

Product Information Bulletin

Storm Cell nutritional concentrate is designed for use with seedling and rooted cuttings grown in soilless propagation media such as vermiculite/pearlite, rock wool plugs/cubes, coco coir and other inert mixes. Storm Cell is specifically formulated to provide a nutritional blend of select macronutrients, secondary nutrients and micronutrients for plants in the post germination – pre-vegetative period of growth and development.

In the hydroponic industry, nutritional solutions are abundantly available for plants in their vegetative and flowering period of growth. But there is a scarcity of nutritional options that exist for use on seedlings and cuttings in their post germination/pre-vegetative stages. **Why?**

One explanation may be that there may be some confusion as to when the plant first need nutrients. Is it at the vegetative stage or perhaps before? If before, how soon before?

Germination

It is pretty clear that during the germination process, the plant is initially dependent on the endosperm for its food supply (energy). The endosperm is the tissue inside the seed of most flowering plants that provides the germinating plant with nutrition in the form of starch reserves.

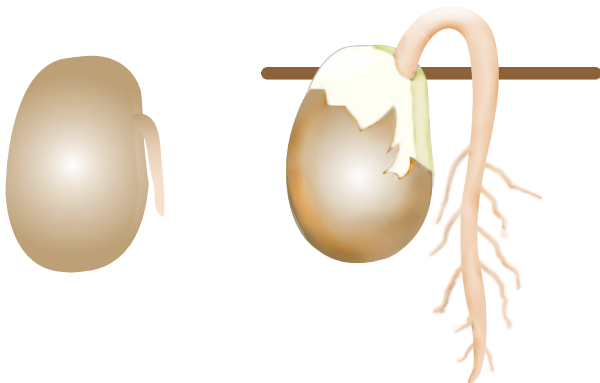
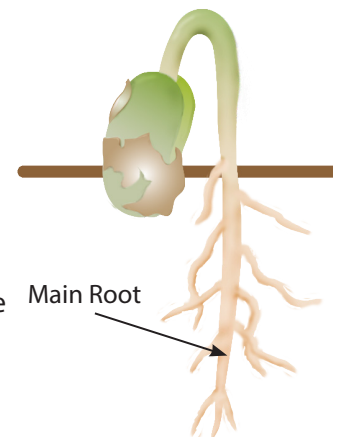


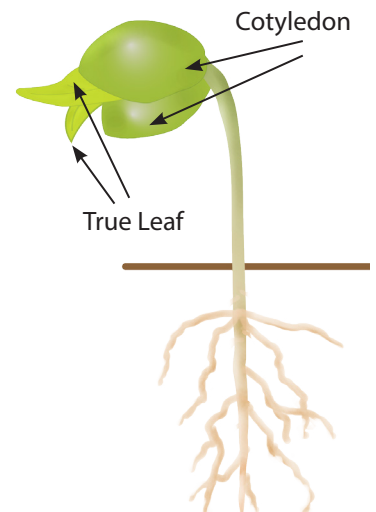
Illustration showing seed in early germination stage (left) showing hypocotyl (part of stem) of embryonic plant. Graphic on right shows further development of embryonic plant with cotyledon (embryonic leaf) breaking through seed coat.

Seedlings

Once the seed has germinated, it is a seedling. On the lower end of the sprout is a single main root. Some plant physiologists point out that once the root has appeared, germination is essentially complete and the plant must produce its own food as its roots seek moisture and nutrients.



On the opposite end of the sprout are the two rounded cotyledon leaves. Because they are part of the seed's embryo, they are also referred to as "seed leaves."



Cotyledons are the first leaves to emerge when the plant germinates. They are usually smooth and appear directly opposite each other on the stem. True leaves unfurl above the cotyledons on the seedling and look like smaller versions of the adult foliage.

In most dicotyledons, the energy and nutrient demand of the seedlings are mainly supported by cotyledons in the early developmental stages.

There is some confusion as to the balance between the cotyledons' early post germination reserve energy storage role and their photosynthetic (autotrophic) energy production role during the pre-growth period.

In dicot plants, the reserve starches in cotyledons are used up rapidly to satisfy the cascade of reactions that result in the rapid growth of the embryo plant. **An enormous body of scientific evidence highlight that while the growth of the seedling initially depends upon the mobilization and transfer of stored material from the cotyledon, there is a very rapid conversion by cotyledons to perform photosynthetic functions.**

Indeed, it has been observed that cotyledons reach their maximum area, possess stomata, develop chlorophyll and expand to form leaf-like structures soon after emergence.

There is general agreement that the photosynthetic output by cotyledons is usually sufficient to balance respiratory losses that occur during early stages of development. In effect, cotyledons provide a "photosynthetic" functional bridge for the young plant until the true leaves emerge and take over this responsibility.

Autotrophic Initiation

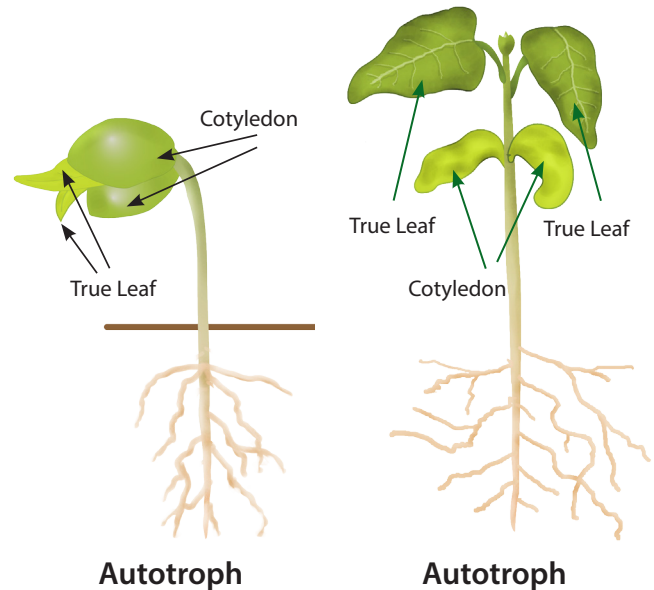
Cotyledons also provide a unique signal to the grower. As the cotyledons emerge and start turning green, they indicate that the plant has now initiated the transition from reliance on energy supplied by the seed to exist to a plant that is capable of providing its own energy and growth components – through photosynthesis.

As the cotyledons turn green, they signal that they are producing chlorophyll and contain the metabolic machinery to support initial development of the seedling.

Organisms are divided into autotrophs and heterotrophs according to their energy pathways. Autotrophs are those organisms that are able to make energy-containing organic molecules from inorganic raw material by using basic energy sources such as sunlight. Plants are the prime example of autotrophs, using photosynthesis.

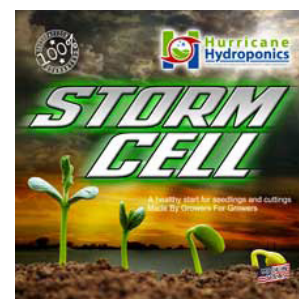
All other organisms must make use of food that comes from other organisms in the form of fats, carbohydrates and proteins. These organisms which feed on others are called heterotrophs.

Under hydroponic production, once a plant begins to function as an autotroph, it must be provided light, water, proper temperature and nutrients to support growth and important plant functions such as stem elongation, photosynthesis and protein production.



Both cotyledons and true leaves are photosynthetic organs, providing the photosynthate used in seedling growth. Therefore, plant development in either stage is autotrophic and under hydroponic practices, require application of nutrients to nutrient solutions to support their function.

STORM CELL



1-Part Nutritional Concentrate for Seedlings and Cuttings

STORM CELL is designed and formulated to provide the hydroponic grower with an easy to use, nutrient solution for seedling and cuttings during the critical autotrophic pre-vegetative growth period of growth and development. It represents the first nutritional step towards your plants reaching their genetic potential.

When To Use STORM CELL

Initial applications of STORM CELL are recommended shortly after emergence of the cotyledon -- usually when they show green pigmentation. Nutrient feeding with STORM CELL should be continued until plants demonstrate that initiation of vegetative growth has begun.



STORM CELL is formulated to supply a full spectrum of nutrients that will provide for a seamless transition from initiation of the autotrophic stage to the beginning of the vegetative growth stage.

Considerations for STORM CELL Use

Avoid Nutrient Toxicity and Nutrient Deficiencies

Seedlings and cuttings grown in soilless media are quite vulnerable to nutrient toxicity. But these young and developing plants are equally vulnerable to nutrient deficiencies. In order to get a crop off to a healthy, robust start and reach its genetic capabilities, it is necessary to provide those essential, secondary and micro elements to satisfy plant requirements. Diluted forms of nutrient combinations designed for plants in the vegetative or flowering stages are not appropriate for sensitive seedlings and cuttings whose roots, organs, metabolic machinery and other functional processes may not be fully developed.

The best and safest way to supply nutrients at the early stages of plant development is to use a well-balanced nutrient product such as STORM CELL that is specifically formulated to supply plants in early development with nutrients in the proper ratios and concentrations.

Precondition Young Plants for Success During the Vegetative Stage

Nurturing your seedlings and cuttings is not just about their survival. Keeping them healthy throughout their early stage of their development as an autotrophic plant is an investment in your future harvest. This certainly includes providing a complete nutrient solution that is appropriate for pre-vegetative plant requirements.

During the pre-vegetative (pre-growth) stage, it is general practice to provide long periods of light. Heavy loads of light stimulate the photosynthetic machinery to produce carbohydrates and provide the plant with energy to develop more of its functional architecture (leaves, stem, roots, etc.) and to complete photosynthetic, metabolic and functional process machinery required for its entry into the vegetative stage. If it is not provide the proper nutrient mix at this time, the success of the vegetative (and even flowering) stage of growth will be jeopardized.

Strong, fully functioning, vigorous and healthy seedlings and cuttings that are well nourished with applications of STORM CELL will be better prepared to transition, thrive and be capable of undertaking the physiological process demands that exist during the explosive vegetative growth stage.

Seamless Integration with TROPICAL STORM 3-Part Vegetative Growth System

Once plants that have been on a STORM CELL feeding program are ready to begin their vegetative growth stage. They are well conditioned and functionally capable to accept the more aggressive nutrient solutions developed for the vegetative stages of plant growth and development. STORM CELL has been formulated to allow plants to transition easily to vegetative growth nutritional programs such as our TROPICAL STORM 3-Part Vegetative Growth System.

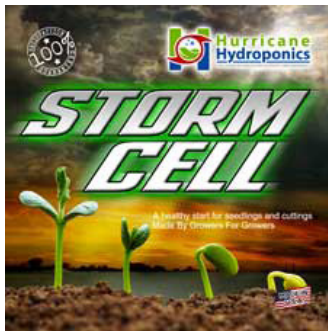
Use of the Hurricane Hydroponics' TROPICAL STORM 3-part system is an ideal nutritional system to use following a STORM CELL feeding system. It provides growers with a stable fertilizer base consisting of all essential minerals needed by the plant during the vegetative growth period. TROPICAL STORM encourages aggressive root development and growth responses capable of optimizing photosynthetic, amino acid/ protein synthesis and metabolic processes to support future developmental and defense processes.

Performance Characteristics

- Easy to use, balanced, 1-part concentrated nutrient
- Can be used on various inert (soilless) mediums and propagation substrates
- Gentle on young, developing post germination, pre-vegetative growth stage plants
- Reduces potential for overfeeding
- Contains ideal concentration of macro, secondary and micro nutrients necessary for metabolic function and robust structural growth of seedlings and cuttings
- Seamless Integration with TROPICAL STORM 3-Part Vegetative Growth System

Benefits

- Enhanced plant and root growth without oversteering plants
- Preconditions seedlings and cutting for robust response to vegetative and flowering nutrient solutions
- Optimizes opportunities for successful production
- Helps prevent nutrient burn
- Boosts early stage photosynthetic production. Reduces the risk of plants turning yellow
- Encourages optimum growth



**Give your crops a chance
to show what they can do.**



WWW.HURRICANEHYDROPONICS.COM
1.888.358.5278
SUPPORT@HURRICANEHYDROPONICS.COM