0.68 \* | 0.22 | 70.44\*\* | -0.17 | -0.14 | -0.07 \* | 0.67 \*\* | -0.26 |
| **A-90 × R-114** | 0.71 | 0.83 | 0.15 \* | 0.05 | -0.37 | 0.58 | 1.66 \*\* | 0.03 | 63.17\*\* | 0.35 | 0.09 | 0.06 \* | -0.64 \*\* | 0.12 |
| **A-92 × R-39** | -0.32 | 0 | -0.05 | -0.54 \* | -0.27 | -0.45 | -0.57 \* | -0.81 \* | 66.57\*\* | -0.17 | -0.1 | -0.02 | -0.05 | -0.29 |
| **A-92 × R-86** | 0.16 | -0.71 | 0.08 | -0.06 | -0.37 | -0.18 | 1.59 \*\* | 0.67 | 79.59\*\* | -0.17 | 0.18 | -0.02 | -0.14 | -0.04 |
| **A-92 × R-114** | 0.16 | 0.71 | -0.03 | 0.60 \* | 0.63 \* | 0.64 | -1.02 \*\* | 0.14 | 74.50\*\* | 0.35 | -0.08 | 0.04 | 0.19 | 0.33 |
| **A-106 × R-39** | -0.32 | -2.11 \* | -0.11 | 0.57 \* | 0.95 \*\* | 0.77 \* | -4.25 \*\* | 0.08 | 59.76\*\* | 0.16 | 0.16 | 0.06 \* | 0.08 | -0.23 |
| **A-106 × R-86** | -1.51 | 1.84 \* | 0.1 | -0.29 | -0.48 | -0.14 | 5.02 \*\* | -0.44 | 71.89\*\* | 0.16 | -0.06 | -0.04 | -0.64 \*\* | 0.25 |
| **A-106 × R-114** | 1.83 | 0.27 | 0.01 | -0.29 | -0.48 | -0.63 | -0.77 \*\* | 0.37 | 65.90\*\* | -0.32 | -0.1 | -0.02 | 0.56 \*\* | -0.02 |
| **SE** | 1.18 | 0.837 | 0.071 | 0.265 | 0.272 | 0.369 | 0.28 | 0.352 | 0.021 | 0.269 | 0.126 | 0.027 | 0.185 | 0.199 |

\* = Significant at *p* < 0.05, \*\* = Significant at *p* < 0.01

**Table S3: Heterosis manifestation (mid parent).**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Crosses** | **GP** | **PH** | **ST** | **DFI** | **DFP** | **HD** | **AYP** | **DTM** | **HSW** | **NLP** | **OC** | **PC** | **LA** | **OA** |
| **A-20 × R-39** | 0.88 | 16.56\*\* | 18.63\*\* | 6.84 \*\* | 6.97 \*\* | 19.87\*\* | 3.66 \*\* | 11.49\*\* | 50.40\*\* | 5.66 \*\* | 12.50\*\* | -2.17 \*\* | -65.04\*\* | 55.21\*\* |
| **A-20 × R-86** | 2.7 | 23.50\*\* | 29.40\*\* | 6.46 \*\* | 7.54 \*\* | 44.19\*\* | -0.97 \*\* | 11.55\*\* | 68.34\*\* | 6.68 \*\* | 16.37\*\* | 0.75 | -65.47\*\* | 59.82\*\* |
| **A-20 × R-114** | 0 | 29.14\*\* | 36.50\*\* | 3.57 \*\* | 4.35 \*\* | 53.93\*\* | -2.69 \*\* | 10.97\*\* | 59.44\*\* | 0.96 | 13.25\*\* | -0.37 | -67.61\*\* | 61.17\*\* |
| **A-42 × R-39** | 3.64 | 20.37\*\* | 25.60\*\* | 18.16\*\* | 18.91\*\* | 44.56\*\* | 1.98 \*\* | 16.56\*\* | 56.26\*\* | 14.12\*\* | 19.13\*\* | -5.11 \*\* | -69.54\*\* | 56.05\*\* |
| **A-42 × R-86** | 5.56 \*\* | 26.68\*\* | 36.28\*\* | 14.76\*\* | 16.52\*\* | 68.55\*\* | 0.05 | 13.40\*\* | 70.93\*\* | 11.43\*\* | 20.97\*\* | -1.59 \*\* | -68.62\*\* | 61.24\*\* |
| **A-42 × R-114** | 4.59 \* | 29.68\*\* | 36.60\*\* | 13.41\*\* | 16.19\*\* | 63.71\*\* | -2.03 \*\* | 14.06\*\* | 64.82\*\* | 11.61\*\* | 19.40\*\* | -3.16 \*\* | -69.87\*\* | 62.19\*\* |
| **A-47 × R-39** | -1.79 | 18.38\*\* | 36.52\*\* | 8.25 \*\* | 8.74 \*\* | 20.90\*\* | 0.29 | 12.32\*\* | 54.52\*\* | 0.47 | 9.38 \*\* | -2.39 \*\* | -65.25\*\* | 54.78\*\* |
| **A-47 × R-86** | 0 | 29.31\*\* | 42.77\*\* | 4.81 \*\* | 4.04 \*\* | 40.15\*\* | -1.40 \*\* | 7.87 \*\* | 70.49\*\* | 1.69 | 12.57\*\* | -0.25 | -66.35 \*\* | 59.59\*\* |
| **A-47 × R-114** | -0.9 | 31.98\*\* | 36.55\*\* | 4.50 \*\* | 5.66 \*\* | 58.46\*\* | 1.11 \*\* | 7.96 \*\* | 63.54\*\* | 0.83 | 11.01\*\* | -1.10 \*\* | -68.44 \*\* | 62.91\*\* |
| **A-51 × R-39** | 3.64 | 18.09\*\* | 31.56\*\* | 7.85 \*\* | 6.60 \*\* | 54.75\*\* | 1.23 \*\* | 11.51\*\* | 51.38\*\* | 4.98 \*\* | 15.29\*\* | -4.17 \*\* | -66.44 \*\* | 54.51\*\* |
| **A-51 × R-86** | 1.85 | 27.13\*\* | 38.01\*\* | 3.86 \*\* | 3.35 \*\* | 77.16\*\* | -4.96 \*\* | 8.36 \*\* | 75.52\*\* | 4.78 \*\* | 17.14\*\* | 0.12 | -68.11 \*\* | 59.19\*\* |
| **A-51 × R-114** | -0.92 | 30.93\*\* | 29.92\*\* | 4.57 \*\* | 4.04 \*\* | 46.62\*\* | 3.73 \*\* | 7.81 \*\* | 64.51\*\* | -2.56 | 15.50\*\* | -0.97 \* | -69.40 \*\* | 63.38\*\* |
| **A-90 × R-39** | -0.9 | 16.87\*\* | 20.47\*\* | 5.45 \*\* | 5.62 \*\* | 42.68\*\* | -2.35 \*\* | 11.33\*\* | 56.68\*\* | 0.27 | 18.71\*\* | -5.11 \*\* | -65.62 \*\* | 55.81\*\* |
| **A-90 × R-86** | 2.75 | 26.33\*\* | 19.13\*\* | 4.08 \*\* | 4.31 \*\* | 66.19\*\* | 0.68 \* | 9.45 \*\* | 70.44\*\* | 0.2 | 20.76\*\* | -2.82 \*\* | -64.53 \*\* | 60.00\*\* |
| **A-90 × R-114** | 1.82 | 31.24\*\* | 32.95\*\* | 2.77 \*\* | 2.61 \*\* | 72.08\*\* | 1.66 \*\* | 9.21 \*\* | 63.17\*\* | -0.65 | 19.39\*\* | -2.67 \*\* | -69.43 \*\* | 63.57\*\* |
| **A-92 × R-39** | 0.88 | 15.88\*\* | 21.64\*\* | 20.20\*\* | 22.86\*\* | 30.84\*\* | -0.57 \* | 20.98\*\* | 66.57\*\* | 1.81 | 21.06\*\* | -6.12 \*\* | -70.26 \*\* | 56.81\*\* |
| **A-92 × R-86** | 2.7 | 24.60\*\* | 34.68\*\* | 18.11\*\* | 19.81\*\* | 54.42\*\* | 1.59 \*\* | 19.87\*\* | 79.59\*\* | 1.69 | 24.60\*\* | -3.34 \*\* | -71.00 \*\* | 62.33\*\* |
| **A-92 × R-114** | 1.79 | 29.83\*\* | 30.21\*\* | 18.14\*\* | 20.83\*\* | 59.31\*\* | -1.02 \*\* | 19.24\*\* | 74.50\*\* | 0.83 | 21.66\*\* | -3.68 \*\* | -71.68 \*\* | 65.84\*\* |
| **A-106 × R-39** | -1.79 | 15.85\*\* | 22.27\*\* | 4.19 \*\* | 4.43 \*\* | 45.20\*\* | -4.25 \*\* | 10.10\*\* | 59.76\*\* | 4.73 \*\* | 11.56\*\* | -3.21 \*\* | -67.42 \*\* | 56.84\*\* |
| **A-106 × R-86** | -1.82 | 28.40\*\* | 39.82\*\* | 0.26 | -0.24 | 61.23\*\* | 5.02 \*\* | 7.24 \*\* | 71.89\*\* | 4.54 \*\* | 13.48\*\* | -1.10 \*\* | -69.89 \*\* | 62.93\*\* |
| **A-106 ×R-114** | 0.9 | 31.22\*\* | 35.62\*\* | -0.51 | -0.48 | 56.99\*\* | -0.77 \*\* | 7.99 \*\* | 65.90\*\* | 0 | 11.32\*\* | -1.70 \*\* | -68.42 \*\* | 65.06\*\* |
| **SE** | 1.777 | 1.713 | 0.083 | 0.558 | 0.566 | 0.417 | 0.471 | 0.578 | 0.038 | 0.341 | 0.34 | 0.057 | 0.271 | 0.282 |

\* = Significant at *p* < 0.05, \*\* = Significant at *p* < 0.01

**Table S4. Heterosis manifestation (better parent)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Crosses** | **GP** | **PH** | **ST** | **DFI** | **DFP** | **HD** | **AYP** | **DTM** | **HSW** | **NLP** | **OC** | **PC** | **LA** | **OA** |
| **A-20 × R-39** | 0 | 15.49\*\* | 14.64\*\* | 6.28 \*\* | 5.91 \*\* | 13.51\*\* | 230.58\*\* | 10.74\*\* | 19.07\*\* | 1.57 | 8.11 \*\* | -7.11\*\* | -78.78\*\* | 0.39 |
| **A-20 × R-86** | 1.79 | 22.86\*\* | 19.17\*\* | 4.04 \*\* | 4.25 \*\* | 21.62\*\* | 229.84\*\* | 8.33 \*\* | 24.98\*\* | 5.20 \*\* | 10.86\*\* | -1.70\*\* | -79.20\*\* | -0.63 |
| **A-20 × R-114** | 0 | 26.38\*\* | 34.20\*\* | 0 | 0.47 | 29.20\*\* | 220.48\*\* | 6.94 \*\* | 20.62\*\* | 0.36 | 9.15 \*\* | -3.58\*\* | -80.57\*\* | -1.31\*\* |
| **A-42 × R-39** | 0 | 18.35\*\* | 15.01\*\* | 9.91 \*\* | 10.59\*\* | 30.04\*\* | 327.24\*\* | 10.91\*\* | 22.16\*\* | 3.52 \*\* | 15.29\*\* | -8.49\*\* | -81.92\*\* | 0.35 |
| **A-42 × R-86** | 3.64 | 26.36\*\* | 19.28\*\* | 8.56 \*\* | 10.59\*\* | 36.03\*\* | 343.38\*\* | 10.30\*\* | 25.49\*\* | 3.52 \*\* | 16.05\*\* | -2.43\*\* | -81.50\*\* | -0.25 |
| **A-42 × R-114** | 1.79 | 27.89\*\* | 27.14\*\* | 8.56 \*\* | 11.02\*\* | 31.52\*\* | 330.62\*\* | 11.82\*\* | 23.25\*\* | 5.66 \*\* | 15.91\*\* | -4.77\*\* | -82.30\*\* | -1.15\*\* |
| **A-47 × R-39** | -3.51 | 15.52\*\* | 18.67\*\* | 6.60 \*\* | 7.18 \*\* | 12.92\*\* | 242.60\*\* | 9.97 \*\* | 25.89\*\* | -1.7 | 4.64 \*\* | -6.42\*\* | -78.70\*\* | 0.86 |
| **A-47 × R-86** | 0 | 27.99\*\* | 18.97\*\* | 4.55 \*\* | 3.30 \*\* | 16.82\*\* | 260.40\*\* | 7.69 \*\* | 29.84\*\* | -2.99 \* | 6.77 \*\* | -1.70\*\* | -79.54\*\* | -0.14 |
| **A-47 × R-114** | -1.79 | 31.16\*\* | 20.51\*\* | 2.96 \*\* | 4.19 \*\* | 31.44\*\* | 276.70\*\* | 6.94 \*\* | 27.03\*\* | -5.62\*\* | 6.52 \*\* | -3.34\*\* | -80.90\*\* | 0.36 |
| **A-51 × R-39** | 0 | 17.46\*\* | 9.27 \*\* | 7.85 \*\* | 5.83 \*\* | 29.83\*\* | 280.29\*\* | 9.35 \*\* | 31.47\*\* | 2.23 | 10.85\*\* | -7.80\*\* | -79.65\*\* | 0.11 |
| **A-51 × R-86** | 0 | 25.97\*\* | 10.19\*\* | 2.02 \* | 1.89 \* | 34.73\*\* | 268.82\*\* | 8.01 \*\* | 41.51\*\* | -0.5 | 11.65\*\* | -0.97 \* | -80.81\*\* | -0.88 |
| **A-51 × R-114** | -3.57 | 27.64\*\* | 9.46 \*\* | 1.48 | 1.86 \* | 11.05\*\* | 327.83\*\* | 6.62 \*\* | 35.56\*\* | -9.20\*\* | 11.40\*\* | -2.86\*\* | -81.67\*\* | 0.18 |
| **A-90 × R-39** | -3.51 | 15.78\*\* | 13.51\*\* | 4.64 \*\* | 4.85 \*\* | 37.41\*\* | 239.14\*\* | 10.60\*\* | 15.51\*\* | -4.33\*\* | 14.75\*\* | -8.49\*\* | -79.35\*\* | 1.08 \* |
| **A-90 × R-86** | 1.82 | 23.38\*\* | 7.13 \* | 3.03 \*\* | 2.83 \*\* | 42.23\*\* | 289.83\*\* | 7.69 \*\* | 18.83\*\* | -6.72\*\* | 15.72\*\* | -3.64\*\* | -78.86\*\* | -0.26 |
| **A-90 × R-114** | 0 | 26.13\*\* | 27.40\*\* | 0.49 | 0.47 | 46.54\*\* | 296.77\*\* | 6.62 \*\* | 15.63\*\* | -9.20\*\* | 15.77\*\* | -4.30\*\* | -81.85\*\* | 0.4 |
| **A-92 × R-39** | 0 | 14.17\*\* | 5.28 | 16.10\*\* | 18.89\*\* | 21.32\*\* | 304.63\*\* | 18.27\*\* | 25.80\*\* | -0.39 | 17.36\*\* | -10.32\*\* | -82.13\*\* | 1.00 \* |
| **A-92 × R-86** | 1.79 | 21.04\*\* | 11.78\*\* | 16.10\*\* | 18.43\*\* | 27.91\*\* | 344.78\*\* | 19.87\*\* | 27.89\*\* | -2.99 \* | 19.74\*\* | -5.10\*\* | -82.70\*\* | 0.56 |
| **A-92 × R-114** | 1.79 | 24.12\*\* | 14.42\*\* | 17.56\*\* | 20.28\*\* | 31.33\*\* | 329.32\*\* | 18.30\*\* | 26.42\*\* | -5.62\*\* | 18.30\*\* | -6.21\*\* | -83.18\*\* | 1.21 \*\* |
| **A-106 × R-39** | -3.51 | 13.37\*\* | 14.23\*\* | 4.19 \*\* | 4.43 \*\* | 30.26\*\* | 230.07\*\* | 9.73 \*\* | 28.82\*\* | 2.12 | 8.50 \*\* | -6.65\*\* | -80.48\*\* | 1.37 \*\* |
| **A-106 × R-86** | -1.82 | 23.90\*\* | 24.73\*\* | -1.52 | -2.36 \* | 29.82\*\* | 325.39\*\* | 4.49 \*\* | 29.71\*\* | 4.48 \*\* | 9.41 \*\* | -1.94\*\* | -82.09\*\* | 1.23 \*\* |
| **A-106 ×R-114** | 0 | 24.62\*\* | 28.83\*\* | -3.45\*\* | -3.26\*\* | 25.83\*\* | 285.62\*\* | 4.42 \*\* | 27.64\*\* | -2.03 | 8.61 \*\* | -3.34\*\* | -81.30\*\* | 1.01 \* |
| **SE** | 2.052 | 1.978 | 0.096 | 0.644 | 0.654 | 0.482 | 0.544 | 0.667 | 0.044 | 0.394 | 0.393 | 0.066 | 0.313 | 0.326 |

\* = Significant at *p* < 0.05, \*\* = Significant at *p* < 0.01