**Table S1** Intracellular fatty acid composition of *C. reinhardtii* (137c) cells subjected to salt stresses (NaCl, KCl, and LiCl) at days 3, 5, and 7. One-hundred milligrams DCW of each stressed cell were collected, and lipids were extracted as described in the Materials and Methods. Data are expressed as mean ± SD. ND: not detected. Significant differences between the mean values of control and stress treatments were assessed by a two-tailed Student's t-test. **p < 0.01*, ***p < 0.001* and ****p < 0.0001* (n = 3).

| Fatty acid (%) | Control | 200 mM NaCl | | | 200 mM KCl | | | 120 mM LiCl | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 3 days | 5 days | 7 days | 3 days | 5 days | 7 days | 3 days | 5 days | 7 days |
| **SATURATED FATTY ACIDS (SFAs)** | | | | | | | | | | |
| Caprylic acid (C8:0) | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Capric acid (C10:0) | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Lauric acid (C12:0) | ND | 0.02 ± 0.00 | 0.01 ± 0.02 | 0.03 ± 0.03 | ND | 0.01 ± 0.00 | ND | 0.05 ± 0.00 | 0.05 ± 0.00 | 0.03 ± 0.00 |
| Myristic acid (C14:0) | 1.93 ± 0.03 | 0.57 ± 0.08 | 1.78 ± 1.49 | 2.24 ± 1.97 | 2.80 ± 0.10 | 2.98 ± 0.06 | 3.28 ± 0.13 | 0.66 ± 0.01 | 0.67 ± 0.01 | 0.07 ± 0.01 |
| Palmitic acid (C16:0) | 31.94 ± 0.16 | 43.14 ± 10.56 | 51.20 ± 14.96 | 59.80 ± 14.46 | 36.20 ± 0.00 | 36.28 ± 0.01 | 39.32 ± 0.03 | 35.98 ± 0.04 | 36.57 ± 0.03 | 37.51 ± 0.03 |
| Stearic acid (C18:0) | 4.70 ± 0.04 | 6.47 ± 2.68 | 6.78 ± 3.85 | 7.75 ± 4.69 | 3.70 ± 0.03 | 3.80 ± 0.03 | 4.16 ± 0.02 | 4.30 ± 0.04 | 4.39 ± 0.00 | 4.64 ± 0.00 |
| Arachinodic acid (C20:0) | 0.22 ± 0.00 | 0.28 ± 0.06 | 0.27 ±0.13 | 0.37 ± 0.13 | 0.22 ± 0.00 | 0.26 ±0.01 | 0.29 ± 0.00 | 0.21 ± 0.01 | 0.22 ±0.00 | 0.21 ± 0.00 |
| Behenic acid (C22:0) | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Lignoceric acid (C24:0) | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| **Total SFA** | **38.79 ± 0.33** | **50.48 ± 6.67***** | **60.04 ± 5.66***** | **70.19 ± 0.00***** | **42.92 ± 0.01***** | **43.33 ± 2.85***** | **47.05 ± 0.00***** | **41.20 ± 0.38**** | **41.90 ± 0.22***** | **43.09 ± 0.00***** |
| **MONO-UNSATURATED FATTY ACIDS (MUFAs)** | | | | | | | | | | |
| Palmitoleic acid (C16:1) | 0.22 ± 0.25 | 0.47 ± 0.38 | 0.55 ± 0.41 | 0.56 ± 0.39 | 0.40 ± 0.37 | 0.48 ± 0.36 | 0.53 ± 0.54 | 0.60 ± 0.31 | 0.56 ± 0.31 | 0.50 ± 0.06 |
| Oleic acid (C18:1) | 5.69 ± 1.70 | 7.20 ± 3.48 | 6.20 ± 2.84 | 5.22 ± 2.80 | 5.05 ± 0.99 | 5.91 ± 0.18 | 6.55 ± 3.52 | 3.09 ± 2.65 | 3.38 ± 2.97 | 1.58 ± 0.68 |
| Erucic acid (C22:1) | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| **Total MUFA** | **5.91 ± 0.66** | **7.67 ± 0.00** | **6.75 ± 0.00** | **5.78 ± 0.00** | **5.45 ± 1.29** | **6.39 ± 0.16** | **7.08 ± 0.00** | **3.69 ± 0.00*** | **3.94 ± 0.00** | **2.08 ± 0.00***** |
| **POLY-UNSATURATED FATTY ACIDS (PUFAs)** | | | | | | | | | | |
| Linoleic acid (C18:2) | 33.64 ± 0.04 | 26.65 ± 7.37 | 22.14 ± 8.52 | 15.93 ± 12.23 | 29.51 ± 2.35 | 30.16 ± 5.54 | 28.48 ± 18.94 | 34.19 ± 2.73 | 34.42 ± 3.59 | 36.97 ± 7.98 |
| Linolenic acid (C18:3) | 22.94 ± 2.36 | 13.60 ± 6.60 | 11.95 ± 7.37 | 7.13 ± 6.42 | 22.20 ± 1.61 | 18.22 ± 2.19 | 17.29 ± 11.81 | 20.96 ± 6.10 | 19.24 ± 5.54 | 17.75 ± 8.74 |
| **Total PUFA** | **56.58 ± 1.03** | **40.25 ± 0.03***** | **34.09 ± 2.11***** | **23.06 ± 0.00***** | **51.71 ± 0.74***** | **44.47 ± 1.55***** | **45.77 ± 0.00***** | **55.15 ± 2.73** | **53.66 ± 3.59***** | **54.72 ± 0.00** |

**Table S2** Primer used in this study.

| Primers | Sequences (5' - 3') | Base pairs |
|---|---|---|
| **ChlmyPDH2_Forward** | CCCATTGTGGAGGGC | 15 |
| **ChlmyPDH2_Reverse** | ACAGCAGAACGTGCT | 15 |
| **ChlamyACCase_Forward** | TCTGCAAGTCGCTCG | 15 |
| **ChlamyACCase_Reverse** | CGTGTCCACGAAGGT | 15 |
| **ChlamyMAT_Forward** | CCGTGAGTCAGCCCG | 15 |
| **ChlamyMAT_Reverse** | TGGACCGGCTTGTCC | 15 |
| **ChlamyKAS2_Forward** | CGCGGACTACACGAC | 15 |
| **ChlamyKAS2_Reverse** | GGCGAAGGGAATGCA | 15 |
| **ChlamyGPD1_Forward** | CAAAGGCCTTGAGGT | 15 |
| **ChlamyGPD1_Reverse** | CAAGTCCATGCCCTC | 15 |
| **ChlamyFAT 1_Forward** | TCAGGAGTCGCGGTG | 15 |
| **ChlamyFAT 1_Reverse** | GCACTTGCAGGCGTG | 15 |
| **ChlamyDGTT1_Forward** | GATTAAGACCGCCGA | 15 |
| **ChlamyDGTT1_Reverse** | AGCGCCTCAGACGCG | 15 |
| **ChlamyDGTT2_Forward** | TCCTGTCCTTCTGGT | 15 |
| **ChlamyDGTT2_Reverse** | TGAACACCACATTCG | 15 |
| **ChlamyDGTT3_Forward** | TACCTCGCACTTGAC | 15 |
| **ChlamyDGTT3_Reverse** | AAGTAGTGACGCCAG | 15 |
| **ChlamyDGTT4_Forward** | GGCTACTTGTTCGGA | 15 |
| **ChlamyDGTT4_Reverse** | GCTGGAGAGGTAGGC | 15 |
| **Chlamy18s rRNA_Forward** | CGGAACCCGCTGGTC | 15 |
| **Chlamy18s rRNA_Reverse** | TGAAGGTGAGCGGCG | 15 |
| **ChMAT_NdeI_Forward** | ATCATATGGTCGCTGTCC | 18 |
| **ChMAT_BamHI_Reverse** | GGATCCAGCGGTGAT | 16 |
| **SynMAT_NdeI_Forward** | CATATGGCTAAAACGGTGTGGGTGT | 25 |
| **SynMAT_BamHI_Reverse** | GGATCCGACCGTGAGGTCTGC | 21 |
| **pSyn_psbA** | TCTTGCCCTTTACAACCT | 18 |
| **pSyn_rrnB** | CGCTACTGCCGCCAG | 15 |
| **7942rnpB_Forward** | GAGGAAAGTCCGGGCTCCC | 19 |
| **7942rnpB _Reverse** | TAAGCCGGGTTCTGTTCTC | 19 |
| **7942MAT_Forward** | CAGCCCTCTACACCG | 15 |
| **7942MAT_Reverse** | GCCATAAACGGCGAG | 15 |
| **7942LACS_Forward** | TGCTTTCTCACGGCA | 15 |
| **7942LACS_Reverse** | TCGATCAAGCGACGT | 15 |

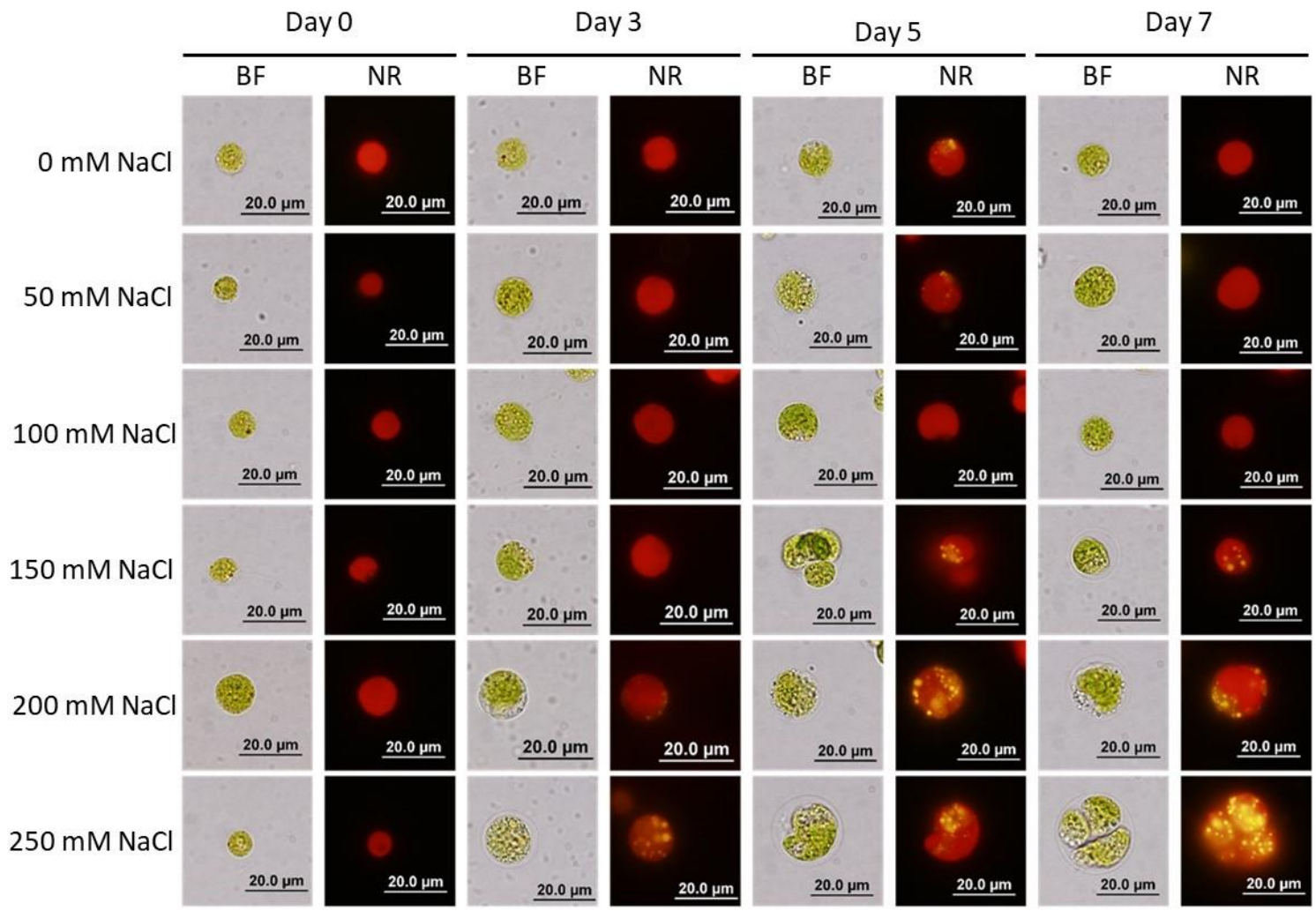


**Figure S1** *C. reinhardtii* (137c) cells observed under a bright field light microscope (BF) and fluorescent microscope (NR). Cells at the exponential growth phase were subjected to salt stress (NaCl) at various concentrations, including 0 mM, 50 mM, 100 mM, 150 mM, 200 mM, and 250 mM for 0, 3, 5, and 7 days. Morphology and lipid bodies were observed by Nile red staining.

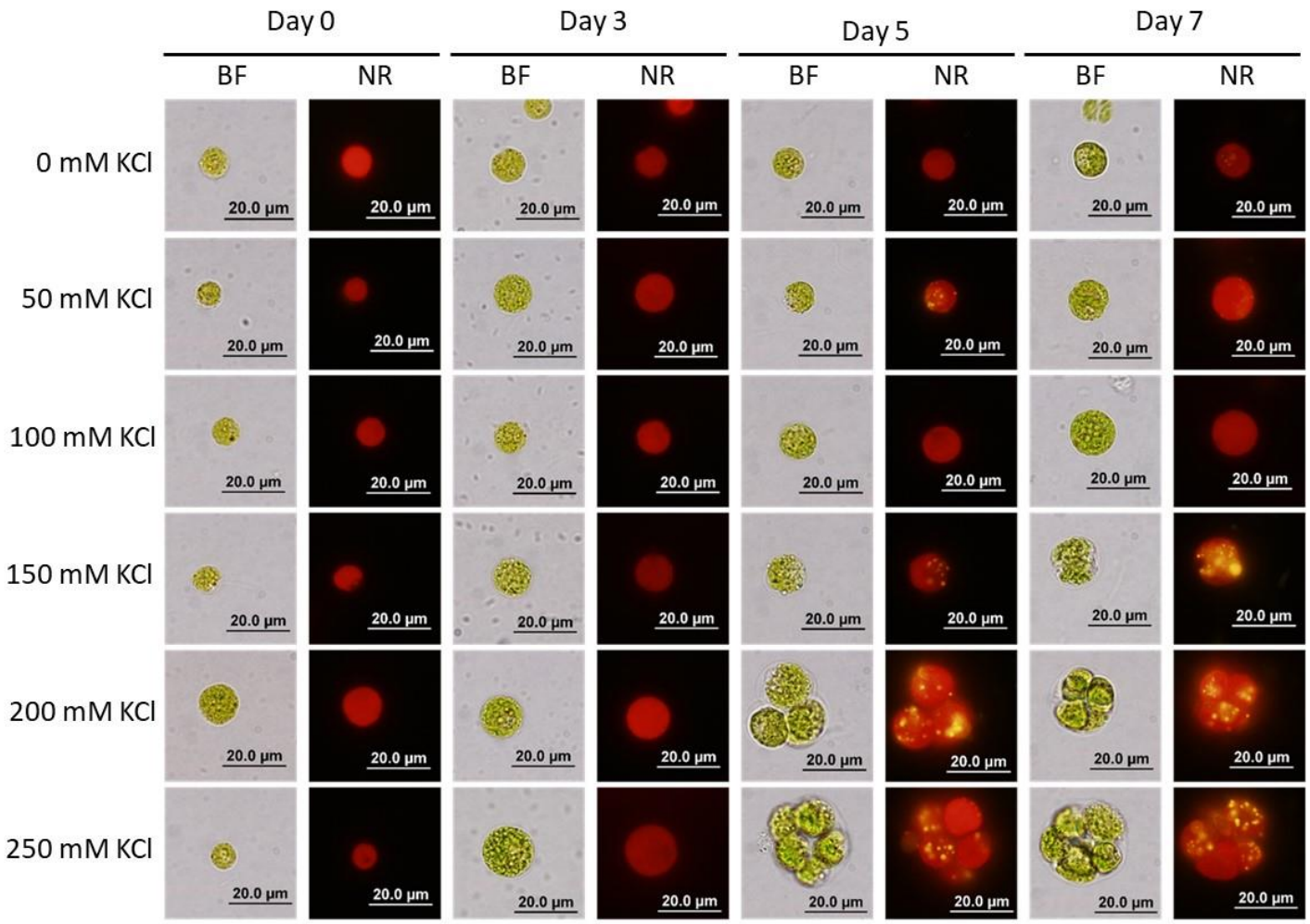


**Figure S2** *C. reinhardtii* (137c) cells observed under bright field light microscope (BF) and fluorescent microscope (NR). Cells at exponential growth phase were subjected to salt stress (KCl) at various concentrations; 0 mM, 50 mM, 100 mM, 150 mM, 200 mM, and 250 mM for 0, 3, 5, and 7 days. Morphology and lipid body were observed by Nile red staining.

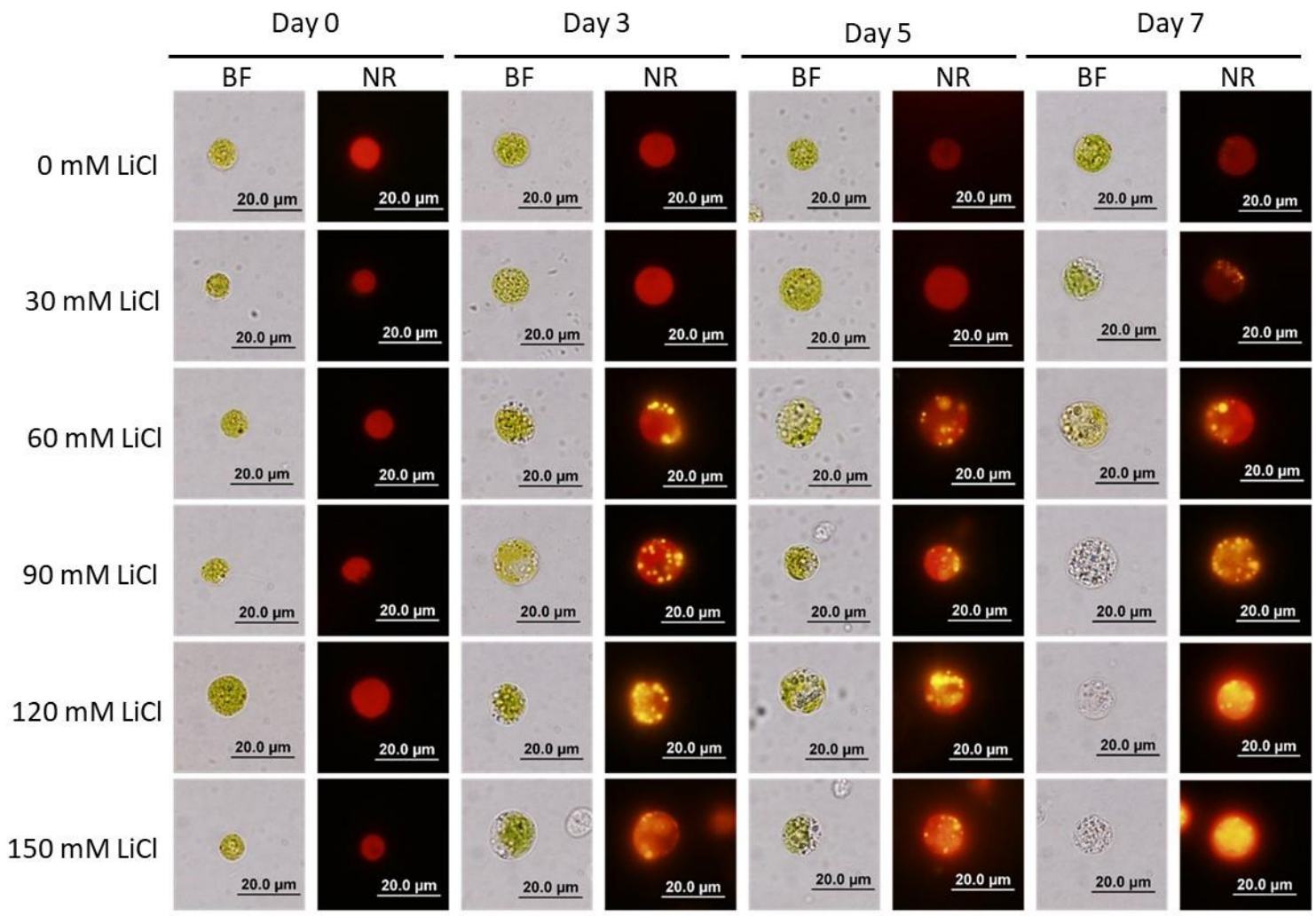


**Figure S3** *C. reinhardtii* (137c) cells observed under a bright field light microscope (BF) and fluorescent microscope (NR). Cells at the exponential growth phase were subjected to salt stress (LiCl) at various concentrations, including 0 mM, 30 mM, 60 mM, 90 mM, 120 mM, and 150 mM for 0, 3, 5, and 7 days. Morphology and lipid bodies were observed by Nile red staining.

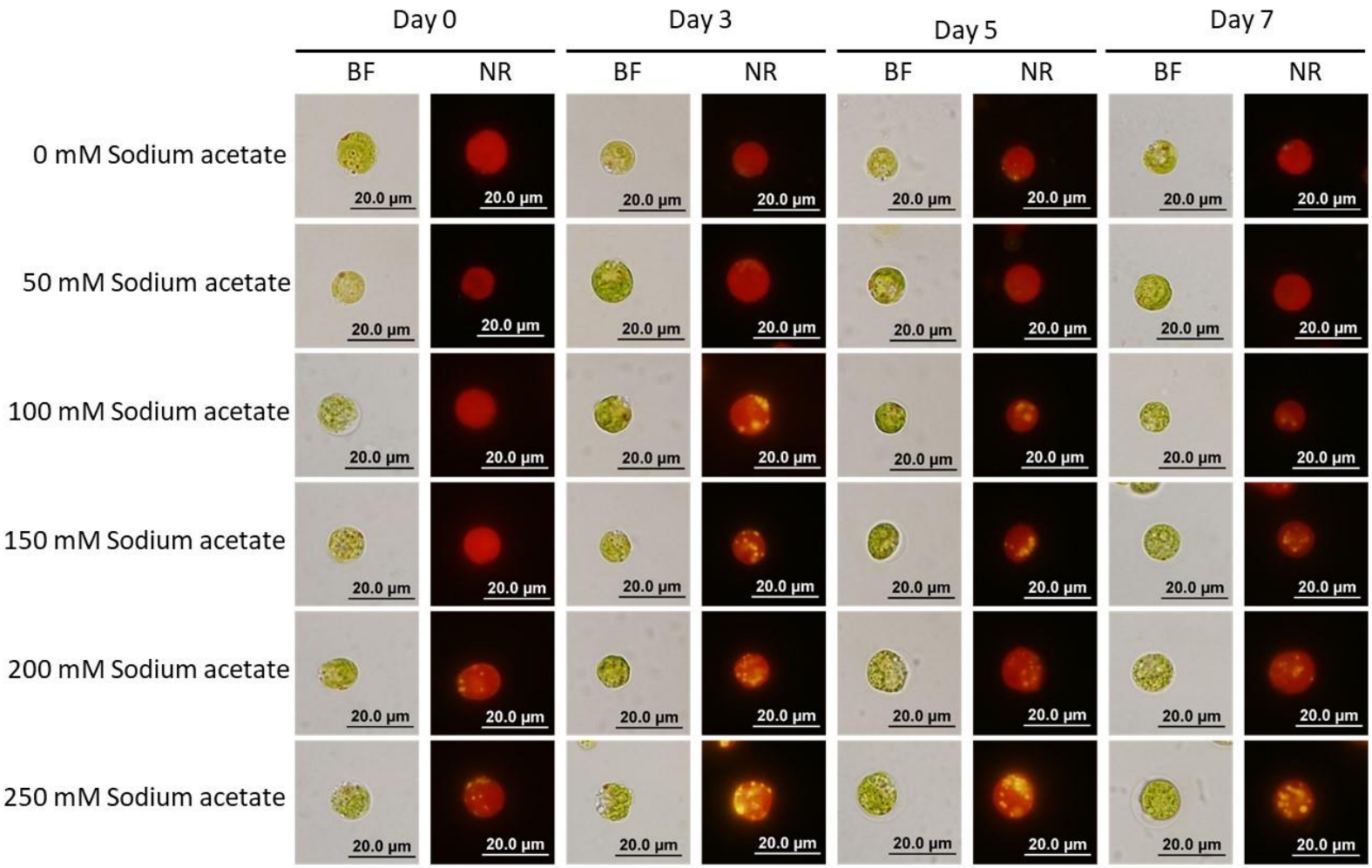


**Figure S4** *C. reinhardtii* (137c) cells observed under a bright field light microscope (BF) and fluorescent microscope (NR). Cells at the exponential growth phase were subjected to sodium acetate at various concentrations, including 0 mM, 50 mM, 100 mM, 150 mM, 200 mM, and 250 mM for 0, 3, 5, and 7 days. Morphology and lipid bodies were observed by Nile red staining.

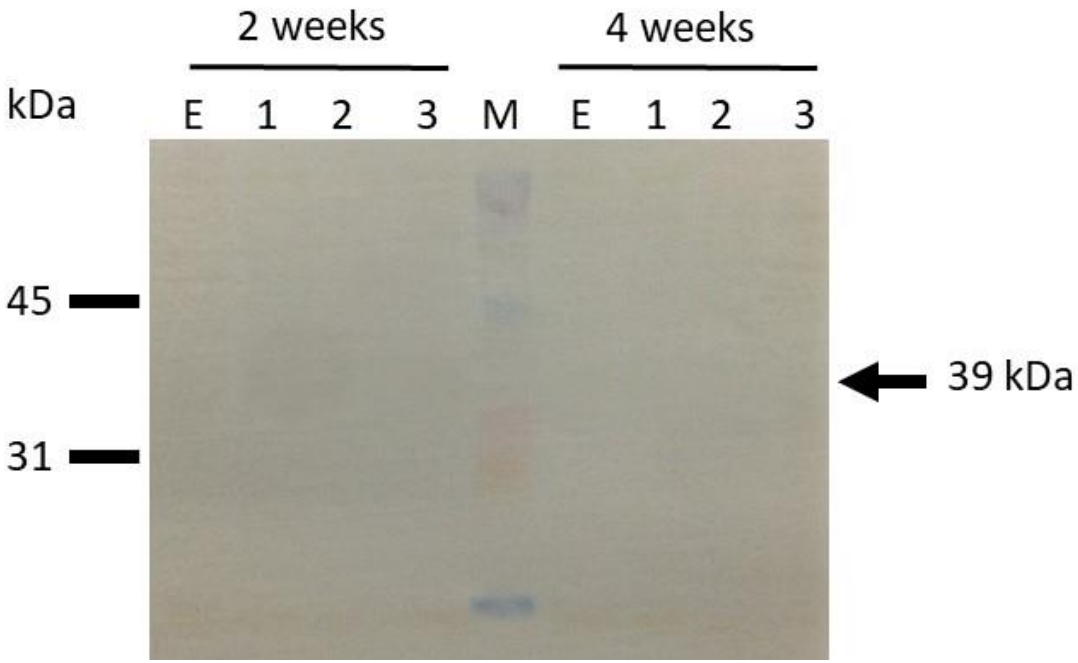


**Figure S5** Western blot analysis of empty vector and ChMAT expressing cells. Empty vector (E) and ChMAT (2 and 4 weeks old). An equal amount of crude extract (20 µg) was loaded in all lanes. Blotting was conducted with a PVDF membrane. Antibody raised against 6x His-tag and HRP-conjugated anti-mouse IgG were used as primary and secondary antibodies, respectively. The membranes were developed using a using Horseradish Peroxidase Conjugate Substrate kit.