**Table S1.** Experimental matrix, experimental and predicted values of reducing sugar contents and gruels flow velocities.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| N° | Real and coded (values in brackets) variables  X1 (h) X2 (%) X3 (°C) X4 (h) X5 (h) | | | | | *Atp-Y* experimental values  VEB VEJ SRB SRJ | | | | *Coca-sr* experimental values  VEB SRB VEJ SRJ | | | | *Atp-Y* predicted values  VEB SRB VEJ SRJ | | | | *Coca-sr* predicted values  VEB SRB VEJ SRJ | | | | |
| 1  2 | 30.00(0)  30.00(0) | 0.85(0)  0.85(0) | 33.00(0)  33.00(0) | 137.50(0)  137.50(0) | 0.77(-α)  58.75(+α) | 82.50±10.61aAa  215.00±10.61aAa | 90.00±10.61aAa  100.00±21.21aBa | 1372.24±78.02aBb  1027.58±24.38bBb | 2275.86±204.82aAb  4248.75±112.16aAb | 57.00±11.31aAa  124.00±4.24aAb | 3144.83±53.64bBa  4110.34±68.27bBa | 79.00±14.85aAa  80.00±1.41aBa | 4772.41±141.42aAa  5551.72±131.67aAa | 78.65a  191.65b | 1310.53a  1431.29a | 67.46a  107.93a | 2148.54a  3610.64b | 77.60a  122.84a | 3762.47a  4487.55a | 67.69a  83.89a | 4685.55a  5615.46a | |
| 3 | 58.39(+α) | 0.85(0) | 33.00(0) | 137.50(0) | 29.75(0) | 107.50±3.54aAa | 94.00±3.54aBa | 620.69±87.78aBb | 2096.55±43.89aAa | 39.00±1.41bAb | 3713.79±263.34aAa | 40.00±2.12aAb | 2255.17±726.61aBa | 54.78b | 233.87b | 60.77b | 2231.07a | 56.42a | 3922.17a | 34.93a | 2546.07a | |
| 4 | 30.00(0) | 0.85(0) | 33.00(0) | 137.50(0) | 29.75(0) | 115.00±14.14aBa | 140.00±14.14aAa | 3372.41±58.52aAa | 3503.45±165.80bAb | 69.00±7.07aAb | 3944.83±160.93bAa | 65.00±4.24aAb | 4468.97±336.48aAa | 129.98a | 3234.28b | 131.48a | 3821.63a | 81.97a | 4509.05a | 71.96a | 4514.11a | |
| 5 | 30.00(0) | 0.85(0) | 33.00(0) | 137.50(0) | 29.75(0) | 130.00±16.26aAa | 140.50±14.14aAa | 2986.21±29.26bBb | 3858.62±19.51aAb | 67.00±12.73aAb | 4420.68±112.16aBa | 82.00±16.26aAb | 4748.27±195.06aAa | 129.98a | 3234.28a | 131.48a | 3821.63a | 81.97a | 4509.05a | 71.96a | 4514.11a | |
| 6 | 30.00(0) | 0.85(0) | 33.00(0) | 137.50(0) | 29.75(0) | 122.50±31.82aBa | 170.00±42.42aAa | 3417.24±78.02aBa | 4558.62±19.51aAa | 67.00±3.54bAb | 3641.38±170.68bBa | 65.00±7.07aAb | 4748.28±131.67aAa | 129.98a | 3234.28b | 131.48a | 3821.63b | 81.97a | 4509.05a | 71.96a | 4514.11a | |
| 7 | 30.00(0) | 0.85(0) | 14.07(-α) | 137.50(0) | 29.75(0) | 90.00±7.07aAa | 82.00±7.77aAa | 3289.66±78.03aBb | 3910.34±29.26aAb | 70.00±20.51aAa | 4510.34±380.37aBa | 60.00±15.56aAa | 6572.41±145.81aAa | 80.91a | 3007.31b | 81.56a | 3133.44b | 59.66a | 4297.69a | 54.39a | 4991.75b | |
| 8 | 30.00(0) | 0.85(0) | 51.93(+α) | 137.50(0) | 29.75(0) | 0.00±0.00aBa | 10.00±0.00aAa | 537.93±156.05bAa | 689.66±121.91aBb | 10.00±0.00bAa | 437.93±0.00bBa | 10.00±0.00aAa | 1558.62±131.67bAa | -18.11b | 1162.28a | -4.17b | 701.15a | 39.78a | 1645.42a | 8.19b | 3116.16a | |
| 9 | 30.00(0) | 0.85(0) | 33.00(0) | 137.50(0) | 29.75(0) | 120.50±13.44aBa | 137.50±17.68aAa | 3406.89±151.17aBa | 4037.93±73.15aAb | 88.50±12.02aAa | 3455.17±409.63bBa | 72.00±21.21aAb | 4468.97±87.78aAa | 129.98a | 3234.28a | 131.48a | 3821.63a | 81.97a | 4509.05a | 71.96a | 4514.11a | |
| 10 | 30.00(0) | 0.85(0) | 33.00(0) | 273.55(+α) | 29.75(0) | 140.00±14.14aAa | 155.00±7.07aAa | 1979.31±151.17bBa | 3751.72±68.27aAa | 130.00±17.68aAa | 4848.27±175.56bAa | 95.00±12.02aBb | 3551.72±941.18aBa | 133.21a | 2342.52a | 153.48a | 3080.77b | 165.05a | 5592.06a | 97.10a | 3677.97a | |
| 11 | 30.00(0) | 0.85(0) | 33.00(0) | 1.46(-α) | 29.75(0) | 0.00±0.00aAa | 0.00±0.00aAa | 124.14±8.29aBa | 210.34±14.63aAa | 0.00±0.00aAa | -165.52±0.00bBb | 0.00±0.00aAa | 0.00±0.00aAb | -20.40b | 102.94a | -13.09b | 115.89b | -15.61b | 85.54a | -9.52b | -149.38b | |
| 12 | 1.61(-α) | 0.85(0) | 33.00(0) | 137.50(0) | 29.75(0) | 60.00±14.14aAa | 65.00±7.07aAa | 1593.10±53.64bBb | 5386.21±43.89aAa | 72.00±3.54aAa | 4096.55±292.60bAa | 67.00±16.97aAa | 4165.52±307.23aAb | 85.52a | 2321.93a | 83.62a | 4486.28b | 74.02a | 4883.02a | 64.66a | 3851.49b | |
| 13 | 30.00(0) | 1.678(+α) | 33.00(0) | 137.50(0) | 29.75(0) | 62.50±15.16aAb | 71.50±14.14aAa | 1282.76±199.94aBb | 4365.52±385.25aAa | 133.50±12.02aAa | 4886.21±102.41bAa | 96.00±12.02aBa | 2593.10±53.64aBb | 49.60a | 1403.07a | 83.67a | 4399.29a | 135.48a | 5373.27a | 80.12a | 2759.85a | |
| 14 | 30.00(0) | 0.022(-α) | 33.00(0) | 137.50(0) | 29.75(0) | 95.00±24.75aBb | 137.50±3.54aBa | 1262.07±151.17aBb | 4772.41±39.01aAa | 139.00±5.66bAa | 4986.21±170.68bAa | 65.00±4.24aBb | 4000.00±209.69aBb | 80.70a | 1483.76a | 110.72b | 3973.23b | 156.46a | 5494.00a | 73.46a | 3810.12a | |
| 15 | 42.00(+1) | 1.20(+1) | 25.00(-1) | 80.00(-1) | 17.50(-1) | 19.00±1.41aBb | 32.50±3.54aAa | 1965.52±48.77aAb | 1965.52±34.14bAb | 78.00±3.54aAa | 3848.28±224.32aAa | 44.00±1.41aBa | 3648.27±307.23aAa | 14.34b | 1406.93b | 20.41b | 2226.71a | 59.96b | 3382.26a | 43.16a | 2337.23b | |
| 16 | 18.00(-1) | 1.20(+1) | 41.00(+1) | 80.00(-1) | 17.50(-1) | 58.50±3.54aBa | 80.00±0.00aAa | 1924.13±82.90aBa | 2544.83±209.69aAb | 52.50±0.71aAa | 1237.93±238.95bBb | 31.00±1.41aBb | 4427.59±277.97aAa | 46.10b | 1457.12b | 69.15b | 2200.22a | 52.43a | 1949.70a | 29.44a | 4231.59a | |
| 17 | 42.00(+1) | 1.20(+1) | 41.00(+1) | 195.00(+1) | 42.00(+1) | 78.00±21.92aBb | 105.00±7.07aBa | 2089.66±4.88aBb | 2317.24±126.79aAb | 145.00±0.71aAa | 5165.52±58.52aAa | 58.00±8.49aBb | 4427.59±321.86aBa | 100.42a | 1518.75b | 95.56a | 2544.43a | 145.72a | 4792.49b | 49.79a | 4036.22a | |
| 18 | 18.00(-1) | 1.20(+1) | 25.00(-1) | 195.00(+1) | 42.00(+1) | 150.00±7.78aAa | 101.50±7.78aBa | 3131.03±146.30aBb | 3806.89±73.15bAb | 57.00±17.68aBb | 4458.62±68.27aBa | 115.00±7.98aAa | 5131.03±395.00aAa | 165.01a | 2830.35a | 115.67a | 4722.60a | 80.31a | 4117.87b | 109.69a | 4865.59a | |
| 19 | 42.00(+1) | 0.50(-1) | 41.00(+1) | 80.00(-1) | 17.50(-1) | 0.00±0.00bAa | 0.00±0.00aAb | 124.13±0.00bBb | 1096.55±121.91aAb | 0.00±0.00aBa | 324.14±0.00aBa | 12.00±3.53bAa | 2117.24±92.65aAa | 10.63a | 204.51a | -6.30b | 690.24b | -22.14b | 7.98b | 22.87a | 1954.35a | |
| 20 | 18.00(-1) | 0.50(-1) | 41.00(+1) | 80.00(-1) | 17.50(-1) | 39.00±0.00bAa | 32.50±3.54bBa | 893.10±58.51aBb | 2386.21±253.58bAb | 0.00±0.00aBb | 1972.41±87.78aBa | 15.00±7.07aAb | 4068.96±175.56aBa | 60.93b | 585.14b | 46.80a | 3057.21a | -1.27b | -45.82b | 7.75a | 3287.98b | |
| 21 | 18.00(-1) | 1.20(+1) | 41.00(+1) | 80.00(-1) | 42.00(+1) | 25.00±4.24bAa | 33.00±3.54bAa | 2006.90±229.20aBb | 3262.07±126.79bAa | 20.50±0.71bBa | 3482.76±24.38aAa | 29.00±1.41bAa | 3082.76±112.16aAa | 47.73a | 2422.08a | 59.91a | 3450.94a | 38.36a | 3051.42b | 38.35a | 2666.43b | |
| 22 | 18.00(-1) | 1.20(+1) | 25.00(-1) | 80.00(-1) | 17.50(-1) | 7.50±0.54aBb | 15.00±3.54aAb | 1082.76±19.51aBb | 1448.28±58.52aAb | 54.50±3.54bAa | 3417.24±121.91aAa | 58.00±1.41bAa | 3141.38±112.16bAa | 4.39a | 920.67b | 19.57a | 1310.97a | 66.70a | 2980.18b | 65.66a | 3632.07a | |
| 23 | 18.00(-1) | 0.50(-1) | 25.00(-1) | 80.00(-1) | 42.00(+1) | 114.50±8.49aAa | 95.00±7.07aBa | 1248.28±214.57aBb | 2520.69±199.94bAb | 80.00±7.07bAb | 5406.89±195.06bAa | 35.00±9.90aBb | 4200.00±39.01aBa | 98.86b | 1246.34a | 64.27b | 3512.25a | 112.38a | 6223.87a | 31.06a | 3684.95b | |
| 24 | 30.00(0) | 0.85(0) | 33.00(0) | 137.50(0) | 29.75(0) | 125.00±7.07aAa | 120.00±14.14aAa | 2331.03±39.01bBb | 4182.75±58.52aAa | 137.50±21.92aAa | 5127.59±326.73aAa | 60.00±0.00bBb | 4234.48±395.00aBa | 129.98a | 3234.28a | 131.48a | 3821.63b | 81.97a | 4509.05a | 71.96a | 4514.11a | |
| 25 | 30.00(0) | 0.85(0) | 33.00(0) | 137.50(0) | 29.75(0) | 110.00±4.24bBa | 140.00±3.54aAa | 3917.24±307.23aAb | 3958.62±63.40aAa | 63.00±5.66bAb | 4782.76±43.89aAa | 65.00±3.54aAb | 4468.97±258.46aBa | 129.98a | 3234.28b | 131.48a | 3821.63b | 81.97a | 4509.05b | 71.96a | 4514.11a | |
| 26 | 30.00(0) | 0.85(0) | 33.00(0) | 137.50(0) | 29.75(0) | 210.00±7.07aAa | 128.50±35.36aBa | 3327.58±121.91aBb | 4841.36±112.16aAa | 63.00±0.00bAb | 4455.17±365.74aAa | 65.00±2.83aAb | 4478.27±39.01aAb | 129.98b | 3234.28a | 131.48a | 3821.63b | 81.97a | 4509.05a | 71.96a | 4514.11a | |
| 27 | 42.00(+1) | 1.20(+1) | 25.00(-1) | 195.00(+1) | 17.50(-1) | 40.50±7.07bBa | 100.00±10.61aAa | 586.21±39.01bBb | 4827.59±185.31aAa | 51.00±6.36bAa | 4468.96±277.97bAa | 48.00±5.66bAb | 1965.52±102.41bBb | 80.07a | 875.97a | 104.34a | 4811.35a | 75.81a | 5336.76a | 72.09a | 3082.89a | |
| 28 | 42.00(+1) | 0.50(-1) | 25.00(-1) | 80.00(-1) | 42.00(+1) | 67.00±9.90bAb | 46.00±0.00bBa | 758.62±117.03bBb | 2944.83±277.97aAa | 120.00±22.63aAa | 5858.62±102.41aAa | 33.00±8.49aBa | 2813.79±0.00bBa | 101.18a | 1289.50a | 90.17a | 2649.60a | 121.01a | 5338.02b | 32.81a | 3528.90a | |
| 29 | 42.00(+1) | 0.50(-1) | 41.00(+1) | 80.00(-1) | 42.00(+1) | 5.00±0.00bBb | 18.00±0.00bAb | 62.06±29.25aBb | 937.93±14.63aAa | 10.00±0.00bBa | 1710.34±14.63aAa | 40.00±0.00bAa | 1193.10±165.80aBa | 7.01a | -766.99b | 21.40a | 761.67b | 10.80a | 1439.87b | 42.66a | 1248.67a | |
| 30 | 18.00(-1) | 0.50(-1) | 25.00(-1) | 195.00(+1) | 17.50(-1) | 130.00±21.21aBa | 195.00±7.07aAa | 4251.72±190.19aAb | 3968.97±102.41aAb | 114.00±7.07aAa | 5879.31±424.26aAa | 90.00±14.85aAb | 4427.59±58.52aBa | 110.46a | 4069.27a | 169.56b | 3713,35a | 94.43a | 5460.29a | 103.59a | 4249.22b | |
| 31 | 42.00(-1) | 0.50(-1) | 25.00(-1) | 195.00(+1) | 17.50(-1) | 101.00±15.56aAa | 130.00±14.14aAa | 3696.55±48.77aAb | 3696.55±29.26bAa | 119.00±21.21aAa | 6586.21±302.35aAa | 95.00±14.14aAa | 4282.76±209.63aBa | 106.91a | 3248.99b | 151.21a | 3980.87a | 105.43a | 5838.23b | 80.71a | 4575.93a | |
| 32 | 30.00(0) | 0.85(0) | 33.00(0) | 137.50(0) | 29.75(0) | 145.00±17.68aAa | 130.00±14.14aAa | 2889.66±39.01bBb | 3006.89±19.51bAb | 80.00±1.41aAb | 4496.55±117.04aAa | 95.00±2.83aAa | 4541.38±121.91aAa | 129.98a | 3234.28a | 131.48a | 3821.63a | 81.97a | 4509.05a | 71.96b | 4514.11a | |
| 33 | 18.00(-1) | 1.20(+1) | 25.00(-1) | 195.00(+1) | 17.50(-1) | 71.50±7.07aBa | 112.50±3.4aAa | 1089.65±126.79bBb | 2827.57±97.53bAb | 90.00±7.78aAa | 5448.28±78.03aAa | 130.00±17.68aAa | 3317.24±297.47aBa | 65.88a | 1756.77a | 109.16a | 3558.08a | 75.00a | 4936.84b | 115.78a | 3373.85a | |
| 34 | 18.00(-1) | 0.50(-1) | 41.00(+1) | 195.00(+1) | 42.00(+1) | 110.00±4.95aAb | 70.00±7.07bBa | 2027.58±78.02bBb | 3765.31±43.89aAa | 158.00±7.07aAa | 6455.17±151.17aAa | 97.00±30.41aBa | 3455.17±97.53bBa | 111.30a | 2541.37a | 92.77a | 3842.88a | 163.33a | 5352.22b | 85.28a | 4550.82a | |
| 35 | 18.00(-1) | 1.20(+1) | 41.00(+1) | 195.00(+1) | 17.50(-1) | 82.50±3.54aBb | 110.00±5.36aAa | 2700.00±199.94aBb | 3293.10±63.40aAb | 170.00±21.21aAa | 6337.93±165.80aAa | 59.00±8.49aBb | 4103.45±736.37aBa | 76.34a | 2253.64a | 105.46a | 3389.98a | 168.41a | 6593.00a | 66.88a | 4068.63a | |
| 36 | 30.00(0) | 0.85(0) | 33.00(0) | 137.50(0) | 29.75(0) | 87.00±2.12bBb | 125.00±17.68aAa | 3844.83±53.64aAa | 3496.55±68.27bBb | 105.00±1.41aAa | 3679.31±214.57bBa | 65.00±2.12bBb | 4541.48±292.60aAa | 129.98a | 3234.28b | 131.48a | 3821.63a | 81.97b | 4509.05a | 71.96a | 4514.11a | |
| 37 | 18.00(-1) | 0.50(-1) | 25.00(-1) | 80.00(-1) | 17.50(-1) | 45.00±4.24aAb | 40.00±1.41bAa | 1848.27±48.77bBb | 2300.00±63.40aAa | 81.50±6.36aAa | 3413.79±497.41aAa | 20.00±3.54aBb | 2275.86±156.05bBa | 55.72a | 2217.59a | 65.38a | 2474.45a | 74.95a | 3736.81a | 27.15a | 3813.90a | |
| 38 | 30.00(0) | 0.85(0) | 33.00(0) | 137.50(0) | 29.75(0) | 120.00±14.14aAa | 95.00±7.07bAa | 2810.34±92.66bAb | 3503.45±297.47aAb | 63.00±12.02aAb | 6131.03±195.06aAa | 82.00±5.66aAa | 4478.27±214.57aBa | 129.98a | 3234.28a | 131.48a | 3821.63a | 81.97a | 4509.05b | 71.96a | 4514.11a | |
| 39 | 42.00(+1) | 1.20(+1) | 41.00(+1) | 80.00(-1) | 42.00(+1) | 17.50±0.00bBa | 50.00±0.00bAa | 1358.62±126.79aAa | 1031.03±24.38bAa | 5.00±0.00bBb | 1917.24±160.93aAa | 42.00±4.95aAa | 1717.24±507.17aAa | 25.30a | 1477.31a | 58.94a | 1277.08a | 12.49b | 1861.26a | 36.10a | 1236.24a | |
| 40 | 18.00(-1) | 1.20(+1) | 25.00(-1) | 80.00(-1) | 42.00(+1) | 72.50±3.54aAa | 37.50±3.54aBa | 1628.59±92.66aBb | 3006.89±243.83aAa | 75.00±1.41aAa | 4455.17±458.40aAa | 53.00±11.31aAa | 2317.24±48.77bBb | 62.90a | 1382.26b | 20.12b | 2735.43a | 62.33b | 3871.12a | 62.13a | 3164.76a | |
| 41 | 30.00(0) | 0.85(0) | 33.00(0) | 137.50(0) | 29.75(0) | 150.00±10.61aAa | 120.00±10.61aBa | 3262.07±53.64aAb | 3600.00±238.95aAb | 63.00±10.61aBb | 5234.43±414.51aAa | 93.00±18.38aAa | 4478.27±473.03aBa | 129.98a | 3234.28b | 131.48a | 3821.63a | 81.97a | 4509.05b | 71.96a | 4514.11a | |
| 42 | 42.00(+1) | 0.50(-1) | 25.00(-1) | 195.00(+1) | 42.00(+1) | 195.00±7.07aBa | 224.00±3.54aAa | 2268.96±219.45aBb | 3031.03±180.43bAb | 175.00±14.14aAa | 6320.69±765.63aAa | 85.00±11.31aBb | 6924.14±97.53aAa | 200.79a | 2386.11a | 194.66b | 3966.08a | 157.74a | 5349.43a | 85.50a | 6927.15a | |
| 43 | 18.00(-1) | 1.20(+1) | 41.00(+1) | 195.00(+1) | 42.00(+1) | 128.50±10.61aAb | 145.00±7.07aAa | 4368.97±14.63aAb | 4368.96±53.64aAa | 197.00±16.26aAa | 6368.97±853.40aAa | 63.00±10.61aBb | 4765.51±414.51aBa | 118.60a | 3830.59b | 102.19b | 4380.76a | 164.03a | 5984.81a | 73.23a | 4462.52a | |
| 44 | 18.00(-1) | 0.50(-1) | 41.00(+1) | 80.00(-1) | 42.00(+1) | 62.00±4.24aAa | 51.50±10.61aAa | 627.57±102.41aBb | 3851.72±24.38aAa | 56.50±12.02aAa | 2475.86±555.93aAa | 29.00±2.83aBb | 2475.86±136.54aBb | 47.19b | 117.26b | 35.91a | 3921.28a | 26.48a | 2652.01a | 24.10a | 2061.19b | |
| 45 | 30.00(0) | 0.85(0) | 33.00(0) | 137.50(0) | 29.75(0) | 141.00±7.07aAa | 140.00±28.28aAa | 3041.35±14.63bBb | 3768.97±102.41aAb | 106.00±4.24aAb | 4144.83±287.72aAa | 59.00±2.12bBb | 4527.59±297.47aAa | 129.98a | 3234.28a | 131.48a | 3821.63a | 81.97b | 4509.05a | 71.96a | 4514.11a | |
| 46 | 18.00(-1) | 0.50(-1) | 25.00(-1) | 195.00(+1) | 42.00(+1) | 180.00±0.71bAa | 160.00±7.07aBa | 4455.17±48.77aAb | 4489.65±73.15aAb | 150.00±14.14aAa | 5979.31±63.40bAa | 108.00±5.66aBb | 5806.90±14.63bBa | 194.22a | 3710.02b | 174.42a | 4491.21a | 141.55a | 6237.43a | 104.94a | 6079.32a | |
| 47 | 42.00(+1) | 0.50(-1) | 41.00(+1) | 195.00(+1) | 17.50(-1) | 33.00±5.66aAb | 30.00±7.07aAb | 448.27±24.38bBb | 1055.17±234.08aAb | 119.00±21.92aAa | 3700.00±151.17bAa | 73.50±9.19aBa | 3420.69±765.63aAa | 38.36a | 649.56a | 38.95a | 1209.31a | 112.59a | 4415.94a | 65.43a | 3488.81a | |
| 48 | 42.00(+1) | 1.20(+1) | 41.00(+1) | 80.00(-1) | 17.50(-1) | 0.00±0.00bBb | 15.00±4.24bAa | 303.45±39.01bBb | 803.45±4.87bAb | 15.00±2.83aAa | 1762.07±92.66aAa | 12.00±1.41bAa | 1544.83±9.75bAa | 13.55a | 1015.97a | 29.59a | 819.00a | 21.37a | 2025.49a | 23.75a | 2280.28a | |
| 49 | 42.00(+1) | 1.20(+1) | 25.00(-1) | 80.00(-1) | 42.00(+1) | 52.00±9.90bAa | 70.00±0.00aAa | 1368.55±24.38aBb | 2579.31±22.32aAa | 62.00±0.00aAa | 3096.05±526.67aAa | 41.00±6.36aBa | 2075.86±112.16aBa | 82.97a | 1364.89a | 59.55b | 2858.53a | 60.77b | 3007.25a | 43.06a | 2391.03a | |
| 50 | 42.00(+1) | 0.50(-1) | 41.00(+1) | 195.00(+1) | 42.00(+1) | 52.00±0.00bAb | 56.25±1.78bAb | 179.31±24.38bBb | 758.62±107.29bAb | 162.50±10.61aAa | 3786.21±463.28aBa | 75.00±2.83aBa | 5800.00±19.51aAa | 75.37a | 290.05a | 72.61a | 1020.80a | 155.21a | 4137.92a | 82.66a | 4742.18b | |
| 51 | 42.00(+1) | 0.50(-1) | 25.00(-1) | 80.00(+1) | 17.50(-1) | 50.00±7.07aAa | 37.00±7.07aBa | 2406.90±19.51aAb | 2210.34±14.63bBb | 59.00±6.36bAa | 3420.69±390.13aAa | 27.00±8.48aBa | 3165.52±248.71aAa | 47.92a | 2764.37a | 52.69a | 2404.44a | 78.39a | 4116.91a | 25.46a | 3136.73a | |
| 52 | 18.00(-1) | 0.50(-1) | 41.00(+1) | 195.00(+1) | 17.50(-1) | 90.00±15.56aAa | 90.00±10.61aAa | 2731.03±58.52aAb | 2793.10±82.90bAb | 125.00±21.21aAa | 4144.83±594.95aAa | 67.00±12.02aBa | 4234.48±121.91aBa | 84.42a | 2397.25b | 97.70a | 3238.76a | 125.90a | 4364.29a | 71.50a | 3818.56b | |
| 53 | 42.00(+1) | 1.20(+1) | 41.00(+1) | 195.00(+1) | 17.50(-1) | 43.50±7.07aAb | 37.50±3.54bAa | 624.14±14.63aBb | 2675.86±39.01aAb | 184.50±21.92aAa | 8872.41±687.60aAa | 41.00±2.12aBa | 4068.97±29.26aBa | 48.03a | 445.43b | 60.23a | 2346.29b | 144.91a | 6666.63b | 40.00a | 3121.20b | |
| 54 | 42.00(+1) | 1.20(+1) | 25.00(-1) | 195.00(+1) | 42.00(+1) | 220.00±14.14aAa | 140.00±7.07aBa | 1013.79±136.54bBb | 5900.00±4.88aAa | 94.00±1.41aAb | 2231.03±277.97bBa | 65.00±11.31aBa | 4668.96±219.45aAb | 189.33a | 1445.92a | 149.45a | 5183.23b | 86.31b | 3251.84 | 69.44a | 5095.75a |

*X1: soaking time (h); X2: salt concentration (%); X3: soaking temperature (°C); X4: germination time (h); X5: maturation time (h).*

*VEB: Coca-sr flow velocity (mm/30s); VEJ: Atp-Y flow velocity (mm/30s); SRJ: Atp-Y reducing sugar content (mg/100 mL gruel); SRB: reducing sugar content Coca-sr (mg/100 mL gruel).*

*Values with the same lowercase and uppercase letters on the same line do not differ significantly (p˃0.05)*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Coca-sr* | | | | | | | | |  | | *Atp-Y* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Coca-sr* gruel flow velocities *Atp-Y* gruel flow velocities | | | | | | | | | ***Coca-sr* gruel reducing sugar *Atp-Y* gruel reducing sugar *Coca-sr* gruel flow velocities  *Atp-Y*  gruel flow velocities *Coca-sr* gruel reducing sugar *Atp-Y* gruel reducing sugar** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Source | **Coeff RC (%)** | | ***P*** | **SS** | ***P* RC (%)** | | **SS** | **Coeff** | ***P* RC (%) SS Coeff *P* RC (%) SS Coeff *P*  SS RC (%) Coeff *P* Coeff RC (%) SS RC (%) SS Coeff *P* RC (%) *P* Coeff SS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Model |  | 86.13 | **0.000** | 117210 | **0.000** | 89.03 | 38805.4 |  | **0.000** | 81.95 | | 130739201 |  | **0.000** | | 81.40 | 80844229 | |  | **0.000** | 151140 | | 86.22 |  | | **0.000** |  | | 87.19 | | 126637 | 88.54 | | | 72982074 | |  | | **0.000** | | 87.42 | | **0.000** |  | 79019327 | |
| Xi (linear) | 81.97 | 50.79 | **0.000** | 69114 | **0.000** | 65.03 | 28344.9 | 71.96 | **0.000** | 46.94 | | 74887132 | 4509 | **0.000** | | 42.42 | 42128232 | | 4514 | **0.000** | 92757 | | 52.91 | 129.98 | | **0.000** | 131.48 | | 50.45 | | 73277 | 29.96 | | | 24694137 | | 3234 | | **0.000** | | 47.19 | | **0.000** | 3822 | 42655872 | |
| X1 | -8.80 | 0.44 | 0.314 | 597 | **0.002** | 3.91 | 1705.00 | -14.86 | 0.162 | 1.12 | | 1781015 | -480 | **0.021** | | 3.31 | 3287377 | | -653 | 0.124 | 1823 | | 1.04 | -15,37 | | 0.190 | -11.43 | | 0.69 | | 1008 | 10.20 | | | 8410793 | | -1044 | | **0.000** | | 10.85 | | **0.000** | -1128 | 9811266 | |
| X2 | -10.49 | 0.62 | 0.232 | 849 | 0.447 | 0.20 | 85.70 | 3.33 | 0.859 | 0.02 | | 28119 | -60 | 0.060 | | 2.14 | 2127914 | | -525 | 0.120 | 1866 | | 1.06 | -15.55 | | 0.123 | -13.52 | | 0.97 | | 1411 | 0.02 | | | 12562 | | -40 | | 0.835 | | 0.39 | | 0.321 | 213 | 350169 | |
| X3 | -9.94 | 0.56 | 0.257 | 762 | **0.000** | 9.45 | 4118.80 | -23.10 | **0.000** | 8.51 | | 13570285 | -1326 | **0.001** | | 6.83 | 6786223 | | -938 | **0.000** | 18916 | | 10.79 | -49.51 | | **0.000** | -42.87 | | 9.76 | | 14179 | 7.97 | | | 6566860 | | -923 | | **0.000** | | 12.63 | | **0.000** | -1216 | 11412604 | |
| X4 | 90.33 | 46.26 | **0.000** | 62957 | **0.000** | 50.31 | 21929.3 | 53.31 | **0.000** | 36.67 | | 58493510 | 2753 | **0.000** | | 28.45 | 28258571 | | 1914 | **0.000** | 45520 | | 25.97 | 76.81 | | **0.000** | 83.28 | | 36.85 | | 53520 | 11.74 | | | 9675790 | | 1120 | | **0.000** | | 18.76 | | **0.000** | 1482 | 16957815 | |
| X5 | 22.62 | 2.90 | **0.013** | 3949 | **0.071** | 1.16 | 506.20 | 8.10 | 0.289 | 0.64 | | 1014202 | 363 | 0.094 | | 1.68 | 1668147 | | 465 | **0.000** | 24632 | | 14.05 | 56.50 | | **0.024** | 20.23 | | 2.18 | | 3159 | 0.03 | | | 28132 | | 60 | | 0.756 | | 4.56 | | **0.002** | 731 | 4124017 | |
| XiXi (square) |  | 8.49 | **0.006** | 11550 | **0.000** | 12.39 | 5402.30 |  | **0.038** | 7.34 | | 11707732 |  | **0.000** | | 20.85 | 20703761 | |  | **0.000** | 38948 | | 22.22 |  | | **0.000** |  | | 21.36 | | 31023 | 30.91 | | | 25479334 | |  | | **0.000** | | 19.28 | | **0.000** |  | 17432197 | |
| X1X1 | -16.70 | 0.49 | 0.341 | 534 | **0.016** | 1.69 | 935.40 | -22.17 | 0.876 | 0.00 | | 21563 | -106 | **0.021** | | 2.57 | 3291778 | | -1315 | **0.004** | 6810 | | 2.73 | -59.80 | | **0.002** | -59.30 | | 3.23 | | 6687 | 6.47 | | | 7282269 | | -1956 | | **0.000** | | 0.15 | | 0.285 | -463 | 407784 | |
| X2X2 | 64.00 | 5.94 | **0.001** | 7794 | 0.584 | 0.26 | 44.30 | 4.83 | 0.181 | 1.41 | | 1626488 | 925 | **0.030** | | 2.40 | 2874440 | | -1229 | **0.002** | 7996 | | 3.60 | -64.80 | | 0.055 | -34.30 | | 0.86 | | 2236 | 5.71 | | | 6102171 | | -1791 | | **0.000** | | 0.74 | | 0.398 | 365 | 252972 | |
| X3X3 | -32.20 | 1.51 | 0.072 | 1979 | **0.000** | 6.86 | 3147.50 | -40.67 | **0.030** | 2.49 | | 4497646 | -1537 | 0.402 | | 0.25 | 402886 | | -460 | **0.000** | 18488 | | 9.92 | -98.60 | | **0.000** | -92.80 | | 10.17 | | 16380 | 2.18 | | | 2514002 | | -1149 | | **0.006** | | 6.53 | | **0.000** | -1904 | 6899928 | |
| X4X4 | -7.20 | 0.09 | 0.679 | 100 | **0.003** | 3.52 | 1510.10 | -28.17 | **0.019** | 3.26 | | 5307910 | -1670 | **0.000** | | 14.85 | 14386896 | | -2750 | **0.001** | 10300 | | 5.93 | -73.60 | | **0.001** | -61.30 | | 4.59 | | 7146 | 8.54 | | | 7698780 | | -2012 | | **0.000** | | 10.00 | | **0.000** | -2223 | 9404908 | |
| X5X5 | 18.30 | 0.47 | 0.300 | 634 | 0.664 | 0.06 | 27.90 | 3.83 | 0.574 | 0.18 | | 280619 | -384 | 0.249 | | 0.78 | 770553 | | 636 | 0.794 | 51 | | 0.03 | 5.20 | | **0.016** | -43.80 | | 2.51 | | 3647 | 8.01 | | | 6606263 | | -1863 | | **0.000** | | 1.87 | | **0.034** | -942 | 1688440 | |
| XiXj (interactions) |  | 26.86 | **0.000** | 36546 | **0.003** | 11.60 | 5058.20 |  | **0.000** | 27.67 | | 44144337 |  | **0.005** | | 18.14 | 18012235 | |  | **0.017** | 19436 | | 11.09 |  | | **0.001** |  | | 15.38 | | 22337 | 27.67 | | | 22808603 | |  | | **0.000** | | 20.94 | | **0.000** |  | 18931259 | |
| X1X2 | -14.30 | 0.15 | 0.551 | 208 | **0.020** | 1.99 | 866.30 | -29.10 | 0.974 | 0.00 | | 966 | 31 | 0.251 | | 0.77 | 763039 | | -864 | 0.360 | 630 | | 0.36 | 24.80 | | 0.426 | 18.90 | | 0.25 | | 366 | 0.01 | | | 7326 | | -85 | | 0.874 | | 2.15 | | **0.024** | 1380 | 1943416 | |
| X1X3 | -34.00 | 0.87 | 0.160 | 1182 | 0.057 | 1.30 | 565.30 | 23.50 | 0.625 | 0.13 | | 212935 | -457 | 0.223 | | 0.87 | 861886 | | -919 | **0.033** | 3613 | | 2.06 | -59.50 | | 0.022 | -56.50 | | 2.25 | | 3265 | 2.09 | | | 1720174 | | -1298 | | **0.020** | | 11.67 | | **0.000** | -3215 | 10552042 | |
| X1X4 | 10.60 | 0.08 | 0.658 | 114 | **0.018** | 2.06 | 897.80 | -29.70 | 0.997 | 0.00 | | 9 | -3 | 0.067 | | 2.03 | 2015560 | | 1405 | 0.826 | 36 | | 0.02 | 5.90 | | 0.738 | -7.90 | | 0.04 | | 64 | 4.53 | | | 3737734 | | -1913 | | **0.001** | | 0.25 | | 0.422 | 472 | 227850 | |
| X1X5 | 7.30 | 0.04 | 0.761 | 54 | 0.689 | 0.05 | 23.60 | 4.80 | 0.064 | 2.01 | | 3205252 | -1772 | 0.332 | | 0.55 | 543132 | | 729 | 0.600 | 205 | | 0.12 | 14.20 | | **0.028** | 54.00 | | 2.05 | | 2979 | 0.62 | | | 507280 | | -705 | | 0.192 | | 1.39 | | 0.065 | -1109 | 1256566 | |
| X2X3 | 86.70 | 5.64 | **0.001** | 7673 | 0.057 | 1.30 | 565.30 | -23.50 | **0.000** | 9.50 | | 15148728 | 3852 | **0.041** | | 2.55 | 2533219 | | 1575 | 0.065 | 2664 | | 1.52 | 51.10 | | **0.000** | 95.40 | | 6.40 | | 9291 | 11.41 | | | 9408224 | | 3035 | | **0.000** | | 0.21 | | 0.466 | 429 | 187874 | |
| X2X4 | -15.70 | 0.18 | 0.513 | 250 | **0.004** | 3.18 | 1384.70 | -36.80 | 0.726 | 0.07 | | 108752 | 326 | 0.199 | | 0.97 | 961989 | | -971 | 0.726 | 91 | | 0.05 | 9.40 | | 0.391 | -20.40 | | 0.29 | | 426 | 2.50 | | | 2062853 | | -1421 | | **0.011** | | 2.25 | | **0.021** | 1411 | 2032998 | |
| X2X5 | -58.50 | 2.57 | **0.019** | 3497 | 0.389 | 0.25 | 110.60 | -10.40 | **0.021** | 3.19 | | 5095190 | -2234 | 0.527 | | 0.23 | 228982 | | -474 | 0.427 | 473 | | 0.27 | 21.50 | | 0.922 | 2.30 | | 0.00 | | 5 | 4.98 | | | 4106034 | | 2005 | | **0.001** | | 0.33 | | 0.358 | 541 | 299015 | |
| X3X4 | 150.70 | 17.04 | **0.000** | 23193 | 0.146 | 0.74 | 321.90 | -17.80 | **0.000** | 9.05 | | 14436056 | 3760 | 0.858 | | 0.02 | 18148 | | 133 | 0.112 | 1953 | | 1.11 | -43.70 | | **0.003** | -74.60 | | 3.91 | | 5678 | 0.00 | | | 3133 | | -55 | | 0.917 | | 2.47 | | **0.016** | -1480 | 2235994 | |
| X3X5 | -13.60 | 0.14 | 0.571 | 188 | 0.153 | 0.71 | 309.40 | 17.40 | 0.752 | 0.06 | | 88855 | 295 | **0.046** | | 2.43 | 2410527 | | -1536 | **0.005** | 6470 | | 3.69 | -79.60 | | 0.564 | -13.70 | | 0.13 | | 191 | 0.61 | | | 506771 | | 704 | | 0.192 | | 0.07 | | 0.678 | -243 | 60366 | |
| X4X5 | 13.60 | 0.14 | 0.571 | 188 | 0.765 | 0.03 | 13.10 | -3.60 | **0.014** | 3.67 | | 5847593 | -2393 | **0.001** | | 7.73 | 7675754 | | 2742 | **0.041** | 3301 | | 1.88 | 56.90 | | 0.724 | 8.40 | | 0.05 | | 71 | 0.91 | | | 749075 | | 856 | | 0.115 | | 0.15 | | 0.536 | -364 | 135138 | |
| Error |  | 13.87 |  | 18877 |  | 10.97 | 4781.80 |  |  | 18.05 | | 28792135 |  |  | | 18.60 | 18474483 | |  |  | 24157 | | 13.78 |  | |  |  | | 12.81 | | 18597 | 11.46 | | | 9447406 | |  | |  | | 12.58 | |  |  | 113753357 | |
| Inadequation |  | 9.25 | 0.522 | 12594 | 0.614 | 7.01 | 3055.10 |  | 0.187 | 13.91 | | 22193268 |  | **0.000** | | 18.40 | 18274999 | |  | 0.751 | 14286 | | 8.15 |  | | 0.090 |  | | 10.42 | | 15137 | 8.86 | | | 7306756 | |  | | 0.180 | | 9.50 | | 0.231 |  | 8588631 | |
| Pure error |  | 4.62 |  | 6283 |  | 3.96 | 1726.70 |  |  | 4.14 | | 6598867 |  |  | | 0.20 | 199484 | |  |  | 9870 | | 5.63 |  | |  |  | | 2.38 | | 3460 | 2.60 | | | 2140649 | |  | |  | | 3.08 | |  |  | 2786726 | |
|  |  | 100.00 |  |  |  | 100.00 |  |  |  | 100.00 | |  |  |  | | 100.00 |  | |  |  |  | | 100.00 |  | |  |  | | 100.00 | |  | 100.00 | | |  | |  | |  | | 100.00 | |  |  |  | |
| Validation of the model | | | | | | | | |  |  | | |  | |  | |  |  |  | | |  | |  | | | |  | |  | | |  |  | |  | | | |  | |  | |  | |
| R2 |  | 86.13 |  |  |  | 89.03 |  |  | 81.95 | 81.40 | | | | | | | | | 86.22 | | | | | | 87.19 | | | | | | 88.54 | | | | | | | 87.42 | | | | | | | | |
| Adjust R2 |  | 77.72 |  |  |  | 82.38 |  |  | 71.01 | 70.13 | | | | | | | | | 77.87 | | | | | | 79.43 | | | | | | 81.59 | | | | | | | 79.79 | | | | | | | | |
| Bias factor |  | 1.002 |  |  |  | 0.998 |  |  | 1.003 | 0.999 | | | | | | | | | 0.997 | | | | | | 0.997 | | | | | | **0.999** | | | | | | | 0.999 | | | | | | | | |
| AADM |  | 0.26 |  |  |  | 0.16 |  |  | 0.21 | 0.13 | | | | | | | | | 0.24 | | | | | | 0.28 | | | | | | 0.30 | | | | | | | 0.15 | | | | | | | | |

**Table S2.** Contribution of variables, coefficient, *P-*value and sums of squares of variables

*X1: Soaking time; X2: Vegetable salt concentration; X3: Soaking temperature; X4: Germination time; X5: Maturation time; X1X1: Quadratic effect soaking time; X2X2: Quadratic effect vegetable salt concentration; X3X3: Quadratic effect soaking temperature; X4X4: Quadratic effect germination time; X5X5: Quadratic effect ripening time; X1X2: Interaction soaking time-plant salt concentration; X1X3: Interaction soaking time-soaking temperature; X1X4: Soaking time-sprouting time interaction; X1X5: Soaking time-maturing time interaction; X2X3: Vegetable salt concentration-soaking temperature interaction; X2X4: Vegetable salt concentration-sprouting time interaction; X2X5: Vegetable salt concentration-maturing time interaction; X3X4: Soaking temperature-sprouting time interaction; X3X5: Soaking temperature-maturing time interaction; X4X5: Sprouting time-maturing time interaction.*

*Coeff : Value of the Coefficients; CV : Contribution of the variables; SC : Sum of squares; p: value of P.*