Half-MS medium

Chemicals	Stock Conc.	Addition	Final Conc.	Location
MS basal salt (M407) †	—	1.22 g	0.5X	4°C (c)
Ammonium nitrate (NH_4NO_3)	—	3.30 g	10.31 mM	VIII
Potassium nitrate (KNO_3)	—	3.80 g	9.40 mM	toxic (D)
Potassium phosphate monobasic (KH_2PO_4)	170 g / L	2 mL	0.63 mM	bench
MES hydrate	—	2 g	0.05% (w/v)	III
PPM™	100%	2 mL	0.05% (v/v)	4°C (a)
KOH ※	5 M	~ 730 µL	—	VII
ddH_2O	—	~ 4 L	—	—
Total volume		**4 L**		

† Murashige & Skoog Modified Basal Salt Mixture (Product ID: M407):
https://phytotechlab.com/murashige-skoog-modified-basal-salt-mixture-m407.html

Gelling agent ⟶ Gelzan™ (G3251, CAS no.: 71010-52-1) : 1.5 g / L (0.15%). Located between **I** and **II**.
Generally, we make 400 mL per bottle, so weigh **(600 ± 2) mg / 400 mL** for each bottle.

The final pH should be around **5.7 ~ 5.8**. Autoclave under **121°C** for **20 mins**.

※ KOH is used for pH adjustment. To prepare 5 M KOH solution, dissolve 330 g of 85% KOH in 900 mL ddH_2O, and then bring to 1 L.
Since KOH releases heat during dissolution, **gradually and slowly add the KOH granules into the water**.

Yoshida Medium

Yoshida's stock solution for root architecture media rice.

800X Yoshida macro-stock solution

800x macro stock	**Grams / L**	**Location**
NH_4NO_3	91.4	VIII
$CaCl_2$	88.6	IV
$NaH_2PO_4 \cdot 2H_2O$ ※	40.3	VIII
K_2SO_4 §	71.4	VIII
$MgSO_4 \cdot 7H_2O$ §	324	VIII

※ If use **$NaH_2PO_4 \cdot H_2O$**, then add **17.8** g / L;

§ K_2SO_4 and $MgSO_4 \cdot 7H_2O$ will be easily contaminated, stored at 4°C;

800X Yoshida micro-stock solution

800x micro stock	**Grams / L**	**Location**
$MnCl_2 \cdot 4H_2O$	1.5	VIII
$(NH_4)_6 \cdot MO_7O_{24} \cdot 4H_2O$	0.074	VIII
H_3BO_3	0.934	VIII
$ZnSO_4 \cdot 7H_2O$	0.035	VIII
$CuSO_4 \cdot 5H_2O$	0.031	VIII
$FeCl_3 \cdot 6H_2O$	7.7	VIII
Citric acid (monohydrate)	11.9	VIII

1X Yoshida medium (pH 5.8)

	1L	2L	4L	Location
800X Macro stock (mL)				
NH_4NO_3	1.25	2.5	5	
$NaH_2PO_4 \cdot H_2O$	1.25	2.5	5	
K_2SO_4	1.25	2.5	5	
$CaCl_2$	1.25	2.5	5	
$MgSO_4 \cdot 7H_2O$	1.25	2.5	5	
800X Micro stock (mL)	1.25	2.5	5	
MES hydrate (g)	0.546	1.092	2.184	III

Hoagland medium

Modified from: https://doi.org/10.1111/nph.20135 (Wang et al., 2024).

- The working solution is generally **0.5X**.
- To conduct P-deficiency experiment, reduce the K_2HPO_4 molarity to 4 μM.

500X Hoagland **macro**-stock solution

Chemical	M.W. (g / mol)	Molarity (mM)	1X solution (mg / L)	500X stock (g / L)	Storage
NH_4NO_3	80.04	5.6	448.22	224.11	VIII
K_2HPO_4	174.18	0.4	69.67	45.64	III
K_2SO_4	174.26	0.8	139.41	69.70	VIII
$MgSO_4•7H_2O$	246.47	0.8	197.18	98.59	VIII
$CaCl_2$	110.98	1.6	177.57	88.78	IV
KNO_3	101.10	0.8	80.88	40.44	Toxin (D)
Ferrous mixture	See below				

500X Ferrous Mixture

- The **$Na_2EDTA•2H_2O$** is slowly soluble in water at room temperature up to 0.26 M, which is approximately 96 mg in a final volume of 1 ml. The pH of this solution will be in the range of 4 to 6. EDTA salts are more soluble in water as the pH increases: the more EDTA there is in the salt form, the higher the pH of a water solution, and therefore, the higher the room temperature solubility. This can be achieved by a gradual addition of concentrated sodium hydroxide solution to the EDTA solution. A stock solution of 0.5 M at pH 8.5 is stable for months at 4°C. Solutions of EDTA may be autoclaved.
- The **$FeSO_4•7H_2O$** is sensitive to heat and light. It should be bluish green color. When it turn yellowish brown, that means it was already oxidized, do not use it.

Chemical	M.W. (g / mol)	Molarity (mM)	1X solution (mg / L)	500X stock (g / L)	Storage
$Na_2EDTA•2H_2O$	372.24	0.18	67.0	33.50	III
$FeSO_4•7H_2O$	278.01	0.18	50.04	25.02	IX

500X Hoagland micro-stock solution

Chemical	M.W. (g / mol)	Molarity (mM)	1X solution (mg / L)	500X stock (g / L)	Storage
H_3BO_3	61.83	0.0230	1.4221	0.7110	VIII
$MnCl_2•4H_2O$	197.91	0.0045	0.8906	0.4453	VIII
$CuSO_4•5H_2O$	249.69	0.0003	0.0749	0.0375	VIII
$ZnCl_2$	136.30	0.0015	0.2045	0.1022	*N/A*
$Na_2MoO_4•2H_2O$	241.95	0.0001	0.0242	0.0121	IX

The $ZnCl_2$ may be substituted with $ZnSO_4•7H_2O$.

	M.W. (g / mol)	Molarity (mM)	1X solution (mg / L)	500X stock (g / L)	Storage
$ZnSO_4•7H_2O$	287.56	0.0015	0.4313	0.2157	VIII