**Table S1** The two-level factorial design in actual level and results

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No. | Sucrose  (g L-1) | Initial pH | Sodium acetate  (g L-1) | Beef extract  (g L-1) | Yeast extract | Casein peptone  (g L-1) | Ammonium citrate  (g L-1) | K2HPO4  (g L-1) | EPS production  (g L-1) |
| 1 | 90 | 6.5 | 7 | 10 | 7 | 7 | 2 | 3 | 36.4 ± 1.2 |
| 2 | 90 | 6.5 | 3 | 6 | 13 | 7 | 2 | 5 | 49.2 ± 0.8 |
| 3 | 90 | 4.5 | 7 | 6 | 13 | 7 | 4 | 3 | 38.4 ± 1.3 |
| 4 | 90 | 6.5 | 3 | 10 | 13 | 3 | 4 | 3 | 47.6 ± 1.5 |
| 5 | 110 | 6.5 | 3 | 6 | 13 | 3 | 4 | 5 | 30.8 ± 0.9 |
| 6 | 100 | 5.5 | 5 | 8 | 10 | 5 | 3 | 4 | 34.0 ± 1.1 |
| 7 | 110 | 4.5 | 3 | 6 | 13 | 3 | 4 | 5 | 35.8 ± 1.0 |
| 8 | 90 | 4.5 | 7 | 10 | 13 | 3 | 2 | 5 | 40.2 ± 1.3 |
| 9 | 110 | 6.5 | 3 | 10 | 7 | 3 | 2 | 5 | 30.6 ± 0.8 |
| 10 | 90 | 6.5 | 7 | 6 | 7 | 3 | 4 | 5 | 50.0 ± 1.7 |
| 11 | 110 | 4.5 | 7 | 6 | 7 | 7 | 2 | 5 | 27.0 ± 0.5 |
| 12 | 100 | 5.5 | 5 | 8 | 10 | 5 | 3 | 4 | 33.7 ± 1.2 |
| 13 | 90 | 6.5 | 7 | 6 | 7 | 3 | 4 | 5 | 43.6 ± 1.3 |
| 14 | 110 | 4.5 | 7 | 6 | 7 | 7 | 2 | 5 | 27.4 ± 0.7 |
| 15 | 90 | 4.5 | 3 | 6 | 7 | 3 | 2 | 3 | 36.8 ± 1.2 |
| 16 | 110 | 6.5 | 7 | 10 | 13 | 7 | 4 | 5 | 35.0 ± 1.1 |
| 17 | 110 | 6.5 | 7 | 6 | 13 | 3 | 2 | 3 | 29.4 ± 1.3 |
| 18 | 110 | 4.5 | 3 | 10 | 13 | 7 | 2 | 3 | 32.8 ± 1.2 |
| 19 | 90 | 6.5 | 7 | 10 | 7 | 7 | 2 | 3 | 45.4 ± 1.3 |
| 20 | 90 | 4.5 | 3 | 10 | 7 | 7 | 4 | 5 | 36.6 ± 1.1 |
| 21 | 110 | 6.5 | 7 | 10 | 13 | 7 | 4 | 5 | 30.6 ± 1.2 |
| 22 | 90 | 4.5 | 7 | 6 | 13 | 7 | 4 | 3 | 29.0 ± 1.2 |
| 23 | 90 | 4.5 | 3 | 10 | 7 | 7 | 4 | 5 | 35.2 ± 1.1 |
| 24 | 110 | 4.5 | 7 | 10 | 7 | 3 | 4 | 3 | 29.8 ± 1.0 |
| 25 | 110 | 6.5 | 3 | 6 | 7 | 7 | 4 | 3 | 36.4 ± 1.4 |
| 26 | 90 | 6.5 | 3 | 10 | 13 | 3 | 1 | 3 | 49.8 ± 1.6 |
| 27 | 110 | 4.5 | 3 | 10 | 13 | 7 | 2 | 3 | 31.6 ± 1.2 |
| 28 | 110 | 4.5 | 7 | 10 | 7 | 3 | 4 | 3 | 38.8 ± 1.4 |
| 29 | 110 | 6.5 | 3 | 6 | 7 | 7 | 4 | 3 | 35.2 ± 1.2 |
| 30 | 110 | 6.5 | 3 | 10 | 7 | 3 | 2 | 5 | 33.6 ± 1.0 |
| 31 | 90 | 4.5 | 3 | 6 | 7 | 3 | 2 | 3 | 46.8 ± 0.9 |
| 32 | 90 | 6.5 | 3 | 6 | 13 | 7 | 2 | 5 | 47.2 ± 1.4 |
| 33 | 110 | 6.5 | 7 | 6 | 13 | 3 | 2 | 3 | 32.4 ± 1.0 |
| 34 | 90 | 4.5 | 7 | 10 | 13 | 3 | 2 | 5 | 30.4 ± 1.0 |
| 35 | 100 | 5.5 | 5 | 8 | 10 | 5 | 3 | 4 | 32.9 ± 0.8 |

**Table S2**  Factors and corresponding levels studied in two-level factorial design

|  |  |  |  |
| --- | --- | --- | --- |
| Factors (unit) | Actual level | | |
| Coded level +1 | Central point 0 | Coded level -1 |
| Sucrose (g L-1) | 110 | 100 | 90 |
| Initial pH | 6.5 | 5.5 | 4.5 |
| Sodium acetate (g L-1) | 7 | 5 | 3 |
| Beef extract (g L-1) | 10 | 8 | 6 |
| Yeast extract (g L-1) | 13 | 10 | 7 |
| Casein peptone (g L-1) | 7 | 5 | 3 |
| Ammonium citrate (g L-1) | 4 | 3 | 2 |
| K2HPO4 (g L-1) | 5 | 4 | 3 |

**Table S3** Factors and corresponding levels studied in central composite design (CCD)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Factors (g L-1) | Actual level | | | | |
| Coded level  -1.083 | Coded  Level -1 | Central point 0 | Coded  level 1 | Coded level  +1.083 |
| Sucrose | 75.9 | 80 | 90 | 100 | 104.1 |
| Initial pH | 5.1 | 5.5 | 6.5 | 7.5 | 7.9 |
| Sodium acetate | 1.6 | 2 | 3 | 4 | 4.4 |

**Table S4** The central composite design (CCD) in actual level and results

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No. | Block | Sucrose  (g L-1) | Initial pH | Sodium acetate  (g L-1) | EPS production  (g L-1) |
| 1 | 1 | 90 | 6.5 | 3 | 95.2 ± 2.1 |
| 2 | 1 | 90 | 6.5 | 3 | 91.8 ± 1.8 |
| 3 | 1 | 80 | 7.5 | 4 | 43.0 ± 0.9 |
| 4 | 1 | 100 | 7.5 | 2 | 68.7 ± 1.2 |
| 5 | 1 | 80 | 5.5 | 2 | 45.3 ± 1.1 |
| 6 | 1 | 100 | 5.5 | 4 | 48.0 ± 1.0 |
| 7 | 2 | 75.9 | 6.5 | 3 | 74.9 ± 1.6 |
| 8 | 2 | 104.1 | 6.5 | 3 | 71.9 ± 1.5 |
| 9 | 2 | 90 | 6.5 | 4.4 | 60.3 ± 1.3 |
| 10 | 2 | 90 | 6.5 | 3 | 92.5 ± 1.9 |
| 11 | 2 | 90 | 7.9 | 0 | 39.2 ± 0.9 |
| 12 | 2 | 90 | 6.5 | 1.6 | 55.7 ± 1.6 |
| 13 | 2 | 90 | 5.1 | 3 | 71.4 ± 1.2 |
| 14 | 2 | 90 | 6.5 | 3 | 92.2 ± 1.5 |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

**Table S5** Equality of Variances

|  |  |  |
| --- | --- | --- |
| Method | *F* ratio | *p* > |F| |
| Folded F | 154.1572 | 0.0129 |

**Table S6** Result of T-test

|  |  |  |  |
| --- | --- | --- | --- |
|  | DF | *p* value | *p* > |F| |
| Variances equal | 33 | 0.816784 | 0.4199 |
| Variances unequal | 32.99021 | 2.615575 | 0.0133 |

**Table S7** Experimental design and results of model validation

|  |  |
| --- | --- |
|  | EPS production (g L-1) |
| Predicted value | 97.7 |
| Experimental values | 97.0 |
| 98.1 |
| 96.1 |
| 96.7 |
| 98.8 |
| 98.5 |