Table S1. The basic physicochemical indexes of chestnuts

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Chestnuts | Total starch  (g / 100g) | Crude fat  (g / 100g) | Crude protein  (g / 100g) | Total soluble sugars  (g / 100g) |
| Raw | 62.50-71.08 | 1.87-2.98 | 7.24-8.27 | 9.69-10.87 |
| Cooked | 57.69-62.91 | 1.42-2.27 | 8.40-8.49 | 8.91-10.14 |

Note: For the determination of starch content refer to GB 5009.9-2016, for the determination of crude fat content refer to GB 5009.6-2016, for the determination of crude protein content refer to GB 5009.5-2016. for the determination of total soluble sugars refer to 959.11 (AOAC, 2000).

Table S2. Annotated list of sensory descriptors

|  |  |
| --- | --- |
| **Attribute** | **Definition** |
| **Visual** |  |
| Seed color dark | After peeling, the external color of the seeds is dark brown, close to black |
| Seed color light | After peeling, the external color of the seeds is light brown and brighter |
| Integrity | After peeling, the seeds are intact |
| Regularity | After peeling, the appearance of the seeds is similar to that of chestnut seeds, which are more regular and have no strange shapes |
| **Aroma** |  |
| Strong chestnut aroma | Chestnuts themselves have a strong aroma |
| Weak chestnut aroma | Chestnuts themselves have a weak aroma |
| Roasted aroma | A roasted brown aroma |
| Cooked | The taste of boiled cabbage and boiled eggs |
| Fermented | Sweet, slightly brown, overripe aromatics associated with fermented fruits, vegetables, or grains with yeasty notes |
| Musty/earthy | Aromatics of a damp basement or soil or decaying vegetation |
| Floral/fruity | Aromatics associated with flowers and non-citrus fruits |
| Mustard | Sweet, woody sour, vinegar-like, somewhat pungent, slightly horseradish-like aromatics associated with prepared mustard |
| Almond-like | Sweet cherry pit-like nutty aromatic associated with almonds |
| Hazelnut-like | Sweet, light brown, oil somewhat woody aromatic associated with hazelnuts |
| Buttery | Aromatics commonly associated with natural, fresh, slightly salted butter |
| Caramelized | Aromatic of a round, full-bodied, medium brown sugar |
| **Taste** |  |
| Bitter | Basic taste described as harsh with the taste simulated by solutions of caffeine |
| Salt | Basic taste related to citric acid |
| Sweet | Basic taste associated with sucrose |
| Sour | Basic taste associated with citric acid |
| Astringent | Sensation of drying, drawing-up or puckering of any of the mouth surfaces |
| **Texture** |  |
| Weak initial hardness | The initial force required to crush a chestnut with your front teeth is similar to a crisp apple |
| Strong initial hardness | The force required to initially crush a chestnut with a front tooth is similar to that of bread |
| Weak flouriness | When chewing the seventh mouth, the particles covered on the mouth are semi-solid |
| Strong flouriness | When chewing the seventh mouth, the particles covered on the mouth are dissolved |
| Weak elasticity | No bubble gum-like feeling when chewing |
| Strong elasticity | When chewing, it feels like bubble gum |

Table S3. Texture parameters of chestnuts after different processing

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Hardness  (N) | Adhesiveness  (N.mm) | Cohesiveness  (Ratio) | Springiness  (mm) | Gumminess  (N) | Chewiness  (mj) |
| NP-1 | 55.92±0.41 a | 0.55±0.01 a | 0.20±0.01 bcd | 2.32±0.06 ab | 11.04±0.29 a | 25.56±1.14 a |
| NP -2 | 56.90±0.37 a | 0.56±0.01 a | 0.19±0.01 bcd | 2.15±0.09 bc | 10.96±0.24 a | 24.52±0.41 a |
| NP -3 | 55.30±0.80 a | 0.50±0.02 b | 0.25±0.01 a | 2.39±0.05 a | 10.28±0.27 b | 25.20±0.65 a |
| VP-1 | 41.11±0.27 c | 0.36±0.01 d | 0.18±0.01 d | 2.03±0.06 cd | 8.35±0.12 c | 15.02±0.11 c |
| VP-2 | 41.14±0.56 c | 0.24±0.02 f | 0.20±0.01 bcd | 1.77±0.04 e | 7.55±0.29 c | 15.38±0.11 c |
| VP-3 | 42.55±0.31 c | 0.31±0.01 e | 0.18±0.01 cd | 1.84±0.01 de | 7.85±0.15 c | 14.42±0.11 c |
| AP-1 | 50.46±0.41 b | 0.40±0.01 c | 0.22±0.02 abc | 2.49±0.08 a | 10.61±0.20 ab | 21.50±0.13 b |
| AP-2 | 49.59±0.37 b | 0.33±0.01 de | 0.23±0.02 ab | 2.15±0.05 bc | 10.96±0.18 a | 21.70±0.22 b |
| AP-3 | 49.82±0.15 b | 0.34±0.01 de | 0.23±0.01 ab | 1.98±0.11 cd | 10.42±0.12 ab | 21.57±0.13 b |

Table S4. Volatile compounds identified in chestnuts treated with different processing methods.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Code. | Compound | CAS# | RI | Formula | content（μg/kg） | | | | | | | | | | Identification | |
| Raw | N2-1 | N2-2 | N2-3 | V -1 | V -2 | V -3 | A-1 | A-2 | A-3 |
|  | **Alcohols** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| A1 | Isopropyl Alcohol | 67-63-0 | 980.88 | C3H8O | - | - | - | - | 1.70±0.12 | 0.49±0.03 | 1.32±0.13 | - | - | - | MS, RI |
| A2 | Ethanol | 64-17-5 | 988.02 | C2H6O | 22.69±1.16 | 2.49±0.28 | 2.62±0.23 | 1.21±0.07 | 2.09±0.2 | 1.36±0.08 | 1.08±0.24 | 1.41±0.04 | 0.81±0.08 | 1.07±0.22 | MS, RI | |
| A3 | 1-Propanol | 71-23-8 | 1105.41 | C3H8O | - | - | - | - | 3.33±0.18 | 3.04±0.14 | 0.61±0.05 | - | - | - | MS, RI | |
| A4 | 2-Butanol | 78-92-2 | 1120.59 | C4H10O | 1.01±0.09 | - | - | - | - | - | - | - | - | - | MS, RI | |
| A5 | 2-Methyl propanol | 78-83-1 | 1172.46 | C4H10O | - | - | - | - | 1.14±0.03 | 1.22±0.02 | 0.52±0.09 | - | - | - | MS, RI | |
| A6 | 2-Pentanol | 6032-29-7 | 1203.00 | C5H12O | 1.15±0.07 | - | - | - | - | - | - | - | - | - | MS, RI | |
| A7 | 1-Butanol | 71-36-3 | 1228.40 | C4H10O | - | - | - | - | - | - | - | 1.34±0.17 | 0.14±0.01 | 1.64±0.22 | MS, RI | |
| A8 | 3-Penten-2-ol | 1569-50-2 | 1245.80 | C5H10O | 0.21±0.02 | - | - | - | - | - | - | - | - | - | MS, RI | |
| A9 | 3-Hexanol | 623-37-0 | 1285.80 | C6H14O | 65.7±2.37 | - | - | - | - | - | - | - | - | - | MS, RI | |
| A10 | 3-Methyl-1-butanol | 123-51-3 | 1308.81 | C5H12O | 5.67±0.47 | - | - | - | 3.24±0.18 | 4.63±0.41 | 4.83±0.11 | - | - | - | MS, RI | |
| A11 | 2-Hexanol | 626-93-7 | 1311.83 | C6H14O | 24.97±1.46 | - | - | - | - | - | - | - | - | - | MS, RI | |
| A12 | 1-Pentanol | 71-41-0 | 1344.02 | C5H12O | - | 0.52±0.05 | 1.52±0.21 | 0.18±0.02 | - | - | - | - | - | - | MS, RI | |
| A13 | (2S)-2-heptanol | 6033-23-4 | 1418.64 | C7H16O | 0.35±0.06 | - | - | - | - | - | - | - | - | - | MS, RI | |
| A14 | 1-Hexanol | 111-27-3 | 1456.10 | C6H14O | 0.19±0.02 | 6.60±0.24 | 4.64±0.16 | 0.12±0.02 | 1.15±0.20 | 0.63±0.05 | 0.15±0.01 | 0.12±0.02 | 0.26±0.02 | 1.25±0.13 | MS, RI | |
| A15 | 2-Nonen-1-ol | 22104-79-6 | 1532.25 | C9H18O | - | 0.14±0.03 | 0.64±0.01 | 3.19±0.23 | - | - | - | - | - | - | MS, RI | |
| A16 | 1-Octen-3-ol | 3391-86-4 | 1558.03 | C8H16O | - | 2.60±0.21 | 0.31±0.07 | - | 1.62±0.1 | 0.38±0.04 | 0.25±0.03 | 0.73±0.02 | 2.16±0.17 | 1.15±0.08 | MS, RI | |
| A17 | 1-Heptanol | 111-70-6 | 1567.23 | C7H16O | 0.22±0.09 | - | - | - | - | - | - | - | - | - | MS, RI | |
| A18 | 2-Ethyl-1-hexanol | 104-76-7 | 1603.32 | C8H18O | - | 34.84±1.38 | 10.81±0.13 | 2.00±0.10 | - | - | - | 0.38±0.04 | 0.54±0.17 | 1.88±0.17 | MS, RI | |
| A19 | Trans-2-Octen-1-ol | 18409-17-1 | 1664.34 | C8H16O | - | - | - | - | 2.57±0.27 | 13.66±0.64 | 12.17±0.31 | 7.58±0.15 | 6.33±0.24 | 5.46±0.22 | MS, RI | |
| A20 | 1-Octanol | 111-87-5 | 1676.63 | C8H18O | 2.96±0.07 | 3.89±0.11 | 1.57±0.36 | 1.29±0.03 | 0.98±0.10 | 0.72±0.05 | 0.81±0.08 | 0.98±0.12 | 2.83±0.13 | 5.64±0.23 | MS, RI | |
| A21 | 1-Nonanol | 143-08-8 | 1781.58 | C9H20O | - | - | - | - | 1.60±0.25 | 8.10±0.12 | 0.71±0.14 | - | - | - | MS, RI | |
| A22 | 2-Furanmethanol | 98-00-0 | 1785.69 | C5H6O2 | - | 27.41±0.57 | 10.35±0.42 | 7.08±0.32 | 87.08±0.63 | 61.86±0.75 | 57.63±0.38 | 12.46±1.19 | 19.54±1.36 | 13.81±0.36 | MS, RI | |
| A23 | 2-Methyl-1-undecanol | 10522-26-6 | 1785.90 | C12H26O | 4.40±0.16 | - | - | - | - | - | - | - | - | - | MS, RI | |
| A24 | 2-Decen-1-ol | 22104-80-9 | 1851.87 | C10H20O | 1.83±0.11 | - | 1.94±0.06 | 2.41±0.15 | - | 5.28±0.36 | 9.86±0.1 | - | 0.99±0.07 | 4.58±0.16 | MS, RI | |
| A25 | E-2-Nonen-1-ol | 31502-14-4 | 1893.84 | C9H18O | - | - | - | - | 1.66±0.11 | - | 1.63±0.16 | - | - | - | MS, RI | |
| A26 | trans-2-tridecen-1-ol | 74962-98-4 | 1963.36 | C13H26O | - | - | - | - | 0.90±0.09 | 0.28±0.05 | 0.95±0.1 | - | - | - | MS, RI | |
| A27 | 1-Decanol | 112-30-1 | 1991.35 | C10H22O | - | - | - | - | 29.43±0.82 | 41.31±0.95 | 21.72±0.24 | - | - | - | MS, RI | |
| A28 | 6-methyl-1-heptanol | 1653-40-3 | 2003.85 | C8H18O | - | - | - | - | 1.07±0.28 | 1.71±0.25 | 4.39±0.26 | - | - | - | MS, RI | |
| A29 | E-2-Decen-1-ol | 18409-18-2 | 2022.46 | C10H20O | - | - | - | - | - | - | - | 0.28±0.05 | 0.99±0.14 | 2.53±0.28 | MS, RI | |
| A30 | 1-Undecanol | 112-42-5 | 2103.62 | C11H24O | - | 10.02±0.47 | 0.84±0.05 | 8.39±0.17 | 19.38±0.67 | 13.62±0.41 | 18.34±0.24 | 2.66±0.18 | 5.76±0.25 | 51.14±0.23 | MS, RI | |
| A31 | 3-Buten-2-ol | 598-32-3 | 2121.44 | C4H8O | - | 16.25±0.28 | 4.71±0.05 | 0.89±0.18 | - | - | - | - | - | - | MS, RI | |
| A32 | Z-2-Dodecenol | 69064-36-4 | 2257.58 | C12H24O | - | 4.74±0.19 | 1.8±0.15 | 2.43±0.15 | - | - | - | - | - | - | MS, RI | |
|  | **Aldehydes** |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |
| B1 | Acetaldehyde | 75-07-0 | 921.09 | C2H4O | 0.23±0.05 | 0.91±0.02 | 0.40±0.13 | 1.66±0.21 | - | - | - | 0.57±0.05 | 0.57±0.06 | 0.16±0.02 | MS, RI | |
| B2 | Butanal | 123-72-8 | 942.60 | C4H8O | - | 1.00±0.10 | 0.20±0.04 | 0.12±0.01 | - | - | - | - | - | - | MS, RI | |
| B3 | 2-methyl-Butanal | 96-17-3 | 970.92 | C5H10O | - | - | - | - | 0.42±0.09 | 0.26±0.01 | 0.16±0.04 | 0.51±0.04 | 3.55±0.2 | 0.84±0.12 | MS, RI | |
| B4 | Pentanal | 110-62-3 | 1037.50 | C5H10O | - | 1.58±0.23 | 0.74±0.15 | 0.08±0.01 | - | - | - | 0.15±0.02 | 0.34±0.04 | 1.39±0.2 | MS, RI | |
| B5 | 3-methyl-Butanal | 590-86-3 | 1037.54 | C5H10O | - | 0.39±0.01 | 0.14±0.02 | 0.13±0.01 | - | - | - | - | - | - | MS, RI | |
| B6 | (E)-But-2-Enal | 15798-64-8 | 1114.53 | C4H6O | - | - | - | - | - | - | - | 1.04±0.08 | 1.07±0.2 | 0.92±0.22 | MS, RI | |
| B7 | Hexanal | 66-25-1 | 1158.87 | C6H12O | - | 1.27±0.27 | 1.65±0.13 | 0.48±0.01 | 0.46±0.03 | 0.45±0.02 | 1.36±0.22 | 0.48±0.08 | 1.42±0.12 | 3.05±0.11 | MS, RI | |
| B8 | Heptanal | 111-71-7 | 1277.11 | C7H14O | - | 0.27±0.1 | 0.30±0.04 | 0.50±0.09 | 0.83±0.09 | 0.26±0.04 | 0.37±0.09 | 1.11±0.15 | 3.60±0.55 | 4.06±0.04 | MS, RI | |
| B9 | 5-methyl-Hexanal | 1860-39-5 | 1277.14 | C7H14O | - | - | - | 2.70±0.23 | - | - | 1.34±0.22 | - | - | 0.81±0.06 | MS, RI | |
| B10 | Octanal | 124-13-0 | 1384.76 | C8H16O | 0.89±0.2 | 9.16±0.02 | 3.55±0.07 | 3.27±0.04 | 4.92±0.13 | 1.35±0.14 | 0.89±0.12 | 1.5±0.18 | 1.5±0.24 | 5.47±0.15 | MS, RI | |
| B11 | (Z)-2-heptenal | 57266-86-1 | 1436.85 | C7H12O | - | - | - | - | - | - | - | 3.49±0.28 | 1.29±0.01 | 1.11±0.20 | MS, RI | |
| B12 | (E)-Hept-2-enal | 18829-55-5 | 1437.39 | C7H12O | - | 2.41±0.04 | 0.68±0.14 | 0.73±0.03 | - | - | - | 8.08±0.49 | 6.24±0.09 | 8.69±0.20 | MS, RI | |
| B13 | Nonanal | 124-19-6 | 1509.65 | C9H18O | 19.4±1.13 | 45.97±2.74 | 66.36±3.18 | 42.45±4.20 | 84.32±0.70 | 25.95±0.64 | 35.35±0.19 | 11.39±0.22 | 35.72±0.62 | 47.87±1.28 | MS, RI | |
| B14 | (E)-oct-2-enal | 2548-87-0 | 1554.80 | C8H14O | - | 3.57±0.20 | 1.90±0.24 | 1.01±0.08 | 1.61±0.07 | 5.06±0.51 | 0.78±0.05 | 4.38±0.26 | 3.67±0.19 | 0.53±0.11 | MS, RI | |
| B15 | 3-Furaldehyde | 498-60-2 | 1587.07 | C5H4O2 | - | 3.41±0.22 | 0.91±0.11 | 0.83±0.03 | 2.87±0.32 | 6.23±0.20 | 1.58±0.18 | 3.77±0.02 | 11.40±0.60 | 9.29±0.27 | MS, RI | |
| B16 | Decanal | 112-31-2 | 1623.30 | C10H20O | 1.81±0.05 | 17.54±0.37 | 14.63±0.95 | 15.32±0.30 | 14.5±1.05 | 4.72±0.18 | 1.58±0.04 | 12.79±0.69 | 3.7±1.05 | 5.41±0.26 | MS, RI | |
| B17 | (Z)-2-nonen-1-al | 60784-31-8 | 1655.04 | C9H16O | - | - | - | - | 4.25±0.17 | 4.71±0.36 | 0.74±0.04 | - | - | - | MS, RI | |
| B18 | Benzaldehyde | 100-52-7 | 1663.30 | C7H6O | 0.18±0.05 | 35.79±2.95 | 1.94±0.06 | 25.63±0.59 | 21.23±0.45 | 28.75±0.8 | 28.95±0.19 | 0.26±0.10 | 0.89±0.15 | 0.68±0.05 | MS, RI | |
| B19 | (Z)-2-decen-1-al | 2497-25-8 | 1670.05 | C10H18O | - | - | - | - | - | - | - | 1.45±0.06 | 0.73±0.11 | 1.18±0.02 | MS, RI | |
| B20 | Undecanal | 112-44-7 | 1693.30 | C11H22O | 1.14±0.10 | 4.17±0.39 | 7.12±0.44 | 13.92±0.61 | 2.00±0.38 | 14.53±0.16 | 25.64±0.33 | 7.60±0.49 | 6.92±0.53 | 2.82±0.32 | MS, RI | |
| B21 | Benzeneacetaldehyde | 122-78-1 | 1789.35 | C8H8O | - | 26.2±1.09 | 0.22±0.09 | 0.59±0.04 | - | 30.46±0.98 | 19.59±0.25 | - | 91.78±1.15 | 71.63±0.72 | MS, RI | |
| B22 | 3-Thiophenecarboxaldehyde | 498-62-4 | 1828.96 | C5H4OS | - | - | - | - | - | - | - | - | 2.61±0.20 | 5.66±0.35 | MS, RI | |
| B23 | Dodecanal | 112-54-9 | 1851.91 | C12H24O | - | 5.43±0.24 | 4.26±0.21 | 1.30±0.04 | - | - | - | 0.65±0.14 | 0.29±0.01 | 0.79±0.11 | MS, RI | |
| B24 | 3-Methyl-2-thiophenecarboxaldehyde | 5834-16-2 | 1888.84 | C6H6OS | - | 10.06±0.19 | - | - | - | - | - | - | - | - | MS, RI | |
| B25 | 13-Methyltetradecanal | 75853-51-9 | 2073.03 | C15H30O | - | 1.84±0.07 | 1.5±0.08 | 4.25±0.51 | - | - | - | - | - | - | MS, RI | |
|  | **Acids** |  |  |  |  |  |  |  |  |  |  |  |  |  | MS, RI | |
| C1 | L-Lactic acid | 79-33-4 | 1396.70 | C3H6O3 | - | - | - | - | - | - | - | 1.48±0.23 | 0.31±0.05 | 0.81±0.06 | MS, RI | |
| C2 | Acetic acid | 64-19-7 | 1643.14 | C2H4O2 | - | - | - | 0.08±0.01 | - | - | 0.88±0.07 | - | - | 1.70±0.20 | MS, RI | |
| C3 | 2-ethyl-hexanoic acid | 149-57-5 | 2149.96 | C8H16O2 | 1.65±0.21 | - | - | - | - | - | - | - | - | - | MS, RI | |
|  | **Ester** |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |
| D1 | Acetic acid, methyl ester | 79-20-9 | 906.76 | C3H6O2 | 6.29±0.27 | 1.23±0.18 | 0.43±0.02 | 0.45±0.01 | 1.34±0.27 | 2.32±0.02 | 0.18±0.03 | - | - | - | MS, RI | |
| D2 | Acetic acid, ethenyl ester | 108-05-4 | 1028.13 | C4H6O2 | - | 2.17±0.08 | 0.58±0.05 | 0.26±0.01 | - | - | - | 0.57±0.06 | 1.58±0.18 | 1.77±0.13 | MS, RI | |
| D3 | Allyl acetate | 591-87-7 | 1117.65 | C5H8O2 | - | 0.64±0.09 | 0.4±0.09 | 0.45±0.15 | - | - | - | - | - | - | MS, RI | |
| D4 | Methyl (2E)-2-butenoate | 623-43-8 | 1188.21 | C5H8O2 | - | 1.56±0.25 | 2.57±0.21 | 42.06±1.02 | 25.62±0.41 | 35.6±0.59 | 35.08±0.45 | 0.08±0.01 | 1.37±0.12 | 12.37±0.14 | MS, RI | |
| D5 | (S)-Isopropyl lactate | 63697-00-7 | 1396.84 | C6H12O3 | - | - | - | - | - | - | - | 0.82±0.03 | 0.46±0.05 | 0.38±0.05 | MS, RI | |
| D6 | 1-heptyl formate | 112-23-2 | 1567.96 | C8H16O2 | 0.71±0.02 | - | - | - | - | - | - | - | - | - | MS, RI | |
| D7 | Ammonium acetate | 631-61-8 | 1626.66 | C2H7NO2 | - | - | - | 0.28±0.02 | 3.17±0.57 | - | - | 0.06±0.04 | 0.68±0.10 | 1.16±0.10 | MS, RI | |
| D8 | Thiocyanic acid, benzyl ester | 3012-37-1 | 1788.72 | C8H7NS | - | - | - | - | 44.85±0.86 | 1.24±0.32 | 6.44±0.14 | - | - | - | MS, RI | |
| D9 | Pentyl phenylacetate | 5137-52-0 | 1792.97 | C13H18O2 | 3.04±0.20 | - | - | - | - | - | - | - | - | - | MS, RI | |
|  | **Ketones** |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |
| E1 | Acetone | 67-64-1 | 905.15 | C3H6O | 1.57±0.1 | 2.45±0.06 | 0.66±0.12 | 0.58±0.03 | - | - | - | 1.86±0.11 | 9.14±0.82 | 2.79±0.27 | MS, RI | |
| E2 | 2-Butanone | 78-93-3 | 959.38 | C4H8O | 0.26±0.03 | 1.37±0.14 | 1.62±0.27 | 1.21±0.15 | 0.52±0.09 | 0.96±0.10 | 0.78±0.09 | 0.58±0.04 | 1.63±0.21 | 1.60±0.10 | MS, RI | |
| E3 | Methyl vinyl ketone | 78-94-4 | 1006.30 | C4H6O | - | 0.38±0.05 | 0.33±0.08 | 1.4±0.26 | - | - | - | - | - | - | MS, RI | |
| E4 | 3,3-Dimethyl-2-butanone | 75-97-8 | 1032.82 | C6H12O | - | - | - | - | 0.46±0.05 | 1.86±0.23 | 1.18±0.22 | - | - | - | MS, RI | |
| E5 | 3-Hexanone | 589-38-8 | 1126.62 | C6H12O | 80.06±0.11 | - | - | - | - | - | - | - | - | - | MS, RI | |
| E6 | 2-Hexanone | 591-78-6 | 1158.91 | C6H12O | 47.39±0.58 | - | - | - | - | - | - | - | - | - | MS, RI | |
| E7 | 3-Penten-2-one | 625-33-2 | 1162.76 | C5H8O | 2.42±0.18 | 3.00±0.06 | 4.51±0.02 | 3.94±0.24 | 3.38±0.30 | 2.64±0.15 | 1.5±0.28 | 7.42±0.61 | 10.52±0.19 | 29.44±0.84 | MS, RI | |
| E8 | 2-Heptanone | 110-43-0 | 1277.23 | C7H14O | 2.57±0.33 | - | - | - | - | - | - | - | - | - | MS, RI | |
| E9 | 4-methyl-2-Heptanone | 6137-06-0 | 1302.90 | C8H16O | - | 1.17±0.11 | 1.52±0.21 | 0.24±0.02 | - | - | - | 0.15±0.01 | 0.41±0.05 | 0.39±0.13 | MS, RI | |
| E10 | 3-Octanone | 106-68-3 | 1358.88 | C8H16O | 1.13±0.10 | - | - | - | - | - | - | - | - | - | MS, RI | |
| E11 | 2-Octanone | 111-13-7 | 1369.96 | C8H16O | - | - | - | - | 1.83±0.07 | 0.31±0.04 | 0.16±0.03 | 0.22±0.06 | 1.25±0.11 | 6.4±0.36 | MS, RI | |
| E12 | Acetoin | 513-86-0 | 1393.90 | C4H8O2 | - | - | - | - | 2.10±0.24 | 0.47±0.01 | 0.19±0.03 | 1.18±0.11 | 1.71±0.22 | 0.29±0.06 | MS, RI | |
| E13 | 1-Octen-3-one | 4312-99-6 | 1402.38 | C8H14O | - | - | 0.48±0.06 | 1.01±0.06 | 1.34±0.16 | 0.33±0.04 | 0.15±0.02 | 0.63±0.16 | 1.53±0.31 | 1.06±0.17 | MS, RI | |
| E14 | 2-Propanone, 1-hydroxy- | 116-09-6 | 1415.38 | C3H6O2 | - | 2.63±0.17 | 0.79±0.11 | 0.43±0.02 | 2.29±0.16 | 3.08±0.2 | 1.08±0.07 | 0.57±0.27 | 1.05±0.04 | 1.21±0.01 | MS, RI | |
| E15 | 6-Methylhept-5-en-2-one | 110-93-0 | 1450.03 | C8H14O | 0.30±0.10 | - | - | - | - | - | - | - | - | - | MS, RI | |
| E16 | 3-Methyl-4-heptanone | 15726-15-5 | 1545.17 | C8H16O | - | 0.17±0.02 | 0.35±0.02 | 0.38±0.02 | - | - | - | 1.40±0.26 | 1.88±0.26 | 0.41±0.10 | MS, RI | |
| E17 | 4-methoxy-4-methyl-2-Pentanone | 107-70-0 | 1551.63 | C7H14O2 | - | - | - | - | 1.49±0.21 | 13.83±0.44 | 0.41±0.05 | - | - | - | MS, RI | |
| E18 | 2-Nonanone | 821-55-6 | 1561.10 | C9H18O | - | - | - | - | - | - | - | 0.56±0.14 | 2.15±0.07 | 1.27±0.19 | MS, RI | |
| E19 | 2-Decanone | 693-54-9 | 1611.14 | C10H20O | - | - | - | - | - | - | - | 0.19±0.03 | 0.62±0.28 | 3.48±0.22 | MS, RI | |
| E20 | 2,4-dimethyl-hexan-3-one | 18641-70-8 | 1656.53 | C8H16O | - | - | - | - | - | - | - | 2.31±0.35 | 0.47±0.04 | - | MS, RI | |
| E21 | Benzoin | 119-53-9 | 1666.67 | C14H12O2 | - | - | - | - | 17.36±1.17 | 25.64±0.33 | 14.50±1.05 | - | - | - | MS, RI | |
| E22 | Isophorone | 78-59-1 | 1753.54 | C9H14O | - | 3.74±0.24 | 1.21±0.09 | 0.27±0.01 | 2.51±0.07 | 4.25±0.17 | 3.46±0.08 | 0.6±0.05 | 0.62±0.28 | 1.56±0.22 | MS, RI | |
| E23 | 2-Dodecanone | 6175-49-1 | 1955.44 | C12H24O | - | - | - | - | - | - | - | 0.49±0.14 | 0.72±0.12 | 0.64±0.04 | MS, RI | |
| E24 | (E)-4-Hepten-2-one | 36678-43-0 | 2007.47 | C7H12O | - | 2.63±0.18 | 1.61±0.26 | 0.10±0.03 | - | - | - | - | - | - | MS, RI | |
| E25 | 2(3H)-Furanone,  dihydro-5-pentyl- | 104-61-0 | 2196.47 | C9H16O2 | - | 29.85±0.83 | 17.33±0.86 | 11.83±0.75 | - | - | - | - | - | - | MS, RI | |
|  | **Alkenes** |  |  |  |  |  |  |  |  |  |  |  |  |  | MS, RI | |
| F1 | Spiro[3.3]hepta-1,5-diene | 22635-78-5 | 1114.23 | C7H8 | - | 0.67±0.21 | 0.30±0.09 | 0.33±0.02 | - | - | - | 2.27±0.20 | 0.42±0.05 | 0.87±0.14 | MS, RI | |
| F2 | Ethylbenzene | 100-41-4 | 1225.85 | C8H10 | 0.40±0.10 | - | - | - | - | - | - | - | - | - | MS, RI | |
| F3 | Limonene | 138-86-3 | 1303.08 | C10H16 | 0.25±0.02 | - | - | - | - | - | - | - | - | - | MS, RI | |
| F4 | Styrene | 100-42-5 | 1364.60 | C8H8 | 0.13±0.01 | 0.29±0.01 | 0.14±0.01 | 0.26±0.06 | - | - | - | - | - | - | MS, RI | |
| F5 | Azulene | 275-51-4 | 1912.05 | C10H8 | 3.16±0.20 | - | - | - | - | - | - | - | - | - | MS, RI | |
| F6 | Butylated Hydroxytoluene | 128-37-0 | 2061.49 | C15H24O | - | 26.37±0.34 | 2.69±0.35 | 0.64±0.04 | - | - | - | - | - | - | MS, RI | |
|  | **Heterocyclic compounds** |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |
| G1 | Benzene | 71-43-2 | 997.68 | C6H6 | 0.24±0.05 | - | - | - | - | - | - | - | - | - | MS, RI | |
| G2 | Pyridine | 110-86-1 | 1291.40 | C5H5N | - | 7.69±2.30 | 7.47±0.23 | 5.93±0.32 | 27.63±0.74 | 30.36±0.69 | 22.65±0.27 | 5.35±0.16 | 12.62±0.27 | 21.11±0.87 | MS, RI | |
| G3 | 2-Butyl furan | 4466-24-4 | 1314.20 | C8H12O | - | - | - | - | - | - | - | 0.39±0.03 | 0.37±0.09 | 1.43±0.16 | MS, RI | |
| G4 | Pyrazine | 290-37-9 | 1317.57 | C4H4N2 | - | 2.39±0.13 | 0.73±0.20 | 0.48±0.02 | 2.57±0.20 | 1.52±0.15 | 0.82±0.07 | 1.09±0.12 | 1.43±0.13 | 5.7±0.28 | MS, RI | |
| G5 | 2-pentyl-furan | 3777-69-3 | 1329.43 | C9H14O | - | 34.19±2.02 | 36.59±1,23 | 39.64±2.66 | 47.12±1.85 | 41.15±2.71 | 40.62±1.23 | 50.15±2.21 | 53.12±2.04 | 57.26±3.09 | MS, RI | |
| G6 | 2-ethyl-5-methyl-Furan | 1703-52-2 | 1636.63 | C7H10O | - | 1.69±0.13 | - | - | - | - | 0.79±0.11 | - | - | - | MS, RI | |
| G7 | 4-Pyridazinamine | 20744-39-2 | 1636.68 | C4H5N3 | - | - | 0.23±0.04 | - | - | - | - | - | - | - | MS, RI | |
| G8 | Pyrrole | 109-97-7 | 1650.04 | C4H5N | - | - | - | - | 0.66±0.11 | 0.61±0.05 | 0.85±0.05 | 1.86±0.12 | 0.52±0.11 | 0.07±0.02 | MS, RI | |
| G9 | Spiro[2.4]hepta-4,6-diene | 765-46-8 | 1792.87 | C7H8 | 1.28±0.20 | - | - | 7.95±0.26 | - | - | 29.38±0.12 | - | - | - | MS, RI | |
| G10 | Isoquinoline | 119-65-3 | 1911.99 | C9H7N | - | 2.02±0.06 | 0.82±0.11 | 0.66±0.08 | 4.86±0.47 | 1.02±0.04 | 2.43±0.31 | 2.64±0.17 | 2.17±0.22 | 0.62±0.08 | MS, RI | |
| G11 | Furfural | 98-01-1 | 1587.06 | C5H4O2 | - | 8.08±0.3 | 2.5±0.07 | 0.9±0.06 | 7.82±0.37 | 4.43±0.11 | 5.59±0.02 | 8.85±0.36 | 35.57±1.48 | 25.29±0.84 | MS, RI | |
| G12 | 3-ethenyl-pyridine | 1121-55-7 | 1364.56 | C7H7N | - | - | - | - | - | - | - | 59.99±0.45 | 2.05±0.16 | 2.5±0.31 | MS, RI | |
| G13 | 2-methyl-pyrazine | 109-08-0 | 1379.19 | C5H6N2 | - | 1.75±0.16 | 0.27±0.06 | 0.23±0.01 | 2.48±0.31 | 1.39±0.14 | 0.83±0.14 | 1.03±0.08 | 1.73±0.17 | 3.71±0.18 | MS, RI | |
| G14 | 3-Acetyl-1H-pyrroline | 1072-82-8 | 2128.53 | C6H7NO | - | 4.25±0.14 | 2.36±0.20 | 0.85±0.07 | 6.15±0.19 | 1.54±0.22 | 2.68±0.21 | - | - | - | MS, RI | |
|  | **Others** |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |
| H1 | 1H-Tetrazole-1,5-diamine | 2165-21-1 | 901.93 | CH4N6 | - | - | - | - | 0.85±0.15 | 0.14±0.03 | 0.16±0.03 | 0.36±0.01 | 1.79±0.22 | 1.14±0.03 | MS, RI | |
| H2 | Propanedinitrile | 109-77-3 | 1135.30 | C3H2N2 | - | 1.21±0.20 | 0.82±0.08 | 0.62±0.02 | 0.22±0.09 | 0.61±0.07 | 2.08±0.14 | - | - | - | MS, RI | |

“-” :Not detected

Table S5. The key difference compounds of chestnuts VIP > 1 after different processing

|  |  |  |
| --- | --- | --- |
| Code | Var ID (Primary) | VIP |
| A22 | 2-Furanmethanol | 2.96303 |
| E5 | 3-Hexanone | 2.80635 |
| A9 | 3-Hexanol | 2.54121 |
| B21 | Benzeneacetaldehyde | 2.53386 |
| A27 | 1-Decanol | 2.238 |
| G5 | 2-pentyl-furan | 2.22177 |
| E25 | 2(3H)-Furanone, dihydro-5-pentyl- | 2.1982 |
| E6 | 2-Hexanone | 2.15891 |
| B18 | Benzaldehyde | 1.95638 |
| G12 | 3-ethenyl-pyridine | 1.8778 |
| D4 | Methyl (2E)-2-butenoate | 1.82903 |
| G11 | Furfural | 1.8091 |
| E21 | Benzoin | 1.76874 |
| A18 | 2-Ethyl-1-hexanol | 1.74305 |
| G2 | Pyridine | 1.71509 |
| B13 | Nonanal | 1.66174 |
| A11 | 2-Hexanol | 1.56587 |
| B16 | Decanal | 1.42934 |
| A2 | Ethanol | 1.42735 |
| D8 | Thiocyanic acid, benzyl ester | 1.39666 |
| E7 | 3-Penten-2-one | 1.39523 |
| F6 | Butylated Hydroxytoluene | 1.33199 |
| A30 | 1-Undecanol | 1.2526 |
| A19 | Trans-2-Octen-1-ol | 1.22293 |
| A31 | 3-Buten-2-ol | 1.19705 |
| B12 | (E)-Hept-2-enal | 1.18453 |
| B15 | 3-Furaldehyde | 1.02273 |
| A10 | 3-Methyl-1-butanol | 1.00263 |