

## Supporting Information

**Table S1. Information on 102 accessions of the US peanut mini-core**

| PI number | Species/subspecies/variety                                       | Origin    |
|-----------|------------------------------------------------------------------|-----------|
| PI 152146 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Brazil    |
| PI 158854 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | China     |
| PI 200441 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Japan     |
| PI 259617 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Canada    |
| PI 259836 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Malawi    |
| PI 262038 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Brazil    |
| PI 290566 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | India     |
| PI 290620 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | India     |
| PI 295730 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Burma     |
| PI 313129 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | China     |
| PI 337406 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Paraguay  |
| PI 339960 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Argentina |
| PI 343398 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Israel    |
| PI 356004 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Argentina |
| PI 429420 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Zimbabwe  |
| PI 461427 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | China     |
| PI 471954 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Zimbabwe  |
| PI 478850 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Uganda    |
| PI 482189 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Zimbabwe  |
| PI 502040 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Peru      |
| PI 475863 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Bolivia   |
| PI 475918 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Bolivia   |
| PI 476025 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Peru      |
| PI 493329 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Argentina |
| PI 493356 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Argentina |
| PI 493547 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Argentina |
| PI 493581 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Argentina |
| PI 493631 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Argentina |
| PI 493693 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Argentina |
| PI 493717 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Argentina |
| PI 493729 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Argentina |
| PI 493880 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Argentina |

|           |                                                                  |              |
|-----------|------------------------------------------------------------------|--------------|
| PI 493938 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Argentina    |
| PI 497517 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Brazil       |
| PI 497639 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>fastigiata</i> | Ecuador      |
| PI 338338 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>peruviana</i>  | Venezuela    |
| PI 502111 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>peruviana</i>  | Peru         |
| PI 502120 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>peruviana</i>  | Peru         |
| PI 155107 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>vulgaris</i>   | Uruguay      |
| PI 157542 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>vulgaris</i>   | China        |
| PI 270998 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>vulgaris</i>   | Zambia       |
| PI 271019 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>vulgaris</i>   | Zambia       |
| PI 288146 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>vulgaris</i>   | India        |
| PI 290560 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>vulgaris</i>   | India        |
| PI 403813 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>vulgaris</i>   | Argentina    |
| PI 407667 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>vulgaris</i>   | Thailand     |
| PI 478819 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>vulgaris</i>   | India        |
| PI 494018 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>vulgaris</i>   | Argentina    |
| PI 494034 | <i>A. hypogaea</i> sub. <i>fastigiata</i> var. <i>vulgaris</i>   | Argentina    |
| PI 159786 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i>     | Senegal      |
| PI 162655 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i>     | Uruguay      |
| PI 162857 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i>     | Sudan        |
| PI 196622 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i>     | Ivory Coast  |
| PI 196635 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i>     | Madagascar   |
| PI 240560 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i>     | South Africa |
| PI 259658 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i>     | Canada       |
| PI 259851 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i>     | Malawi       |
| PI 268586 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i>     | Zambia       |
| PI 268696 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i>     | South Africa |
| PI 268755 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i>     | Zambia       |
| PI 268806 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i>     | Zambia       |
| PI 268868 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i>     | Sudan        |
| PI 268996 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i>     | Zambia       |
| PI 270786 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i>     | Zambia       |
| PI 270905 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i>     | Zambia       |
| PI 270907 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i>     | Zambia       |
| PI 274193 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i>     | Bolivia      |
| PI 288210 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i>     | India        |

|           |                                                              |              |
|-----------|--------------------------------------------------------------|--------------|
| PI 290536 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | India        |
| PI 290594 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | India        |
| PI 292950 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | South Africa |
| PI 295250 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Israel       |
| PI 295309 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Israel       |
| PI 296550 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Israel       |
| PI 296558 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Israel       |
| PI 298854 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | South Africa |
| PI 319768 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Israel       |
| PI 323268 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Pakistan     |
| PI 325943 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Venezuela    |
| PI 331297 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Argentina    |
| PI 331314 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Argentina    |
| PI 337293 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Brazil       |
| PI 337399 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Morocco      |
| PI 343384 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Israel       |
| PI 355268 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Mexico       |
| PI 355271 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Mexico       |
| PI 370331 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Israel       |
| PI 371521 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Israel       |
| PI 372271 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Nigeria      |
| PI 372305 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Nigeria      |
| PI 399581 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Nigeria      |
| PI 442768 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Zimbabwe     |
| PI 461434 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | China        |
| PI 471952 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Zimbabwe     |
| PI 476636 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Nigeria      |
| PI 481795 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Mozambique   |
| PI 482120 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Zimbabwe     |
| PI 494795 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Zambia       |
| PI 496401 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Burkina Faso |
| PI 496448 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Burkina Faso |
| PI 504614 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Colombia     |
| PI 497318 | <i>A. hypogaea</i> sub. <i>hypogaea</i> var. <i>hypogaea</i> | Bolivia      |

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**Table S2. Variation Sources and Significance from Statistical Analysis**

| <b>Trait</b>       | <b>Source</b> | <b>DF</b> | <b>Type I SS</b> | <b>Mean Square</b> | <b>F Value</b> | <b>Pr &gt; F</b> | <b>Trait</b> | <b>Source</b> | <b>DF</b> | <b>Type I SS</b> | <b>Mean Square</b> | <b>F Value</b> | <b>Pr &gt; F</b> |
|--------------------|---------------|-----------|------------------|--------------------|----------------|------------------|--------------|---------------|-----------|------------------|--------------------|----------------|------------------|
| <b>Oil Content</b> | Year          | 1         | 427.59           | 427.59             | 591.45         | <.0001           | <b>C16:0</b> | Year          | 1         | 10.14            | 10.14              | 4891.32        | <.0001           |
|                    | PI            | 101       | 1419.25          | 14.05              | 19.44          | <.0001           |              | PI            | 101       | 558.80           | 5.53               | 2668.07        | <.0001           |
|                    | Year*PI       | 100       | 292.89           | 2.93               | 4.05           | <.0001           |              | Year*PI       | 101       | 68.27            | 0.68               | 325.98         | <.0001           |
| <b>O/L ratio</b>   | Year          | 1         | 2.33             | 2.33               | 30515.1        | <.0001           | <b>C18:0</b> | Year          | 1         | 11.70            | 11.70              | 38737.6        | <.0001           |
|                    | PI            | 101       | 108.99           | 1.08               | 14120.6        | <.0001           |              | PI            | 101       | 340.86           | 3.38               | 11174.0        | <.0001           |
|                    | Year*PI       | 101       | 12.44            | 0.12               | 1611.42        | <.0001           |              | Year*PI       | 101       | 103.19           | 1.02               | 3382.76        | <.0001           |
| <b>Quercetin</b>   | Year          | 1         | 527.52           | 527.52             | 233.43         | <.0001           | <b>C18:1</b> | Year          | 1         | 297.42           | 297.42             | 23179.2        | <.0001           |
|                    | PI            | 101       | 159515.65        | 1579.36            | 698.89         | <.0001           |              | PI            | 101       | 15877.06         | 157.20             | 12251.1        | <.0001           |
|                    | Year*PI       | 101       | 19829.32         | 196.33             | 86.88          | <.0001           |              | Year*PI       | 101       | 1348.97          | 13.36              | 1040.89        | <.0001           |
| <b>Kaempferol</b>  | Year          | 1         | 3.22             | 3.22               | 58.73          | <.0001           | <b>C18:2</b> | Year          | 1         | 168.99           | 168.99             | 28472.5        | <.0001           |
|                    | PI            | 101       | 271.02           | 2.68               | 48.89          | <.0001           |              | PI            | 101       | 9727.31          | 96.31              | 16226.8        | <.0001           |
|                    | Year*PI       | 101       | 34.93            | 0.35               | 6.30           | <.0001           |              | Year*PI       | 101       | 944.07           | 9.35               | 1574.88        | <.0001           |
| <b>Geneistein</b>  | Year          | 1         | 12.71            | 12.70              | 170.66         | <.0001           | <b>C20:0</b> | Year          | 1         | 0.17             | 0.17               | 3477.54        | <.0001           |
|                    | PI            | 101       | 57.88            | 0.57               | 7.70           | <.0001           |              | PI            | 101       | 25.39            | 0.25               | 5140.91        | <.0001           |
|                    | Year*PI       | 101       | 19.70            | 0.20               | 2.62           | <.0001           |              | Year*PI       | 101       | 6.08             | 0.06               | 1231.54        | <.0001           |
| <b>Seed weight</b> | Year          | 1         | 3174.80          | 3174.80            | 699.84         | <.0001           | <b>C20:1</b> | Year          | 1         | 1.22             | 1.22               | 44612.1        | <.0001           |
|                    | PI            | 101       | 50121.76         | 496.26             | 109.39         | <.0001           |              | PI            | 101       | 17.90            | 0.18               | 6457.81        | <.0001           |
|                    | Year*PI       | 100       | 4334.22          | 43.34              | 9.55           | <.0001           |              | Year*PI       | 101       | 1.90             | 0.02               | 686.00         | <.0001           |

|              |         |     |       |      |         |        |              |         |     |       |      |         |        |
|--------------|---------|-----|-------|------|---------|--------|--------------|---------|-----|-------|------|---------|--------|
| <b>C24:0</b> | Year    | 1   | 0.01  | 0.01 | 75.40   | <.0001 | <b>C22:0</b> | Year    | 1   | 2.52  | 2.52 | 13324.9 | <.0001 |
|              | PI      | 101 | 17.63 | 0.18 | 1948.89 | <.0001 |              | PI      | 101 | 86.29 | 0.85 | 4516.12 | <.0001 |
|              | Year*PI | 101 | 3.12  | 0.03 | 344.84  | <.0001 |              | Year*PI | 101 | 12.25 | 0.12 | 641.10  | <.0001 |

**Table S3. The Average Value for Seed Weight, Seed-Coat Color, and Chemical Composition from Two Year data for Each Accession with the Genotype from Functional SNP of *FAD2A***

| PI number | Oil   | C16:0 | C18:0 | C18:1 | C18:2 | C20:0 | C20:1 | C22:0 | C24:0 | O/L  | FSNP | Querc | Kaemp | Genist | Resver <sup>a</sup> | SdWt  | SdColor |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|-------|-------|--------|---------------------|-------|---------|
| PI 497318 | 54.22 | 9.08  | 3.64  | 54.75 | 24.36 | 1.83  | 1.16  | 3.42  | 1.78  | 2.25 | A/A  | 40.69 | 0     | 0      | 0.07                | 52.52 | 4       |
| PI 370331 | 54.13 | 7.98  | 3.48  | 62.04 | 19.03 | 1.68  | 1.17  | 3.22  | 1.42  | 3.28 | A/A  | 42.35 | 1.13  | 0.21   | 0.04                | 88.52 | 1       |
| PI 290620 | 53.74 | 8.75  | 4.66  | 58.60 | 21.31 | 1.81  | 0.96  | 2.55  | 1.37  | 2.78 | A/A  | 2.97  | 1.30  | 0.24   | 0.18                | 52.60 | 3       |
| PI 319768 | 52.96 | 11.72 | 3.77  | 46.17 | 32.11 | 1.57  | 0.79  | 2.74  | 1.14  | 1.44 | G/G  | 3.30  | 0.44  | 0      | 0.14                | 55.83 | 3       |
| PI 274193 | 52.02 | 9.04  | 4.54  | 56.08 | 22.55 | 1.99  | 1.03  | 3.20  | 1.58  | 2.68 | A/A  | 29.55 | 1.27  | 0      | 0.07                | 61.57 | 4       |
| PI 478819 | 51.92 | 11.53 | 4.05  | 43.67 | 33.43 | 1.82  | 0.92  | 3.21  | 1.37  | 1.31 | G/G  | 4.79  | 1.73  | 0.29   | 0.11                | 60.37 | 3       |
| PI 355271 | 51.70 | 9.80  | 2.99  | 50.44 | 29.73 | 1.51  | 1.11  | 2.84  | 1.58  | 1.70 | A/A  | 3.97  | 0.51  | 0      | 0.13                | 61.06 | 3       |
| PI 496448 | 51.68 | 10.37 | 2.85  | 52.62 | 27.47 | 1.44  | 1.11  | 2.81  | 1.37  | 1.95 | A/A  | 3.15  | 1.01  | 0      | 0.13                | 52.51 | 3       |
| PI 371521 | 51.67 | 9.06  | 3.75  | 58.32 | 22.67 | 1.56  | 1.03  | 2.37  | 1.25  | 2.58 | A/A  | 4.23  | 0.75  | 0.24   | 0.13                | 45.67 | 1       |
| PI 259658 | 51.65 | 8.95  | 3.11  | 56.42 | 24.18 | 1.53  | 1.25  | 2.99  | 1.58  | 2.35 | A/A  | 5.89  | 1.23  | 0.28   | 0.12                | 48.39 | 3       |
| PI 343398 | 51.32 | 9.79  | 3.14  | 52.69 | 28.07 | 1.50  | 0.95  | 2.49  | 1.38  | 1.88 | A/A  | 4.23  | 1.63  | 0.29   | 0.13                | 83.75 | 1       |
| PI 442768 | 51.19 | 9.60  | 3.28  | 48.55 | 30.30 | 1.58  | 1.45  | 3.17  | 2.10  | 1.60 | A/A  | 5.25  | 0.40  | 0      | 0.09                | 49.53 | 3       |
| PI 157542 | 51.18 | 8.67  | 4.15  | 58.95 | 21.05 | 1.79  | 1.04  | 2.87  | 1.48  | 2.81 | A/A  | 3.17  | 0     | 0      | 0.21                | 65.07 | 3       |
| PI 372305 | 51.04 | 9.73  | 3.33  | 51.68 | 26.08 | 1.72  | 1.36  | 4.02  | 2.10  | 1.99 | A/A  | 2.69  | 0.52  | 0      | 0.26                | 61.66 | 5       |
| PI 399581 | 50.88 | 8.70  | 4.11  | 57.40 | 22.37 | 1.85  | 1.04  | 3.17  | 1.37  | 2.58 | A/A  | 2.76  | 1.11  | 0      | 0.10                | 57.18 | 3       |
| PI 196622 | 50.87 | 9.34  | 2.81  | 55.63 | 25.46 | 1.38  | 1.25  | 2.58  | 1.56  | 2.21 | A/A  | 3.52  | 1.70  | 0      | 0.13                | 49.59 | 3       |
| PI 481795 | 50.72 | 12.17 | 4.77  | 42.17 | 33.90 | 1.79  | 0.81  | 3.17  | 1.24  | 1.24 | G/G  | 3.12  | 1.17  | 0      | 0.11                | 39.64 | 3       |
| PI 290594 | 50.60 | 8.59  | 2.67  | 57.93 | 23.83 | 1.35  | 1.35  | 2.65  | 1.64  | 2.45 | A/A  | 2.81  | 1.27  | 0.22   | 0.16                | 48.66 | 3       |
| PI 475918 | 50.60 | 10.44 | 3.81  | 42.13 | 36.24 | 1.68  | 0.97  | 3.22  | 1.51  | 1.16 | G/G  | 29.76 | 1.83  | 0.76   | 0.08                | 44.57 | 1       |
| PI 476636 | 50.58 | 10.01 | 3.06  | 51.55 | 28.47 | 1.48  | 1.14  | 2.83  | 1.47  | 1.82 | A/A  | 3.62  | 0.62  | 0.19   | 0.14                | 55.54 | 3       |
| PI 478850 | 50.55 | 12.21 | 2.63  | 45.03 | 33.42 | 1.32  | 1.16  | 2.85  | 1.39  | 1.35 | G/G  | 22.22 | 2.88  | 0.26   | 0.19                | 41.08 | 2       |

|           |       |       |      |       |       |      |      |      |      |      |     |       |      |      |      |       |   |
|-----------|-------|-------|------|-------|-------|------|------|------|------|------|-----|-------|------|------|------|-------|---|
| PI 482120 | 50.52 | 11.77 | 4.30 | 42.48 | 34.35 | 1.70 | 0.85 | 3.23 | 1.33 | 1.24 | G/G | 1.89  | 1.36 | 0.21 | 0.10 | 41.20 | 3 |
| PI 494034 | 50.51 | 11.06 | 4.92 | 43.39 | 33.88 | 1.74 | 0.80 | 2.99 | 1.24 | 1.28 | G/G | 19.19 | 1.37 | 0.65 | 0.05 | 36.04 | 2 |
| PI 271019 | 50.44 | 12.39 | 3.27 | 42.12 | 35.32 | 1.50 | 0.89 | 3.16 | 1.37 | 1.19 | G/G | 2.03  | 1.28 | 0    | 0.10 | 39.38 | 3 |
| PI 270998 | 50.42 | 9.95  | 5.52 | 48.07 | 27.96 | 2.32 | 0.80 | 3.86 | 1.53 | 1.72 | A/A | 30.25 | 1.34 | 0    | 0.22 | 39.95 | 4 |
| PI 355268 | 50.40 | 9.00  | 3.65 | 56.85 | 23.77 | 1.65 | 0.99 | 2.68 | 1.43 | 2.41 | A/A | 4.58  | 0    | 0    | 0.11 | 69.94 | 3 |
| PI 407667 | 50.34 | 12.17 | 5.08 | 40.04 | 35.79 | 1.85 | 0.74 | 3.07 | 1.28 | 1.12 | G/G | 5.56  | 0.75 | 0    | 0.08 | 50.35 | 3 |

**Table S4. Comparison of Seed Weight and Chemical Composition Value among Botanical Varieties and FAD2A Functional Mutation Genotypes<sup>a</sup>**

| Variety/Genotype | Botanical variety |        |        |        |       | FAD2A functional mutation genotype |        |        |        |
|------------------|-------------------|--------|--------|--------|-------|------------------------------------|--------|--------|--------|
| Trait            | ff                | fp     | fv     | hh     | LSD   | G/G                                | G/A    | A/A    | LSD    |
| Oil              | 48.52b            | 47.35c | 49.84a | 49.57a | 0.984 | 49.70a                             | 50.60a | 50.86a | 1.431  |
| C16:0            | 10.93b            | 12.49a | 11.13b | 10.25c | 0.551 | 11.40a                             | 9.79b  | 9.26b  | 0.600  |
| C18:0            | 3.78b             | 2.81c  | 4.89a  | 3.52b  | 0.478 | 3.68a                              | 3.54a  | 3.29a  | 0.547  |
| C18:1            | 44.70b            | 44.90b | 44.10b | 49.78a | 2.879 | 43.20c                             | 51.50b | 54.81a | 2.520  |
| C18:2            | 33.31a            | 33.22a | 32.89a | 29.19b | 2.269 | 34.41a                             | 27.76b | 25.13c | 2.015  |
| C20:0            | 1.65b             | 1.34c  | 1.84a  | 1.60b  | 0.127 | 1.64a                              | 1.65a  | 1.57a  | 0.153  |
| C20:1            | 0.98b             | 1.03ab | 0.86c  | 1.09a  | 0.099 | 0.98b                              | 1.11a  | 1.23a  | 0.127  |
| C22:0            | 3.15a             | 2.83b  | 3.31a  | 3.09a  | 0.234 | 3.28a                              | 3.37a  | 3.09a  | 0.362  |
| C24:0            | 1.48ab            | 1.39b  | 1.39b  | 1.54a  | 0.106 | 1.42b                              | 1.50ab | 1.62a  | 0.149  |
| O/L Ratio        | 1.40b             | 1.38b  | 1.40b  | 1.80a  | 0.244 | 1.26c                              | 1.97b  | 2.26a  | 0.259  |
| Quercetin        | 19.68a            | 12.92a | 10.34a | 14.64a | 10.04 | 19.60a                             | 17.70a | 13.25a | 16.005 |
| Kaempferol       | 1.89b             | 3.56a  | 1.25c  | 1.13c  | 0.349 | 1.74a                              | 1.73a  | 1.30a  | 0.577  |
| Geneistein       | 0.36a             | 0.11b  | 0.26b  | 0.16b  | 0.203 | 0.65a                              | 0.13b  | 0.22b  | 0.399  |
| Resveratrol      | 0.10a             | 0.10a  | 0.11a  | 0.11a  | 0.029 | 0.09b                              | 0.09b  | 0.12a  | 0.028  |
| Seed weight      | 47.17b            | 55.08a | 45.28b | 54.51a | 5.318 | 49.04b                             | 50.63b | 60.77a | 8.363  |

<sup>a</sup>Means with different letters within the same row are significantly different among botanical varieties or FAD2A functional mutation genotypes. LSD stands for least significant difference.