

# Bee-pollination promotes rapid divergent evolution in plants growing in different soils

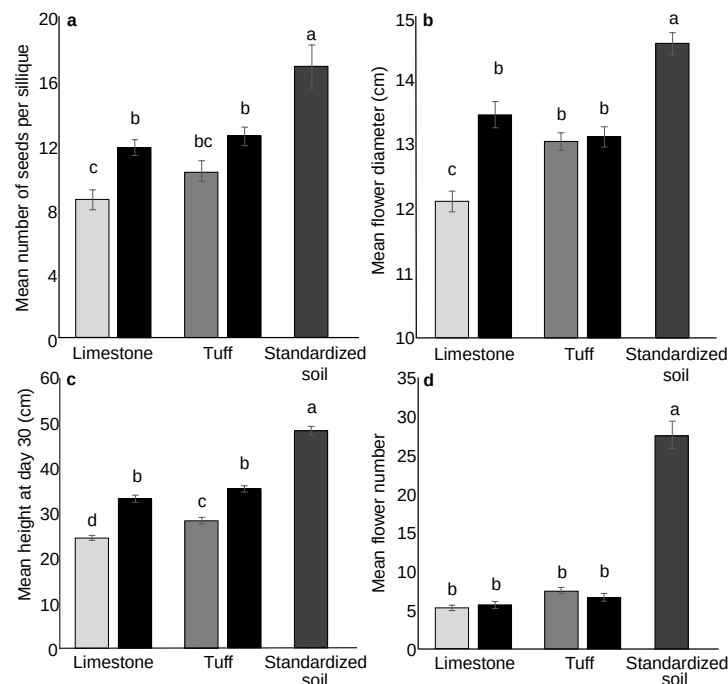
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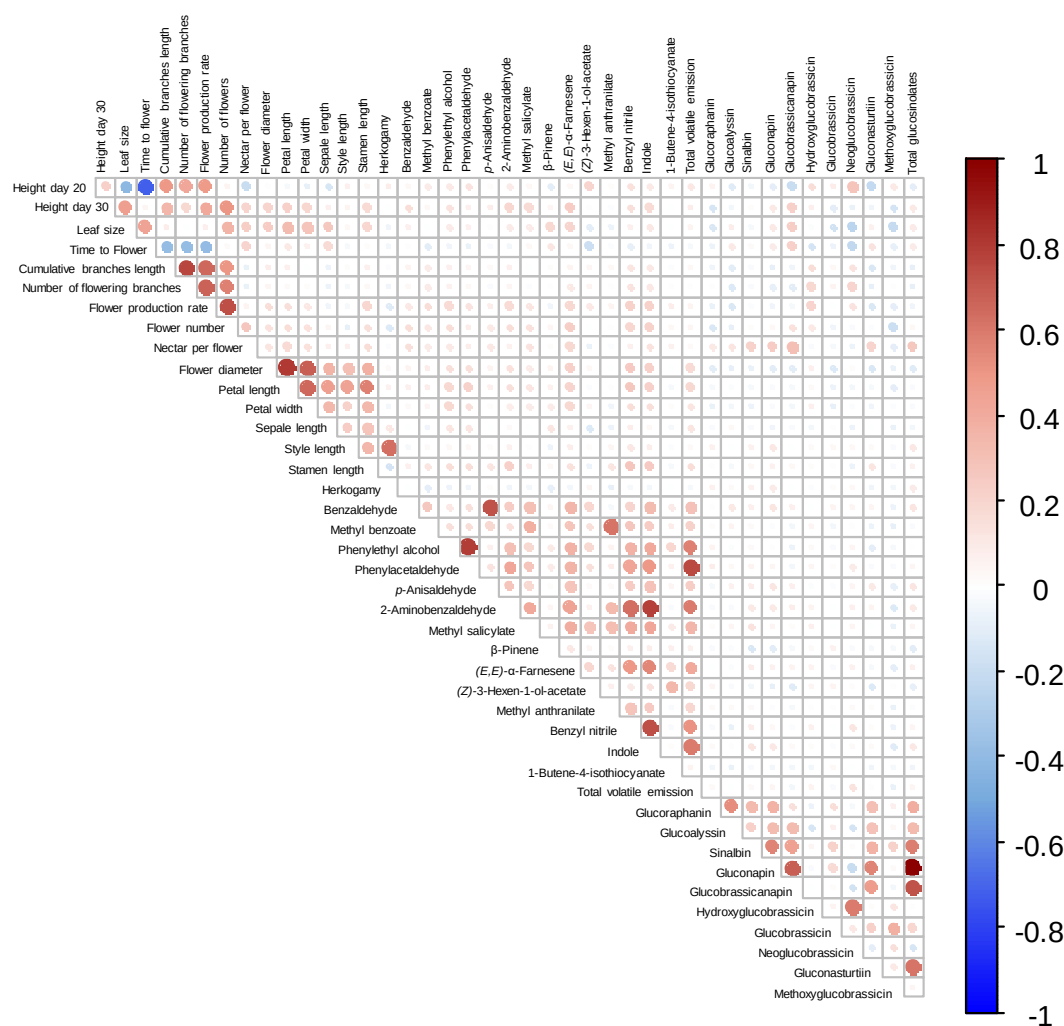
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## Supplementary Information



**Supplementary Figure 1: Impact of soil type on plants' reproduction and phenotype** (mean  $\pm$  s.e.m. values). a: on number of seeds per silique (N=421), b: on flower diameter (N=399), c: on plant height at day 30 (N=412), d: on flower number at pollination date (N=412). For limestone and tuff soil, the left bar shows the soil without fertilizer, and the right bar with fertilizer (i.e. the soil type used in the experiment starting from generation 5). The standardized soil is the soil used for growing plants in the common garden experiment for phenotyping plants. Significance was determined using a two-sided generalized mixed model with trait as dependent variable, "soil treatment" and their interaction as fixed factors (5 levels: limestone with fertilizer, limestone without fertilizer, tuff with fertilizer, tuff without fertilizer, and standardized soil) and replicate as random factors. Different letters indicate significant differences between treatments (P<0.05). We detected resource limitation in seed production in

hand-pollinated plants growing in both natural soils with or without fertilizer, as the use of standardized soil always increased seed set in plants (effect of “soil treatment”,  $\chi^2$ : 57.13,  $P < 0.001$ ). The data also show that the plants’ trait development were different after the use of fertilizer for both soil types, with significant increases in flower diameter and plant height, but overall still smaller/lower trait production that with standardized soil even with the use of fertilizer (effect of “soil treatment”,  $\chi^2$ : 608.79,  $P < 0.001$ ,  $\chi^2$ : 524.68,  $P < 0.001$ ,  $\chi^2$ : 118.34,  $P < 0.001$  for height day at 30, number of open flowers and flower diameter, respectively).



**Supplementary Figure 2: Pearson product-moment correlation heatmap using plants of all generations and treatments combined (N=515).** Nectar, scent and glucosinolates variables were  $\ln(1+x)$  transformed before correlations were calculated. Positive correlations are shown in shades of red, and negative correlation in shades of blue. The size of the circle is proportional to the correlation coefficients. Only significant correlations ( $P < 0.05$ ) are shown.

**Supplementary Table 1: Evolutionary rates assessed in haldanes (s.d. per generation) for plant traits among the different evolutionary lines.** LHB: plants that evolved in limestone with aphid-herbivory and bee-pollination, LHH: plants that evolved in limestone with aphid-herbivory and hand-pollination, LNHB: plants that evolved in limestone with no-herbivory and bee-pollination, LNHH: plants that evolved in limestone with no-herbivory and hand-pollination, THB: plants that evolved in tuff with aphid-herbivory and bee-pollination, THH: plants that evolved in tuff with aphid-herbivory and hand-pollination, TNHB: plants that evolved in tuff with no-herbivory and bee-pollination, TNHH: plants that evolved in tuff with no-herbivory and hand-pollination. Bold indicates evolutionary changes in traits that had significantly different mean values between generation 10 and generation one.

|                                      | LHB          | LHH          | LNHB         | LNHH         | THB          | THH          | TNHB         | TNHH         |
|--------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| <i>Morphology</i>                    |              |              |              |              |              |              |              |              |
| Height day 20 (cm)                   | 0.00         | -0.02        | -0.02        | -0.02        | <b>-0.12</b> | 0.00         | <b>-0.07</b> | -0.02        |
| Height day 30 (cm)                   | <b>-0.06</b> | 0.00         | <b>-0.05</b> | -0.02        | -0.02        | -0.02        | <b>0.07</b>  | 0.02         |
| Flowering time (day)                 | 0.00         | <b>0.05</b>  | 0.02         | <b>0.05</b>  | <b>0.11</b>  | 0.02         | <b>0.11</b>  | <b>0.03</b>  |
| Leaf size (cm <sup>2</sup> )         | -0.02        | 0.02         | 0.01         | 0.02         | <b>0.08</b>  | -0.01        | <b>0.11</b>  | 0.04         |
| Cumulative branches length (cm)      | 0.00         | 0.01         | 0.00         | <b>-0.03</b> | <b>-0.02</b> | 0.02         | 0.01         | 0.00         |
| Number of flowering branches         | 0.02         | 0.02         | 0.02         | -0.02        | -0.01        | 0.00         | -0.01        | 0.01         |
| Flower production rate (per day)     | 0.00         | <b>0.07</b>  | 0.02         | 0.04         | <b>0.11</b>  | 0.01         | <b>0.10</b>  | <b>0.07</b>  |
| Flower number                        | 0.00         | <b>0.05</b>  | 0.03         | 0.03         | <b>0.06</b>  | 0.00         | <b>0.07</b>  | <b>0.06</b>  |
| Nectar amount (nL/flower)            | -0.01        | 0.03         | -0.01        | 0.01         | <b>0.04</b>  | <b>0.04</b>  | <b>0.07</b>  | <b>0.06</b>  |
| Flower diameter (mm)                 | 0.02         | <b>-0.03</b> | <b>0.03</b>  | -0.01        | <b>0.04</b>  | -0.01        | <b>0.05</b>  | <b>-0.04</b> |
| Petal length (cm)                    | 0.01         | -0.03        | 0.01         | -0.01        | <b>0.03</b>  | -0.01        | 0.03         | <b>-0.04</b> |
| Petal width (cm)                     | 0.02         | <b>-0.05</b> | <b>0.05</b>  | 0.01         | 0.01         | -0.03        | 0.02         | 0.00         |
| Sepale length (cm)                   | <b>-0.04</b> | <b>-0.04</b> | 0.01         | 0.00         | -0.01        | -0.01        | 0.01         | -0.03        |
| Style length (cm)                    | -0.03        | -0.01        | -0.03        | -0.02        | -0.02        | 0.00         | -0.01        | <b>-0.05</b> |
| Stamen length (cm)                   | -0.02        | -0.02        | -0.03        | -0.02        | 0.03         | -0.01        | -0.02        | 0.01         |
| Herkogamy                            | -0.01        | 0.01         | -0.01        | -0.01        | 0.00         | 0.02         | 0.00         | -0.03        |
| <i>Floral Scent</i>                  |              |              |              |              |              |              |              |              |
| <b>Aromatic compounds</b>            |              |              |              |              |              |              |              |              |
| Benzaldehyde                         | 0.00         | -0.03        | 0.02         | <b>0.04</b>  | <b>0.04</b>  | <b>0.07</b>  | <b>0.05</b>  | 0.02         |
| Methyl benzoate                      | <b>0.05</b>  | -0.01        | 0.00         | 0.00         | <b>-0.03</b> | 0.00         | 0.01         | <b>-0.05</b> |
| Phenylethyl alcohol                  | 0.01         | 0.02         | <b>0.04</b>  | <b>0.07</b>  | -0.03        | 0.00         | -0.01        | 0.01         |
| Phenylacetaldehyde                   | 0.02         | 0.01         | 0.03         | <b>0.09</b>  | <b>-0.05</b> | 0.00         | -0.02        | -0.02        |
| <i>p</i> -Anisaldehyde               | 0.01         | 0.00         | 0.03         | 0.02         | 0.03         | <b>0.03</b>  | 0.02         | -0.02        |
| 2-Aminobenzaldehyde                  | 0.01         | <b>0.03</b>  | -0.02        | 0.02         | -0.02        | 0.00         | 0.01         | -0.02        |
| Methyl salicylate                    | 0.03         | 0.00         | -0.01        | 0.02         | 0.00         | -0.02        | 0.02         | -0.03        |
| <b>Terpenoids</b>                    |              |              |              |              |              |              |              |              |
| β-Pinene                             | -0.03        | -0.02        | -0.02        | -0.03        | -0.02        | -0.03        | -0.01        | -0.02        |
| ( <i>E,E</i> )-α-Farnesene           | -0.02        | -0.01        | 0.02         | 0.03         | 0.03         | 0.03         | <b>0.05</b>  | -0.01        |
| <b>Fatty acid derivatives</b>        |              |              |              |              |              |              |              |              |
| ( <i>Z</i> )-3-Hexen-1-ol-acetate    | 0.01         | -0.01        | 0.01         | 0.00         | <b>-0.05</b> | 0.02         | 0.02         | -0.01        |
| <b>Nitrogen containing compounds</b> |              |              |              |              |              |              |              |              |
| Methyl anthranilate                  | <b>0.04</b>  | 0.02         | <b>-0.06</b> | 0.00         | <b>-0.07</b> | <b>-0.04</b> | -0.03        | <b>-0.08</b> |
| Benzyl nitrile                       | <b>0.06</b>  | 0.01         | <b>0.03</b>  | 0.03         | 0.00         | 0.01         | 0.00         | -0.01        |
| Indole                               | <b>0.04</b>  | <b>0.03</b>  | 0.00         | 0.03         | 0.02         | 0.01         | 0.03         | 0.00         |

### Sulphur containing compounds

|                            |              |              |              |              |              |       |              |             |
|----------------------------|--------------|--------------|--------------|--------------|--------------|-------|--------------|-------------|
| 1-Butene-4-isothiocyanate  | -0.01        | 0.00         | 0.02         | <b>0.04</b>  | 0.00         | 0.03  | 0.02         | 0.03        |
| <i>Leaf glucosinolates</i> |              |              |              |              |              |       |              |             |
| Glucoraphanin              | -0.02        | 0.00         | <b>-0.05</b> | 0.01         | <b>-0.04</b> | 0.01  | <b>-0.05</b> | -0.03       |
| Glucoalyssin               | <b>-0.04</b> | -0.01        | 0.03         | 0.03         | 0.02         | 0.01  | 0.00         | 0.01        |
| Sinalbin                   | -0.02        | -0.02        | -0.03        | -0.01        | 0.00         | 0.00  | -0.01        | -0.01       |
| Gluconapin                 | <b>-0.05</b> | -0.01        | -0.04        | -0.01        | 0.00         | -0.01 | -0.01        | 0.03        |
| Glucobrassicinapin         | -0.03        | <b>0.04</b>  | -0.02        | -0.02        | 0.00         | 0.02  | <b>0.06</b>  | <b>0.06</b> |
| Hydroxyglucobrassicin      | -0.01        | -0.02        | -0.03        | <b>-0.07</b> | <b>-0.09</b> | -0.01 | -0.03        | -0.01       |
| Glucobrassicin             | -0.03        | 0.00         | -0.02        | 0.01         | -0.03        | -0.01 | -0.04        | -0.01       |
| Neoglucobrassicin          | 0.02         | <b>-0.05</b> | -0.02        | -0.02        | <b>-0.07</b> | 0.00  | <b>-0.06</b> | -0.02       |
| Gluconasturtiin            | -0.03        | -0.01        | <b>-0.04</b> | 0.03         | 0.00         | 0.03  | -0.02        | <b>0.05</b> |
| Methoxyglucobrassicin      | 0.01         | -0.01        | 0.01         | -0.02        | -0.04        | 0.00  | -0.08        | 0.01        |

**Supplementary Table 2: Effects of bee-pollination, aphid-herbivory, soil type and their interactions on absolute evolutionary rates for different traits categories: plant morphology, floral scent and leaf glucosinolates.** Evolutionary rates were assessed in haldanes (s.d. per generation). Significance was determined using a two-sided linear mixed model (LMM) with absolute evolutionary rates as dependent variable, pollination, herbivory, soil, trait groups and their interaction as fixed factors and replicate as random factors. Multiple-comparison post hoc tests were ran using estimated marginal means (EMMs) and their contrasts were computed with the emmeans package<sup>1</sup>. P-values are Tukey-corrected for multiple comparisons. Bold indicates significant factor effect (P<0.05) on trait evolutionary rate.

|                    | N                                          | Factors                | df         | $\chi^2$    | P            |
|--------------------|--------------------------------------------|------------------------|------------|-------------|--------------|
| Evolutionary rates | 528                                        | <b>Pollination (P)</b> | <b>1</b>   | <b>8.82</b> | <b>0.003</b> |
|                    |                                            | Herbivory (H)          | 1          | 0.54        | 0.464        |
|                    |                                            | <b>Soil (S)</b>        | <b>1</b>   | <b>8.04</b> | <b>0.005</b> |
|                    |                                            | Trait groups (Tg)      | 2          | 0.30        | 0.862        |
|                    |                                            | Replicate              | 1          | 0.10        | 0.748        |
|                    |                                            | (P) x (H)              | 1          | 0.00        | 0.946        |
|                    |                                            | (P) x (Tg)             | 2          | 0.40        | 0.818        |
|                    |                                            | <b>(P) x (S)</b>       | <b>1</b>   | <b>4.56</b> | <b>0.033</b> |
|                    |                                            | (H) x (Tg)             | 2          | 0.69        | 0.708        |
|                    |                                            | (H) x (S)              | 1          | 0.17        | 0.678        |
|                    |                                            | (S) x (Tg)             | 2          | 4.90        | 0.086        |
|                    |                                            | (P) x (H) x (S)        | 1          | 0.01        | 0.907        |
|                    |                                            | (P) x (H) x (Tg)       | 2          | 2.99        | 0.224        |
|                    |                                            | (P) x (S) x (Tg)       | 2          | 1.07        | 0.584        |
|                    |                                            | (H) x (S) x (Tg)       | 2          | 2.39        | 0.303        |
|                    |                                            | (P) x (H) x (S) x (Tg) | 2          | 0.31        | 0.857        |
|                    | Post hoc tests                             |                        |            |             |              |
| Parameters         | Treatment groups                           |                        | N          | t-values    | P            |
| Limestone          | Bee-pollination vs Hand-pollination        |                        | 264        | 0.70        | 0.897        |
| <b>Tuff</b>        | <b>Bee-pollination vs Hand-pollination</b> |                        | <b>264</b> | <b>3.67</b> | <b>0.002</b> |

**Supplementary Table 3: Effects of bee-pollination, aphid-herbivory, soil type and their interactions on absolute evolutionary rates for different traits categories: plant morphology, floral scent and leaf glucosinolates.** Evolutionary rates were assessed in haldanes (s.d. per generation). Plants that evolved in different soils are analyzed separately to disentangle the role of herbivory and pollination in driving plant evolution in each soil type. Significance was determined using two-sided linear mixed models (LMM) with absolute evolutionary rates as dependent variable, pollination, herbivory, trait groups and their interaction as fixed factors and replicate as random factors. Significant P-values ( $P < 0.05$ ) are given in bold.

|                    |                        | Limestone |    |          |       | Tuff       |          |              |              |
|--------------------|------------------------|-----------|----|----------|-------|------------|----------|--------------|--------------|
| Factors            |                        | N         | df | $\chi^2$ | P     | N          | df       | $\chi^2$     | P            |
| Evolutionary rates | <b>Pollination (P)</b> | 264       | 1  | 0.46     | 0.500 | <b>264</b> | <b>1</b> | <b>10.66</b> | <b>0.001</b> |
|                    | Herbivory (H)          |           | 1  | 0.07     | 0.797 |            | 1        | 0.54         | 0.463        |
|                    | Trait groups (Tg)      |           | 2  | 1.92     | 0.384 |            | 2        | 3.05         | 0.218        |
|                    | Replicate              |           | 1  | 1.28     | 0.259 |            | 1        | 0.74         | 0.389        |
|                    | (P) x (H)              |           | 1  | 0.00     | 0.969 |            | 1        | 0.01         | 0.906        |
|                    | (P) x (Tg)             |           | 2  | 1.72     | 0.422 |            | 2        | 0.13         | 0.938        |
|                    | (H) x (Tg)             |           | 2  | 1.47     | 0.480 |            | 2        | 1.60         | 0.449        |
|                    | (P) x (H) x (Tg)       |           | 2  | 3.36     | 0.186 |            | 2        | 0.60         | 0.740        |

**Supplementary Table 4: Summary of post hoc analyses and multiple comparisons of linear discriminant analyses.** Significance was determined using two-sided linear mixed models (LMM) with linear discriminant scores as dependent variable, treatment as fixed factor and replicate as random factors. LH: limestone-line plants (L) growing with aphid-herbivory (H). LNH: limestone-line plants (T) growing without herbivory (NH) and bee-pollination (B). TH tuff-line plants (T) growing with aphid-herbivory (H). TNH: tuff-line plants (T) growing without herbivory (NH). P-values are Tukey-corrected for multiple comparisons. Bold indicates significant factor effects ( $P < 0.05$ ).

| Bee-pollination (N=283) |             |                              | Hand-pollination (N=281) |                              |
|-------------------------|-------------|------------------------------|--------------------------|------------------------------|
| Parameters              | t-ratio     | P                            | t-ratio                  | P                            |
| G1 - LH                 | -0.17       | 0.215                        | 0.25                     | 0.078                        |
| G1 - LNH                | <b>0.31</b> | <b>0.028</b>                 | <b>0.39</b>              | <b>0.006</b>                 |
| G1 - TH                 | <b>1.14</b> | <b>1.98*10<sup>-14</sup></b> | 0.28                     | 0.072                        |
| G1 - TNH                | <b>1.20</b> | <b>1.32*10<sup>-17</sup></b> | <b>0.81</b>              | <b>1.77*10<sup>-08</sup></b> |
| LH - LNH                | <b>0.47</b> | <b>7.76*10<sup>-04</sup></b> | 0.14                     | 0.379                        |
| LH - TH                 | <b>1.31</b> | <b>1.85*10<sup>-17</sup></b> | 0.02                     | 0.860                        |
| LH - TNH                | <b>1.37</b> | <b>8.35*10<sup>-21</sup></b> | <b>0.56</b>              | <b>1.98*10<sup>-04</sup></b> |
| LNH - TH                | <b>0.83</b> | <b>3.29*10<sup>-08</sup></b> | -0.11                    | 0.464                        |
| LNH - TNH               | <b>0.89</b> | <b>2.68*10<sup>-10</sup></b> | <b>0.42</b>              | <b>0.004</b>                 |
| TH - TNH                | 0.06        | 0.658                        | <b>0.54</b>              | <b>5.20*10<sup>-04</sup></b> |

**Supplementary Table 5:** Effects of experimental treatments on plant trait evolution. Significance was determined using two-sided linear mixed models (LMM) with individual trait as dependent variable, treatment and its interactions with replicate as fixed factors, and replicate as random factors. Bold indicates significant factor effects ( $P < 0.05$ ).

|                                                                             | Treatment |    |               |                                          | Replicate |          |       | Treatment x Replicate |              |                                          |
|-----------------------------------------------------------------------------|-----------|----|---------------|------------------------------------------|-----------|----------|-------|-----------------------|--------------|------------------------------------------|
|                                                                             | N         | df | $\chi^2$      | P                                        | df        | $\chi^2$ | P     | df                    | $\chi^2$     | P                                        |
| <i>Morphology</i>                                                           |           |    |               |                                          |           |          |       |                       |              |                                          |
| Height day 20 (cm)                                                          | 575       | 7  | <b>94.26</b>  | <b><math>1.65 \times 10^{-17}</math></b> | <b>1</b>  | 61.03    | 0.708 | 7                     | <b>61.03</b> | <b><math>9.40 \times 10^{-11}</math></b> |
| Height day 30 (cm)                                                          | 575       | 7  | <b>92.20</b>  | <b><math>4.38 \times 10^{-17}</math></b> | <b>1</b>  | 0.15     | 0.697 | 7                     | <b>18.17</b> | <b>0.011</b>                             |
| Leaf size (cm <sup>2</sup> )                                                | 575       | 7  | <b>124.31</b> | <b><math>9.70 \times 10^{-24}</math></b> | <b>1</b>  | 0.00     | 0.997 | 7                     | <b>26.67</b> | <b><math>3.81 \times 10^{-04}</math></b> |
| Time to flower (day)                                                        | 575       | 7  | <b>89.25</b>  | <b><math>1.76 \times 10^{-16}</math></b> | <b>1</b>  | 0.05     | 0.832 | 7                     | <b>43.74</b> | <b><math>2.40 \times 10^{-07}</math></b> |
| Cumulative branches length (cm)                                             | 575       | 7  | <b>18.79</b>  | <b>0.009</b>                             | <b>1</b>  | 0.02     | 0.877 | 7                     | <b>41.96</b> | <b><math>5.30 \times 10^{-05}</math></b> |
| Number of flowering branches                                                | 575       | 7  | <b>14.05</b>  | <b>0.050</b>                             | <b>1</b>  | 0.02     | 0.877 | 7                     | <b>46.52</b> | <b><math>6.92 \times 10^{-08}</math></b> |
| Flower production rate (per day)                                            | 575       | 7  | <b>33.85</b>  | <b><math>1.99 \times 10^{-05}</math></b> | <b>1</b>  | 0.25     | 0.620 | 7                     | 9.83         | 0.277                                    |
| Flower number                                                               | 575       | 7  | <b>49.28</b>  | <b><math>2.00 \times 10^{-08}</math></b> | <b>1</b>  | 0.02     | 0.902 | 7                     | 11.94        | 0.102                                    |
| Nectar amount (nL/flower)                                                   | 575       | 7  | <b>41.95</b>  | <b><math>5.33 \times 10^{-07}</math></b> | <b>1</b>  | 0.02     | 0.875 | 7                     | <b>27.62</b> | <b><math>2.58 \times 10^{-04}</math></b> |
| Flower diameter (mm)                                                        | 575       | 7  | <b>51.94</b>  | <b><math>6.00 \times 10^{-09}</math></b> | <b>1</b>  | 0.42     | 0.517 | 7                     | 13.97        | 0.052                                    |
| Petal length (cm)                                                           | 564       | 7  | <b>37.71</b>  | <b><math>3.44 \times 10^{-08}</math></b> | <b>1</b>  | 1.37     | 0.241 | 7                     | <b>17.61</b> | <b>0.014</b>                             |
| Petal width (cm)                                                            | 564       | 7  | <b>58.61</b>  | <b><math>2.85 \times 10^{-10}</math></b> | <b>1</b>  | 0.51     | 0.474 | 7                     | <b>39.52</b> | <b><math>1.56 \times 10^{-06}</math></b> |
| Sepal length (cm)                                                           | 564       | 7  | <b>22.91</b>  | <b>0.002</b>                             | <b>1</b>  | 0.20     | 0.656 | 7                     | <b>31.34</b> | <b><math>5.38 \times 10^{-05}</math></b> |
| Style length (cm)                                                           | 564       | 7  | 11.27         | 0.127                                    | 1         | 1.35     | 0.245 | 7                     | <b>26.49</b> | <b><math>4.11 \times 10^{-04}</math></b> |
| Stamen length (cm)                                                          | 564       | 7  | <b>14.58</b>  | <b>0.042</b>                             | <b>1</b>  | 3.81     | 0.051 | 7                     | <b>21.07</b> | <b>0.004</b>                             |
| Herkogamy (cm)                                                              | 564       | 7  | 9.05          | 0.249                                    | 1         | 0.50     | 0.479 | 7                     | 13.82        | 0.055                                    |
| <i>Bioassays</i>                                                            |           |    |               |                                          |           |          |       |                       |              |                                          |
| Number of aphid visits                                                      | 568       | 7  | 7.58          | 0.372                                    | 1         | 0.39     | 0.532 | 7                     | 8.48         | 0.293                                    |
| Number of bee visits                                                        | 568       | 7  | <b>32.21</b>  | <b><math>3.71 \times 10^{-05}</math></b> | <b>1</b>  | 0.08     | 0.781 | 7                     | 11.94        | 0.102                                    |
| <i>Floral scent (pg.l<sup>-1</sup>.hr<sup>-1</sup>.flower<sup>-1</sup>)</i> |           |    |               |                                          |           |          |       |                       |              |                                          |
| <b>Aromatic compounds</b>                                                   |           |    |               |                                          |           |          |       |                       |              |                                          |
| Benzaldehyde                                                                | 564       | 7  | <b>56.08</b>  | <b><math>9.35 \times 10^{-07}</math></b> | <b>1</b>  | 0.00     | 0.993 | 7                     | <b>15.75</b> | <b>0.027</b>                             |
| Methyl benzoate                                                             | 564       | 7  | <b>52.56</b>  | <b><math>2.52 \times 10^{-08}</math></b> | <b>1</b>  | 0.19     | 0.662 | 7                     | <b>17.91</b> | <b><math>1.34 \times 10^{-05}</math></b> |
| Phenylethyl alcohol                                                         | 564       | 7  | <b>42.58</b>  | <b><math>2.34 \times 10^{-04}</math></b> | <b>1</b>  | 0.94     | 0.331 | 7                     | <b>25.00</b> | <b><math>7.58 \times 10^{-04}</math></b> |
| Phenylacetaldehyde                                                          | 564       | 7  | <b>82.03</b>  | <b><math>3.39 \times 10^{-14}</math></b> | <b>1</b>  | 0.64     | 0.423 | 7                     | <b>32.73</b> | <b><math>2.97 \times 10^{-05}</math></b> |
| <i>p</i> -Anisaldehyde                                                      | 564       | 7  | <b>17.55</b>  | <b>0.014</b>                             | <b>1</b>  | 0.05     | 0.815 | 7                     | <b>29.07</b> | <b><math>1.41 \times 10^{-04}</math></b> |
| 2-Aminobenzaldehyde                                                         | 564       | 7  | <b>19.75</b>  | <b>0.006</b>                             | <b>1</b>  | 0.03     | 0.854 | 7                     | <b>26.95</b> | <b><math>3.40 \times 10^{-04}</math></b> |
| Methyl salicylate                                                           | 564       | 7  | <b>25.31</b>  | <b><math>6.69 \times 10^{-04}</math></b> | <b>1</b>  | 0.00     | 0.999 | 7                     | <b>28.93</b> | <b><math>1.49 \times 10^{-04}</math></b> |
| <b>Terpenoids</b>                                                           |           |    |               |                                          |           |          |       |                       |              |                                          |
| $\beta$ -Pinene                                                             | 564       | 7  | 2.43          | 0.932                                    | <b>1</b>  | 0.17     | 0.681 | 7                     | 3.77         | 0.806                                    |
| ( <i>E,E</i> )- $\alpha$ -Farnesene                                         | 564       | 7  | <b>34.97</b>  | <b><math>1.13 \times 10^{-05}</math></b> | <b>1</b>  | 0.45     | 0.505 | 7                     | 13.31        | 0.065                                    |
| <b>Fatty acid derivatives</b>                                               |           |    |               |                                          |           |          |       |                       |              |                                          |
| ( <i>Z</i> )-3-Hexen-1-ol-acetate                                           | 564       | 7  | <b>33.38</b>  | <b><math>2.24 \times 10^{-05}</math></b> | <b>1</b>  | 0.00     | 0.958 | 7                     | 12.88        | 0.075                                    |

|                                                 |     |   |               |                              |          |      |       |   |              |                              |
|-------------------------------------------------|-----|---|---------------|------------------------------|----------|------|-------|---|--------------|------------------------------|
| <b>Nitrogen containing compounds</b>            |     |   |               |                              |          |      |       |   |              |                              |
| Methyl anthranilate                             | 564 | 7 | <b>120.66</b> | <b>5.59*10<sup>-23</sup></b> | <b>1</b> | 0.11 | 0.745 | 7 | <b>57.24</b> | <b>5.34*10<sup>-10</sup></b> |
| Benzyl nitrile                                  | 564 | 7 | <b>17.31</b>  | <b>0.016</b>                 | <b>1</b> | 0.17 | 0.683 | 7 | <b>17.86</b> | <b>0.013</b>                 |
| Indole                                          | 564 | 7 | 13.03         | 0.071                        | 1        | 0.08 | 0.772 | 7 | <b>28.85</b> | <b>1.54*10<sup>-04</sup></b> |
| <b>Sulphur containing compounds</b>             |     |   |               |                              |          |      |       |   |              |                              |
| 1-Butene-4-isothiocyanate                       | 564 | 7 | <b>16.57</b>  | <b>0.020</b>                 | <b>1</b> | 0.26 | 0.607 | 7 | 7.73         | 0.357                        |
| <b>Total emission</b>                           | 564 | 7 | <b>28.08</b>  | <b>1.98*10<sup>-04</sup></b> | <b>1</b> | 0.00 | 0.998 | 7 | 13.19        | 0.067                        |
| <b>Leaf glucosinolates (pg.mg<sup>-1</sup>)</b> |     |   |               |                              |          |      |       |   |              |                              |
| Glucoraphin                                     | 485 | 7 | <b>22.79</b>  | <b>0.002</b>                 | <b>1</b> | 0.06 | 0.801 | 7 | 10.38        | 0.168                        |
| Glucoalyssin                                    | 500 | 7 | <b>19.71</b>  | <b>0.006</b>                 | <b>1</b> | 0.42 | 0.517 | 7 | <b>22.35</b> | <b>0.002</b>                 |
| Sinabin                                         | 512 | 7 | 3.67          | 0.817                        | 1        | 0.01 | 0.903 | 7 | 8.45         | 0.294                        |
| Gluconapin                                      | 512 | 7 | <b>20.39</b>  | <b>0.005</b>                 | <b>1</b> | 0.03 | 0.872 | 7 | 12.00        | 0.100                        |
| Glucobrassicinapin                              | 509 | 7 | <b>58.74</b>  | <b>3.16*10<sup>-11</sup></b> | <b>1</b> | 0.02 | 0.883 | 7 | <b>22.96</b> | <b>0.002</b>                 |
| Hydroxyglucobrassicin                           | 510 | 7 | <b>31.47</b>  | <b>7.77*10<sup>-04</sup></b> | <b>1</b> | 0.05 | 0.821 | 7 | <b>28.68</b> | <b>0.001</b>                 |
| Glucobrassicin                                  | 510 | 7 | <b>14.43</b>  | <b>0.044</b>                 | <b>1</b> | 0.11 | 0.738 | 7 | <b>18.71</b> | <b>0.009</b>                 |
| Neoglucobrassicin                               | 511 | 7 | <b>36.45</b>  | <b>4.88*10<sup>-06</sup></b> | <b>1</b> | 0.09 | 0.766 | 7 | <b>22.55</b> | <b>0.002</b>                 |
| Gluconasturtiin                                 | 512 | 7 | <b>49.38</b>  | <b>1.91*10<sup>-08</sup></b> | <b>1</b> | 1.85 | 0.174 | 7 | <b>55.06</b> | <b>1.45*10<sup>-09</sup></b> |
| Methoxyglucobrassicin                           | 511 | 7 | <b>27.11</b>  | <b>4.17*10<sup>-04</sup></b> | <b>1</b> | 0.22 | 0.640 | 7 | <b>19.12</b> | <b>0.008</b>                 |
| <b>Total glucosinolates</b>                     | 477 | 7 | <b>18.90</b>  | <b>0.009</b>                 | <b>1</b> | 0.07 | 0.794 | 7 | <b>17.71</b> | <b>0.040</b>                 |

**Supplementary Table 6:** Effects of pollination (bee-pollination or hand-pollination), herbivory (aphid-herbivory or no herbivory), and soil (limestone or tuff soil), and their interactions on plant-trait evolution estimated by two-sided linear mixed models (LMM). Bold indicates significant factors effects ( $P < 0.05$ ) in driving divergence between treatments.

| Traits               | N   | Factor                 | df       | $\chi^2$     | P                            | sign |
|----------------------|-----|------------------------|----------|--------------|------------------------------|------|
| <b>Morphology</b>    |     |                        |          |              |                              |      |
| Height day 20 (cm)   | 575 | <b>Pollination (P)</b> | <b>1</b> | <b>20.87</b> | <b>4.92*10<sup>-06</sup></b> | -    |
|                      |     | Herbivory (H)          | 1        | 0.00         | 0.966                        |      |
|                      |     | <b>Soil (S)</b>        | <b>1</b> | <b>18.79</b> | <b>1.46*10<sup>-05</sup></b> | -    |
|                      |     | Replicate              | 1        | 0.13         | 0.720                        |      |
|                      |     | (S) x (H)              | 1        | 3.53         | 0.060                        |      |
|                      |     | <b>(S) x (P)</b>       | <b>1</b> | <b>36.23</b> | <b>1.75*10<sup>-09</sup></b> |      |
|                      |     | (P) x (H)              | 1        | 0.67         | 0.413                        |      |
|                      |     | <b>(S) x (P) x (H)</b> | <b>1</b> | <b>6.01</b>  | <b>0.014</b>                 |      |
| Height day 30 (cm)   | 575 | Pollination (P)        | 1        | 2.40         | 0.122                        |      |
|                      |     | <b>Herbivory (H)</b>   | <b>1</b> | <b>6.31</b>  | <b>0.012</b>                 | -    |
|                      |     | <b>Soil (S)</b>        | <b>1</b> | <b>30.89</b> | <b>2.73*10<sup>-08</sup></b> | +    |
|                      |     | Replicate              | 1        | 0.15         | 0.699                        |      |
|                      |     | <b>(S) x (H)</b>       | <b>1</b> | <b>19.58</b> | <b>9.63*10<sup>-06</sup></b> |      |
|                      |     | <b>(S) x (P)</b>       | <b>1</b> | <b>19.26</b> | <b>1.14*10<sup>-05</sup></b> |      |
|                      |     | <b>(P) x (H)</b>       | <b>1</b> | <b>12.02</b> | <b>5.27*10<sup>-04</sup></b> |      |
|                      |     | (S) x (P) x (H)        | 1        | 0.06         | 0.814                        |      |
| Time to flower (day) | 575 | <b>Pollination (P)</b> | <b>1</b> | <b>7.94</b>  | <b>0.005</b>                 | +    |
|                      |     | Herbivory (H)          | 1        | 0.00         | 0.991                        |      |
|                      |     | <b>Soil (S)</b>        | <b>1</b> | <b>25.77</b> | <b>3.85*10<sup>-07</sup></b> | +    |
|                      |     | Replicate              | 1        | 0.04         | 0.837                        |      |
|                      |     | (S) x (H)              | 1        | 0.70         | 0.404                        |      |
|                      |     | <b>(S) x (P)</b>       | <b>1</b> | <b>48.57</b> | <b>3.18*10<sup>-12</sup></b> |      |
|                      |     | (P) x (H)              | 1        | 0.15         | 0.702                        |      |

|                                  |     |                        |          |              |                              |   |
|----------------------------------|-----|------------------------|----------|--------------|------------------------------|---|
|                                  |     | (S) x (P) x (H)        | 1        | 0.72         | 0.395                        |   |
| Leaf size (cm <sup>2</sup> )     | 575 | <b>Pollination (P)</b> | <b>1</b> | <b>11.97</b> | <b>5.42*10<sup>-04</sup></b> | + |
|                                  |     | <b>Herbivory (H)</b>   | <b>1</b> | <b>6.45</b>  | <b>0.011</b>                 | - |
|                                  |     | <b>Soil (S)</b>        | <b>1</b> | <b>54.43</b> | <b>1.61*10<sup>-13</sup></b> | + |
|                                  |     | Replicate              | 1        | 0.00         | 0.997                        |   |
|                                  |     | (S) x (H)              | 1        | 3.69         | 0.055                        |   |
|                                  |     | <b>(S) x (P)</b>       | <b>1</b> | <b>39.82</b> | <b>2.79*10<sup>-10</sup></b> |   |
|                                  |     | (P) x (H)              | 1        | 2.92         | 0.088                        |   |
|                                  |     | (S) x (P) x (H)        | 1        | 1.01         | 0.315                        |   |
| Cumulative branches length (cm)  | 575 | Pollination (P)        | 1        | 0.54         | 0.463                        |   |
|                                  |     | Herbivory (H)          | 1        | 0.40         | 0.527                        |   |
|                                  |     | Soil (S)               | 1        | 0.10         | 0.750                        |   |
|                                  |     | Replicate              | 1        | 0.02         | 0.880                        |   |
|                                  |     | <b>(S) x (H)</b>       | <b>1</b> | <b>6.38</b>  | <b>0.012</b>                 |   |
|                                  |     | (S) x (P)              | 1        | 1.30         | 0.253                        |   |
|                                  |     | <b>(P) x (H)</b>       | <b>1</b> | <b>8.70</b>  | <b>0.003</b>                 |   |
|                                  |     | (S) x (P) x (H)        | 1        | 0.28         | 0.596                        |   |
| Number of flowering branches     | 575 | Pollination (P)        | 1        | 0.03         | 0.862                        |   |
|                                  |     | Herbivory (H)          | 1        | 1.40         | 0.236                        |   |
|                                  |     | Soil (S)               | 1        | 1.04         | 0.308                        |   |
|                                  |     | Replicate              | 1        | 0.02         | 0.881                        |   |
|                                  |     | (S) x (H)              | 1        | 2.20         | 0.138                        |   |
|                                  |     | <b>(S) x (P)</b>       | <b>1</b> | <b>5.83</b>  | <b>0.016</b>                 |   |
|                                  |     | (P) x (H)              | 1        | 0.52         | 0.470                        |   |
|                                  |     | (S) x (P) x (H)        | 1        | 2.09         | 0.149                        |   |
| Flower production rate (per day) | 575 | Pollination (P)        | 1        | 0.96         | 0.327                        |   |
|                                  |     | Herbivory (H)          | 1        | 1.16         | 0.280                        |   |
|                                  |     | <b>Soil (S)</b>        | <b>1</b> | <b>7.72</b>  | <b>0.005</b>                 | + |
|                                  |     | Replicate              | 1        | 0.38         | 0.537                        |   |
|                                  |     | <b>(S) x (H)</b>       | <b>1</b> | <b>12.35</b> | <b>1.11*10<sup>-04</sup></b> |   |
|                                  |     | <b>(S) x (P)</b>       | <b>1</b> | <b>4.74</b>  | <b>0.029</b>                 |   |
|                                  |     | (P) x (H)              | 1        | 0.73         | 0.392                        |   |
|                                  |     | (S) x (P) x (H)        | 1        | 2.99         | 0.084                        |   |
| Number of flowers                | 575 | Pollination (P)        | 1        | 0.12         | 0.733                        |   |
|                                  |     | Herbivory (H)          | 1        | 1.71         | 0.191                        |   |
|                                  |     | <b>Soil (S)</b>        | <b>1</b> | <b>9.53</b>  | <b>0.002</b>                 | + |
|                                  |     | Replicate              | 1        | 0.02         | 0.902                        |   |
|                                  |     | <b>(S) x (H)</b>       | <b>1</b> | <b>10.47</b> | <b>0.001</b>                 |   |
|                                  |     | <b>(S) x (P)</b>       | <b>1</b> | <b>15.57</b> | <b>7.95*10<sup>-05</sup></b> |   |
|                                  |     | (P) x (H)              | 1        | 0.06         | 0.802                        |   |
|                                  |     | <b>(S) x (P) x (H)</b> | <b>1</b> | <b>11.45</b> | <b>7.17*10<sup>-04</sup></b> |   |
| Nectar amount (nL/flower)        | 563 | Pollination (P)        | 1        | 0.45         | 0.504                        |   |
|                                  |     | Herbivory (H)          | 1        | 2.79         | 0.095                        |   |
|                                  |     | <b>Soil (S)</b>        | <b>1</b> | <b>29.11</b> | <b>6.85*10<sup>-08</sup></b> | + |
|                                  |     | Replicate              | 1        | 0.02         | 0.878                        |   |
|                                  |     | (S) x (H)              | 1        | 0.71         | 0.399                        |   |
|                                  |     | <b>(S) x (P)</b>       | <b>1</b> | <b>70.03</b> | <b>0.008</b>                 |   |
|                                  |     | (P) x (H)              | 1        | 0.15         | 0.697                        |   |
|                                  |     | (S) x (P) x (H)        | 1        | 0.48         | 0.488                        |   |
| Flower diameter (cm)             | 564 | <b>Pollination (P)</b> | <b>1</b> | <b>44.63</b> | <b>2.38*10<sup>-05</sup></b> | + |



|                    |     |                        |          |              |                              |   |
|--------------------|-----|------------------------|----------|--------------|------------------------------|---|
|                    |     | Herbivory (H)          | 1        | 0.85         | 0.355                        |   |
|                    |     | Soil (S)               | 1        | 0.39         | 0.533                        |   |
|                    |     | Replicate              | 1        | 0.12         | 0.734                        |   |
|                    |     | (S) x (H)              | 1        | 2.52         | 0.113                        |   |
|                    |     | (S) x (P)              | 1        | 0.76         | 0.383                        |   |
|                    |     | (P) x (H)              | 1        | 0.72         | 0.396                        |   |
|                    |     | (S) x (P) x (H)        | 1        | 1.52         | 0.218                        |   |
| Petal length (cm)  | 564 | <b>Pollination (P)</b> | <b>1</b> | <b>29.10</b> | <b>6.86*10<sup>-08</sup></b> | + |
|                    |     | Herbivory (H)          | 1        | 0.00         | 0.982                        |   |
|                    |     | Soil (S)               | 1        | 0.91         | 0.340                        |   |
|                    |     | Replicate              | 1        | 1.35         | 0.246                        |   |
|                    |     | (S) x (H)              | 1        | 1.62         | 0.203                        |   |
|                    |     | <b>(S) x (P)</b>       | <b>1</b> | <b>3.84</b>  | <b>0.050</b>                 |   |
|                    |     | (P) x (H)              | 1        | 0.04         | 0.832                        |   |
|                    |     | (S) x (P) x (H)        | 1        | 1.46         | 0.228                        |   |
| Petal width (cm)   | 564 | <b>Pollination (P)</b> | <b>1</b> | <b>30.40</b> | <b>3.52*10<sup>-08</sup></b> | + |
|                    |     | <b>Herbivory (H)</b>   | <b>1</b> | <b>16.98</b> | <b>3.78*10<sup>-05</sup></b> | - |
|                    |     | Soil (S)               | 1        | 0.62         | 0.431                        |   |
|                    |     | Replicate              | 1        | 0.48         | 0.487                        |   |
|                    |     | (S) x (H)              | 1        | 3.70         | 0.055                        |   |
|                    |     | (S) x (P)              | 1        | 2.85         | 0.091                        |   |
|                    |     | (P) x (H)              | 1        | 1.30         | 0.254                        |   |
|                    |     | (S) x (P) x (H)        | 1        | 0.03         | 0.854                        |   |
| Sepal length (cm)  | 564 | Pollination (P)        | 1        | 0.84         | 0.359                        |   |
|                    |     | <b>Herbivory (H)</b>   | <b>1</b> | <b>5.45</b>  | <b>0.020</b>                 | - |
|                    |     | Soil (S)               | 1        | 1.18         | 0.278                        |   |
|                    |     | Replicate              | 1        | 0.19         | 0.663                        |   |
|                    |     | <b>(S) x (H)</b>       | <b>1</b> | <b>9.86</b>  | <b>0.002</b>                 |   |
|                    |     | (S) x (P)              | 1        | 1.42         | 0.233                        |   |
|                    |     | (P) x (H)              | 1        | 2.37         | 0.124                        |   |
|                    |     | (S) x (P) x (H)        | 1        | 0.79         | 0.375                        |   |
| Style length (cm)  | 564 | Pollination (P)        | 1        | 0.09         | 0.764                        |   |
|                    |     | Herbivory (H)          | 1        | 2.80         | 0.094                        |   |
|                    |     | Soil (S)               | 1        | 0.42         | 0.518                        |   |
|                    |     | Replicate              | 1        | 1.30         | 0.254                        |   |
|                    |     | (S) x (H)              | 1        | 1.68         | 0.195                        |   |
|                    |     | (S) x (P)              | 1        | 1.03         | 0.311                        |   |
|                    |     | (P) x (H)              | 1        | 3.00         | 0.083                        |   |
|                    |     | (S) x (P) x (H)        | 1        | 1.86         | 0.173                        |   |
| Stamen length (cm) | 564 | Pollination (P)        | 1        | 0.00         | 0.978                        |   |
|                    |     | Herbivory (H)          | 1        | 1.54         | 0.139                        |   |
|                    |     | <b>Soil (S)</b>        | <b>1</b> | <b>5.09</b>  | <b>0.024</b>                 | + |
|                    |     | Replicate              | 1        | 3.71         | 0.054                        |   |
|                    |     | (S) x (H)              | 1        | 0.14         | 0.709                        |   |
|                    |     | (S) x (P)              | 1        | 0.26         | 0.613                        |   |
|                    |     | <b>(P) x (H)</b>       | <b>1</b> | <b>4.64</b>  | <b>0.031</b>                 |   |
|                    |     | (S) x (P) x (H)        | 1        | 2.60         | 0.107                        |   |
| Herkogamy (cm)     | 564 | Pollination (P)        | 1        | 0.00         | 0.947                        |   |
|                    |     | Herbivory (H)          | 1        | 2.53         | 0.112                        |   |
|                    |     | Soil (S)               | 1        | 0.19         | 0.667                        |   |
|                    |     | Replicate              | 1        | 0.49         | 0.482                        |   |

|                                                                             |     |                        |          |              |                              |   |
|-----------------------------------------------------------------------------|-----|------------------------|----------|--------------|------------------------------|---|
|                                                                             |     | (S) x (H)              | 1        | 0.92         | 0.337                        |   |
|                                                                             |     | (S) x (P)              | 1        | 0.42         | 0.516                        |   |
|                                                                             |     | <b>(P) x (H)</b>       | <b>1</b> | <b>4.14</b>  | <b>0.042</b>                 |   |
|                                                                             |     | (S) x (P) x (H)        | 1        | 0.74         | 0.389                        |   |
| <hr/>                                                                       |     |                        |          |              |                              |   |
| <i>Bioassays</i>                                                            |     |                        |          |              |                              |   |
| Number of aphid visits                                                      | 575 | Pollination (P)        | 1        | 2.81         | 0.094                        |   |
|                                                                             |     | Herbivory (H)          | 1        | 0.10         | 0.750                        |   |
|                                                                             |     | Soil (S)               | 1        | 1.71         | 0.191                        |   |
|                                                                             |     | Replicate              | 1        | 0.39         | 0.533                        |   |
|                                                                             |     | (S) x (H)              | 1        | 0.69         | 0.405                        |   |
|                                                                             |     | (S) x (P)              | 1        | 0.27         | 0.603                        |   |
|                                                                             |     | (P) x (H)              | 1        | 1.98         | 0.160                        |   |
|                                                                             |     | (S) x (P) x (H)        | 1        | 0.00         | 0.960                        |   |
| Number of bee visits                                                        | 575 | <b>Pollination (P)</b> | <b>1</b> | <b>8.27</b>  | <b>0.004</b>                 | + |
|                                                                             |     | Herbivory (H)          | 1        | 1.44         | 0.230                        |   |
|                                                                             |     | <b>Soil (S)</b>        | <b>1</b> | <b>5.13</b>  | <b>0.023</b>                 | + |
|                                                                             |     | Replicate              | 1        | 0.08         | 0.782                        |   |
|                                                                             |     | <b>(S) x (H)</b>       | <b>1</b> | <b>5.36</b>  | <b>0.021</b>                 |   |
|                                                                             |     | (S) x (P)              | 1        | 2.41         | 0.120                        |   |
|                                                                             |     | <b>(P) x (H)</b>       | <b>1</b> | <b>8.56</b>  | <b>0.003</b>                 |   |
|                                                                             |     | (S) x (P) x (H)        | 1        | 0.79         | 0.375                        |   |
| <hr/>                                                                       |     |                        |          |              |                              |   |
| <i>Floral scent (pg.l<sup>-1</sup>.hr<sup>-1</sup>.flower<sup>-1</sup>)</i> |     |                        |          |              |                              |   |
| <b>Aromatic compounds</b>                                                   |     |                        |          |              |                              |   |
| Benzaldehyde                                                                | 564 | Pollination (P)        | 1        | 0.03         | 0.859                        |   |
|                                                                             |     | Herbivory (H)          | 1        | 1.73         | 0.188                        |   |
|                                                                             |     | <b>Soil (S)</b>        | <b>1</b> | <b>22.19</b> | <b>2.47*10<sup>-06</sup></b> | + |
|                                                                             |     | Replicate              | 1        | 0.00         | 0.993                        |   |
|                                                                             |     | <b>(S) x (H)</b>       | <b>1</b> | <b>20.59</b> | <b>5.69*10<sup>-06</sup></b> |   |
|                                                                             |     | (S) x (P)              | 1        | 0.09         | 0.761                        |   |
|                                                                             |     | (P) x (H)              | 1        | 0.43         | 0.512                        |   |
|                                                                             |     | <b>(S) x (P) x (H)</b> | <b>1</b> | <b>10.09</b> | <b>0.001</b>                 |   |
| Methyl benzoate                                                             | 564 | <b>Pollination (P)</b> | <b>1</b> | <b>5.17</b>  | <b>0.023</b>                 | + |
|                                                                             |     | Herbivory (H)          | 1        | 1.69         | 0.193                        |   |
|                                                                             |     | <b>Soil (S)</b>        | <b>1</b> | <b>16.94</b> | <b>3.86*10<sup>-05</sup></b> | - |
|                                                                             |     | Replicate              | 1        | 0.19         | 0.665                        |   |
|                                                                             |     | (S) x (H)              | 1        | 1.13         | 0.287                        |   |
|                                                                             |     | (S) x (P)              | 1        | 0.81         | 0.368                        |   |
|                                                                             |     | (P) x (H)              | 1        | 0.32         | 0.573                        |   |
|                                                                             |     | <b>(S) x (P) x (H)</b> | <b>1</b> | <b>25.54</b> | <b>4.39*10<sup>-07</sup></b> |   |
| Phenylethyl alcohol                                                         | 564 | <b>Pollination (P)</b> | <b>1</b> | <b>4.73</b>  | <b>0.030</b>                 | - |
|                                                                             |     | <b>Herbivory (H)</b>   | <b>1</b> | <b>8.02</b>  | <b>0.005</b>                 | - |
|                                                                             |     | <b>Soil (S)</b>        | <b>1</b> | <b>24.20</b> | <b>8.68*10<sup>-07</sup></b> | - |
|                                                                             |     | Replicate              | 1        | 0.53         | 0.469                        |   |
|                                                                             |     | (S) x (H)              | 1        | 2.08         | 0.150                        |   |
|                                                                             |     | (S) x (P)              | 1        | 0.02         | 0.882                        |   |
|                                                                             |     | (P) x (H)              | 1        | 0.48         | 0.489                        |   |
|                                                                             |     | (S) x (P) x (H)        | 1        | 1.71         | 0.191                        |   |
| Phenylacetaldehyde                                                          | 564 | <b>Pollination (P)</b> | <b>1</b> | <b>6.67</b>  | <b>0.010</b>                 | - |
|                                                                             |     | <b>Herbivory (H)</b>   | <b>1</b> | <b>8.56</b>  | <b>0.003</b>                 | - |
|                                                                             |     | <b>Soil (S)</b>        | <b>1</b> | <b>47.12</b> | <b>6.66*10<sup>-12</sup></b> | - |
|                                                                             |     | Replicate              | 1        | 0.61         | 0.433                        |   |

|                                    |     |                        |          |              |                              |   |
|------------------------------------|-----|------------------------|----------|--------------|------------------------------|---|
|                                    |     | (S) x (H)              | 1        | 3.40         | 0.065                        |   |
|                                    |     | (S) x (P)              | 1        | 0.06         | 0.799                        |   |
|                                    |     | (P) x (H)              | 1        | 0.82         | 0.365                        |   |
|                                    |     | <b>(S) x (P) x (H)</b> | <b>1</b> | <b>11.71</b> | <b>6.21*10<sup>-04</sup></b> |   |
| <i>p</i> -Anisaldehyde             | 564 | Pollination (P)        | 1        | 1.26         | 0.261                        |   |
|                                    |     | Herbivory (H)          | 1        | 0.43         | 0.510                        |   |
|                                    |     | Soil (S)               | 1        | 0.04         | 0.843                        |   |
|                                    |     | Replicate              | 1        | 0.05         | 0.819                        |   |
|                                    |     | <b>(S) x (H)</b>       | <b>1</b> | <b>11.39</b> | <b>7.38*10<sup>-04</sup></b> |   |
|                                    |     | (S) x (P)              | 1        | 0.27         | 0.602                        |   |
|                                    |     | (P) x (H)              | 1        | 1.20         | 0.274                        |   |
|                                    |     | (S) x (P) x (H)        | 1        | 2.37         | 0.123                        |   |
| 2-Aminobenzaldehyde                | 564 | Pollination (P)        | 1        | 2.23         | 0.135                        |   |
|                                    |     | Herbivory (H)          | 1        | 1.38         | 0.240                        |   |
|                                    |     | <b>Soil (S)</b>        | <b>1</b> | <b>3.88</b>  | <b>0.049</b>                 | - |
|                                    |     | Replicate              | 1        | 0.30         | 0.856                        |   |
|                                    |     | <b>(S) x (H)</b>       | <b>1</b> | <b>4.04</b>  | <b>0.045</b>                 |   |
|                                    |     | <b>(S) x (P)</b>       | <b>1</b> | <b>4.38</b>  | <b>0.036</b>                 |   |
|                                    |     | (P) x (H)              | 1        | 0.69         | 0.406                        |   |
|                                    |     | (S) x (P) x (H)        | 1        | 2.49         | 0.115                        |   |
| Methyl salicylate                  | 564 | Pollination (P)        | 1        | 3.29         | 0.070                        |   |
|                                    |     | Herbivory (H)          | 1        | 0.69         | 0.408                        |   |
|                                    |     | Soil (S)               | 1        | 3.59         | 0.058                        |   |
|                                    |     | Replicate              | 1        | 0.00         | 0.999                        |   |
|                                    |     | (S) x (H)              | 1        | 0.98         | 0.322                        |   |
|                                    |     | <b>(S) x (P)</b>       | <b>1</b> | <b>6.77</b>  | <b>0.009</b>                 |   |
|                                    |     | (P) x (H)              | 1        | 0.89         | 0.346                        |   |
|                                    |     | <b>(S) x (P) x (H)</b> | <b>1</b> | <b>8.10</b>  | <b>0.004</b>                 |   |
| <b>Terpenoids</b>                  |     |                        |          |              |                              |   |
| $\beta$ -Pinene                    | 564 | Pollination (P)        | 1        | 0.39         | 0.534                        |   |
|                                    |     | Herbivory (H)          | 1        | 0.64         | 0.425                        |   |
|                                    |     | Soil (S)               | 1        | 0.01         | 0.930                        |   |
|                                    |     | Replicate              | 1        | 0.17         | 0.680                        |   |
|                                    |     | (S) x (H)              | 1        | 0.43         | 0.510                        |   |
|                                    |     | (S) x (P)              | 1        | 0.15         | 0.701                        |   |
|                                    |     | (P) x (H)              | 1        | 0.04         | 0.848                        |   |
|                                    |     | (S) x (P) x (H)        | 1        | 0.77         | 0.379                        |   |
| <i>(E,E)</i> - $\alpha$ -Farnesene | 564 | Pollination (P)        | 1        | 3.46         | 0.063                        |   |
|                                    |     | Herbivory (H)          | 1        | 2.29         | 0.130                        |   |
|                                    |     | <b>Soil (S)</b>        | <b>1</b> | <b>4.75</b>  | <b>0.029</b>                 | + |
|                                    |     | Replicate              | 1        | 0.44         | 0.507                        |   |
|                                    |     | <b>(S) x (H)</b>       | <b>1</b> | <b>10.68</b> | <b>0.001</b>                 |   |
|                                    |     | <b>(S) x (P)</b>       | <b>1</b> | <b>6.57</b>  | <b>0.010</b>                 |   |
|                                    |     | <b>(P) x (H)</b>       | <b>1</b> | <b>4.50</b>  | <b>0.034</b>                 |   |
|                                    |     | (S) x (P) x (H)        | 1        | 2.35         | 0.125                        |   |
| <b>Fatty acid derivatives</b>      |     |                        |          |              |                              |   |
| <i>(Z)</i> -3-Hexen-1-ol-acetate   | 564 | Pollination (P)        | 1        | 0.02         | 0.898                        |   |
|                                    |     | <b>Herbivory (H)</b>   | <b>1</b> | <b>3.99</b>  | <b>0.046</b>                 | - |
|                                    |     | Soil (S)               | 1        | 1.29         | 0.256                        |   |
|                                    |     | Replicate              | 1        | 0.00         | 0.958                        |   |
|                                    |     | (S) x (H)              | 1        | 1.31         | 0.252                        |   |
|                                    |     | <b>(S) x (P)</b>       | <b>1</b> | <b>6.46</b>  | <b>0.011</b>                 |   |

|                                              |     |                        |                        |          |              |                              |   |
|----------------------------------------------|-----|------------------------|------------------------|----------|--------------|------------------------------|---|
|                                              |     |                        | <b>(P) x (H)</b>       | <b>1</b> | <b>6.24</b>  | <b>0.013</b>                 |   |
|                                              |     |                        | <b>(S) x (P) x (H)</b> | <b>1</b> | <b>13.88</b> | <b>1.95*10<sup>-04</sup></b> |   |
| <b>Nitrogen containing compounds</b>         |     |                        |                        |          |              |                              |   |
| Methyl anthranilate                          | 564 | Pollination (P)        |                        | 1        | 0.60         | 0.438                        |   |
|                                              |     | <b>Herbivory (H)</b>   |                        | <b>1</b> | <b>16.12</b> | <b>5.94*10<sup>-05</sup></b> | + |
|                                              |     | <b>Soil (S)</b>        |                        | <b>1</b> | <b>48.18</b> | <b>3.88*10<sup>-12</sup></b> | - |
|                                              |     | Replicate              |                        | 1        | 0.10         | 0.755                        |   |
|                                              |     | <b>(S) x (H)</b>       |                        | <b>1</b> | <b>17.06</b> | <b>3.63*10<sup>-05</sup></b> |   |
|                                              |     | <b>(S) x (P)</b>       |                        | <b>1</b> | <b>5.40</b>  | <b>0.020</b>                 |   |
|                                              |     | (P) x (H)              |                        | 1        | 0.07         | 0.786                        |   |
|                                              |     | <b>(S) x (P) x (H)</b> |                        | <b>1</b> | <b>23.17</b> | <b>1.48*10<sup>-06</sup></b> |   |
| Benzyl nitrile                               | 564 | <b>Pollination (P)</b> |                        | <b>1</b> | <b>3.88</b>  | <b>0.049</b>                 | + |
|                                              |     | Herbivory (H)          |                        | 1        | 1.24         | 0.265                        |   |
|                                              |     | <b>Soil (S)</b>        |                        | <b>1</b> | <b>18.36</b> | <b>1.83*10<sup>-05</sup></b> | - |
|                                              |     | Replicate              |                        | 1        | 0.25         | 0.620                        |   |
|                                              |     | (S) x (H)              |                        | 1        | 0.01         | 0.917                        |   |
|                                              |     | (S) x (P)              |                        | 1        | 2.06         | 0.152                        |   |
|                                              |     | (P) x (H)              |                        | 1        | 0.58         | 0.447                        |   |
|                                              |     | (S) x (P) x (H)        |                        | 1        | 2.10         | 0.147                        |   |
| Indole                                       | 564 | Pollination (P)        |                        | 1        | 0.85         | 0.356                        |   |
|                                              |     | <b>Herbivory (H)</b>   |                        | <b>1</b> | <b>4.16</b>  | <b>0.042</b>                 | + |
|                                              |     | Soil (S)               |                        | 1        | 2.16         | 0.142                        |   |
|                                              |     | Replicate              |                        | 1        | 0.08         | 0.776                        |   |
|                                              |     | (S) x (H)              |                        | 1        | 0.28         | 0.595                        |   |
|                                              |     | (S) x (P)              |                        | 1        | 2.90         | 0.089                        |   |
|                                              |     | (P) x (H)              |                        | 1        | 0.41         | 0.524                        |   |
|                                              |     | (S) x (P) x (H)        |                        | 1        | 1.82         | 0.177                        |   |
| <b>Total N-containing volatile compounds</b> | 564 | Pollination (P)        |                        | 1        | 2.08         | 0.149                        |   |
|                                              |     | Herbivory (H)          |                        | 1        | 3.64         | 0.057                        |   |
|                                              |     | <b>Soil (S)</b>        |                        | <b>1</b> | <b>9.75</b>  | <b>0.002</b>                 | - |
|                                              |     | Replicate              |                        | 1        | 0.01         | 0.934                        |   |
|                                              |     | (S) x (H)              |                        | 1        | 0.34         | 0.559                        |   |
|                                              |     | (S) x (P)              |                        | 1        | 1.11         | 0.291                        |   |
|                                              |     | (P) x (H)              |                        | 1        | 0.24         | 0.627                        |   |
|                                              |     | (S) x (P) x (H)        |                        | 1        | 3.50         | 0.061                        |   |
| <b>Sulphhur containing compounds</b>         |     |                        |                        |          |              |                              |   |
| 1-Butene-4-isothiocyanate                    | 564 | Pollination (P)        |                        | 1        | 3.22         | 0.073                        |   |
|                                              |     | <b>Herbivory (H)</b>   |                        | <b>1</b> | <b>7.76</b>  | <b>0.005</b>                 | - |
|                                              |     | Soil (S)               |                        | 1        | 0.15         | 0.694                        |   |
|                                              |     | Replicate              |                        | 1        | 0.26         | 0.607                        |   |
|                                              |     | (S) x (H)              |                        | 1        | 3.76         | 0.053                        |   |
|                                              |     | (S) x (P)              |                        | 1        | 0.02         | 0.896                        |   |
|                                              |     | (P) x (H)              |                        | 1        | 0.01         | 0.905                        |   |
|                                              |     | (S) x (P) x (H)        |                        | 1        | 1.65         | 0.199                        |   |
| <b>Total emission</b>                        | 564 | Pollination (P)        |                        | 1        | 0.10         | 0.756                        |   |
|                                              |     | Herbivory (H)          |                        | 1        | 0.36         | 0.547                        |   |
|                                              |     | <b>Soil (S)</b>        |                        | <b>1</b> | <b>8.89</b>  | <b>0.003</b>                 | - |
|                                              |     | Replicate              |                        | 1        | 0.00         | 0.992                        |   |
|                                              |     | <b>(S) x (H)</b>       |                        | <b>1</b> | <b>4.12</b>  | <b>0.042</b>                 |   |
|                                              |     | (S) x (P)              |                        | 1        | 1.18         | 0.278                        |   |
|                                              |     | (P) x (H)              |                        | 1        | 0.03         | 0.860                        |   |
|                                              |     | <b>(S) x (P) x (H)</b> |                        | <b>1</b> | <b>14.07</b> | <b>1.51*10<sup>-04</sup></b> |   |

| <i>Leaf glucosinolates (pg.mg<sup>-1</sup>)</i> |     |                        |          |              |                                |
|-------------------------------------------------|-----|------------------------|----------|--------------|--------------------------------|
| Glucoraphanin                                   | 485 | <b>Pollination (P)</b> | <b>1</b> | <b>13.04</b> | <b>3.05*10<sup>-04</sup></b> - |
|                                                 |     | Herbivory (H)          | 1        | 2.09         | 0.149                          |
|                                                 |     | Soil (S)               | 1        | 0.51         | 0.475                          |
|                                                 |     | Replicate              | 1        | 0.06         | 0.802                          |
|                                                 |     | (S) x (H)              | 1        | 1.44         | 0.230                          |
|                                                 |     | (S) x (P)              | 1        | 0.46         | 0.496                          |
|                                                 |     | (P) x (H)              | 1        | 0.05         | 0.820                          |
|                                                 |     | <b>(S) x (P) x (H)</b> | <b>1</b> | <b>4.81</b>  | <b>0.028</b>                   |
| Glucoalyssin                                    | 500 | Pollination (P)        | 1        | 0.09         | 0.760                          |
|                                                 |     | <b>Herbivory (H)</b>   | <b>1</b> | <b>4.76</b>  | <b>0.029</b> -                 |
|                                                 |     | Soil (S)               | 1        | 0.05         | 0.830                          |
|                                                 |     | Replicate              | 1        | 0.41         | 0.523                          |
|                                                 |     | <b>(S) x (H)</b>       | <b>1</b> | <b>10.91</b> | <b>9.58*10<sup>-04</sup></b>   |
|                                                 |     | (S) x (P)              | 1        | 0.14         | 0.712                          |
|                                                 |     | (P) x (H)              | 1        | 0.39         | 0.531                          |
|                                                 |     | (S) x (P) x (H)        | 1        | 2.81         | 0.094                          |
| Sinalbin                                        | 512 | Pollination (P)        | 1        | 0.50         | 0.481                          |
|                                                 |     | Herbivory (H)          | 1        | 0.29         | 0.591                          |
|                                                 |     | Soil (S)               | 1        | 2.52         | 0.112                          |
|                                                 |     | Replicate              | 1        | 0.01         | 0.904                          |
|                                                 |     | (S) x (H)              | 1        | 0.04         | 0.836                          |
|                                                 |     | (S) x (P)              | 1        | 0.00         | 0.996                          |
|                                                 |     | (P) x (H)              | 1        | 0.31         | 0.579                          |
|                                                 |     | (S) x (P) x (H)        | 1        | 0.00         | 0.946                          |
| Gluconapin                                      | 512 | <b>Pollination (P)</b> | <b>1</b> | <b>5.05</b>  | <b>0.025</b> -                 |
|                                                 |     | Herbivory (H)          | 1        | 1.30         | 0.254                          |
|                                                 |     | <b>Soil (S)</b>        | <b>1</b> | <b>8.69</b>  | <b>0.003</b> +                 |
|                                                 |     | Replicate              | 1        | 0.03         | 0.873                          |
|                                                 |     | (S) x (H)              | 1        | 0.17         | 0.683                          |
|                                                 |     | (S) x (P)              | 1        | 1.84         | 0.175                          |
|                                                 |     | (P) x (H)              | 1        | 1.00         | 0.316                          |
|                                                 |     | (S) x (P) x (H)        | 1        | 1.98         | 0.159                          |
| Glucobrassicinapin                              | 509 | <b>Pollination (P)</b> | <b>1</b> | <b>6.74</b>  | <b>0.009</b> -                 |
|                                                 |     | Herbivory (H)          | 1        | 2.21         | 0.137                          |
|                                                 |     | <b>Soil (S)</b>        | <b>1</b> | <b>19.83</b> | <b>8.47*10<sup>-06</sup></b> + |
|                                                 |     | Replicate              | 1        | 0.02         | 0.885                          |
|                                                 |     | <b>(S) x (H)</b>       | <b>1</b> | <b>20.18</b> | <b>7.04*10<sup>-06</sup></b>   |
|                                                 |     | (S) x (P)              | 1        | 1.99         | 0.158                          |
|                                                 |     | (P) x (H)              | 1        | 2.74         | 0.098                          |
|                                                 |     | (S) x (P) x (H)        | 1        | 3.25         | 0.072                          |
| Hydroxyglucobrassicin                           | 510 | Pollination (P)        | 1        | 2.63         | 0.105                          |
|                                                 |     | Herbivory (H)          | 1        | 0.20         | 0.655                          |
|                                                 |     | Soil (S)               | 1        | 0.72         | 0.397                          |
|                                                 |     | Replicate              | 1        | 0.05         | 0.825                          |
|                                                 |     | <b>(S) x (H)</b>       | <b>1</b> | <b>9.07</b>  | <b>0.003</b>                   |
|                                                 |     | <b>(S) x (P)</b>       | <b>1</b> | <b>13.36</b> | <b>2.67*10<sup>-04</sup></b>   |
|                                                 |     | (P) x (H)              | 1        | 3.73         | 0.054                          |
|                                                 |     | (S) x (P) x (H)        | 1        | 0.27         | 0.604                          |
| Glucobrassicin                                  | 510 | <b>Pollination (P)</b> | <b>1</b> | <b>11.05</b> | <b>0.002</b> -                 |
|                                                 |     | Herbivory (H)          | 1        | 0.19         | 0.650                          |

|                             |     |                        |          |              |                              |   |
|-----------------------------|-----|------------------------|----------|--------------|------------------------------|---|
|                             |     | Soil (S)               | 1        | 3.48         | 0.080                        |   |
|                             |     | Replicate              | 1        | 0.13         | 0.741                        |   |
|                             |     | (S) x (H)              | 1        | 0.43         | 0.489                        |   |
|                             |     | (S) x (P)              | 1        | 0.02         | 0.859                        |   |
|                             |     | (P) x (H)              | 1        | 0.25         | 0.621                        |   |
|                             |     | (S) x (P) x (H)        | 1        | 0.00         | 0.945                        |   |
| Neoglucobrassicin           | 511 | Pollination (P)        | 1        | 1.58         | 0.223                        |   |
|                             |     | Herbivory (H)          | 1        | 0.96         | 0.346                        |   |
|                             |     | <b>Soil (S)</b>        | <b>1</b> | <b>4.13</b>  | <b>0.048</b>                 | - |
|                             |     | Replicate              | 1        | 0.08         | 0.770                        |   |
|                             |     | (S) x (H)              | 1        | 0.03         | 0.852                        |   |
|                             |     | <b>(S) x (P)</b>       | <b>1</b> | <b>21.21</b> | <b>1.06*10<sup>-05</sup></b> |   |
|                             |     | (P) x (H)              | 1        | 2.01         | 0.166                        |   |
|                             |     | <b>(S) x (P) x (H)</b> | <b>1</b> | <b>7.70</b>  | <b>0.005</b>                 |   |
| Gluconasturtiin             | 512 | <b>Pollination (P)</b> | <b>1</b> | <b>33.52</b> | <b>7.05*10<sup>-09</sup></b> | - |
|                             |     | Herbivory (H)          | 1        | 0.13         | 0.718                        |   |
|                             |     | <b>Soil (S)</b>        | <b>1</b> | <b>5.41</b>  | <b>0.020</b>                 | + |
|                             |     | Replicate              | 1        | 1.69         | 0.194                        |   |
|                             |     | (S) x (H)              | 1        | 0.00         | 0.947                        |   |
|                             |     | (S) x (P)              | 1        | 0.52         | 0.469                        |   |
|                             |     | <b>(P) x (H)</b>       | <b>1</b> | <b>4.74</b>  | <b>0.030</b>                 |   |
|                             |     | (S) x (P) x (H)        | 1        | 0.53         | 0.465                        |   |
| Methoxyglucobrassicin       | 511 | Pollination (P)        | 1        | 2.20         | 0.150                        |   |
|                             |     | Herbivory (H)          | 1        | 0.32         | 0.579                        |   |
|                             |     | <b>Soil (S)</b>        | <b>1</b> | <b>6.30</b>  | <b>0.013</b>                 | - |
|                             |     | Replicate              | 1        | 0.21         | 0.644                        |   |
|                             |     | (S) x (H)              | 1        | 0.04         | 0.827                        |   |
|                             |     | <b>(S) x (P)</b>       | <b>1</b> | <b>16.12</b> | <b>7.03*10<sup>-05</sup></b> |   |
|                             |     | (P) x (H)              | 1        | 1.19         | 0.277                        |   |
|                             |     | (S) x (P) x (H)        | 1        | 1.16         | 0.340                        |   |
| <b>Total glucosinolates</b> | 477 | <b>Pollination (P)</b> | <b>1</b> | <b>4.69</b>  | <b>0.030</b>                 | - |
|                             |     | Herbivory (H)          | 1        | 2.72         | 0.099                        |   |
|                             |     | <b>Soil (S)</b>        | <b>1</b> | <b>6.62</b>  | <b>0.010</b>                 | + |
|                             |     | Replicate              | 1        | 0.07         | 0.796                        |   |
|                             |     | (S) x (H)              | 1        | 0.23         | 0.634                        |   |
|                             |     | (S) x (P)              | 1        | 1.32         | 0.251                        |   |
|                             |     | (P) x (H)              | 1        | 0.56         | 0.453                        |   |
|                             |     | (S) x (P) x (H)        | 1        | 2.16         | 0.141                        |   |

**Supplementary Table 7: Trait differences (mean  $\pm$  SD) among first generation plants and those having evolved with or without aphid-herbivory, with or without bee-pollination and either in limestone or tuff soil.** Significance between treatments was determined using two-sided linear mixed models (LMM) with individual traits as dependent variable, treatment and its interactions with replicate as fixed factors, and replicate as random factors. Different letters below each treatment group mean indicate significant differences between treatment groups ( $P < 0.05$ ); P-values are Tukey-corrected for multiple comparisons. G1: plants of generation one. LHB: limestone line plants (L) growing with aphid-herbivory (H) and bee-pollination (B). LHH: limestone line plants (L) growing with aphid-herbivory (H) and hand-pollination (H). LNHB: limestone line plants (L) growing without herbivory (NH) and bee-pollination (B). LNHH: limestone line plants (L) growing without herbivory (NH) and hand-pollination (H). THB: tuff line plants (T) growing with aphid-herbivory (H) and bee-pollination (B). THH: tuff line plants (T) growing with aphid-herbivory (H) and hand-pollination (H). TNHB: tuff line plants (T) growing without herbivory (NH) and bee-pollination (B). TNHH: tuff line plants (T) growing without herbivory (NH) and hand-pollination (H).

| Traits                       | N   | G1               | LHB                          | LHH              | LNHB             | LNHH             | THB                          | THH              | TNHB                         | TNHH             |
|------------------------------|-----|------------------|------------------------------|------------------|------------------|------------------|------------------------------|------------------|------------------------------|------------------|
| <i>Morphology</i>            |     |                  |                              |                  |                  |                  |                              |                  |                              |                  |
| Height day 20 (cm)           | 647 | 24.70 $\pm$ 8.02 | 24.77 $\pm$ 7.06             | 22.74 $\pm$ 8.18 | 22.44 $\pm$ 6.46 | 22.55 $\pm$ 8.12 | 15.16 $\pm$ 7.65             | 24.23 $\pm$ 9.70 | 18.50 $\pm$ 7.53             | 23.29 $\pm$ 7.70 |
|                              |     |                  | A                            | A                | A                | A                | B                            | A                | B                            | A                |
|                              |     |                  |                              |                  |                  |                  | <b>1.99*10<sup>-11</sup></b> |                  | <b>4.43*10<sup>-06</sup></b> |                  |
| Height day 30 (cm)           | 647 | 48.05 $\pm$ 8.03 | 42.84 $\pm$ 8.24             | 49.07 $\pm$ 8.87 | 43.73 $\pm$ 7.96 | 45.57 $\pm$ 9.00 | 46.42 $\pm$ 7.71             | 47.02 $\pm$ 8.47 | 53.64 $\pm$ 7.26             | 49.20 $\pm$ 7.49 |
|                              |     |                  | D                            | B                | CD               | BCD              | BCD                          | BC               | A                            | B                |
|                              |     |                  | <b>1.81*10<sup>-04</sup></b> |                  | <b>0.001</b>     |                  |                              |                  | <b>2.33*10<sup>-05</sup></b> |                  |
| Leaf size (cm <sup>2</sup> ) | 647 | 40.11 $\pm$ 2.22 | 35.69 $\pm$ 1.74             | 43.25 $\pm$ 1.95 | 40.19 $\pm$ 1.58 | 40.40 $\pm$ 1.52 | 52.97 $\pm$ 2.00             | 40.70 $\pm$ 2.48 | 59.96 $\pm$ 2.07             | 45.79 $\pm$ 1.81 |
|                              |     |                  | D                            | CD               | CD               | CD               | AB                           | CD               | A                            | BC               |
|                              |     |                  |                              |                  |                  |                  | <b>3.09*10<sup>-05</sup></b> |                  | <b>9.67*10<sup>-10</sup></b> | <b>0.049</b>     |

|                                  |     |               |               |                              |               |               |                              |               |                              |                              |
|----------------------------------|-----|---------------|---------------|------------------------------|---------------|---------------|------------------------------|---------------|------------------------------|------------------------------|
| Time to flower (day)             | 647 | 18.64 ± 1.92  | 18.69 ± 1.97  | 19.48 ± 1.84                 | 18.92 ± 1.56  | 19.54 ± 1.94  | 21.01 ± 2.61                 | 19.15 ± 2.27  | 20.67 ± 2.12                 | 19.22 ± 1.70                 |
|                                  |     |               | B             | B                            | B             | B             | A                            | B             | A                            | B                            |
|                                  |     |               |               | <b>0.008</b>                 |               | <b>0.005</b>  | <b>6.31*10<sup>-09</sup></b> |               | <b>1.39*10<sup>-08</sup></b> |                              |
| Cumulative branches length (cm)  | 647 | 90.21 ± 46.99 | 84.37 ± 40.25 | 94.93 ± 46.86                | 85.44 ± 42.22 | 72.13 ± 40.00 | 72.52 ± 36.45                | 87.25 ± 45.63 | 87.27 ± 36.69                | 85.41 ± 39.08                |
|                                  |     |               | AB            | A                            | AB            | B             | B                            | AB            | AB                           | AB                           |
|                                  |     |               |               |                              |               | <b>0.014</b>  | <b>0.013</b>                 |               |                              |                              |
| Number of flowering branches     | 647 | 4.89 ± 2.29   | 5.17 ± 1.93   | 5.15 ± 1.99                  | 5.08 ± 1.80   | 4.36 ± 1.78   | 4.60 ± 2.00                  | 4.90 ± 2.46   | 4.53 ± 1.65                  | 5.07 ± 2.00                  |
|                                  |     |               | A             | A                            | A             | A             | A                            | A             | A                            | A                            |
| Flower production rate (per day) | 647 | 5.44 ± 0.22   | 5.27 ± 0.27   | 6.33 ± 0.28                  | 5.30 ± 1.84   | 5.40 ± 1.80   | 5.86 ± 1.88                  | 5.47 ± 1.85   | 6.55 ± 3.00                  | 6.49 ± 2.42                  |
|                                  |     |               | C             | ABC                          | C             | BC            | ABC                          | ABC           | A                            | AB                           |
|                                  |     |               |               | <b>1.98*10<sup>-05</sup></b> |               |               |                              |               | <b>1.11*10<sup>-08</sup></b> | <b>3.48*10<sup>-05</sup></b> |
| Flower number                    | 647 | 27.42 ± 14.90 | 27.71 ± 15.18 | 37.80 ± 16.62                | 29.86 ± 13.06 | 30.71 ± 14.24 | 36.81 ± 16.16                | 28.26 ± 14.78 | 38.60 ± 14.58                | 38.00 ± 16.76                |
|                                  |     |               | D             | AB                           | CD            | BCD           | ABC                          | D             | A                            | AB                           |
|                                  |     |               |               | <b>1.32*10<sup>-04</sup></b> |               |               | <b>4.03*10<sup>-04</sup></b> |               | <b>1.14*10<sup>-05</sup></b> | <b>1.00*10<sup>-04</sup></b> |



|                           |     |             |              |              |              |             |                              |              |                              |                              |
|---------------------------|-----|-------------|--------------|--------------|--------------|-------------|------------------------------|--------------|------------------------------|------------------------------|
| Nectar amount (nL/flower) | 634 | 5.91 ± 3.50 | 5.40 ± 3.58  | 7.12 ± 4.33  | 6.14 ± 4.76  | 7.02 ± 5.13 | 8.47 ± 1.62                  | 7.58 ± 4.46  | 9.33 ± 5.01                  | 8.68 ± 3.97                  |
|                           |     |             | D            | ABCD         | CD           | BCD         | ABC                          | ABCD         | A                            | AB                           |
|                           |     |             |              |              |              |             | <b>8.72*10<sup>-04</sup></b> | <b>0.016</b> | <b>5.87*10<sup>-06</sup></b> | <b>2.13*10<sup>-05</sup></b> |
| Flower diameter (cm)      | 636 | 1,46 ± 0.14 | 1.48 ± 0.16  | 1.40 ± 0.15  | 1.51 ± 0.17  | 1.41 ± 0.12 | 1.51 ± 0.15                  | 1.44 ± 0.18  | 1.53 ± 0.15                  | 1.40 ± 0.14                  |
|                           |     |             | AB           | C            | AB           | BC          | AB                           | BC           | A                            | C                            |
|                           |     |             |              | <b>0.035</b> | <b>0.038</b> |             | <b>0.035</b>                 |              | <b>0.006</b>                 | <b>0.024</b>                 |
| Petal length (cm)         | 636 | 1.06 ± 0.10 | 1.07 ± 0.10  | 1.03 ± 0.09  | 1.07 ± 0.08  | 1.05 ± 0.09 | 1.09 ± 0.10                  | 1.04 ± 0.11  | 1.09 ± 0.11                  | 1.02 ± 0.09                  |
|                           |     |             | AB           | B            | AB           | AB          | A                            | B            | A                            | B                            |
|                           |     |             |              |              |              |             | <b>0.042</b>                 |              |                              | <b>0.020</b>                 |
| Petal width (cm)          | 636 | 0.51 ± 0.07 | 0.53 ± 0.06  | 0.48 ± 0.07  | 0.55 ± 0.08  | 0.52 ± 0.06 | 0.52 ± 0.06                  | 0.49 ± 0.07  | 0.53 ± 0.08                  | 0.51 ± 0.07                  |
|                           |     |             | ABC          | D            | A            | ABC         | ABC                          | CD           | AB                           | BC                           |
|                           |     |             |              | <b>0.001</b> | <b>0.004</b> |             |                              |              |                              |                              |
| Sepal length (cm)         | 636 | 0.55 ± 0.07 | 0.52 ± 0.07  | 0.53 ± 0.07  | 0.56 ± 0.07  | 0.56 ± 0.06 | 0.55 ± 0.08                  | 0.55 ± 0.06  | 0.56 ± 0.09                  | 0.53 ± 0.06                  |
|                           |     |             | B            | AB           | A            | AB          | AB                           | AB           | A                            | AB                           |
|                           |     |             | <b>0.009</b> | <b>0.034</b> |              |             |                              |              |                              |                              |

|                        |     |             |             |             |             |             |             |             |                              |              |
|------------------------|-----|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------------------------------|--------------|
| Style length (cm)      | 636 | 0.76 ± 0.10 | 0.73 ± 0.10 | 0.74 ± 0.13 | 0.73 ± 0.09 | 0.73 ± 0.11 | 0.75 ± 0.14 | 0.76 ± 0.12 | 0.75 ± 0.10                  | 0.71 ± 0.09  |
|                        |     |             | AB          | AB          | AB          | AB          | AB          | A           | AB                           | B            |
|                        |     |             |             |             |             |             |             |             |                              | <b>0.002</b> |
| Stamen length (cm)     | 636 | 0.67 ± 0.06 | 0.66 ± 0.07 | 0.66 ± 0.07 | 0.65 ± 0.06 | 0.66 ± 0.06 | 0.69 ± 0.07 | 0.67 ± 0.08 | 0.66 ± 0.08                  | 0.68 ± 0.07  |
|                        |     |             | AB          | AB          | B           | AB          | A           | AB          | AB                           | AB           |
| Herkogamy (cm)         | 636 | 0.12 ± 0.06 | 0.12 ± 0.07 | 0.13 ± 0.08 | 0.12 ± 0.06 | 0.12 ± 0.06 | 0.12 ± 5.25 | 0.14 ± 0.08 | 0.12 ± 0.06                  | 0.10 ± 0.06  |
|                        |     |             | A           | A           | A           | A           | A           | A           | A                            | A            |
| <i>Bioassays</i>       |     |             |             |             |             |             |             |             |                              |              |
| Number of aphid visits | 639 | 1.15 ± 1.74 | 1.00 ± 1.78 | 1.04 ± 1.61 | 1.13 ± 1.58 | 0.78 ± 1.02 | 1.14 ± 1.51 | 1.03 ± 1.26 | 1.47 ± 2.23                  | 1.00 ± 1.51  |
|                        |     |             | A           | A           | A           | A           | A           | A           | A                            | A            |
| Number of bee visits   | 639 | 13          | 22          | 24          | 25          | 14          | 24          | 22          | 48                           | 21           |
|                        |     |             | B           | B           | B           | B           | B           | B           | A                            | B            |
|                        |     |             |             |             |             |             |             |             | <b>3.44*10<sup>-06</sup></b> |              |

| Floral scent (pg.l <sup>-1</sup> .hr <sup>-1</sup> .flower <sup>-1</sup> ) |     |               |                |               |               |                              |               |                              |               |               |
|----------------------------------------------------------------------------|-----|---------------|----------------|---------------|---------------|------------------------------|---------------|------------------------------|---------------|---------------|
| <b>Aromatic compounds</b>                                                  |     |               |                |               |               |                              |               |                              |               |               |
| Benzaldehyde                                                               | 635 | 244.61±199.47 | 224.35±184.94  | 200.03±244.46 | 300.81±244.99 | 362.54±376.78                | 403.80±438.70 | 504.57±539.78                | 365.42±349.91 | 291.18±260.23 |
|                                                                            |     |               | CD             | D             | BC            | ABC                          | ABC           | A                            | AB            | BCD           |
|                                                                            |     |               |                |               |               | <b>0.012</b>                 | <b>0.012</b>  | <b>2.77*10<sup>-05</sup></b> | <b>0.002</b>  |               |
| Methyl benzoate                                                            | 635 | 35.04±33.39   | 67.10±84.71    | 30.53±32.98   | 33.87±43.02   | 37.44±44.59                  | 26.68±42.12   | 32.75±33.58                  | 32.79±36.59   | 19.27±20.05   |
|                                                                            |     |               | A              | BC            | BC            | AB                           | BC            | BC                           | AB            | C             |
|                                                                            |     |               | <b>0.003</b>   |               |               |                              | <b>0.039</b>  |                              |               | <b>0.004</b>  |
| Phenylethyl alcohol                                                        | 635 | 23.23±35.65   | 27.05±43.58    | 29.25±44.32   | 34.70±45.16   | 47.12±51.92                  | 16.39±27.12   | 24.49±38.55                  | 20.14±35.16   | 24.01±33.91   |
|                                                                            |     |               | BC             | BC            | AB            | A                            | C             | BC                           | BC            | BC            |
|                                                                            |     |               |                |               | <b>0.034</b>  | <b>3.18*10<sup>-05</sup></b> |               |                              |               |               |
| Phenylacetaldehyde                                                         | 635 | 586.50±913.11 | 907.59±1480.09 | 648.55±910.23 | 801.30±868.05 | 1458.44±1497.11              | 292.24±488.40 | 700.34±1144.85               | 391.27±561.36 | 433.51±682.81 |
|                                                                            |     |               | B              | B             | B             | A                            | C             | BC                           | BC            | BC            |
|                                                                            |     |               |                |               |               | <b>3.68*10<sup>-07</sup></b> | <b>0.008</b>  |                              |               |               |
| <i>p</i> -Anisaldehyde                                                     | 635 | 17.75±17.06   | 20.09±19.67    | 18.82±21.42   | 25.38±25.37   | 30.1±41.11                   | 26.53±33.22   | 29.30±32.73                  | 20.29±21.43   | 16.54±34.15   |

|                     |     |               |               |               |               |               |               |               |               |               |
|---------------------|-----|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
|                     |     |               | AB            | AB            | AB            | AB            | AB            | A             | AB            | B             |
|                     |     |               |               |               |               |               |               | <b>0.041</b>  |               |               |
| 2-Aminobenzaldehyde | 635 | 428.18±439.37 | 532.94±599.35 | 546.68±411.05 | 326.96±366.17 | 497.73±452.03 | 357.98±541.18 | 477.08±593.74 | 402.51±451.43 | 336.25±401.05 |
|                     |     |               | AB            | A             | B             | AB            | B             | AB            | AB            | B             |
|                     |     |               |               | <b>0.028</b>  |               |               |               |               |               |               |
| Methyl salicylate   | 635 | 23.84±27.94   | 23.67±19.44   | 22.05±23.00   | 16.60±16.57   | 22.75±21.46   | 20.83±21.65   | 17.57±18.10   | 29.35±32.84   | 15.05±13.93   |
|                     |     |               | A             | AB            | AB            | A             | AB            | AB            | A             | B             |
| <b>Terpenoids</b>   |     |               |               |               |               |               |               |               |               |               |
| β-Pinene            | 635 | 8.81±7.10     | 7.59±7.42     | 7.83±7.93     | 7.81±7.86     | 9.65±18.60    | 8.16±7.62     | 7.66±8.12     | 9.07±9.00     | 7.79±6.61     |
|                     |     |               | A             | A             | A             | A             | A             | A             | A             | A             |
| (E,E)-α-Farnesene   | 635 | 239.79±160.79 | 194.01±133.79 | 218.42±132.44 | 309.58±236.96 | 260.92±174.86 | 303.01±178.94 | 285.52±181.65 | 319.36±187.81 | 203.01±131.70 |
|                     |     |               | C             | BC            | ABC           | ABC           | AB            | ABC           | A             | C             |
|                     |     |               |               |               |               |               |               | <b>0.002</b>  |               |               |

### Fatty acid derivatives

|                          |     |             |             |             |             |             |             |             |             |             |
|--------------------------|-----|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| (Z)-3-Hexen-1-ol-acetate | 635 | 54.10±66.76 | 59.27±99.98 | 36.87±44.72 | 44.15±41.81 | 47.39±56.38 | 20.49±23.03 | 58.48±76.17 | 59.96±87.40 | 38.65±44.28 |
|                          |     |             | A           | AB          | A           | A           | B           | A           | A           | AB          |
|                          |     |             |             |             |             |             | 0.002       |             |             |             |

### Nitrogen containing compounds

|                                       |     |               |                        |               |                        |               |                        |               |               |                        |
|---------------------------------------|-----|---------------|------------------------|---------------|------------------------|---------------|------------------------|---------------|---------------|------------------------|
| Methyl anthranilate                   | 635 | 36.66±56.55   | 67.70±104.66           | 55.37±73.79   | 22.90±67.44            | 42.07±70.12   | 14.59±25.34            | 22.47±39.45   | 24.11±36.16   | 11.05±21.35            |
|                                       |     |               | A                      | A             | CD                     | AB            | CD                     | BCD           | BC            | D                      |
|                                       |     |               | 0.012                  |               | 3.25*10 <sup>-04</sup> |               | 7.45*10 <sup>-05</sup> | 0.015         |               | 2.20*10 <sup>-06</sup> |
| Benzyl nitrile                        | 635 | 58.69±54.21   | 103.24±89.28           | 59.98±54.01   | 74.88±72.11            | 65.83±70.26   | 66.48±75.97            | 62.18±63.45   | 51.14±62.74   | 51.79±61.49            |
|                                       |     |               | AB                     | B             | A                      | AB            | AB                     | A             | AB            | AB                     |
|                                       |     |               | 6.03*10 <sup>-04</sup> |               | 0.042                  |               |                        |               |               |                        |
| Indole                                | 635 | 159.78±139.71 | 231.11±186.65          | 187.16±116.61 | 177.96±162.43          | 199.65±183.53 | 220.81±223.39          | 193.95±182.18 | 169.84±157.44 | 145.00±148.38          |
|                                       |     |               | A                      | A             | A                      | A             | A                      | A             | A             | A                      |
|                                       |     |               | 0.012                  | 0.047         |                        |               |                        |               |               |                        |
| Total N-containing volatile compounds | 635 | 258.13±24.93  | 402.04±35.18           | 302.51±24.20  | 275.74±31.80           | 307.55±31.80  | 301.89±35.93           | 278.60±29.41  | 245.09±25.79  | 207.84±25.79           |
|                                       |     |               | A                      | AB            | AB                     | AB            | AB                     | AB            | AB            | B                      |

|                                            |     |                 |                        |                 |                 |                 |                 |                 |                 |                 |
|--------------------------------------------|-----|-----------------|------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                                            |     |                 | 0.012                  |                 |                 |                 |                 |                 |                 |                 |
| Sulphur containing compounds               |     |                 |                        |                 |                 |                 |                 |                 |                 |                 |
| 1-Butene-4-isothiocyanate                  | 635 | 61.06±96.35     | 49.02±50.39            | 50.56±56.16     | 68.77±104.20    | 88.70±82.93     | 53.09±56.00     | 79.95±103.71    | 58.89±61.12     | 77.17±101.43    |
|                                            |     |                 | B                      | B               | AB              | A               | AB              | AB              | AB              | AB              |
|                                            |     |                 | 0.006                  |                 |                 |                 |                 |                 |                 |                 |
| Total emission                             | 635 | 1981.03±1525.46 | 2514.72±2132.24        | 2112.10±1443.98 | 2245.67±1444.41 | 3171.32±2277.12 | 1831.09±1455.26 | 2496.31±1989.04 | 1954.12±1237.20 | 1670.26±1310.88 |
|                                            |     |                 | AB                     | B               | AB              | A               | B               | AB              | AB              | B               |
|                                            |     |                 | 2.68*10 <sup>-04</sup> |                 |                 |                 |                 |                 |                 |                 |
| Leaf glucosinolates (pg.mg <sup>-l</sup> ) |     |                 |                        |                 |                 |                 |                 |                 |                 |                 |
| Glucoraphanin                              | 551 | 66.36±5.71      | 54.87±6.20             | 64.03±5.55      | 46.14±6.31      | 71.03±6.73      | 50.51±4.53      | 72.55±7.21      | 49.47±3.94      | 52.05±4.18      |
|                                            |     |                 | AB                     | AB              | B               | A               | AB              | A               | AB              | AB              |
|                                            |     |                 | 0.015                  |                 |                 |                 | 0.018           |                 | 0.033           | 0.048           |
| Glucoalyssin                               | 566 | 18.14±3.81      | 9.68±1.32              | 15.18±1.79      | 33.32±8.03      | 31.74±7.16      | 28.59±7.72      | 19.06±3.17      | 15.76±1.52      | 23.78±5.36      |
|                                            |     |                 | B                      | AB              | A               | A               | A               | AB              | AB              | AB              |
|                                            |     |                 | 0.035                  |                 |                 |                 |                 |                 |                 |                 |

|                       |     |                 |                              |                             |                              |                                           |                                            |                       |                                            |                                             |
|-----------------------|-----|-----------------|------------------------------|-----------------------------|------------------------------|-------------------------------------------|--------------------------------------------|-----------------------|--------------------------------------------|---------------------------------------------|
| Sinalbin              | 578 | 184.55±15.04    | 160.78±11.17<br>A            | 163.01±12.11<br>A           | 154.22±11.65<br>A            | 166.26±14.79<br>A                         | 179.26±15.06<br>A                          | 179.68±15.02<br>A     | 165.98±12.44<br>A                          | 179.02±14.98<br>A                           |
| Gluconapin            | 578 | 10528.85±696.33 | 8124.47±587.20<br>B<br>0.006 | 9995.91±757.28<br>AB        | 8773.15±660.95<br>B<br>0.031 | 10384.45±479.29<br>AB                     | 10995.42±821.84<br>AB                      | 10008.11±792.83<br>AB | 10382.91±696.53<br>AB                      | 11545.03±675.08<br>A                        |
| Glucobrassicinapin    | 574 | 334.43±39.60    | 254.24±26.29<br>C            | 490.95±58.67<br>AB<br>0.025 | 266.52±26.60<br>C            | 301.55±46.35<br>C                         | 348.55±42.17<br>BC                         | 365.26±36.20<br>ABC   | 518.21±48.75<br>A<br>0.002                 | 581.28±65.40<br>A<br>9.42*10 <sup>-04</sup> |
| Hydroxyglucobrassicin | 576 | 14.22±1.32      | 12.90±1.03<br>A              | 12.47±1.18<br>A             | 11.35±1.19<br>A              | 8.73±0.93<br>AB<br>9.07*10 <sup>-04</sup> | 6.67±0.55<br>B<br>9.26*10 <sup>-07</sup>   | 12.69±1.14<br>A       | 10.54±1.17<br>AB<br>0.038                  | 12.81±1.35<br>A                             |
| Glucobrassicin        | 576 | 75.15±10.15     | 56.11±6.38<br>AB             | 74.74±8.45<br>AB            | 61.87±9.82<br>AB             | 85.27±10.19<br>B                          | 53.49±11.68<br>AB                          | 67.20±9.59<br>AB      | 47.53±8.82<br>A<br>0.027                   | 69.12±9.30<br>AB                            |
| Neoglucobrassicin     | 577 | 147.36±24.19    | 173.65±30.83<br>C            | 101.28±23.63<br>AB<br>0.006 | 125.62±24.82<br>ABC          | 137.19±35.60<br>ABC                       | 87.79±24.15<br>A<br>2.56*10 <sup>-04</sup> | 155.78±32.96<br>BC    | 92.12±30.18<br>A<br>1.35*10 <sup>-04</sup> | 130.23±25.39<br>ABC                         |
| Gluconasturtiin       | 578 | 500.63±65.87    | 370.03±51.06<br>A            | 583.61±78.13<br>ABC         | 331.92±44.33<br>A            | 621.47±61.70<br>BC                        | 498.42±52.16<br>ABC                        | 596.32±69.87<br>BC    | 394.56±39.50<br>AB                         | 704.49±64.89<br>C                           |

|                                                      |     |            |              |            |              |             |              |             |                              |              |
|------------------------------------------------------|-----|------------|--------------|------------|--------------|-------------|--------------|-------------|------------------------------|--------------|
|                                                      |     |            |              |            | <b>0.019</b> |             |              |             |                              | <b>0.007</b> |
| Methoxyglucobrassicin                                | 576 | 73.73±8.28 | 86.53±12.70  | 66.74±8.08 | 82.22±10.30  | 67.12±10.75 | 50.06±6.15   | 73.27±12.19 | 32.49±4.62                   | 80.74±9.61   |
|                                                      |     |            | A            | AB         | A            | AB          | AB           | AB          | B                            | A            |
|                                                      |     |            |              |            |              |             | <b>0.022</b> |             | <b>2.21*10<sup>-05</sup></b> |              |
| <b>Total glucosinolates<br/>(µg.mg<sup>-1</sup>)</b> | 543 | 11.79±0.78 | 9.20±0.66    | 11.29±0.84 | 10.30±0.87   | 11.78±0.87  | 12.19±0.99   | 11.03±0.81  | 11.74±0.77                   | 13.10±0.77   |
|                                                      |     |            | B            | AB         | AB           | AB          | AB           | AB          | AB                           | A            |
|                                                      |     |            | <b>0.006</b> |            |              |             |              |             |                              |              |



**Supplementary Table 8: Effects of bee-pollination, aphid-herbivory, and their interaction on the evolution of plant morphology, nectar, floral scent, and leaf glucosinolates content in each soil line separately.** Only traits with a significant effect (indicated by Y for “yes”) of either bee-pollination, aphid-herbivory, or soil are shown in this table (see Supplementary Table 9 for full statistical values); (+) indicates positive effect (increase) of the factor on trait evolution, whereas (-) indicates a negative effect (decrease) of either factor on plant trait evolution. Only plants of generation 10 were analyzed here.

| Trait                               | N   | Pollination (P)  |             | Herbivory (H)    |             | (P) x (H)        |             |
|-------------------------------------|-----|------------------|-------------|------------------|-------------|------------------|-------------|
| <i>Morphology</i>                   |     | <i>Limestone</i> | <i>Tuff</i> | <i>Limestone</i> | <i>Tuff</i> | <i>Limestone</i> | <i>Tuff</i> |
| Height day 20 (cm)                  | 575 |                  | Y (-)       |                  |             |                  | Y           |
| Height day 30 (cm)                  | 575 | Y (-)            | Y (+)       |                  | Y (-)       |                  | Y           |
| Time to flower (day)                | 575 | Y (-)            | Y (+)       |                  |             |                  |             |
| Leaf size (cm <sup>2</sup> )        | 575 | Y (-)            | Y (+)       |                  | Y (-)       | Y                |             |
| Cumulative branches length (cm)     | 575 |                  |             | Y (+)            | Y (-)       | Y                | Y           |
| Number of flowering branches        | 575 |                  |             | Y (+)            |             |                  |             |
| Flower production rate (per day)    | 575 | Y (-)            |             |                  | Y (-)       |                  |             |
| Flower number                       | 575 | Y (-)            | Y (+)       |                  | Y (-)       | Y                | Y           |
| Nectar amount (nL/flower)           | 564 | Y (-)            |             |                  |             |                  |             |
| Flower diameter (cm)                | 564 | Y (+)            | Y (+)       |                  |             |                  |             |
| Petal length (cm)                   | 564 | Y (+)            | Y (+)       |                  |             |                  |             |
| Petal width (cm)                    | 564 | Y (+)            | Y (+)       | Y (-)            |             |                  |             |
| Sepal length (cm)                   | 564 |                  |             | Y (-)            |             |                  |             |
| Stamen length (cm)                  | 564 |                  |             |                  |             |                  |             |
| <i>Bioassays</i>                    |     |                  |             |                  |             |                  |             |
| Number of aphid visits              | 575 |                  | Y (+)       |                  |             |                  |             |
| Number of bee visits                | 575 |                  | Y (+)       |                  | Y (-)       |                  |             |
| <i>Floral scent</i>                 |     |                  |             |                  |             |                  |             |
| Benzaldehyde                        | 564 |                  |             | Y (-)            | Y (+)       |                  | Y           |
| Methyl benzoate                     | 564 | Y (+)            |             |                  |             | Y                | Y           |
| Phenylethyl alcohol                 | 564 |                  |             | Y (-)            |             |                  |             |
| Phenylacetaldehyde                  | 564 |                  | Y (-)       | Y (-)            |             | Y                |             |
| <i>p</i> -Anisaldehyde              | 564 |                  |             |                  | Y (+)       |                  |             |
| 2-Aminobenzaldehyde                 | 564 | Y (-)            |             | Y (+)            |             |                  |             |
| Methyl salicylate                   | 564 |                  | Y (+)       |                  |             | Y                |             |
| ( <i>E,E</i> )- $\alpha$ -Farnesene | 564 |                  | Y (+)       | Y (-)            |             |                  | Y           |
| ( <i>Z</i> )-3-Hexen-1-ol-acetate   | 564 |                  |             |                  | Y (-)       |                  | Y           |
| Methyl anthranilate                 | 564 | Y (-)            |             | Y (+)            |             | Y                | Y           |
| Benzyl nitrile                      | 564 | Y (+)            |             |                  |             |                  |             |
| 1-Butene-4-isothiocyanate           | 564 |                  |             | Y (-)            |             |                  |             |
| Total emission                      | 564 |                  |             |                  |             | Y                | Y           |
| <i>Leaf glucosinolates</i>          |     |                  |             |                  |             |                  |             |
| Glucoraphanin                       | 485 | Y (-)            | Y (-)       |                  | Y (+)       |                  |             |
| Glucoalyssin                        | 500 |                  |             | Y (-)            |             |                  |             |
| Gluconapin                          | 512 | Y (-)            |             |                  |             |                  |             |
| Glucobrassicinapin                  | 509 | Y (-)            |             | Y (+)            | Y (-)       | Y                |             |
| Hydroxyglucobrassicin               | 510 |                  | Y (-)       | Y (+)            |             |                  |             |
| Glucobrassicin                      | 510 | Y (-)            | Y (-)       |                  |             |                  |             |
| Neoglucobrassicin                   | 511 | Y (-)            | Y (-)       |                  |             | Y                |             |

|                       |     |       |       |   |
|-----------------------|-----|-------|-------|---|
| Gluconasturtiin       | 512 | Y (-) | Y (-) | Y |
| Methoxyglucobrassicin | 511 |       | Y (-) |   |
| Total glucosinolates  | 477 | Y (-) |       |   |

**Supplementary Table 9: Effects of bee-pollination, aphid-herbivory, and their interaction on the evolution of plant morphology, nectar, floral scent, and leaf glucosinolates content in each soil line separately.** Significance between pollination and herbivory treatments in each soil line was determined using two-sided linear mixed models (LMM) with individual traits as dependent variable, pollination, herbivory, and their interaction as fixed factors, and replicate as random factors. Bold indicates significant factor effects ( $P < 0.05$ ). (+) indicates positive effect (increase) of either bees or herbivory on plant traits evolution whereas (-) indicate a negative effect (decrease). Only plants of generation 10 were analyzed here.

| Traits                           | Factor          | Limestone lines |     |          |                        |      | Tuff lines |          |                        |      |  |
|----------------------------------|-----------------|-----------------|-----|----------|------------------------|------|------------|----------|------------------------|------|--|
|                                  |                 | df              | N   | $\chi^2$ | P                      | sign | N          | $\chi^2$ | P                      | sign |  |
| Morphology                       |                 |                 |     |          |                        |      |            |          |                        |      |  |
| Heigth at day 20 (cm)            | Pollination (P) | 1               | 287 | 1.17     | 0.280                  |      | 288        | 51.48    | 7.23*10 <sup>-13</sup> | -    |  |
|                                  | Herbivory (H)   | 1               |     | 2.03     | 0.154                  |      |            | 1.54     | 0.214                  |      |  |
|                                  | Replicate       | 1               |     | 0.01     | 0.921                  |      |            | 0.16     | 0.693                  |      |  |
|                                  | (P) x (H)       | 1               |     | 1.46     | 0.227                  |      |            | 4.91     | 0.027                  |      |  |
| Heigth at day 30 (cm)            | Pollination (P) | 1               | 287 | 16.06    | 6.14*10 <sup>-05</sup> | -    | 288        | 4.41     | 0.036                  | +    |  |
|                                  | Herbivory (H)   | 1               |     | 1.67     | 0.196                  |      |            | 26.48    | 2.67*10 <sup>-07</sup> | -    |  |
|                                  | Replicate       | 1               |     | 0.12     | 0.731                  |      |            | 0.04     | 0.845                  |      |  |
|                                  | (P) x (H)       | 1               |     | 4.75     | 0.029                  |      |            | 7.57     | 0.006                  |      |  |
| Time to flower (day)             | Pollination (P) | 1               | 287 | 10.52    | 0.001                  | -    | 288        | 40.57    | 1.90*10 <sup>-10</sup> | +    |  |
|                                  | Herbivory (H)   | 1               |     | 0.43     | 0.510                  |      |            | 0.29     | 0.593                  |      |  |
|                                  | Replicate       | 1               |     | 0.27     | 0.870                  |      |            | 0.02     | 0.895                  |      |  |
|                                  | (P) x (H)       | 1               |     | 0.13     | 0.715                  |      |            | 0.64     | 0.422                  |      |  |
| Leaf size (cm <sup>2</sup> )     | Pollination (P) | 1               | 287 | 5.16     | 0.023                  | -    | 288        | 39.32    | 3.59*10 <sup>-10</sup> | +    |  |
|                                  | Herbivory (H)   | 1               |     | 0.24     | 0.624                  |      |            | 8.20     | 0.007                  | -    |  |
|                                  | Replicate       | 1               |     | 0.00     | 0.958                  |      |            | 0.00     | 0.962                  |      |  |
|                                  | (P) x (H)       | 1               |     | 4.66     | 0.031                  |      |            | 0.21     | 0.650                  |      |  |
| Cumulative branches length (cm)  | Pollination (P) | 1               | 287 | 0.08     | 0.777                  |      | 288        | 0.82     | 0.366                  |      |  |
|                                  | Herbivory (H)   | 1               |     | 4.65     | 0.031                  | +    |            | 4.98     | 0.026                  | -    |  |
|                                  | Replicate       | 1               |     | 0.01     | 0.931                  |      |            | 0.01     | 0.933                  |      |  |
|                                  | (P) x (H)       | 1               |     | 5.66     | 0.017                  |      |            | 4.67     | 0.031                  |      |  |
| Number of flowering branches     | Pollination (P) | 1               | 287 | 2.75     | 0.097                  |      | 288        | 3.07     | 0.080                  |      |  |
|                                  | Herbivory (H)   | 1               |     | 3.91     | 0.048                  | +    |            | 0.04     | 0.841                  |      |  |
|                                  | Replicate       | 1               |     | 0.10     | 0.747                  |      |            | 0.01     | 0.928                  |      |  |
|                                  | (P) x (H)       | 1               |     | 2.58     | 0.108                  |      |            | 0.24     | 0.625                  |      |  |
| Flower production rate (per day) | Pollination (P) | 1               | 287 | 5.73     | 0.017                  | -    | 288        | 0.65     | 0.421                  |      |  |
|                                  | Herbivory (H)   | 1               |     | 3.37     | 0.066                  |      |            | 9.36     | 0.002                  | -    |  |

|                              |                 |   |     |              |                              |   |     |              |                              |   |
|------------------------------|-----------------|---|-----|--------------|------------------------------|---|-----|--------------|------------------------------|---|
|                              | Replicate       | 1 |     | 0.53         | 0.466                        |   |     | 0.03         | 0.858                        |   |
|                              | (P) x (H)       | 1 |     | 3.81         | 0.051                        |   |     | 0.34         | 0.562                        |   |
| Number of flowers            | Pollination (P) | 1 | 287 | <b>9.69</b>  | <b>0.002</b>                 | - | 288 | <b>6.16</b>  | <b>0.013</b>                 | + |
|                              | Herbivory (H)   | 1 |     | 1.96         | 0.162                        |   |     | <b>9.80</b>  | <b>0.002</b>                 | - |
|                              | Replicate       | 1 |     | 0.09         | 0.760                        |   |     | 0.01         | 0.905                        |   |
|                              | (P) x (H)       | 1 |     | <b>6.96</b>  | <b>0.008</b>                 |   |     | <b>4.66</b>  | <b>0.031</b>                 |   |
| Nectar amount<br>(nL/flower) | Pollination (P) | 1 | 281 | <b>5.75</b>  | <b>0.016</b>                 | - | 282 | 1.87         | 0.171                        |   |
|                              | Herbivory (H)   | 1 |     | 0.35         | 0.553                        |   |     | 3.04         | 0.081                        |   |
|                              | Replicate       | 1 |     | 0.01         | 0.910                        |   |     | 0.01         | 0.917                        |   |
|                              | (P) x (H)       | 1 |     | 0.61         | 0.434                        |   |     | 0.04         | 0.834                        |   |
| Flower diameter (cm)         | Pollination (P) | 1 | 283 | <b>17.71</b> | <b>2.58*10<sup>-04</sup></b> | + | 281 | <b>27.44</b> | <b>1.62*10<sup>-07</sup></b> | + |
|                              | Herbivory (H)   | 1 |     | 3.27         | 0.071                        |   |     | 0.21         | 0.648                        |   |
|                              | Replicate       | 1 |     | 0.45         | 0.503                        |   |     | 0.03         | 0.862                        |   |
|                              | (P) x (H)       | 1 |     | 0.07         | 0.787                        |   |     | 2.08         | 0.149                        |   |
| Petal length (cm)            | Pollination (P) | 1 | 283 | <b>7.03</b>  | <b>0.008</b>                 | + | 281 | <b>23.31</b> | <b>1.38*10<sup>-06</sup></b> | + |
|                              | Herbivory (H)   | 1 |     | 0.92         | 0.336                        |   |     | 0.73         | 0.390                        |   |
|                              | Replicate       | 1 |     | 1.16         | 0.280                        |   |     | 0.36         | 0.547                        |   |
|                              | (P) x (H)       | 1 |     | 0.59         | 0.444                        |   |     | 0.87         | 0.350                        |   |
| Petal width (cm)             | Pollination (P) | 1 | 283 | <b>27.03</b> | <b>2.00*10<sup>-07</sup></b> | + | 281 | <b>7.07</b>  | <b>0.008</b>                 | + |
|                              | Herbivory (H)   | 1 |     | <b>18.94</b> | <b>1.35*10<sup>-05</sup></b> | - |     | 2.35         | 0.125                        |   |
|                              | Replicate       | 1 |     | 1.14         | 0.286                        |   |     | 0.00         | 0.948                        |   |
|                              | (P) x (H)       | 1 |     | 0.90         | 0.343                        |   |     | 0.45         | 0.501                        |   |
| Sepal length (cm)            | Pollination (P) | 1 | 283 | 0.04         | 0.836                        |   | 281 | 1.98         | 0.160                        |   |
|                              | Herbivory (H)   | 1 |     | <b>17.08</b> | <b>3.58*10<sup>-05</sup></b> | - |     | 0.29         | 0.591                        |   |
|                              | Replicate       | 1 |     | 0.01         | 0.918                        |   |     | 0.24         | 0.624                        |   |
|                              | (P) x (H)       | 1 |     | 0.25         | 0.618                        |   |     | 2.60         | 0.107                        |   |
| Style length (cm)            | Pollination (P) | 1 | 283 | 0.26         | 0.608                        |   | 281 | 0.83         | 0.361                        |   |
|                              | Herbivory (H)   | 1 |     | 0.08         | 0.774                        |   |     | <b>4.23</b>  | <b>0.040</b>                 | + |
|                              | Replicate       | 1 |     | 0.09         | 0.765                        |   |     | 1.70         | 0.193                        |   |
|                              | (P) x (H)       | 1 |     | 0.08         | 0.782                        |   |     | <b>4.61</b>  | <b>0.032</b>                 |   |
| Stamen length (cm)           | Pollination (P) | 1 | 283 | 0.17         | 0.678                        |   | 281 | 0.10         | 0.754                        |   |
|                              | Herbivory (H)   | 1 |     | 0.45         | 0.503                        |   |     | 1.14         | 0.286                        |   |
|                              | Replicate       | 1 |     | <b>4.25</b>  | <b>0.039</b>                 |   |     | 0.63         | 0.428                        |   |
|                              | (P) x (H)       | 1 |     | 0.19         | 0.663                        |   |     | <b>6.05</b>  | <b>0.014</b>                 |   |
| Herkogamy                    | Pollination (P) | 1 | 283 | 0.26         | 0.609                        |   | 281 | 0.17         | 0.681                        |   |
|                              | Herbivory (H)   | 1 |     | 0.22         | 0.642                        |   |     | 3.17         | 0.075                        |   |
|                              | Replicate       | 1 |     | 0.00         | 0.962                        |   |     | 1.08         | 0.300                        |   |
|                              | (P) x (H)       | 1 |     | 0.72         | 0.396                        |   |     | <b>4.12</b>  | <b>0.043</b>                 |   |

| <i>Bioassays</i>       |                 |   |     |      |       |  |     |             |              |   |
|------------------------|-----------------|---|-----|------|-------|--|-----|-------------|--------------|---|
| Number of aphid visits | Pollination (P) | 1 | 288 | 1.66 | 0.197 |  | 288 | <b>0.18</b> | <b>0.023</b> | + |

|                                                                             |                 |   |     |              |                              |     |              |                              |              |
|-----------------------------------------------------------------------------|-----------------|---|-----|--------------|------------------------------|-----|--------------|------------------------------|--------------|
|                                                                             | Herbivory (H)   | 1 |     | 0.33         | 0.566                        |     | 1.43         | 0.232                        |              |
|                                                                             | Replicate       | 1 |     | 2.75         | 0.097                        |     | <b>4.77</b>  | <b>0.029</b>                 |              |
|                                                                             | (P) x (H)       | 1 |     | 2.91         | 0.088                        |     | 1.65         | 0.199                        |              |
| Number of bee visits                                                        | Pollination (P) | 1 | 288 | 0.80         | 0.371                        | 288 | 6.55         | <b>0.010</b>                 | +            |
|                                                                             | Herbivory (H)   | 1 |     | 0.56         | 0.455                        |     | 4.19         | <b>0.041</b>                 | -            |
|                                                                             | Replicate       | 1 |     | 0.08         | 0.773                        |     | 1.46         | 0.226                        |              |
|                                                                             | (P) x (H)       | 1 |     | 2.33         | 0.127                        |     | 3.52         | 0.061                        |              |
| <i>Floral scent (pg.l<sup>-1</sup>.hr<sup>-1</sup>.flower<sup>-1</sup>)</i> |                 |   |     |              |                              |     |              |                              |              |
| <b>Aromatic compounds</b>                                                   |                 |   |     |              |                              |     |              |                              |              |
| Benzaldehyde                                                                | Pollination (P) | 1 | 282 | 0.15         | 0.702                        |     | 282          | 0.01                         | 0.940        |
|                                                                             | Herbivory (H)   | 1 |     | <b>19.09</b> | <b>1.25*10<sup>-05</sup></b> | -   | <b>4.79</b>  | <b>0.003</b>                 | +            |
|                                                                             | Replicate       | 1 |     | 0.35         | 0.557                        |     | 0.30         | 0.584                        |              |
|                                                                             | (P) x (H)       | 1 |     | 3.57         | 0.059                        |     | <b>6.67</b>  | <b>0.010</b>                 |              |
| Methyl benzoate                                                             | Pollination (P) | 1 | 282 | <b>5.04</b>  | <b>0.025</b>                 | +   | 282          | 0.96                         | 0.327        |
|                                                                             | Herbivory (H)   | 1 |     | 2.76         | 0.097                        |     |              | 0.03                         | 0.867        |
|                                                                             | Replicate       | 1 |     | 0.01         | 0.932                        |     |              | 0.28                         | 0.597        |
|                                                                             | (P) x (H)       | 1 |     | <b>10.01</b> | <b>0.002</b>                 |     | <b>15.81</b> | <b>6.99*10<sup>-05</sup></b> |              |
| Phenylethyl alcohol                                                         | Pollination (P) | 1 | 282 | 2.09         | 0.148                        |     | 282          | 2.65                         | 0.104        |
|                                                                             | Herbivory (H)   | 1 |     | <b>9.28</b>  | <b>0.002</b>                 | -   |              | 0.95                         | 0.330        |
|                                                                             | Replicate       | 1 |     | 0.20         | 0.652                        |     |              | 0.33                         | 0.568        |
|                                                                             | (P) x (H)       | 1 |     | 2.03         | 0.154                        |     |              | 0.19                         | 0.664        |
| Phenylacetaldehyde                                                          | Pollination (P) | 1 | 282 | 2.80         | 0.094                        |     | 282          | <b>3.88</b>                  | <b>0.049</b> |
|                                                                             | Herbivory (H)   | 1 |     | <b>11.74</b> | <b>6.13*10<sup>-04</sup></b> | +   |              | 0.57                         | 0.452        |
|                                                                             | Replicate       | 1 |     | 0.29         | 0.593                        |     |              | 0.33                         | 0.567        |
|                                                                             | (P) x (H)       | 1 |     | <b>9.67</b>  | <b>0.002</b>                 |     |              | 3.06                         | 0.080        |
| <i>p</i> -Anisaldehyde                                                      | Pollination (P) | 1 | 282 | 0.22         | 0.639                        |     | 282          | 1.51                         | 0.219        |
|                                                                             | Herbivory (H)   | 1 |     | 3.76         | 0.053                        |     |              | <b>8.76</b>                  | <b>0.003</b> |
|                                                                             | Replicate       | 1 |     | 1.57         | 0.210                        |     |              | 0.94                         | 0.333        |
|                                                                             | (P) x (H)       | 1 |     | 0.11         | 0.735                        |     |              | 3.56                         | 0.059        |
| 2-Aminobenzaldehyde                                                         | Pollination (P) | 1 | 282 | <b>6.25</b>  | <b>0.012</b>                 | -   | 282          | 0.19                         | 0.666        |
|                                                                             | Herbivory (H)   | 1 |     | <b>4.94</b>  | <b>0.026</b>                 | +   |              | 0.36                         | 0.551        |
|                                                                             | Replicate       | 1 |     | 0.00         | 0.992                        |     |              | 0.06                         | 0.804        |
|                                                                             | (P) x (H)       | 1 |     | 0.27         | 0.600                        |     |              | 2.95                         | 0.086        |
| Methyl salicylate                                                           | Pollination (P) | 1 | 282 | 0.35         | 0.556                        |     | 282          | <b>8.50</b>                  | <b>0.004</b> |
|                                                                             | Herbivory (H)   | 1 |     | 1.94         | 0.164                        |     |              | 0.01                         | 0.915        |
|                                                                             | Replicate       | 1 |     | 0.19         | 0.664                        |     |              | 0.14                         | 0.709        |
|                                                                             | (P) x (H)       | 1 |     | <b>8.59</b>  | <b>0.003</b>                 |     |              | 1.53                         | 0.216        |
| <b>Terpenoids</b>                                                           |                 |   |     |              |                              |     |              |                              |              |
| β-Pinene                                                                    | Pollination (P) | 1 | 282 | 0.00         | 0.858                        |     | 282          | 0.49                         | 0.483        |
|                                                                             | Herbivory (H)   | 1 |     | 0.01         | 0.917                        |     |              | 1.02                         | 0.312        |
|                                                                             | Replicate       | 1 |     | 0.01         | 0.909                        |     |              | 0.21                         | 0.644        |

|                                                 |                 |   |     |              |                              |   |      |              |                                |
|-------------------------------------------------|-----------------|---|-----|--------------|------------------------------|---|------|--------------|--------------------------------|
|                                                 | (P) x (H)       | 1 |     | 0.59         | 0.443                        |   | 0.23 | 0.643        |                                |
| (E,E)- $\alpha$ -Farnesene                      | Pollination (P) | 1 | 282 | 0.21         | 0.648                        |   | 282  | <b>11.08</b> | <b>8.72*10<sup>-04</sup></b> + |
|                                                 | Herbivory (H)   | 1 |     | <b>10.39</b> | <b>0.001</b>                 | - |      | 1.73         | 0.188                          |
|                                                 | Replicate       | 1 |     | 0.00         | 0.947                        |   |      | 0.85         | 0.357                          |
|                                                 | (P) x (H)       | 1 |     | 0.15         | 0.698                        |   |      | <b>7.43</b>  | <b>0.006</b>                   |
| <b>Fatty acid derivatives</b>                   |                 |   |     |              |                              |   |      |              |                                |
| (Z)-3-Hexen-1-ol-acetate                        | Pollination (P) | 1 | 282 | 2.88         | 0.090                        |   | 282  | 3.65         | 0.056                          |
|                                                 | Herbivory (H)   | 1 |     | 0.36         | 0.548                        |   |      | <b>5.09</b>  | <b>0.024</b> -                 |
|                                                 | Replicate       | 1 |     | 0.11         | 0.740                        |   |      | 0.07         | 0.790                          |
|                                                 | (P) x (H)       | 1 |     | 0.74         | 0.388                        |   |      | <b>19.83</b> | <b>8.48*10<sup>-06</sup></b>   |
| <b>Nitrogen containing compounds</b>            |                 |   |     |              |                              |   |      |              |                                |
| Methyl anthranilate                             | Pollination (P) | 1 | 282 | <b>4.33</b>  | <b>0.038</b>                 | - | 282  | 1.35         | 0.245                          |
|                                                 | Herbivory (H)   | 1 |     | <b>30.22</b> | <b>3.85*10<sup>-04</sup></b> | + |      | 0.01         | 0.932                          |
|                                                 | Replicate       | 1 |     | 0.03         | 0.867                        |   |      | 0.42         | 0.516                          |
|                                                 | (P) x (H)       | 1 |     | <b>11.87</b> | <b>5.72*10<sup>-04</sup></b> |   |      | <b>11.34</b> | <b>7.57*10<sup>-06</sup></b>   |
| Benzyl nitrile                                  | Pollination (P) | 1 | 282 | <b>6.68</b>  | <b>0.010</b>                 | + | 282  | 0.14         | 0.711                          |
|                                                 | Herbivory (H)   | 1 |     | 0.56         | 0.454                        |   |      | 0.67         | 0.412                          |
|                                                 | Replicate       | 1 |     | 0.88         | 0.348                        |   |      | 0.03         | 0.864                          |
|                                                 | (P) x (H)       | 1 |     | 2.81         | 0.094                        |   |      | 0.20         | 0.657                          |
| Indole                                          | Pollination (P) | 1 | 282 | 0.28         | 0.597                        |   | 282  | 3.61         | 0.057                          |
|                                                 | Herbivory (H)   | 1 |     | 3.16         | 0.075                        |   |      | 1.18         | 0.277                          |
|                                                 | Replicate       | 1 |     | 0.02         | 0.899                        |   |      | 0.29         | 0.581                          |
|                                                 | (P) x (H)       | 1 |     | 1.92         | 0.165                        |   |      | 0.25         | 0.616                          |
| <b>Total N-containing volatile compounds</b>    | Pollination (P) | 1 | 282 | 0.09         | 0.767                        |   | 282  | 3.09         | 0.079                          |
|                                                 | Herbivory (H)   | 1 |     | 3.16         | 0.075                        |   |      | 0.86         | 0.354                          |
|                                                 | Replicate       | 1 |     | 0.16         | 0.688                        |   |      | 0.26         | 0.612                          |
|                                                 | (P) x (H)       | 1 |     | 2.89         | 0.090                        |   |      | 0.91         | 0.341                          |
| <b>Sulfphur containing compounds</b>            |                 |   |     |              |                              |   |      |              |                                |
| 1-Butene-4-isothiocyanate                       | Pollination (P) | 1 | 282 | 1.36         | 0.243                        |   | 282  | 1.86         | 0.173                          |
|                                                 | Herbivory (H)   | 1 |     | <b>11.06</b> | <b>8.82*10<sup>-04</sup></b> | - |      | 0.63         | 0.548                          |
|                                                 | Replicate       | 1 |     | 0.11         | 0.744                        |   |      | 0.16         | 0.689                          |
|                                                 | (P) x (H)       | 1 |     | 0.98         | 0.323                        |   |      | 0.68         | 0.410                          |
| <b>Total emission</b>                           | Pollination (P) | 1 | 282 | 0.80         | 0.371                        |   | 282  | 0.07         | 0.789                          |
|                                                 | Herbivory (H)   | 1 |     | 3.00         | 0.083                        |   |      | 1.22         | 0.270                          |
|                                                 | Replicate       | 1 |     | 0.10         | 0.752                        |   |      | 0.13         | 0.723                          |
|                                                 | (P) x (H)       | 1 |     | <b>6.94</b>  | <b>0.008</b>                 |   |      | <b>7.41</b>  | <b>0.006</b>                   |
| <b>Leaf glucosinolates (pg.mg<sup>-1</sup>)</b> |                 |   |     |              |                              |   |      |              |                                |
| Glucoraphanin                                   | Pollination (P) | 1 | 242 | <b>7.60</b>  | <b>0.006</b>                 | - | 243  | <b>5.16</b>  | <b>0.023</b> -                 |
|                                                 | Herbivory (H)   | 1 |     | 0.02         | 0.883                        |   |      | <b>4.49</b>  | <b>0.034</b> +                 |
|                                                 | Replicate       | 1 |     | 0.14         | 0.704                        |   |      | 0.00         | 0.947                          |
|                                                 | (P) x (H)       | 1 |     | 1.63         | 0.202                        |   |      | 3.49         | 0.062                          |

|                             |                 |   |     |              |                              |   |     |              |                              |   |
|-----------------------------|-----------------|---|-----|--------------|------------------------------|---|-----|--------------|------------------------------|---|
| Glucoalyssin                | Pollination (P) | 1 | 252 | 0.16         | 0.691                        | - | 248 | 0.01         | 0.940                        |   |
|                             | Herbivory (H)   | 1 |     | <b>13.26</b> | <b>2.71*10<sup>-04</sup></b> |   |     | 0.98         | 0.322                        |   |
|                             | Replicate       | 1 |     | 0.02         | 0.878                        |   |     | 1.40         | 0.237                        |   |
|                             | (P) x (H)       | 1 |     | 0.42         | 0.519                        |   |     | 3.28         | 0.070                        |   |
| Sinalbin                    | Pollination (P) | 1 | 257 | 0.28         | 0.599                        |   | 255 | 0.22         | 0.641                        |   |
|                             | Herbivory (H)   | 1 |     | 0.06         | 0.804                        |   |     | 0.25         | 0.617                        |   |
|                             | Replicate       | 1 |     | 0.05         | 0.815                        |   |     | 0.00         | 0.964                        |   |
|                             | (P) x (H)       | 1 |     | 0.14         | 0.708                        |   |     | 0.17         | 0.681                        |   |
| Gluconapin                  | Pollination (P) | 1 | 257 | <b>6.25</b>  | <b>0.012</b>                 | - | 255 | 0.41         | 0.522                        |   |
|                             | Herbivory (H)   | 1 |     | 0.25         | 0.615                        |   |     | 1.27         | 0.260                        |   |
|                             | Replicate       | 1 |     | 0.00         | 0.992                        |   |     | 0.05         | 0.826                        |   |
|                             | (P) x (H)       | 1 |     | 0.08         | 0.779                        |   |     | 3.03         | 0.082                        |   |
| Glucobrassicinapin          | Pollination (P) | 1 | 257 | <b>9.63</b>  | <b>0.002</b>                 | - | 252 | 0.58         | 0.446                        |   |
|                             | Herbivory (H)   | 1 |     | <b>5.28</b>  | <b>0.022</b>                 |   |     | <b>15.51</b> | <b>8.19*10<sup>-05</sup></b> |   |
|                             | Replicate       | 1 |     | 0.00         | 0.997                        |   |     | 0.04         | 0.851                        |   |
|                             | (P) x (H)       | 1 |     | <b>7.11</b>  | <b>0.008</b>                 |   |     | 0.01         | 0.910                        |   |
| Hydroxyglucobrassicin       | Pollination (P) | 1 | 256 | 2.01         | 0.156                        | + | 254 | <b>13.61</b> | <b>2.25*10<sup>-04</sup></b> | - |
|                             | Herbivory (H)   | 1 |     | <b>5.99</b>  | <b>0.014</b>                 |   |     | 3.29         | 0.070                        |   |
|                             | Replicate       | 1 |     | 0.12         | 0.725                        |   |     | 0.00         | 0.975                        |   |
|                             | (P) x (H)       | 1 |     | 1.03         | 0.309                        |   |     | 2.91         | 0.088                        |   |
| Glucobrassicin              | Pollination (P) | 1 | 256 | <b>6.00</b>  | <b>0.014</b>                 | - | 254 | <b>4.21</b>  | <b>0.040</b>                 | - |
|                             | Herbivory (H)   | 1 |     | 0.69         | 0.406                        |   |     | 0.03         | 0.873                        |   |
|                             | Replicate       | 1 |     | 0.03         | 0.871                        |   |     | 0.09         | 0.763                        |   |
|                             | (P) x (H)       | 1 |     | 0.09         | 0.759                        |   |     | 0.15         | 0.699                        |   |
| Neoglucobrassicin           | Pollination (P) | 1 | 256 | <b>4.75</b>  | <b>0.029</b>                 | - | 255 | <b>16.77</b> | <b>4.21*10<sup>-05</sup></b> | - |
|                             | Herbivory (H)   | 1 |     | 0.28         | 0.598                        |   |     | 0.66         | 0.418                        |   |
|                             | Replicate       | 1 |     | 0.10         | 0.750                        |   |     | 0.01         | 0.930                        |   |
|                             | (P) x (H)       | 1 |     | <b>8.19</b>  | <b>0.004</b>                 |   |     | 1.03         | 0.309                        |   |
| Gluconasturtiin             | Pollination (P) | 1 | 257 | <b>20.55</b> | <b>5.82*10<sup>-04</sup></b> | - | 255 | <b>13.30</b> | <b>2.65*10<sup>-04</sup></b> | - |
|                             | Herbivory (H)   | 1 |     | 0.10         | 0.749                        |   |     | 0.03         | 0.861                        |   |
|                             | Replicate       | 1 |     | 2.40         | 0.121                        |   |     | 0.08         | 0.778                        |   |
|                             | (P) x (H)       | 1 |     | 1.09         | 0.296                        |   |     | <b>4.32</b>  | <b>0.038</b>                 |   |
| Methoxyglucobrassicin       | Pollination (P) | 1 | 257 | 2.51         | 0.113                        |   | 254 | <b>19.04</b> | <b>1.28*10<sup>-05</sup></b> | - |
|                             | Herbivory (H)   | 1 |     | 0.06         | 0.809                        |   |     | 0.34         | 0.559                        |   |
|                             | Replicate       | 1 |     | 0.73         | 0.392                        |   |     | 0.11         | 0.742                        |   |
|                             | (P) x (H)       | 1 |     | 0.00         | 0.946                        |   |     | 2.70         | 0.100                        |   |
| <b>Total glucosinolates</b> | Pollination (P) | 1 | 238 | <b>5.19</b>  | <b>0.023</b>                 | - | 239 | 0.58         | 0.447                        |   |
|                             | Herbivory (H)   | 1 |     | 0.67         | 0.414                        |   |     | 2.37         | 0.124                        |   |
|                             | Replicate       | 1 |     | 0.02         | 0.900                        |   |     | 0.06         | 0.808                        |   |
|                             | (P) x (H)       | 1 |     | 0.25         | 0.620                        |   |     | 2.56         | 0.110                        |   |

**Supplementary Table 10: Rotated loadings of the morphological, scent and glucosinolate variables on the principal components calculated from of *Brassica rapa* data in generation one and ten combined.** The highest loading of each variable is indicated in bold. Only principal components with eigenvalues >1 were retained. Positive loadings indicate positive correlations of PCs scores and variables, whereas negative loadings values indicate negative correlations.

|                                         | PC1         | PC2         | PC3         | PC4          | PC5         | PC6         | PC7         | PC8         | PC9         | PC10        | PC11  | PC12        |
|-----------------------------------------|-------------|-------------|-------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------|-------------|
| Eigenvalues                             | 5.93        | 4.23        | 3.75        | 2.98         | 2.63        | 1.69        | 1.56        | 1.43        | 1.35        | 1.19        | 1.08  | 1.01        |
| Variance explained (%)                  | 14.83       | 10.58       | 9.36        | 7.45         | 6.58        | 4.22        | 3.90        | 3.57        | 3.39        | 2.98        | 2.71  | 2.53        |
| Rotated loadings on retained components |             |             |             |              |             |             |             |             |             |             |       |             |
| Height day 20 (cm)                      | 0.07        | 0.21        | -0.12       | <b>-0.82</b> | -0.02       | 0.09        | 0.10        | 0.13        | 0.03        | 0.00        | 0.04  | -0.04       |
| Height day 30 (cm)                      | 0.00        | <b>0.59</b> | 0.25        | -0.01        | 0.20        | 0.05        | 0.04        | -0.02       | 0.07        | -0.22       | -0.26 | -0.07       |
| Leaf size (cm <sup>2</sup> )            | 0.01        | 0.39        | 0.16        | <b>0.55</b>  | 0.29        | 0.00        | -0.01       | -0.09       | -0.02       | -0.03       | -0.24 | -0.12       |
| Time to flower (day)                    | -0.02       | -0.04       | 0.13        | <b>0.86</b>  | 0.04        | -0.01       | -0.09       | -0.11       | 0.02        | -0.06       | -0.03 | 0.08        |
| Cumulative branches length (cm)         | 0.04        | <b>0.75</b> | -0.14       | -0.42        | 0.00        | 0.05        | -0.01       | 0.07        | 0.04        | 0.08        | 0.03  | -0.03       |
| Number of flowering branches            | 0.04        | <b>0.75</b> | -0.17       | -0.38        | -0.02       | -0.02       | 0.03        | 0.13        | -0.03       | 0.13        | 0.14  | 0.01        |
| Flower production rate (per day)        | 0.03        | <b>0.77</b> | 0.13        | 0.42         | 0.11        | -0.10       | -0.08       | -0.02       | -0.04       | -0.12       | -0.06 | 0.08        |
| Flower number                           | 0.05        | <b>0.89</b> | 0.11        | 0.08         | 0.10        | -0.11       | -0.05       | 0.01        | -0.05       | -0.11       | -0.07 | 0.03        |
| Nectar amount (nL/flower)               | -0.04       | 0.15        | <b>0.48</b> | 0.20         | 0.21        | -0.05       | 0.06        | 0.02        | -0.02       | -0.05       | -0.15 | 0.06        |
| Flower diameter (cm)                    | 0.06        | 0.07        | -0.10       | 0.01         | <b>0.85</b> | 0.06        | 0.01        | 0.08        | 0.03        | -0.03       | -0.10 | 0.10        |
| Petal length (cm)                       | 0.09        | 0.09        | -0.01       | 0.06         | <b>0.90</b> | 0.15        | -0.04       | -0.02       | 0.04        | 0.01        | -0.04 | 0.03        |
| Petal width (cm)                        | 0.07        | 0.03        | -0.01       | 0.08         | <b>0.80</b> | -0.06       | 0.07        | 0.09        | -0.04       | -0.01       | -0.06 | -0.04       |
| Sepal length (cm)                       | 0.15        | 0.04        | -0.13       | 0.32         | <b>0.51</b> | 0.23        | 0.06        | -0.03       | -0.14       | 0.18        | 0.08  | -0.08       |
| Stamen length (cm)                      | 0.16        | 0.08        | 0.14        | -0.11        | <b>0.66</b> | -0.03       | -0.21       | -0.16       | 0.09        | -0.10       | 0.10  | -0.03       |
| Style length (cm)                       | 0.00        | -0.06       | 0.09        | -0.10        | 0.39        | <b>0.81</b> | -0.08       | -0.01       | 0.03        | -0.04       | 0.04  | -0.04       |
| Herkogamy (cm)                          | -0.06       | -0.06       | 0.02        | -0.02        | -0.07       | <b>0.93</b> | 0.03        | 0.03        | -0.09       | 0.02        | -0.05 | 0.02        |
| Benzaldehyde                            | 0.22        | 0.01        | 0.10        | 0.07         | -0.02       | -0.01       | 0.38        | 0.04        | 0.17        | 0.03        | 0.00  | <b>0.72</b> |
| Methyl benzoate                         | 0.13        | 0.00        | -0.06       | -0.14        | 0.06        | 0.00        | 0.30        | 0.04        | <b>0.77</b> | 0.02        | -0.01 | 0.22        |
| Phenylethyl alcohol                     | <b>0.83</b> | 0.02        | 0.00        | -0.02        | 0.16        | -0.06       | 0.37        | 0.01        | -0.04       | -0.04       | 0.00  | -0.09       |
| Phenylacetaldehyde                      | <b>0.84</b> | -0.05       | 0.01        | -0.08        | 0.13        | -0.08       | 0.28        | 0.07        | 0.04        | -0.02       | 0.01  | -0.01       |
| p-Anisaldehyde                          | 0.26        | 0.00        | 0.09        | -0.01        | 0.01        | -0.03       | 0.04        | -0.02       | 0.17        | 0.05        | -0.06 | <b>0.79</b> |
| 2-Aminobenzaldehyde                     | <b>0.73</b> | 0.11        | 0.10        | 0.01         | 0.01        | -0.02       | -0.09       | 0.04        | 0.33        | -0.03       | -0.01 | 0.27        |
| Methyl salicylate                       | 0.25        | -0.02       | 0.04        | 0.14         | -0.01       | -0.05       | 0.24        | 0.02        | <b>0.75</b> | 0.04        | -0.02 | 0.15        |
| β-Pinene                                | 0.00        | 0.05        | -0.30       | <b>0.40</b>  | -0.03       | -0.05       | 0.14        | 0.09        | 0.13        | 0.36        | 0.06  | -0.30       |
| (E,E)-α-Farnesene                       | <b>0.45</b> | 0.09        | 0.00        | 0.14         | 0.06        | 0.05        | 0.45        | -0.01       | 0.32        | 0.04        | 0.00  | 0.38        |
| (Z)-3-Hexen-1-ol-acetate                | 0.16        | -0.06       | -0.07       | -0.24        | -0.09       | 0.01        | <b>0.73</b> | 0.02        | 0.17        | 0.01        | 0.00  | 0.07        |
| Methyl anthranilate                     | 0.34        | -0.03       | -0.04       | -0.03        | -0.02       | -0.04       | -0.10       | 0.02        | <b>0.84</b> | -0.01       | 0.01  | -0.01       |
| Benzyl nitrile                          | <b>0.75</b> | 0.03        | 0.00        | 0.00         | 0.12        | 0.03        | 0.03        | 0.00        | 0.38        | 0.00        | 0.00  | 0.25        |
| 1-Butene-4-isothiocyanate               | 0.08        | -0.03       | -0.04       | 0.01         | -0.02       | -0.03       | <b>0.80</b> | -0.08       | 0.08        | -0.04       | 0.07  | 0.11        |
| Indole                                  | <b>0.71</b> | 0.05        | 0.01        | -0.04        | 0.11        | 0.06        | -0.15       | -0.01       | 0.25        | -0.02       | -0.08 | 0.24        |
| Glucoraphanin                           | 0.01        | -0.11       | 0.31        | -0.16        | -0.03       | 0.04        | -0.04       | -0.04       | 0.01        | <b>0.75</b> | 0.08  | -0.01       |
| Glucosylsin                             | -0.10       | -0.08       | 0.32        | 0.05         | 0.00        | -0.03       | -0.01       | -0.11       | 0.01        | <b>0.73</b> | -0.06 | 0.11        |
| Sinigrin                                | 0.03        | -0.02       | <b>0.69</b> | -0.06        | -0.05       | 0.07        | -0.08       | 0.07        | 0.04        | 0.10        | 0.26  | 0.04        |
| Gluconapin                              | 0.07        | 0.00        | <b>0.84</b> | -0.01        | -0.06       | 0.11        | -0.01       | -0.09       | -0.01       | 0.18        | 0.05  | 0.04        |
| Glucobrassicinapin                      | -0.03       | 0.11        | <b>0.81</b> | 0.16         | -0.08       | -0.01       | 0.01        | -0.02       | -0.06       | 0.08        | -0.12 | 0.00        |
| Hydroxyglucobrassicin                   | 0.00        | 0.10        | 0.07        | -0.07        | 0.05        | -0.02       | -0.03       | <b>0.88</b> | 0.05        | -0.08       | 0.03  | -0.08       |

|                       |       |       |             |       |       |       |       |             |       |       |             |       |
|-----------------------|-------|-------|-------------|-------|-------|-------|-------|-------------|-------|-------|-------------|-------|
| Glucobrassicin        | 0.01  | 0.04  | 0.12        | -0.03 | -0.06 | 0.07  | 0.02  | 0.01        | -0.01 | 0.07  | <b>0.81</b> | 0.02  |
| Neoglucobrassicin     | 0.09  | -0.01 | -0.13       | -0.18 | -0.04 | 0.04  | -0.03 | <b>0.85</b> | 0.01  | -0.03 | 0.13        | 0.09  |
| Gluconasturtiin       | 0.05  | -0.06 | <b>0.63</b> | 0.13  | -0.03 | -0.07 | -0.10 | -0.03       | 0.01  | 0.23  | 0.25        | 0.06  |
| Methoxyglucobrassicin | -0.08 | -0.15 | 0.07        | -0.09 | 0.00  | -0.09 | 0.05  | 0.14        | 0.00  | -0.05 | <b>0.73</b> | -0.10 |

**Supplementary Table 11: Physical, chemical, and mineralogical features of each soil used in this study.** Soil physics and chemistry was analyzed by the INRA laboratories following the SOL-1031 protocol <sup>2</sup>. This method used an acid mixed (HF-LCO4), which digests soil clay and thus quantifies both available and unavailable nutrients to plants.

|                     |                     |             | Limestone | Tuff  |
|---------------------|---------------------|-------------|-----------|-------|
| Physical parameters | Clay                |             | 9.30      | 6.70  |
|                     | Fine Silt           |             | 17.40     | 13.70 |
|                     | Coarse Silt         | %           | 6.90      | 12.80 |
|                     | Fine Sand           |             | 14.20     | 20.80 |
|                     | Coarse Sand         |             | 52.20     | 46.00 |
| Chemical Parameters | N                   | g/kg        | 2.57      | 1.06  |
|                     | P                   | g/kg        | 3.61      | 1.79  |
|                     | Org. Carbon         | g/kg        | 28.40     | 12.50 |
|                     | Soil organic matter | g/kg        | 49.10     | 21.60 |
|                     | C/N                 |             | 11.00     | 11.80 |
|                     | Cu                  | g / 100 g   | 0.48      | 0.35  |
|                     | Zn                  | g / 100 g   | 0.77      | 0.91  |
|                     | CaCO3               | g / 100 g   | 19.40     | 0.60  |
|                     | Si                  | g / 100 g   | 17.00     | 26.50 |
|                     | Ca                  | meq / 100 g | 5.94      | 1.12  |
|                     | Mg                  | meq / 100 g | 0.91      | 0.26  |
|                     | K                   | meq / 100 g | 0.75      | 1.56  |
|                     | Na                  | meq / 100 g | 0.37      | 0.96  |
|                     | Fe                  | meq / 100 g | 5.59      | 4.05  |
|                     | Mn                  | meq / 100 g | 9.93      | 11.71 |
|                     | Al                  | meq / 100 g | 0.31      | 8.53  |

## Supplementary References

- 1 Lenth, R. V. Estimated marginal means, aka least-squares means [R Package Emmeans Version 1.6. 0]. Comprehensive R Archive Network (CRAN). (2021).
- 2 Ciesielski, H., Proix, N. & Sterckeman, T. Détermination des incertitudes liées à une méthode de mise en solution des sols et sédiments par étude interlaboratoire. *Analisis* **25**, 188-192 (1997).



