Table **S1** Linear regression equation of 16 reference substances in Xin-Su-Ning capsules

|  |  |  |  |
| --- | --- | --- | --- |
| Compounds | Regression equation | **R2** | **Linear range（ng/mL）** |
| Sophocarpine | y = 8033.5x + 112717 | R² = 0.9992 | 15.625-1000 |
| Matrine | y = 3834.2x - 25.176 | R² = 0.9997 | 15.625-1000 |
| Febrifugine | y = 2782.7x - 1136.3 | R² = 0.9994 | 0.78-50 |
| Berberine | y = 13757x + 16757 | R² = 0.9999 | 15.625-1000 |
| Palmatine | y = 16658x - 3566.1 | R² = 1 | 15.625-1000 |
| Tangeretin | y = 92881x + 5240.1 | R² = 0.9994 | 0.78-50 |
| Nobiletin | y = 73488x + 16786 | R² = 0.9998 | 0.78-50 |
| Liensinine | y = 721.52x - 757.6 | R² = 0.999 | 1.56-100 |
| Neferine | y = 1079.9x - 3426.7 | R² = 0.9993 | 7.81-500 |
| Scopoletin | y = 148.42x - 293.17 | R² = 0.9995 | 3.91-250 |
| Isoliquiritigenin | y = 418.49x - 279.76 | R² = 0.9994 | 1.56-100 |
| Liquiritigenin | y = 233.48x - 115.91 | R² = 0.9992 | 1.56-100 |
| Naringenin | y = 295.3x - 599.14 | R² = 0.9996 | 7.81-500 |
| Naringin | y = 156.15x + 1022.2 | R² = 1 | 234-15000 |
| Hesperidin | y = 433.93x + 109.3 | R² = 0.9992 | 15.625-1000 |
| Glycyrrhizic acid | y = 213.75x - 2960.3 | R² = 0.9993 | 31.25-2000 |

Table **S2** Precision test results（n=6）

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Compounds | Peak area | | | | | | **average value** | **RSD（%）** |
| **1** | **2** | **3** | **4** | **5** | **6** |
| Sophocarpine | 427173.3 | 429326 | 420923.3 | 422875.7 | 422474.4 | 422708.3 | 424246.8 | 0.77 |
| Matrine | 859321.4 | 857109.4 | 859654.9 | 855249.5 | 853271.4 | 857118.2 | 856954.1 | 0.28 |
| Febrifugine | 7347.323 | 7459.282 | 7463.939 | 7437.4 | 7467.394 | 7102.002 | 7379.557 | 1.94 |
| Berberine | 8437305 | 8410241 | 8471244 | 8469066 | 8422350 | 8602112 | 8468720 | 0.82 |
| Palmatine | 2539083 | 2518566 | 2447878 | 2518923 | 2575514 | 2518676 | 2519773 | 1.65 |
| Tangeretin | 599434.1 | 593037 | 589666.6 | 596885.4 | 599842.8 | 590017.7 | 594813.9 | 0.77 |
| Nobiletin | 531399.2 | 531511.9 | 529267.9 | 535050.3 | 536421.6 | 532394.1 | 532674.1 | 0.49 |
| Liensinine | 1467.885 | 1482.295 | 1469.917 | 1436.086 | 1413.45 | 1481.086 | 1458.453 | 1.90 |
| Neferine | 22675.02 | 23713.65 | 22755.58 | 22683.59 | 22578.22 | 22371.75 | 22796.3 | 2.06 |
| Scopoletin | 9169.368 | 9109.136 | 9198.241 | 9124.18 | 9102.259 | 9183.219 | 9147.734 | 0.45 |
| Isoliquiritigenin | 4749.488 | 4718.296 | 4706.793 | 4725.309 | 4792.359 | 4712.019 | 4734.044 | 0.68 |
| Liquiritigenin | 3949.071 | 4069.269 | 3918.159 | 3940.523 | 4082.048 | 4087.353 | 4007.737 | 1.98 |
| Naringenin | 13922.02 | 13825.74 | 13597.12 | 13528.85 | 13836.29 | 13688.49 | 13733.08 | 1.11 |
| Naringin | 641724 | 646779.5 | 645672.5 | 646880.6 | 645599.6 | 649031.7 | 645948 | 0.37 |
| Hesperidin | 66881.22 | 66556.93 | 66532.84 | 66594.34 | 66375.98 | 66585.55 | 66587.81 | 0.25 |
| Glycyrrhizic acid | 76881.91 | 76665.83 | 76819.6 | 76083.38 | 76059.34 | 76633.74 | 76523.97 | 0.47 |

Table **S3** Repeatability experiment results (n=6)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Compounds | Peak area | | | | | | **average value** | **RSD（%）** |
| **1** | **2** | **3** | **4** | **5** | **6** |
| Sophocarpine | 409357.6 | 403281.2 | 412101.8 | 407980.2 | 410333.4 | 402941.9 | 407666 | 0.93 |
| Matrine | 805137.3 | 801941.8 | 823416.6 | 806662.5 | 810277.9 | 806596.6 | 809005.5 | 0.93 |
| Febrifugine | 7196.273 | 6920.652 | 7258.516 | 7234.317 | 7317.582 | 7307.694 | 7205.839 | 2.04 |
| Berberine | 8537278 | 8349836 | 8555677 | 8611886 | 8667258 | 8521130 | 8540511 | 1.26 |
| Palmatine | 2555673 | 2516393 | 2582171 | 2600477 | 2590430 | 2574767 | 2569985 | 1.18 |
| Tangeretin | 589792.5 | 592034.5 | 605720.6 | 606177 | 605139.2 | 603218.9 | 600347.1 | 1.23 |
| Nobiletin | 536247.7 | 535295.2 | 550897.9 | 546987.7 | 534789.3 | 539766.4 | 540664 | 1.25 |
| Liensinine | 1451.905 | 1414.171 | 1477.226 | 1412.683 | 1464.996 | 1496.719 | 1452.95 | 2.34 |
| Neferine | 22368.68 | 22179.45 | 22162.08 | 22475.6 | 22692.87 | 22839.08 | 22452.96 | 1.22 |
| Scopoletin | 9095.352 | 8436.791 | 8730.415 | 8607.964 | 8548.876 | 8676.004 | 8682.567 | 2.61 |
| Isoliquiritigenin | 4450.419 | 4258.962 | 4494.71 | 4262.468 | 4414.893 | 4433.776 | 4385.871 | 2.29 |
| Liquiritigenin | 3794.277 | 3554.605 | 3737.184 | 3634.12 | 3818.003 | 3609.609 | 3691.3 | 2.90 |
| Naringenin | 12937.66 | 12194.02 | 12510.93 | 12605.52 | 12646.48 | 12590.78 | 12580.9 | 1.90 |
| Naringin | 615839.9 | 570396.5 | 611295.7 | 609646.5 | 604155.8 | 599550.1 | 601814.1 | 2.73 |
| Hesperidin | 63845.45 | 59591.83 | 63584.63 | 63015.63 | 62536.6 | 62020.44 | 62432.43 | 2.47 |
| Glycyrrhizic acid | 76522.81 | 73410.2 | 76776.97 | 76232.45 | 75887.98 | 73905.34 | 75455.96 | 1.90 |

Table **S4** Stability test results

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Compounds | Peak area | | | | | | **RSD(%)** |
| **0 h** | **2 h** | **4 h** | **6 h** | **12 h** | **24 h** |
| Sophocarpine | 427173.3 | 422875.7 | 422708.3 | 422202 | 422632.9 | 422915.4 | 0.44 |
| Matrine | 859321.4 | 855249.5 | 857118.2 | 853145.3 | 852298.3 | 855966.1 | 0.30 |
| Febrifugine | 7126.28 | 7347.323 | 7437.4 | 7102.002 | 7381.183 | 7472.21 | 2.17 |
| Berberine | 8437305 | 8469066 | 8445850 | 8485343 | 8553465 | 8614455 | 0.81 |
| Palmatine | 2539083 | 2518923 | 2582751 | 2541604 | 2568544 | 2518698 | 1.02 |
| Tangeretin | 599434.1 | 596885.4 | 599693.3 | 591300.1 | 594692.3 | 594897.2 | 0.54 |
| Nobiletin | 531399.2 | 535050.3 | 532725.7 | 538229.6 | 535289.4 | 531145 | 0.51 |
| Liensinine | 1448.52 | 1467.885 | 1436.086 | 1481.086 | 1434.2 | 1443.128 | 1.29 |
| Neferine | 22797.9 | 22675.02 | 22683.59 | 22371.75 | 22213.82 | 22764.18 | 1.05 |
| Scopoletin | 9121.918 | 9169.368 | 9124.18 | 9183.219 | 9137.334 | 9239.838 | 0.49 |
| Isoliquiritigenin | 4653.54 | 4749.488 | 4725.309 | 4712.019 | 4745.091 | 4711.684 | 0.73 |
| Liquiritigenin | 3960.257 | 3949.071 | 3940.523 | 4087.353 | 3903.51 | 4056.888 | 1.82 |
| Naringenin | 13186.2 | 13922.02 | 13528.85 | 13688.49 | 13237.95 | 13950.79 | 2.42 |
| Naringin | 640245.5 | 641724 | 646880.6 | 649031.7 | 645463.7 | 654574.3 | 0.80 |
| Hesperidin | 66929.1 | 66881.22 | 66594.34 | 66585.55 | 65907.84 | 67618.98 | 0.84 |
| Glycyrrhizic acid | 75123.6 | 76881.91 | 76083.38 | 76633.74 | 76557.41 | 77740.52 | 1.14 |

Table **S5** sample recovery experiment results

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Compounds | **Measured amount（µg）** | **Sample size（g）** | **Original content（µg）** | **Adding amount（µg）** | **Sample recovery rate（%）** | **The average recovery rate（%）** | **RSD（%）** |
| Sophocarpine | 469.32 | 0.1 | 239.49 | 239.00 | 96.16 | 100.43 | 4.35 |
|  | 468.83 | 0.1 | 239.49 | 239.00 | 95.96 |  |  |
|  | 488.99 | 0.1 | 239.49 | 239.00 | 104.39 |  |  |
|  | 471.96 | 0.1 | 239.49 | 239.00 | 97.27 |  |  |
|  | 488.36 | 0.1 | 239.49 | 239.00 | 104.13 |  |  |
|  | 489.62 | 0.1 | 239.49 | 239.00 | 104.66 |  |  |
| Matrine | 2279.47 | 0.1 | 1125.72 | 1125.00 | 102.56 | 101.14 | 2.15 |
|  | 2277.25 | 0.1 | 1125.72 | 1125.00 | 102.36 |  |  |
|  | 2230.52 | 0.1 | 1125.72 | 1125.00 | 98.20 |  |  |
|  | 2254.12 | 0.1 | 1125.72 | 1125.00 | 100.30 |  |  |
|  | 2295.50 | 0.1 | 1125.72 | 1125.00 | 103.98 |  |  |
|  | 2244.63 | 0.1 | 1125.72 | 1125.00 | 99.46 |  |  |
| Febrifugine | 8.60 | 0.1 | 4.29 | 4.30 | 100.45 | 101.58 | 1.32 |
|  | 8.61 | 0.1 | 4.29 | 4.30 | 100.46 |  |  |
|  | 8.63 | 0.1 | 4.29 | 4.30 | 101.04 |  |  |
|  | 8.76 | 0.1 | 4.29 | 4.30 | 104.05 |  |  |
|  | 8.67 | 0.1 | 4.29 | 4.30 | 101.86 |  |  |
|  | 8.66 | 0.1 | 4.29 | 4.30 | 101.62 |  |  |
| Berberine | 6369.81 | 0.1 | 3181.51 | 3181.50 | 100.21 | 99.92 | 0.43 |
|  | 6350.45 | 0.1 | 3181.51 | 3181.50 | 99.61 |  |  |
|  | 6337.77 | 0.1 | 3181.51 | 3181.50 | 99.21 |  |  |
|  | 6367.97 | 0.1 | 3181.51 | 3181.50 | 100.16 |  |  |
|  | 6373.52 | 0.1 | 3181.51 | 3181.50 | 100.33 |  |  |
|  | 6364.09 | 0.1 | 3181.51 | 3181.50 | 100.03 |  |  |
| Palmatine | 1529.33 | 0.1 | 771.10 | 770.00 | 98.47 | 100.35 | 1.25 |
|  | 1551.52 | 0.1 | 771.10 | 770.00 | 101.35 |  |  |
|  | 1548.90 | 0.1 | 771.10 | 770.00 | 101.01 |  |  |
|  | 1533.77 | 0.1 | 771.10 | 770.00 | 99.05 |  |  |
|  | 1548.46 | 0.1 | 771.10 | 770.00 | 100.96 |  |  |
|  | 1550.61 | 0.1 | 771.10 | 770.00 | 101.24 |  |  |
| Tangeretin | 64.02 | 0.1 | 31.80 | 31.80 | 101.33 | 101.65 | 0.25 |
|  | 64.04 | 0.1 | 31.80 | 31.80 | 101.39 |  |  |
|  | 64.19 | 0.1 | 31.80 | 31.80 | 101.85 |  |  |
|  | 64.15 | 0.1 | 31.80 | 31.80 | 101.72 |  |  |
|  | 64.11 | 0.1 | 31.80 | 31.80 | 101.60 |  |  |
|  | 64.23 | 0.1 | 31.80 | 31.80 | 101.98 |  |  |
| Nobiletin | 63.21 | 0.1 | 31.29 | 31.20 | 102.31 | 101.19 | 1.03 |
|  | 63.11 | 0.1 | 31.29 | 31.20 | 102.00 |  |  |
|  | 63.14 | 0.1 | 31.29 | 31.20 | 102.09 |  |  |
|  | 62.51 | 0.1 | 31.29 | 31.20 | 100.09 |  |  |
|  | 62.56 | 0.1 | 31.29 | 31.20 | 100.23 |  |  |
|  | 62.62 | 0.1 | 31.29 | 31.20 | 100.44 |  |  |
| Liensinine | 6.16 | 0.1 | 3.05 | 3.05 | 102.04 | 101.98 | 2.79 |
|  | 6.30 | 0.1 | 3.05 | 3.05 | 106.62 |  |  |
|  | 6.18 | 0.1 | 3.05 | 3.05 | 102.71 |  |  |
|  | 6.09 | 0.1 | 3.05 | 3.05 | 99.81 |  |  |
|  | 6.05 | 0.1 | 3.05 | 3.05 | 98.32 |  |  |
|  | 6.17 | 0.1 | 3.05 | 3.05 | 102.39 |  |  |
| Neferine | 57.04 | 0.1 | 28.88 | 29.00 | 97.09 | 99.65 | 1.92 |
|  | 58.59 | 0.1 | 28.88 | 29.00 | 102.43 |  |  |
|  | 58.06 | 0.1 | 28.88 | 29.00 | 100.61 |  |  |
|  | 58.01 | 0.1 | 28.88 | 29.00 | 100.44 |  |  |
|  | 57.63 | 0.1 | 28.88 | 29.00 | 99.12 |  |  |
|  | 57.36 | 0.1 | 28.88 | 29.00 | 98.19 |  |  |
| Scopoletin | 123.82 | 0.1 | 60.90 | 60.70 | 103.66 | 101.81 | 1.47 |
|  | 122.34 | 0.1 | 60.90 | 60.70 | 101.21 |  |  |
|  | 123.13 | 0.1 | 60.90 | 60.70 | 102.52 |  |  |
|  | 121.91 | 0.1 | 60.90 | 60.70 | 100.51 |  |  |
|  | 121.53 | 0.1 | 60.90 | 60.70 | 99.88 |  |  |
|  | 123.47 | 0.1 | 60.90 | 60.70 | 103.07 |  |  |
| Isoliquiritigenin | 24.26 | 0.1 | 12.19 | 12.20 | 98.98 | 99.71 | 0.77 |
|  | 24.37 | 0.1 | 12.19 | 12.20 | 99.86 |  |  |
|  | 24.44 | 0.1 | 12.19 | 12.20 | 100.47 |  |  |
|  | 24.47 | 0.1 | 12.19 | 12.20 | 100.73 |  |  |
|  | 24.27 | 0.1 | 12.19 | 12.20 | 99.09 |  |  |
|  | 24.27 | 0.1 | 12.19 | 12.20 | 99.11 |  |  |
| Liquiritigenin | 30.76 | 0.1 | 15.47 | 15.48 | 98.79 | 101.50 | 2.09 |
|  | 31.20 | 0.1 | 15.47 | 15.48 | 101.60 |  |  |
|  | 30.92 | 0.1 | 15.47 | 15.48 | 99.85 |  |  |
|  | 31.40 | 0.1 | 15.47 | 15.48 | 102.93 |  |  |
|  | 31.68 | 0.1 | 15.47 | 15.48 | 104.70 |  |  |
|  | 31.12 | 0.1 | 15.47 | 15.48 | 101.11 |  |  |
| Naringenin | 88.27 | 0.1 | 43.61 | 43.60 | 102.45 | 99.28 | 2.50 |
|  | 87.09 | 0.1 | 43.61 | 43.60 | 99.74 |  |  |
|  | 85.72 | 0.1 | 43.61 | 43.60 | 96.58 |  |  |
|  | 86.23 | 0.1 | 43.61 | 43.60 | 97.75 |  |  |
|  | 88.03 | 0.1 | 43.61 | 43.60 | 101.90 |  |  |
|  | 86.01 | 0.1 | 43.61 | 43.60 | 97.26 |  |  |
| Naringin | 7811.18 | 0.1 | 3820.91 | 3810.00 | 104.73 | 104.03 | 0.60 |
|  | 7742.23 | 0.1 | 3820.91 | 3810.00 | 102.92 |  |  |
|  | 7777.75 | 0.1 | 3820.91 | 3810.00 | 103.85 |  |  |
|  | 7783.44 | 0.1 | 3820.91 | 3810.00 | 104.00 |  |  |
|  | 7796.22 | 0.1 | 3820.91 | 3810.00 | 104.34 |  |  |
|  | 7795.06 | 0.1 | 3820.91 | 3810.00 | 104.31 |  |  |
| Hesperidin | 278.38 | 0.1 | 139.56 | 140.00 | 99.16 | 99.89 | 1.27 |
|  | 279.36 | 0.1 | 139.56 | 140.00 | 99.86 |  |  |
|  | 276.97 | 0.1 | 139.56 | 140.00 | 98.15 |  |  |
|  | 279.59 | 0.1 | 139.56 | 140.00 | 100.02 |  |  |
|  | 279.73 | 0.1 | 139.56 | 140.00 | 100.12 |  |  |
|  | 282.35 | 0.1 | 139.56 | 140.00 | 102.00 |  |  |
| Glycyrrhizic acid | 815.15 | 0.1 | 408.44 | 408.00 | 99.68 | 101.06 | 1.27 |
|  | 828.52 | 0.1 | 408.44 | 408.00 | 102.96 |  |  |
|  | 822.65 | 0.1 | 408.44 | 408.00 | 101.52 |  |  |
|  | 815.29 | 0.1 | 408.44 | 408.00 | 99.72 |  |  |
|  | 823.92 | 0.1 | 408.44 | 408.00 | 101.83 |  |  |
|  | 819.12 | 0.1 | 408.44 | 408.00 | 100.66 |  |  |