

## Plant Growth Regulators

The importance of plant growth regulators in plant tissue culture is well documented. *Phyto*Technology offers a broad range of plant growth regulators specifically tested for plant cell culture. Each product is assayed for physical and chemical characteristics then is biologically tested following the criteria established for powdered media. Each auxin is tested for enhancement of callus growth and/or root initiation *in vitro*. Each cytokinin is tested for stimulation of shoot production.

**FOR LABORATORY USE, PLANT TISSUE CULTURE MEDIA PREPARATION, AND PLANT RESEARCH PURPOSES ONLY. NOT FOR USE AS A PLANT GROWTH REGULATOR ON DEVELOPED PLANTS. NOT FOR DRUG OR HOUSEHOLD USE.**

### PRODUCT USE

**Auxins:** Auxins are generally used in plant cell culture at a concentration range of 0.01-10.0 mg/L. When added in appropriate concentrations they may regulate cell elongation, tissue swelling, cell division, formation of adventitious roots, inhibition of adventitious and axillary shoot formation, callus initiation and growth, and induction of embryogenesis.

**Cytokinins:** Cytokinins are generally used in plant cell culture at a concentration range of 0.1-10.0 mg/L. When added in appropriate concentrations they may regulate cell division, stimulate auxiliary and adventitious shoot proliferation, regulate differentiation, inhibit root formation, activate RNA synthesis, and stimulate protein and enzyme activity.

**Gibberellins:** Gibberellins are generally used to promote flowering, break dormancy of seeds, buds, corms, and bulbs, and causes stem elongation. There are over 90 forms of gibberellins, but GA<sub>3</sub> is the most commonly used form. Compounds like paclobutrazol and ancymidol inhibit the synthesis of gibberellins.

**Abscisic Acid:** Abscisic Acid (ABA) plays a role in dormancy development in embryos, buds and bulbs, and in leaf abscission. When used in tissue culture, ABA inhibits the growth of shoots and the germination of embryos. Fluridone may inhibit ABA synthesis.

**Polyamines:** Polyamines are compounds that occur in high levels within plants and are used in tissue culture media at concentrations of 10-1000 mM. Polyamines may enhance regeneration of roots, shoots and embryos, delay or prevent senescence, and regulate flowering.

### METHODS OF PREPARATION

To prepare a 1 mg/ml stock solution: Add 100 mg of the plant growth regulator to a 100 ml volumetric flask or other glass container. Add 2-5 ml of solvent to dissolve the powder. Once completely dissolved, bring to volume with double processed water. Stirring the solution while adding water may be required to keep the material in solution. Store the stock solution as recommended in the tables. Add 1.0 ml of the stock solution to 1 liter of medium to obtain a final concentration of 1.0 mg/L of

the plant growth regulator in the culture medium. (See conversion tables).

$$\frac{\text{Desired Hormone Concentration}}{\text{Stock Solution Concentration}} \times \frac{\text{Medium Volume}}{\text{Volume of Stock Solution Required}} =$$

### STOCK SOLUTION DILUTION CHART

To use this chart:

1. Determine the final concentration of the hormone/vitamin etc. desired in the culture medium. In column A, locate the final concentration desired under the heading corresponding to the quantity of medium you will prepare.
2. Once you have located the desired final concentration the go across the chart to column B to determine the concentration of stock solution to prepare.
3. Find the volume of stock solution to use to achieve the final desired concentration in the medium in column C.

B Concentration of Stock Solution	C Amount to use (mL)	A Concentration of Final Solution (mg/L)				
		250 mL	500 mL	1 Liter	2 Liter	10 liters
0.01 mg/mL	0.1	0.004	0.002	0.001	0.0005	0.0001
	0.5	0.02	0.01	0.005	0.025	0.005
	1.0	0.04	0.02	0.01	0.005	0.001
	10.0	0.4	0.2	0.1	0.05	0.01
0.1 mg/mL	0.1	0.04	0.02	0.01	0.005	0.001
	0.5	0.2	0.1	0.05	0.25	0.05
	1.0	0.4	0.2	0.1	0.05	0.01
	10.0	4.0	2.0	1.0	0.5	0.1
1.0 mg/mL	0.1	0.4	0.2	0.1	0.05	0.01
	0.5	2.0	1.0	0.5	0.25	0.5
	1.0	4.0	2.0	1.0	0.5	0.1
	10.0	40.0	20.0	10.0	5.0	1.0
10.0 mg/mL	0.1	4.0	2.0	1.0	0.5	0.1
	0.5	20.0	10.0	5.0	2.5	0.5
	1.0	40.0	20.0	10.0	5.0	1.0
	10.0	400.0	200.0	100.0	50.0	10.0

<b>Hormone</b>	<b>Product Name</b>	<b>Product Number</b>	<b>Function in Plant Tissue Culture</b>
Auxins	Indole-3-Acetic Acid Indole-3-Butyric Acid Indole-3-Butyric Acid, Potassium Salt $\alpha$ -Naphthaleneacetic Acid 2,4-Dichlorophenoxyacetic Acid p-Chlorophenoxyacetic acid Picloram Dicamba	I 885 I538 I530 N600 D299 C213 P717 D159	Adventitious root formation (high concen) Adventitious shoot formation (low concen) Induction of somatic embryos Cell Division Callus formation and growth Inhibition of axillary buds Inhibition of root elongation
Cytokinins	6-Benzylaminopurine 6- $\gamma,\gamma$ -Dimethylallylaminopurine (2iP) Kinetin Thidiazuron (TDZ) N-(2-chloro-4-pyridyl)-N'-Phenylurea Zeatin Zeatin Riboside	B800 D525 K750 T888 C279 Z125 Z899	Adventitious shoot formation Inhibition of root formation Promotes cell division Modulates callus initiation and growth Stimulation of axillary's bud breaking and growth Inhibition of shoot elongation Inhibition of leaf senescence
Gibberellins	Gibberellic Acid	G500	Stimulates shoot elongation Release seeds, embryos, and apical buds from dormancy Inhibits adventitious root formation Paclbutrazol and ancymidol inhibit gibberellin synthesis thus resulting in shorter shoots, and promoting tuber, corm, and bulb formation.
Abscisic Acid	Abscisic Acid	A102	Stimulates bulb and tuber formation Stimulates the maturation of embryos Promotes the start of dormancy
Polyamines	Putrescine Spermidine	P733 S837	Promotes adventitious root formation Promotes somatic embryogenesis Promotes shoot formation