




# Comparative Formulation

## Murashige & Skoog

|  Powdered Media | MSP01     | MSP02     | MSP03     | MSP04    | MSP05     | MSP06     | MSP07     | MSP08    |
|---|-----------|-----------|-----------|----------|-----------|-----------|-----------|----------|
| <b>Macronutrients</b>   | mg/L      | mg/L      | mg/L      | mg/L     | mg/L      | mg/L      | mg/L      | mg/L     |
| Ammonium Nitrate  | 1650.0000 | 1650.0000 | 1650.0000 | 825.0000 |           | 1650.0000 |           | 825.0000 |
| Calcium Chloride, Anhydrous   | 332.2000  | 332.2000  | 332.2000  | 166.1000 | 332.2000  | 332.2000  | 332.2000  | 166.1000 |
| Magnesium Sulfate, Anhydrous  | 180.7000  | 180.7000  | 180.7000  | 180.7000 | 180.7000  | 180.7000  | 180.7000  | 90.3500  |
| Potassium Chloride  |           |           |           |          |           |           | 709.9100  |          |
| Potassium Nitrate   | 1900.0000 | 1900.0000 | 1900.0000 | 950.0000 | 1900.0000 | 1900.0000 |           | 950.0000 |
| Potassium Phosphate, Monobasic, Anhydrous   | 170.0000  | 170.0000  | 170.0000  | 170.0000 | 170.0000  | 170.0000  | 170.0000  | 85.0000  |
| Potassium Sulfate, Anhydrous  |           |           |           |          |           |           | 1637.8900 |          |
| <b>Micronutrients</b>   | mg/L      | mg/L      | mg/L      | mg/L     | mg/L      | mg/L      | mg/L      | mg/L     |
| Boric Acid  | 6.2000    | 6.2000    | 6.2000    | 6.2000   | 6.2000    | 6.2000    | 6.2000    | 6.2000   |
| Cobalt Chloride, Hexahydrate  | 0.0250    | 0.0250    | 0.0250    | 0.0250   | 0.0250    | 0.0250    | 0.0250    | 0.0250   |
| Cupric Sulfate, Pentahydrate  | 0.0250    | 0.0250    | 0.0250    | 0.0250   | 0.0250    | 0.0250    | 0.0250    | 0.0250   |
| EDTA, Disodium, Dihydrate   | 37.2600   | 37.2600   | 37.2600   | 37.2600  | 37.2600   | 37.2600   | 37.2600   | 18.6300  |
| Ferrous Sulfate, Heptahydrate   | 27.8000   |           |           | 27.8000  |           | 27.8000   | 27.8000   | 13.9000  |
| Manganese Sulfate, Monohydrate  | 16.9000   | 16.9000   | 16.9000   | 16.9000  | 16.9000   | 16.9000   | 16.9000   | 16.9000  |
| Molybdic Acid Sodium Salt, Dihydrate  | 0.2500    | 0.2500    | 0.2500    | 0.2500   | 0.2500    | 0.2500    | 0.2500    | 0.2500   |
| Potassium Iodide  | 0.8300    | 0.8300    | 0.8300    | 0.8300   | 0.8300    | 0.8300    | 0.8300    | 0.8300   |
| Zinc Sulfate, Heptahydrate  | 8.6000    | 8.6000    | 8.6000    | 8.6000   | 8.6000    | 8.6000    | 8.6000    | 8.6000   |
| <b>Other Components</b>   | mg/L      | mg/L      | mg/L      | mg/L     | mg/L      | mg/L      | mg/L      | mg/L     |
| Adenine Sulfate, Dihydrate  |           |           | 80.0000   |          |           |           |           |          |



## Powdered Media

MSP01

MSP02

MSP03

MSP04

MSP05

MSP06

MSP07

MSP08

Vitamins

mg/L

mg/L

mg/L

mg/L

mg/L

mg/L

mg/L

mg/L

Myo-Inositol

100.0000

100.0000

100.0000

100.0000

Nicotinic Acid

0.5000

1.0000

0.5000

Pyridoxine, Hydrochloride

0.5000

1.0000

0.5000


Thiamine, Hydrochloride

0.1000

0.4000

10.0000

0.1000

|  Powdered Media | MSP09     | MSP10    | MSP11     | MSP12      | MSP13      | MSP14      | MSP16    | MSP17     |
|--|-----------|----------|-----------|------------|------------|------------|----------|-----------|
| <b>Macronutrients</b>  | mg/L      | mg/L     | mg/L      | mg/L       | mg/L       | mg/L       | mg/L     | mg/L      |
| Ammonium Nitrate   | 1650.0000 |          | 1650.0000 | 1650.0000  | 1650.0000  | 1650.0000  | 825.0000 | 1650.0000 |
| Calcium Chloride, Anhydrous  | 332.2000  | 332.2000 | 332.2000  | 332.2000   | 332.2000   | 332.2000   | 332.2000 | 332.2000  |
| Magnesium Sulfate, Anhydrous   | 180.7000  | 180.7000 | 180.7000  | 180.7000   | 180.7000   | 180.7000   | 180.7000 | 180.7000  |
| Potassium Nitrate  | 1900.0000 |          | 1900.0000 | 1900.0000  | 1900.0000  | 1900.0000  | 950.0000 | 1900.0000 |
| Potassium Phosphate, Monobasic, Anhydrous  | 170.0000  | 170.0000 |           | 170.0000   | 170.0000   | 170.0000   | 170.0000 | 170.0000  |
| Sodium Phosphate, Monobasic, Monohydrate   |           |          |           | 148.0000   |            |            |          |           |
| <b>Micronutrients</b>  | mg/L      | mg/L     | mg/L      | mg/L       | mg/L       | mg/L       | mg/L     | mg/L      |
| Boric Acid   | 6.2000    | 6.2000   | 6.2000    | 6.2000     | 6.2000     | 6.2000     | 6.2000   |           |
| Cobalt Chloride, Hexahydrate   | 0.0250    | 0.0250   | 0.0250    | 0.0250     | 0.0250     | 0.0250     | 0.0250   |           |
| Cupric Sulfate, Pentahydrate   | 0.0250    | 0.0250   | 0.0250    | 0.0250     | 0.0250     | 0.0250     | 0.0250   |           |
| EDTA, Disodium, Dihydrate  | 37.2600   | 37.2600  | 37.2600   | 37.2600    | 37.2600    | 37.2600    | 37.2600  |           |
| Ferrous Sulfate, Heptahydrate  |           | 27.8000  | 27.8000   |            | 27.8000    |            |          |           |
| Manganese Sulfate, Monohydrate   | 16.9000   | 16.9000  | 16.9000   | 16.9000    | 16.9000    | 16.9000    | 16.9000  |           |
| Molybdcic Acid Sodium Salt, Dihydrate  | 0.2500    | 0.2500   | 0.2500    | 0.2500     | 0.2500     | 0.2500     | 0.2500   |           |
| Potassium Iodide   | 0.8300    | 0.8300   | 0.8300    | 0.8300     | 0.8300     | 0.8300     | 0.8300   |           |
| Zinc Sulfate, Heptahydrate   | 8.6000    | 8.6000   | 8.6000    | 8.6000     | 8.6000     | 8.6000     | 8.6000   |           |
| <b>Other Components</b>  | mg/L      | mg/L     | mg/L      | mg/L       | mg/L       | mg/L       | mg/L     | mg/L      |
| Adenine Sulfate, Dihydrate   |           |          |           | 80.0000    |            |            |          |           |
| Glycine  | 2.0000    |          |           |            |            | 2.0000     |          |           |
| Kinetin  |           |          |           | 1.0000     |            |            |          |           |
| Naphthaleneacetic Acid   |           |          |           | 0.1000     |            |            |          |           |
| Sucrose  |           |          |           | 30000.0000 | 30000.0000 | 30000.0000 |          |           |



## Powdered Media

MSP09

MSP10

MSP11

MSP12

MSP13

MSP14

MSP16

MSP17

Vitamins

mg/L

mg/L

mg/L

mg/L

mg/L

mg/L

mg/L

mg/L

Myo-Inositol

100.0000

100.0000

100.0000

Nicotinic Acid

0.5000

0.5000

Pyridoxine, Hydrochloride

0.5000

0.5000


0.5000

Thiamine, Hydrochloride

0.1000

0.4000

0.1000

|  Powdered Media | MSP18     | MSP19     | MSP20     | MSP21     | MSP22     | MSP23     | MSP24      | MSP25     |
|--|-----------|-----------|-----------|-----------|-----------|-----------|------------|-----------|
| Macronutrients   | mg/L      | mg/L      | mg/L      | mg/L      | mg/L      | mg/L      | mg/L       | mg/L      |
| Ammonium Chloride  |           |           |           |           |           |           | 364.0000   | 364.0000  |
| Ammonium Nitrate   |           | 1650.0000 | 1650.0000 |           | 1650.0000 | 616.0000  |            |           |
| Calcium Chloride, Anhydrous  |           | 332.2000  | 332.2000  | 332.2000  | 332.2000  | 332.2000  | 332.2000   | 332.2000  |
| Magnesium Sulfate, Anhydrous   |           | 180.7000  | 180.7000  | 180.7000  | 180.7000  | 180.7000  | 180.7000   | 180.7000  |
| Potassium Chloride   |           |           |           | 709.9100  |           |           |            |           |
| Potassium Nitrate  |           | 1900.0000 | 1900.0000 |           | 1900.0000 | 1532.0000 | 3033.0000  | 3033.0000 |
| Potassium Phosphate, Monobasic, Anhydrous  |           |           | 170.0000  | 170.0000  | 170.0000  | 170.0000  | 170.0000   | 170.0000  |
| Potassium Sulfate, Anhydrous   |           |           |           | 1637.8900 |           |           |            |           |
| Sodium Phosphate, Monobasic, Monohydrate   |           |           |           |           | 170.0000  |           |            |           |
| Micronutrients   | mg/L      | mg/L      | mg/L      | mg/L      | mg/L      | mg/L      | mg/L       | mg/L      |
| Boric Acid   | 620.0000  | 6.2000    | 6.2000    | 6.2000    | 6.2000    | 6.2000    | 6.2000     | 6.2000    |
| Cobalt Chloride, Hexahydrate   | 2.5000    | 0.0250    | 0.0250    | 0.0250    | 0.0250    | 0.0250    | 0.0250     | 0.0250    |
| Cupric Sulfate, Pentahydrate   | 2.5000    | 0.0250    | 0.0250    | 0.0250    | 0.0250    | 0.0250    | 0.0250     | 0.0250    |
| EDTA, Disodium, Dihydrate  | 3726.0000 | 37.2600   |           | 37.2600   | 37.2600   | 37.2600   | 37.2600    | 37.2600   |
| EDTA, Iron Sodium Salt   |           |           | 36.7000   |           |           |           |            |           |
| Ferrous Sulfate, Heptahydrate  |           | 27.8000   |           |           |           |           | 27.8000    | 27.8000   |
| Manganese Sulfate, Monohydrate   | 1690.0000 | 16.9000   | 16.9000   | 16.9000   | 16.9000   | 16.9000   | 16.9000    | 16.9000   |
| Molybdc Acid Sodium Salt, Dihydrate  | 25.0000   | 0.2500    | 0.2500    | 0.2500    | 0.2500    | 0.2500    | 0.2500     | 0.2500    |
| Potassium Iodide   | 83.0000   | 0.8300    | 0.8300    | 0.8300    | 0.8300    | 0.8300    | 0.8300     | 0.8300    |
| Zinc Sulfate, Heptahydrate   | 860.0000  | 8.6000    | 8.6000    | 8.6000    | 8.6000    | 8.6000    | 8.6000     | 8.6000    |
| Other Components   | mg/L      | mg/L      | mg/L      | mg/L      | mg/L      | mg/L      | mg/L       | mg/L      |
| Adenine Sulfate, Dihydrate   |           |           |           |           | 80.0000   |           |            |           |
| Charcoal, Activated, Acid Washed   |           |           |           |           |           |           | 500.0000   | 500.0000  |
| Glycine  |           |           | 2.0000    |           |           | 2.0000    |            |           |
| Sucrose  |           |           |           |           |           |           | 60000.0000 |           |



## Powdered Media

MSP18

MSP19

MSP20

MSP21

MSP22

MSP23

MSP24

MSP25

Vitamins

mg/L

mg/L

mg/L

mg/L

mg/L

mg/L

mg/L

mg/L

Glycine

2.0000

Myo-Inositol

100.0000

100.0000

100.0000

100.0000

1000.0000

1000.0000

Nicotinic Acid

0.5000

0.5000

0.5000

0.5000

0.5000

Pyridoxine, Hydrochloride

0.5000

0.5000

0.5000

0.5000

0.5000

Thiamine, Hydrochloride

0.1000


0.1000

0.4000

0.1000

0.1000

0.1000

|  Powdered Media | MSP26     | MSP27     | MSP29     | MSP31     | MSP32     | MSP33     | MSP34     | MSP38     |
|--|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>Macronutrients</b>  | mg/L      | mg/L      | mg/L      | mg/L      | mg/L      | mg/L      | mg/L      | mg/L      |
| Ammonium Nitrate   | 1650.0000 | 1650.0000 | 1650.0000 | 1650.0000 | 1650.0000 | 1650.0000 | 1650.0000 | 1650.0000 |
| Calcium Chloride, Anhydrous  | 166.1000  | 332.2000  | 332.0200  | 332.2000  | 332.2000  | 332.2000  | 332.2000  | 333.0000  |
| Magnesium Sulfate, Anhydrous   | 180.7000  | 180.7000  | 180.5400  | 180.7000  | 180.7000  | 180.7000  | 180.7000  | 181.0000  |
| Potassium Nitrate  | 1900.0000 | 1900.0000 | 1900.0000 | 1900.0000 | 1900.0000 | 1900.0000 | 1900.0000 | 1900.0000 |
| Potassium Phosphate, Monobasic, Anhydrous  | 170.0000  | 170.0000  | 170.0000  | 170.0000  | 170.0000  | 170.0000  | 170.0000  | 170.0000  |
| Sodium Phosphate, Monobasic, Monohydrate   |           |           |           |           |           |           |           | 85.0000   |
| <b>Micronutrients</b>  | mg/L      | mg/L      | mg/L      | mg/L      | mg/L      | mg/L      | mg/L      | mg/L      |
| Boric Acid   | 6.2000    |           | 6.2000    | 6.2000    | 6.2000    | 6.2000    | 6.2000    | 6.2000    |
| Cobalt Chloride, Hexahydrate   | 0.0250    | 0.0250    | 0.0250    | 0.0250    | 0.0250    | 0.0250    | 0.0250    | 0.0250    |
| Cupric Sulfate, Pentahydrate   | 0.0250    | 0.0250    | 0.0250    | 0.0250    | 0.0250    | 0.0250    | 0.0250    | 0.0250    |
| EDTA, Disodium, Dihydrate  | 37.2600   | 37.2600   |           | 37.2600   | 37.2600   |           |           |           |
| EDTA, Iron Sodium Salt   |           |           | 36.7000   |           |           |           | 36.7000   | 36.7000   |
| Ferrous Sulfate, Heptahydrate  | 27.8000   | 27.8000   |           | 27.8000   |           |           |           |           |
| Manganese Sulfate, Monohydrate   | 16.9000   | 16.9000   | 16.9000   | 16.9000   | 16.9000   | 16.9000   | 16.9000   | 16.9000   |
| Molybdic Acid Sodium Salt, Dihydrate   | 0.2500    | 0.2500    | 0.2500    | 0.2500    | 0.2500    | 0.2500    | 0.2500    | 0.2500    |
| Potassium Iodide   | 0.8300    | 0.8300    | 0.8300    | 0.8300    | 0.8300    | 0.8300    | 0.8300    | 0.8300    |
| Zinc Sulfate, Heptahydrate   | 8.6000    | 8.6000    | 8.6000    | 8.6000    | 8.6000    | 8.6000    | 8.6000    | 8.6000    |
| <b>Other Components</b>  | mg/L      | mg/L      | mg/L      | mg/L      | mg/L      | mg/L      | mg/L      | mg/L      |
| Adenine Sulfate, Dihydrate   |           |           |           |           |           |           |           | 80.0000   |
| Gibberellic Acid   |           |           |           |           | 5.0000    |           |           |           |
| Glycine  |           |           | 2.0000    |           | 2.0000    |           |           |           |
| Indole-3-Acetic Acid   |           |           |           |           |           |           |           | 0.5000    |
| Kinetin  |           |           |           |           |           |           |           | 10.0000   |
| L-Tyrosine   |           |           |           |           |           |           |           | 100.0000  |
| Putrescine, Dihydrochloride  |           |           |           | 36.5500   |           |           |           |           |



## Powdered Media

MSP26

MSP27

MSP29

MSP31

MSP32

MSP33

MSP34

MSP38

Vitamins

mg/L

mg/L

mg/L

mg/L

mg/L

mg/L

mg/L

mg/L

Biotin

0.0500

Folic Acid

0.5000

Myo-Inositol

100.0000

100.0000

100.0000

Nicotinic Acid

5.0000

0.5000

10.0000

Pyridoxine, Hydrochloride

0.5000

0.5000

1.0000


Thiamine, Hydrochloride

0.5000

0.1000

30.0000



|  Powdered Media | MSP39     | MSP41     | MSP42    | MSP44     |
|--|-----------|-----------|----------|-----------|
| <b>Macronutrients</b>  | mg/L      | mg/L      | mg/L     | mg/L      |
| Ammonium Nitrate   | 1650.0000 | 1650.0000 |          | 1650.0000 |
| Calcium Chloride, Anhydrous  | 333.0000  | 333.0000  | 332.2000 | 332.2000  |
| Magnesium Chloride, Anhydrous  |           |           |          | 142.9300  |
| Magnesium Sulfate, Anhydrous   | 181.0000  | 181.0000  | 180.7000 |           |
| Potassium Nitrate  | 1900.0000 | 1900.0000 | 250.0000 | 1900.0000 |
| Potassium Phosphate, Monobasic, Anhydrous  | 170.0000  | 170.0000  | 170.0000 | 170.0000  |
| Sodium Phosphate, Monobasic, Monohydrate   | 170.0000  | 85.0000   |          |           |
| <b>Micronutrients</b>  | mg/L      | mg/L      | mg/L     | mg/L      |
| Boric Acid   | 6.2000    | 6.2000    | 6.2000   | 6.2000    |
| Cobalt Chloride, Hexahydrate   | 0.0250    | 0.0250    | 0.0250   | 0.0250    |
| Copper II Chloride, Anhydrous  |           |           |          | 0.0135    |
| Cupric Sulfate, Pentahydrate   | 0.0250    | 0.0250    | 0.0250   |           |
| EDTA, Disodium, Dihydrate  |           |           | 37.2600  | 37.2600   |
| EDTA, Iron Sodium Salt   | 36.7000   | 36.7000   |          |           |
| Ferrous Sulfate, Heptahydrate  |           |           | 27.8000  |           |
| Iron III Chloride, Anhydrous   |           |           |          | 16.2200   |
| Manganese Sulfate, Monohydrate   | 16.9000   | 16.9000   | 16.9000  |           |
| Molybdic Acid Sodium Salt, Dihydrate   | 0.2500    | 0.2500    | 0.5000   | 0.2500    |
| Potassium Iodide   | 0.8300    | 0.8300    | 0.8300   | 0.8300    |
| Zinc Chloride, Anhydrous   |           |           |          | 4.0800    |
| Zinc Sulfate, Heptahydrate   | 8.6000    | 8.6000    | 8.6000   |           |
| <b>Other Components</b>  | mg/L      | mg/L      | mg/L     | mg/L      |
| Adenine Sulfate, Dihydrate   | 80.0000   | 80.0000   |          |           |
| Indole-3-Acetic Acid   | 2.0000    |           |          |           |
| Kinetin  | 2.0000    |           |          |           |
| L-Tyrosine   |           | 100.0000  |          |           |



## Powdered Media

MSP39

MSP41

MSP42

MSP44

Vitamins

mg/L

mg/L

mg/L

mg/L

Myo-Inositol

100.0000

100.0000

100.0000

Nicotinic Acid

10.0000

1.0000

Pyridoxine, Hydrochloride

1.0000

1.0000

Thiamine, Hydrochloride

0.4000

30.0000

10.0000



## Liquid Media

MVL01

### Vitamins

mg/L

Glycine 2000.0000

Myo-Inositol 100000.000  
0

Nicotinic Acid 500.0000

Pyridoxine, Hydrochloride 500.0000

Thiamine, Hydrochloride 100.0000