***Supplementary Material***

**Microbe-assisted seedling crop improvement by a seaweed extract to address fucalean forest restoration**

**Francesca Malfatti 1\*, Sara Kaleb1 Amira Saidi2,3, Alberto Pallavicini1, Laura Agostini1, Fabrizia Gionechetti1, Sara Natale1, Cecilia Balestra2, Stanislao Bevilacqua1, Annalisa Falace1**

1Department of Life Sciences, University of Trieste, Trieste, Italy

2 National Institute of Oceanography and Applied Geophysics - OGS, Oceanography, Trieste, Italy

3Department of Environmental Sciences, Informatics and Statics, Ca’Foscari, University of Venice, Venice, Italy

**\* Correspondence:** Corresponding Author: fmalfatti@units.it

**Supplementary Table 2.** Summary of ANOVA and PERMANOVA examining the effects of time (Ti), tank (Ta) and treatment (Tr) on the change in survival (*i.e.*, area), growth (*i.e.,* length) and fitness (*i.e*., Fv/Fm) of seedlings monitored both in the laboratory (lab) and in the field.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***Seedling survival* (i.e. area, mm2)** |  |  |  |  |  |
| **ANOVA cover mesocosm** |  |  |  |  |  |
| Source | df | SS | MS | F | P |
| Ti | 1 | 57084.0 | 57084.0 | 13.467 |  |
| Tr | 5 | 127430.0 | 25486.0 | 6.0123 |  |
|  |  |  |  |  |  |
| TixTr | 5 | 76450.0 | 15290.0 | 3.607 | **0.0036** |
| Res | 24 | 101733.6 | 4238.9 |  |  |
| Pairwise test for TixTr  T2 C=A1=A3=VS=VSA<A2  T3 C=A3<A1=VS=VSA=A2 |  |  |  |  |  |
|  |  |  |  |  |  |
| ***Seedling survival* (i.e. area, mm2)** |  |  |  |  |  |
| **ANOVA cover field** |  |  |  |  |  |
| Source | df | SS | MS | F | P |
| Tr | 4 | 2.05E+05 | 5.11E+04 | 63.803 | **0.0002** |
| Res | 10 | 8.01E+04 | 8.01E+03 |  |  |
| Pairwise tests for Treatment A2>A1=VS=VSA>A3 |  |  |  |  |  |
| the controls are not present because dead (see the main text) |  |  |  |  |  |
|  |  |  |  |  |  |
| ***Seedling growth* (seedlings length, mm)** |  |  |  |  |  |
| **ANOVA length mesocosm** |  |  |  |  |  |
| Source | df | SS | MS | F | P |
| Ti | 1 | 4.0706 | 4.0706 | 1843.7 |  |
| Tr | 5 | 2.6846 | 0.53692 | 243.19 |  |
| TixTr | 5 | 0.60534 | 0.12107 | 54.835 | **0.0000** |
| Res | 48 | 0.10598 | 2.21E-03 |  |  |
| Total | 59 | 7.4665 |  |  |  |
| Pairwise test for TixTr  T2 A1=C<A2=A3=VSA<VS  T3 C<A3<A1<A2<VS=VSA |  |  |  |  |  |
|  |  |  |  |  |  |
| ***Seedling growth* (seedlings length, mm)** |  |  |  |  |  |
| **ANOVA length field** |  |  |  |  |  |
| Source | df | SS | MS | F | P |
| Tr | 4 | 2.40E+00 | 5.99E-01 | 3.943 | **0.0242** |
| Res | 10 | 1.52E+00 | 1.52E-01 |  |  |
| Pairwise tests for Treatment  A1=A2=A3=VS=VSA |  |  |  |  |  |
| the controls are not present because dead (see the main text) |  |  |  |  |  |
|  |  |  |  |  |  |
| ***Seedling fitness* (i.e. Fv/Fm)** |  |  |  |  |  |
| **ANOVA photo mesocosm** |  |  |  |  |  |
| Source | df | SS | MS | F | P |
| Tr | 5 | 2.21E-01 | 4.42E-02 | 71.551 | **0.0002** |
| Res | 12 | 7.42E-03 | 6.18E-04 |  |  |
| Pairwise tests for Treatment  VS=VSA<C=A1=A2=A3 |  |  |  |  |  |
|  |  |  |  |  |  |
| ***Seedling fitness* (i.e. Fv/Fm)** |  |  |  |  |  |
| **ANOVA photo field** |  |  |  |  |  |
| Source | df | SS | MS | F | P |
| Tr | 4 | 1.60E-03 | 4.00E-04 | 3.8153 | **0.0390** |
| Res | 10 | 1.00E-03 | 1.00E-04 |  |  |
| Pairwise tests for Treatment A1<A2=A3=VS=VSA |  |  |  |  |  |
| the controls are not present because dead (see the main text) |  |  |  |  |  |