

Supporting information

Optimization of probiotic beverage made from Sohiong fruit using response surface methodology and artificial neural network- genetic algorithm hybrid model

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Table S1. Analysis of variance (ANOVA) for the quadratic model

| Source | Sum of Squares | df | Mean Square | F-value | p-value |
|----------------------|-----------------------|-----------|-----------------------|----------------|----------------|
| Model | 51.77 | 9 | 5.75 | 13.81 | 0.0011 ** |
| A | 1.51×10^{-3} | 1 | 1.51×10^{-3} | 0.0036 | 0.9536 |
| B | 1.01×10^{-3} | 1 | 1.01×10^{-3} | 0.0024 | 0.9621 |
| C | 50.80 | 1 | 50.80 | 122.00 | <0.0001 ** |
| A² | 0.44 | 1 | 0.44 | 1.06 | 0.3382 |
| B² | 0.099 | 1 | 0.099 | 0.24 | 0.6409 |
| C² | 0.21 | 1 | 0.21 | 0.52 | 0.4961 |
| AB | 0.11 | 1 | 0.11 | 0.25 | 0.6300 |
| AC | 8.10×10^{-3} | 1 | 8.10×10^{-3} | 0.019 | 0.8930 |
| BC | 0.017 | 1 | 0.017 | 0.041 | 0.8461 |
| Residual | 2.92 | 7 | 0.42 | | |
| Lack of Fit | 1.51 | 3 | 0.50 | 1.42 | 0.3597 ns |
| Pure Error | 1.41 | 4 | 0.35 | | |

** indicates significance at $p < 0.01$

ns indicates not significant ($p > 0.05$)

Table S2. Design matrix and experimental responses for the selected parameters

| Std | Run | Temperature (°C) | Strain | Inoculation period (h) | Inoculum size (CFU/mL) | D1 | D2 | D3 | D4 | D5 | D6 | D7 | TPC (mg GAE/g) | TAC (mg C3GE/100 mL) | DPPH (%) | TFC (mg QE/100 mL) |
|-----|-----|------------------|--------|------------------------|------------------------|----|----|----|----|----|----|----|----------------|----------------------|----------|--------------------|
| 11 | 1 | 35.00 | B | 24.00 | 4×10^6 | -1 | 1 | 1 | 1 | -1 | 1 | 1 | 160.00 | 223.11 | 66.24 | 172.67 |
| 7 | 2 | 35.00 | B | 72.00 | 8×10^6 | -1 | 1 | 1 | -1 | 1 | -1 | -1 | 164.21 | 224.51 | 66.94 | 183.45 |
| 8 | 3 | 35.00 | L | 72.00 | 8×10^6 | 1 | -1 | 1 | 1 | -1 | 1 | -1 | 169.62 | 227.09 | 67.43 | 181.83 |
| 5 | 4 | 37.00 | B | 24.00 | 8×10^6 | 1 | -1 | 1 | -1 | -1 | -1 | 1 | 158.00 | 226.67 | 70.17 | 179.56 |
| 2 | 5 | 37.00 | B | 24.00 | 8×10^6 | -1 | -1 | -1 | 1 | 1 | 1 | -1 | 158.00 | 226.67 | 70.17 | 179.56 |
| 1 | 6 | 37.00 | L | 72.00 | 4×10^6 | -1 | -1 | 1 | 1 | 1 | -1 | 1 | 157.70 | 227.83 | 70.81 | 183.62 |
| 6 | 7 | 37.00 | B | 72.00 | 4×10^6 | 1 | 1 | -1 | 1 | -1 | -1 | -1 | 156.49 | 225.61 | 70.02 | 177.03 |
| 12 | 8 | 35.00 | L | 24.00 | 4×10^6 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | 162.45 | 228.84 | 67.37 | 175.78 |
| 9 | 9 | 35.00 | L | 24.00 | 8×10^6 | 1 | 1 | -1 | 1 | 1 | -1 | 1 | 161.37 | 227.54 | 68.12 | 176.29 |
| 4 | 10 | 37.00 | L | 72.00 | 8×10^6 | -1 | 1 | -1 | -1 | -1 | 1 | 1 | 160.00 | 227.09 | 71.11 | 182.60 |
| 10 | 11 | 37.00 | L | 24.00 | 4×10^6 | 1 | 1 | 1 | -1 | 1 | 1 | -1 | 156.10 | 229.23 | 70.10 | 176.56 |
| 3 | 12 | 35.00 | B | 72.00 | 4×10^6 | 1 | -1 | -1 | -1 | 1 | 1 | 1 | 161.20 | 226.74 | 65.34 | 180.50 |

D1–D7 represent coded independent variables; TPC = Total Phenolic Content (mg gallic acid equivalents per gram); TAC = Total Anthocyanin Content (mg cyanidin-3-glucoside equivalents per 100 mL); DPPH = DPPH radical scavenging activity (%); TFC = Total Flavonoid Content (mg quercetin equivalents per 100 mL).