

**Table S1.** Observed probabilities of the contrasts associated with the interactions of the analysis of variance of the variables related to the variations in the pH gradient and the fertility of the substrate according to the covering material (Silica, Calcite and Calcite +) and the height level of the substrate plug (top, center and bottom) during the germination phase of white spruce seedlings (1+0).

| Interaction                 | Contrast                                          | pH<br>water | pH<br>CaCl <sub>2</sub> | N-NH <sub>4</sub><br>(mg/kg) | N-NO <sub>3</sub><br>mg/kg | Nmin<br>mg/kg | P<br>(mg/kg) | K<br>mg/kg | Ca<br>mg/kg | Mg<br>mg/kg |
|-----------------------------|---------------------------------------------------|-------------|-------------------------|------------------------------|----------------------------|---------------|--------------|------------|-------------|-------------|
| Date × Level ×<br>Treatment | Top: Date*2-1 (Calcite. Calcite+ vs Silica)       | 0.0179      | 0.0325                  |                              | 0.1449                     | 0.0305        | <0.0001      |            | 0.0278      | 0.0488      |
|                             | Top: Date 2-1 (Calcite vs Calcite+)               | 0.9998      | 0.7760                  |                              | 0.9464                     | 0.9933        | 0.9934       |            | 1.0000      | 0.9983      |
|                             | Center: Date 2-1 (Calcite. Calcite+ vs Silica)    | 0.9756      | 0.9933                  |                              | 0.9551                     | 0.9945        | 0.6921       |            | 1.0000      | 1.0000      |
|                             | Center: Date 2-1 (Calcite vs Calcite+)            | 1.0000      | 0.8692                  |                              | 0.0569                     | 0.1150        | 0.0002       |            | 0.9305      | 0.9998      |
|                             | Bottom : Date 2-1 (Calcite. Calcite+ vs Silica)   | 1.0000      | 0.0006                  |                              | 0.9998                     | 1.0000        | 1.0000       |            | 0.9966      | 0.9953      |
|                             | Bottom: Date 2-1 (Calcite vs Calcite+)            | 0.1634      | 0.5484                  |                              | 1.0000                     | 0.9998        | 0.4522       |            | 1.0000      | 0.8624      |
|                             | 25June2014/Top : Calcite vs Calcite+              | 1.0000      | 1.0000                  |                              | 1.0000                     | 1.0000        | 0.3299       |            | 1.0000      | 0.9998      |
|                             | 25June2014/Top : (Calcite. Calcite+) vs Silica    | 0.9929      | 0.4265                  |                              | 0.9896                     | 0.9967        | <0.0001      |            | 0.9345      | 0.8086      |
|                             | 25June2014/Center : Calcite vs Calcite+           | 0.9710      | 0.9998                  |                              | 0.0048                     | 0.0235        | 0.9998       |            | 0.9998      | 0.9698      |
|                             | 25June2014/Center : (Calcite. Calcite+) vs Silica | 0.0641      | 1.0000                  |                              | 0.2651                     | 0.0058        | 0.9998       |            | 0.0003      | <0.0001     |
|                             | 25June2014/Bottom : Calcite vs Calcite+           | 0.9407      | 0.9972                  |                              | 0.9528                     | 0.9967        | 0.9979       |            | 0.4388      | 0.6704      |
|                             | 25June2014/Bottom : (Calcite. Calcite+) vs Silica | 0.0040      | 0.9969                  |                              | 0.7799                     | 0.0637        | 0.9997       |            | <0.0001     | 0.0008      |
|                             | 02June2014/Top : Calcite VS Calcite+              | 0.9984      | 0.1357                  |                              | 0.9257                     | 0.9994        | 0.9948       |            | 1.0000      | 1.0000      |
|                             | 02June2014/Top : (Calcite. Calcite+) VS Silica    | <0.0001     | <0.0001                 |                              | 0.0014                     | 0.0001        | 1.0000       |            | <0.0001     | <0.0001     |
|                             | 02June2014/Center : Calcite vs Calcite+           | 0.8894      | 0.9871                  |                              | 1.0000                     | 1.0000        | 0.0001       |            | 0.2375      | 1.0000      |
|                             | 02June2014/Center : (Calcite. Calcite+) vs Silica | 0.0013      | 1.0000                  |                              | 0.9993                     | 0.0778        | 0.6846       |            | 0.0008      | 0.0001      |
|                             | 02June 014/Bottom : Calcite vs Calcite+           | 0.3058      | 0.9829                  |                              | 0.8560                     | 0.7652        | 0.4268       |            | 0.8792      | 1.0000      |
|                             | 02June 2014/Bottom: (Calcite. Calcite+) vs Silica | 0.0028      | 0.0083                  |                              | 0.9989                     | 0.0822        | 0.8686       |            | 0.0025      | 0.0152      |
| Level × Treatment           | Top : Calcite vs Calcite+                         |             |                         | 0.3389                       |                            |               |              | 0.5530     |             |             |
|                             | Top : (Calcite. Calcite+) vs Silica               |             |                         | 0.9593                       |                            |               |              | <0.0001    |             |             |
|                             | Center : Calcite vs Calcite+                      |             |                         | 0.7273                       |                            |               |              | 0.0095     |             |             |
|                             | Center : (Calcite. Calcite+) vs Silica            |             |                         | 0.0005                       |                            |               |              | <0.0001    |             |             |
|                             | Bottom : Calcite vs Calcite+                      |             |                         | 0.9282                       |                            |               |              | 0.9925     |             |             |

Bottom : (Calcite. Calcite+) vs Silica

0.0006

0.0022

---

\*Date 2 : 25 June, Date 1 : 2 June .

**Table S2.** Observed probabilities of the contrasts of the Date × interaction of the analysis of variance of the fertility and physico-chemical variables of the growing media during the first growing season of white spruce plants (1 + 0).

| Contrast                                     | pH<br>water | pH<br>CaCl <sub>2</sub> | Cond<br>(μS/cm) | N-NH <sub>4</sub><br>(mg/kg) | N-NO <sub>3</sub><br>(mg/kg) | Nmin<br>(mg/kg) | P<br>(mg/kg) | K<br>(mg/kg) | Ca<br>(mg/kg) | Mg<br>(mg/kg) |
|----------------------------------------------|-------------|-------------------------|-----------------|------------------------------|------------------------------|-----------------|--------------|--------------|---------------|---------------|
| 14Jul2014 : (Calcite. Calcite+) vs Silica    | 1.0000      | 0.0014                  | <0.0001         | 0.9553                       | 0.0002                       | 0.0063          | <0.0001      | 0.0253       | <0.0001       | 0.0006        |
| 14Jul2014 : Calcite vs Calcite+              | 0.9933      | 0.8336                  | 1.0000          | 0.9957                       | 1.0000                       | 1.0000          | 0.9984       | 1.0000       | 1.0000        | 1.0000        |
| 28Jul2014 : (Calcite. Calcite+) vs Silica    | 0.9931      | 0.0001                  | 0.7952          | 0.9855                       | 0.2240                       | 0.8336          | <0.0001      | 0.5157       | 0.0006        | 0.1157        |
| 28Jul2014 : Calcite vs Calcite+              | 1.0000      | 0.9142                  | 1.0000          | 1.0000                       | 0.8737                       | 0.9269          | 0.9300       | 0.9970       | 0.8314        | 0.5887        |
| 11August2014 : (Calcite. Calcite+) vs Silica | 0.5639      | 0.0078                  | 1.0000          | 0.0002                       | 0.8915                       | 0.9913          | <0.0001      | 0.5823       | <0.0001       | 0.3624        |
| 11August2014 : Calcite VS Calcite+           | 0.9637      | 0.9617                  | 0.9952          | 0.5226                       | 1.0000                       | 0.9699          | 0.9999       | 0.9849       | 0.7818        | 1.0000        |
| 25August2014 : (Calcite. Calcite+) vs Silica | 0.7914      | 0.0018                  | 0.9921          | <0.0001                      | 0.7169                       | 0.9975          | <0.0001      | 0.0073       | <0.0001       | 0.2092        |
| 25August2014 : Calcite vs Calcite+           | 0.9870      | 0.7983                  | 0.7310          | 0.9299                       | 0.9966                       | 0.9180          | 0.9990       | 0.9606       | 0.9998        | 0.7604        |
| 08Sep2014 : (Calcite. Calcite+) vs Silica    | 0.0923      | 0.0036                  | 0.0423          | <0.0001                      | 1.0000                       | 0.2661          | <0.0001      | 0.1664       | <0.0001       | 1.0000        |
| 08Sep2014 : Calcite vs Calcite+              | 0.8543      | 0.9796                  | 0.0355          | 0.8819                       | 0.6656                       | 0.5972          | 1.0000       | 0.9984       | 0.8290        | 0.8486        |
| 22Sep2014 : (Calcite. Calcite+) vs Silica    | 0.0191      | <0.0001                 | 0.4685          | <0.0001                      | 1.0000                       | 0.5768          | <0.0001      | 0.1893       | 0.0385        | 1.0000        |
| 22Sep2014 : Calcite vs Calcite+              | 0.6701      | 1.0000                  | 0.5645          | 0.9954                       | 0.7052                       | 0.6954          | 1.0000       | 1.0000       | 0.6652        | 0.4354        |
| 06Oct2014 : (Calcite. Calcite+) vs Silica    | 0.2171      | <0.0001                 | 0.9958          | <0.0001                      | 1.0000                       | 0.7714          | <0.0001      | 1.0000       | <0.0001       | 0.9548        |
| 06Oct2014 : Calcite vs Calcite+              | 0.8122      | 1.0000                  | 0.0663          | 0.9996                       | 0.0933                       | 0.1403          | 0.9889       | 0.2647       | <0.0001       | 0.0678        |
| 27Oct2014 : (Calcite. Calcite+) vs Silica    | 0.2950      | 0.0002                  | 0.9920          | <0.0001                      | <0.0001                      | <0.0001         | 0.0005       | 0.9929       | <0.0001       | 0.0512        |
| 27Oct2014 : Calcite vs Calcite+              | 1.0000      | 0.9903                  | 1.0000          | 0.9999                       | 0.9637                       | 0.9989          | 0.9956       | 1.0000       | 1.0000        | 1.0000        |
| Date lin.*(Calcite vs Calcite+)              | 1.0000      | 1.0000                  | 0.1457          | 0.9998                       | 0.0971                       | 0.2597          | 0.9718       | 0.9189       | 0.1023        | 0.0352        |
| Date lin.*(Calcite. Calcite+ vs Silica)      | 0.1192      | 0.0029                  | 0.0010          | 0.3934                       | 0.0071                       | 0.0097          | 0.1472       | 0.4263       | 0.4443        | 0.0287        |
| Date quad.*(Calcite vs Calcite+)             | 1.0000      | 1.0000                  | 0.0110          | 0.8206                       | 0.2017                       | 0.1029          | 0.9999       | 0.7648       | 0.2635        | 0.0642        |
| Date quad.*(Calcite. Calcite+ vs Silica)     | 1.0000      | 0.5767                  | 0.0015          | <0.0001                      | 0.7453                       | 0.0106          | <0.0001      | 0.0002       | 0.0006        | 0.9999        |

**Table S3.** Observed probabilities of the contrasts of the interaction Date × Treatment of the analysis of variance of morphological variables during the first growing season of white spruce seedlings (1 + 0).

| Contrast                                  | Height<br>(H)<br>(cm) | Diameter<br>(D)<br>(mm) | H/D     | Shoot dry<br>mass<br>(mg) | Root dry<br>mass<br>(mg) | Total dry<br>mass<br>(g) |
|-------------------------------------------|-----------------------|-------------------------|---------|---------------------------|--------------------------|--------------------------|
| 14 Jul : Calcite/Calcite+ vs Silica       | 0.6699                | 0.2693                  | 0.0048  | 1.0000                    | 0.9972                   | 1.0000                   |
| 14 Jul : Calcite vs Calcite+              | 1.0000                | 0.9961                  | 0.7886  | 1.0000                    | 0.9583                   | 1.0000                   |
| 28 Jul : Calcite/Calcite+ vs Silica +     | 0.0033                | 0.1625                  | 0.0027  | 0.9842                    | 0.7246                   | 0.9457                   |
| 28 Jul : Calcite vs Calcite+              | 0.0401                | 0.1830                  | 1.0000  | 0.5157                    | 0.9199                   | 0.4724                   |
| 11 August : Calcite/Calcite+ vs Silica    | 0.0110                | 1.0000                  | 0.0002  | 0.9794                    | 0.0054                   | 0.7031                   |
| 11 August : Calcite vs Calcite+           | 0.9408                | 0.8374                  | 0.9975  | 0.4363                    | 0.6941                   | 0.4160                   |
| 25 August : Calcite/Calcite+ vs Silica    | 0.0011                | 0.0141                  | 0.0175  | 0.8655                    | 0.0233                   | 0.4546                   |
| 25 August : Calcite vs Calcite+           | 1.0000                | 0.9878                  | 1.0000  | 1.0000                    | 1.0000                   | 1.0000                   |
| 08 Sept : Calcite/Calcite+ vs Silica      | 0.0002                | 0.0784                  | 0.0047  | 0.0660                    | 0.0055                   | 0.0040                   |
| 08 Sept : Calcite vs Calcite+             | 0.9974                | 0.9882                  | 1.0000  | 0.9913                    | 1.0000                   | 0.9841                   |
| 22 Sept : Calcite/Calcite+ vs Silica      | 0.0002                | 0.0055                  | 0.0025  | 0.1927                    | 0.0005                   | 0.0585                   |
| 22 Sept : Calcite vs Calcite+             | 1.0000                | 1.0000                  | 0.9990  | 1.0000                    | 1.0000                   | 1.0000                   |
| 06 Oct : Calcite/Calcite+ vs Silica       | 0.0002                | 0.0021                  | 0.0701  | 0.0177                    | 0.0012                   | 0.0067                   |
| 06 Oct : Calcite vs Calcite+              | 0.2551                | 0.9589                  | 0.5719  | 0.5356                    | 0.7948                   | 0.5790                   |
| 27 Oct : Calcite/Calcite+ vs Silica       | <0.0001               | 0.0098                  | <0.0001 | 0.0012                    | 0.0002                   | 0.0005                   |
| 27 Oct : Calcite vs Calcite+              | 0.5669                | 0.9293                  | 0.9865  | 0.9518                    | 0.7971                   | 0.8981                   |
| Date lin. × (Calcite vs Calcite+)         | 0.9815                | 0.9975                  | 0.9999  | 0.8792                    | 0.5560                   | 0.8014                   |
| Date lin. × (Calcite/Calcite+ vs Silica)  | <0.0001               | <0.0001                 | 0.0093  | 0.0002                    | <0.0001                  | 0.0003                   |
| Date quad. × (Calcite vs Calcite+)        | 1.0000                | 1.0000                  | 0.6688  | 1.0000                    | 0.9896                   | 1.0000                   |
| Date quad. × (Calcite/Calcite+ vs Silica) | 0.0229                | 0.2662                  | 0.5453  | 0.9999                    | 0.8553                   | 0.9918                   |

**Table S4.** Estimation of the parameters of the logistic model for height, diameter, root and shoot dry masses, and total dry mass of white spruce seedlings (1 + 0).

| Variable            | Parameter | Estimate | Standard error | P-value | Lower bound of a confidence interval 95% | Upper bound of a confidence interval 95% |
|---------------------|-----------|----------|----------------|---------|------------------------------------------|------------------------------------------|
| Height (cm)         | a0        | 7.9629   | 0.1580         | <0.0001 | 7.6501                                   | 8.2757                                   |
|                     | a1        | 1.7409   | 0.2017         | <0.0001 | 1.3415                                   | 2.1403                                   |
|                     | a2        | 2.1185   | 0.2032         | <0.0001 | 1.7162                                   | 2.5209                                   |
|                     | b0        | 7.9923   | 1.0541         | <0.0001 | 5.9050                                   | 10.0796                                  |
|                     | b12       | 4.4143   | 1.1571         | 0.0002  | 2.1231                                   | 6.7055                                   |
|                     | c0        | 0.0606   | 0.0022         | <0.0001 | 0.0563                                   | 0.0650                                   |
| Diameter (mm)       | a0        | 2.3252   | 0.0367         | <0.0001 | 2.2526                                   | 2.3978                                   |
|                     | a12       | 0.1301   | 0.0323         | 0.0001  | 0.0662                                   | 0.1941                                   |
|                     | b0        | 32.1681  | 0.7461         | <0.0001 | 30.6906                                  | 33.6455                                  |
|                     | c0        | 0.0474   | 0.0013         | <0.0001 | 0.0447                                   | 0.0500                                   |
|                     | c12       | 0.0073   | 0.0013         | <0.0001 | 0.0047                                   | 0.0099                                   |
| Shoot dry mass (mg) | a0        | 646.5249 | 15.0724        | <0.0001 | 616.9239                                 | 676.1260                                 |
|                     | a1        | 154.5694 | 18.9110        | <0.0001 | 117.4296                                 | 191.7093                                 |
|                     | a2        | 199.3705 | 19.1785        | <0.0001 | 161.7054                                 | 237.0356                                 |
|                     | b0        | 38.3151  | 0.6249         | <0.0001 | 37.0877                                  | 39.5424                                  |
|                     | b12       | 3.5602   | 0.5452         | <0.0001 | 2.4894                                   | 4.6310                                   |
|                     | c0        | 0.0729   | 0.0008         | <0.0001 | 0.0713                                   | 0.0744                                   |
| Root dry mass (mg)  | a0        | 516.7170 | 25.9700        | <0.0001 | 465.7139                                 | 567.7201                                 |
|                     | a12       | 63.8152  | 29.7746        | 0.0325  | 5.3402                                   | 122.2903                                 |
|                     | b0        | 75.3154  | 1.9765         | <0.0001 | 71.4337                                  | 79.1971                                  |
|                     | b12       | -6.0244  | 2.1973         | 0.0063  | -10.3397                                 | -1.7091                                  |
|                     | c0        | 0.0537   | 0.0010         | <0.0001 | 0.0518                                   | 0.0556                                   |

| Variable               | Parameter | Estimate  | Standard<br>error | P-<br>value | Lower<br>bound of a<br>confidence<br>interval | Upper<br>bound of a<br>confidence<br>interval |
|------------------------|-----------|-----------|-------------------|-------------|-----------------------------------------------|-----------------------------------------------|
|                        |           |           |                   |             | 95%                                           | 95%                                           |
|                        | c12       | 0.0069    | 0.0012            | <0.0001     | 0.0045                                        | 0.0092                                        |
| Total dry<br>mass (mg) | a0        | 1026.7786 | 25.6104           | <0.0001     | 976.4817                                      | 1077.0755                                     |
|                        | a1        | 246.4828  | 30.9018           | <0.0001     | 185.7938                                      | 307.1717                                      |
|                        | a2        | 308.8024  | 31.3220           | <0.0001     | 247.2884                                      | 370.3165                                      |
|                        | b0        | 45.4555   | 0.7063            | <0.0001     | 44.0684                                       | 46.8427                                       |
|                        | b12       | 3.4290    | 0.5778            | <0.0001     | 2.2942                                        | 4.5638                                        |
|                        | c0        | 0.0672    | 0.0007            | <0.0001     | 0.0659                                        | 0.0686                                        |

**Table S5.** Observed probabilities of the contrasts of the interaction Date × Treatment of analysis of variance for content (mg / plant), concentration (%) and use efficiency of mineral nutrients in shoots of white spruce seedlings (1 + 0).

| Contrast                                  | N<br>(mg/plt) | P<br>(mg/plt) | K<br>(mg/plt) | Ca<br>(g/plt) | Mg<br>(mg/plt) | N<br>(%) | P<br>(%) | K<br>(%) | Ca<br>(%) | Mg<br>(%) | NUE*    | PUE*   | KUE*    |
|-------------------------------------------|---------------|---------------|---------------|---------------|----------------|----------|----------|----------|-----------|-----------|---------|--------|---------|
| 14Jul2014 : (Calcite. Calcite+) vs Silica | 0.9975        | 1.0000        | 0.6741        | <0.0001       | 0.9992         | 0.2713   | 0.9679   | 0.1188   | <0.0001   | 0.9388    | <0.0001 | 0.9999 | 0.0006  |
| 14Jul2014 : Calcite vs Calcite+           | 1.0000        | 0.9731        | 0.9829        | 0.9993        | 0.9999         | 1.0000   | 0.9025   | 0.9901   | 0.9999    | 1.0000    | 1.0000  | 0.9995 | 0.5020  |
| 28Jul2014 : (Calcite. Calcite+) vs Silica | 0.9996        | 1.0000        | 0.0006        | <0.0001       | 0.8244         | 1.0000   | 0.9992   | 0.0205   | <0.0001   | 1.0000    | 1.0000  | 0.9999 | 0.0006  |
| 28Jul2014 : Calcite vs Calcite+           | 0.0736        | 0.0696        | 0.0108        | 0.0216        | 0.1016         | 0.4490   | 0.3025   | 0.9002   | 0.0562    | 0.9672    | 0.1939  | 0.5822 | 0.4466  |
| 11Aug2014 : (Calcite. Calcite+) vs Silica | 0.9975        | 0.9285        | 0.0826        | <0.0001       | 0.7760         | 1.0000   | 1.0000   | 0.0106   | <0.0001   | 0.9977    | 1.0000  | 1.0000 | <0.0001 |
| 11Aug2014 : Calcite vs Calcite+           | 0.6996        | 0.3451        | 0.5086        | 1.0000        | 0.2925         | 1.0000   | 1.0000   | 1.0000   | 0.9764    | 1.0000    | 0.9999  | 1.0000 | 0.9999  |
| 25Aug2014 : (Calcite. Calcite+) vs Silica | 0.0408        | 0.0172        | 0.0012        | 0.0040        | 0.4500         | 0.1895   | 0.0060   | 0.0006   | 0.0138    | 0.4771    | 0.0477  | 0.0052 | 0.0002  |
| 25Aug2014 : Calcite vs Calcite+           | 1.0000        | 0.9276        | 0.2919        | 1.0000        | 0.9970         | 1.0000   | 0.8293   | 0.1809   | 1.0000    | 0.9361    | 1.0000  | 0.9234 | 0.0815  |
| 08Sep2014 : (Calcite. Calcite+) vs Silica | 0.0114        | 0.0966        | 0.1731        | <0.0001       | 0.2834         | 0.6677   | 0.7958   | 0.4893   | <0.0001   | 1.0000    | 0.9853  | 0.6439 | 0.9582  |
| 08Sep2014 : Calcite vs Calcite+           | 0.6291        | 0.9998        | 1.0000        | 1.0000        | 0.9997         | 1.0000   | 1.0000   | 0.9165   | 1.0000    | 1.0000    | 1.0000  | 1.0000 | 0.9871  |
| 22Sep2014 : (Calcite. Calcite+) vs Silica | 0.1468        | 0.0929        | 0.8727        | 0.0029        | 0.9969         | 0.9996   | 1.0000   | 0.7648   | 0.0005    | 0.0002    | 0.9998  | 1.0000 | 0.6174  |
| 22Sep2014 : Calcite vs Calcite+           | 0.9998        | 0.9902        | 0.8772        | 1.0000        | 0.9652         | 0.9981   | 0.7865   | 0.6628   | 0.9999    | 0.3614    | 0.9972  | 0.6332 | 0.5637  |
| 06Oct2014 : (Calcite. Calcite+) vs Silica | 0.1046        | 0.0219        | 1.0000        | <0.0001       | 0.9916         | 0.6079   | 1.0000   | 0.0003   | <0.0001   | <0.0001   | 0.6713  | 1.0000 | 0.0307  |
| 06Oct2014 : Calcite vs Calcite+           | 0.9971        | 1.0000        | 0.9965        | 0.3299        | 0.9454         | 0.3365   | 0.0354   | 1.0000   | 0.7898    | 1.0000    | 0.3814  | 0.1512 | 1.0000  |
| 27Oct2014 : (Calcite. Calcite+) vs Silica | 0.0140        | 0.0010        | 0.5890        | <0.0001       | 0.9997         | 0.0002   | 0.9350   | <0.0001  | <0.0001   | <0.0001   | 0.0006  | 0.9867 | 0.0002  |
| 27Oct2014 : Calcite vs Calcite+           | 0.9615        | 0.9968        | 0.9961        | 0.4754        | 1.0000         | 1.0000   | 0.9998   | 1.0000   | 0.9640    | 0.9672    | 1.0000  | 1.0000 | 1.0000  |
| Date lin.*(Calcite vs Calcite+)           | 0.9998        | 1.0000        | 1.0000        | 0.4516        | 1.0000         | 0.5180   | 0.0049   | 0.8432   | 0.9948    | 0.3587    | 0.1707  | 0.0429 | 0.9522  |
| Date lin.*(Calcite. Calcite+ vs Silica)   | 0.0065        | 0.0006        | 0.8662        | <0.0001       | 0.9785         | 0.1902   | 1.0000   | <0.0001  | 0.0028    | <0.0001   | 0.0071  | 1.0000 | <0.0001 |
| Date quad.*(Calcite vs Calcite+)          | 1.0000        | 1.0000        | 1.0000        | 1.0000        | 1.0000         | 1.0000   | 0.9998   | 0.9977   | 1.0000    | 1.0000    | 1.0000  | 1.0000 | 0.9921  |
| Date quad.*(Calcite. Calcite+ vs Silica)  | 0.9629        | 1.0000        | 0.0103        | 0.0532        | 0.5029         | 0.0027   | 0.0068   | <0.0001  | 0.0021    | 0.0002    | 0.0179  | 0.0194 | 0.0008  |

\*Use efficiency of nitrogen (NUE), phosphorus (PUE) and potassium (KUE).

**Table S6.** Observed probabilities of the contrasts of the interaction Date × Treatment of analysis of variance for content (mg / plant), concentration (%) and use efficiency of mineral nutrients in roots of white spruce seedlings (1 + 0).

| Contrast                                  | N<br>(mg/plt) | P<br>(mg/plt) | K<br>(mg/plt) | Ca<br>(mg/plt) | Mg<br>(mg/plt) | N<br>(%) | P<br>(%) | K<br>(%) | Ca<br>(%) | Mg<br>(%) | NUE*   | PUE*   | KUE*    |
|-------------------------------------------|---------------|---------------|---------------|----------------|----------------|----------|----------|----------|-----------|-----------|--------|--------|---------|
| 11Aug2014 : (Calcite. Calcite+) vs Silica | 0.0255        | 0.0199        | <0.0001       | <0.0001        | <0.0001        | 0.7081   | 1.0000   | <0.0001  | <0.0001   | <0.0001   | 0.3669 | 1.0000 | <0.0001 |
| 11Aug2014 : Calcite vs Calcite+           | 0.9997        | 0.9956        | 1.0000        | 1.0000         | 0.9848         | 0.6102   | 0.9692   | 0.4866   | 0.7709    | 1.0000    | 0.2901 | 0.9687 | 0.5871  |
| 25Aug2014 : (Calcite. Calcite+) vs Silica | 0.1658        | 0.0358        | <0.0001       | <0.0001        | 0.0129         | 0.0113   | 1.0000   | <0.0001  | <0.0001   | 0.0424    | 0.0217 | 1.0000 | <0.0001 |
| 25Aug2014 : Calcite vs Calcite+           | 0.8972        | 0.9989        | 1.0000        | 0.4588         | 1.0000         | 0.2143   | 0.9880   | 1.0000   | 0.7709    | 1.0000    | 0.1560 | 0.9956 | 1.0000  |
| 08Sep2014 : (Calcite. Calcite+) vs Silica | 0.0914        | 0.1054        | 0.0128        | <0.0001        | 0.0367         | 0.0016   | 0.0968   | 0.5406   | <0.0001   | 0.2642    | 0.0155 | 0.0331 | 0.8961  |
| 08Sep2014 : Calcite vs Calcite+           | 1.0000        | 1.0000        | 1.0000        | 0.8766         | 1.0000         | 0.9589   | 1.0000   | 0.9137   | 0.2953    | 0.9659    | 0.9475 | 0.9998 | 0.9896  |
| 22Sep2014 : (Calcite. Calcite+) vs Silica | 0.0004        | <0.0001       | <0.0001       | 0.0038         | 0.0416         | 0.0006   | 1.0000   | 0.0025   | 0.3622    | 1.0000    | 0.0071 | 1.0000 | 0.0070  |
| 22Sep2014 : Calcite vs Calcite+           | 1.0000        | 1.0000        | 0.9987        | 0.3678         | 0.9857         | 0.9718   | 0.9945   | 0.9137   | 0.1479    | 0.8961    | 0.9320 | 0.9962 | 0.9636  |
| 06Oct2014 : (Calcite. Calcite+) vs Silica | 0.3428        | 0.0041        | 0.0016        | <0.0001        | 0.7070         | 0.0001   | 0.9881   | 0.8125   | <0.0001   | 1.0000    | 0.0013 | 0.9970 | 0.8605  |
| 06Oct2014 : Calcite vs Calcite+           | 0.9999        | 1.0000        | 0.9891        | 0.1113         | 0.9998         | 0.0344   | 0.2705   | 0.1388   | 0.2607    | 1.0000    | 0.0451 | 0.4885 | 0.1423  |
| 27Oct2014 : (Calcite. Calcite+) vs Silica | 0.6988        | <0.0001       | 0.0180        | <0.0001        | 0.6135         | <0.0001  | 1.0000   | 1.0000   | 0.0003    | 0.6478    | 0.0006 | 1.0000 | 1.0000  |
| 27Oct2014 : Calcite vs Calcite+           | 0.9999        | 0.5818        | 0.9992        | 0.3196         | 0.9961         | 0.9718   | 1.0000   | 1.0000   | 0.9999    | 1.0000    | 0.9672 | 1.0000 | 1.0000  |
| Date lin.*(Calcite vs Calcite+)           | 1.0000        | 0.8588        | 1.0000        | 0.0443         | 0.9976         | 1.0000   | 1.0000   | 1.0000   | 0.1142    | 1.0000    | 1.0000 | 1.0000 | 0.9999  |
| Date lin.*(Calcite. Calcite+ vs Silica)   | 0.9349        | <0.0001       | 0.2100        | <0.0001        | 0.9998         | 0.0033   | 0.9997   | <0.0001  | <0.0001   | <0.0001   | 0.0028 | 0.9993 | 0.0002  |
| Date quad.*(Calcite vs Calcite+)          | 0.9981        | 0.9251        | 0.9607        | 0.9342         | 0.9970         | 1.0000   | 1.0000   | 1.0000   | 0.0312    | 0.9957    | 1.0000 | 1.0000 | 1.0000  |
| Date quad.*(Calcite. Calcite+ vs Silica)  | 0.2946        | 1.0000        | 0.0545        | 1.0000         | 0.4708         | 1.0000   | 1.0000   | 0.6537   | 0.2246    | 0.9126    | 0.9659 | 1.0000 | 0.9990  |

\*Use efficiency of nitrogen (NUE), phosphorus (PUE) and potassium (KUE).