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Production

Nutrition Of Bedding Plants

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Adequate and balanced nutrition is important for your bedding plants to maintain a sturdy growth. Regular fertilization coupled with somewhat later sowing will reduce the length of time the crop is handled, therefore reducing the cost while maintaining or increasing the quality.

I would like to discuss individual nutrients, their role in nutrition, and sources of these nutrients from various fertilizers.

NITROGEN

This is the key element in plant growth. It may exist in inorganic or organic forms. Inorganic forms may be more familiar to you, because most of the commonly used fertilizers contain them. Inorganic nitrogen exists in three different forms: ammonium (NH_4+), nitrite (NO_2-) and nitrate (NO_3-). The ammonium and nitrate forms predominate, while nitrite may also be present in traces. Nearly all plants absorb most of their nitrogen as nitrate. For this reason, measuring the amount of NO_3- is helpful in evaluating their nitrogen status.

Nitrite nitrogen is toxic to plants in very small quantities (eg. 5 ppm). I would like to elaborate on nitrites, because up to 25 ppm have come to my attention in greenhouse soils in Alberta. Such a high content of nitrite has been traced to steaming. If the soil is steamed, then stacked in large piles in a moist condition, there is considerable danger of formation of nitrites. This is particularly true if manure is used. The reason is that the proteins and amino-acids present in the manure are converted to ammonium through microbial activity.

The ammonium is changed to nitrites, then quickly to nitrates, again through microbial action, under conditions of good aeration. However, if the soil is unduly moist, there won't be enough oxygen for the conversion of nitrites to nitrates. The soil, therefore, should neither be stacked in large piles or piled in an unduly moist condition. Tile or perforated pipe should be placed at intervals in the soil pile to permit air to enter.

Ammonium nitrogen is also absorbed by the plants. It may be more toxic in acid or alkaline soils than in nearly neutral soils. Another thing to watch for is the use of hydrated lime, which may release toxic amounts of ammonia gas.

Now let us consider how **deficiency or excess of nitrogen** affects your bedding plants. As a general rule too little means starved, yellowish plants, and too much means soft growth. A **deficiency of nitrogen** appears as 1) a general light green to yellow color of the foliage; 2) reduced rate of growth; 3) hardy and woody stems and 4) small leaves. Flowering is also reduced on many plants.

An overabundance of nitrogen in the soil raises the soluble salts, and the plant symptoms will appear as they would with an excess of soluble salts. Yellowing of the upper parts of the plant, marginal leaf burn, and wilting are symptoms.

Inorganic Nitrogen Fertilizers

The most common nitrogen sources include ammonium nitrate (34-0-0); ammonium sulfate (21-0-0), calcium nitrate (15.5-0-0), and potassium nitrate (12-0-44). At this point I would like to mention what these numbers mean. The first number indicates the percentage of elemental nitrogen (N). The second number indicates the percentage of phosphorus in the oxide form (P_2O_5). The third number stands for potassium, expressed as the oxide (K_2O).

These inorganic nitrogen fertilizers are completely soluble in water and become available to the plant as soon as they are applied to the soil. An advantage to their use is that the amount of nitrogen available to the plant can be measured by soil tests.

PHOSPHORUS

Phosphorus has been called the "key to life" because of its role in most life processes. In plants, phosphorus has many functions, including: cell division; flowering and fruiting; maturation; root development and starch formation. Deficiencies of this element are very common in bedding plants, especially if growers have used a clay type of soil in their mixture. Added phosphorus can be fixed by clay and also by calcium, if soil pH values exceed 7.0.

The symptoms of phosphorus deficiency are a purplish color of the petiole and main veins on the underside of the older leaves. Similar symptoms are noted when plants are grown at too cool a temperature, limiting either phosphorus absorption by the roots or metabolic activity in the plant. Marigolds, petunias, and tomatoes show symptoms of phosphorus deficiency quite readily. On the other hand, excessively high quantities of phosphorus may induce certain micronutrient deficiencies, particularly those of zinc and copper.

The most commonly used phosphorus fertilizer for preincorporation is 20 percent superphosphate (0-20-0). This material is preferred over triple superphosphate (0-40-0 or 0-46-0), because it supplies sulfur as well as calcium and phosphorus. 11-48-0, 11-52-0, and 20-20-20 are other commonly used soluble phosphatic fertilizers.

POTASSIUM

Potassium (K) or potash (K_2O), as it is known to many growers, is an element needed in relatively large amounts by plants. It has many functions in plants. It plays an important role in photosynthesis, carbohydrate metabolism and translocation, and disease resistance and quality.

An important point about potassium is that it is held relatively loosely in the soil by the negatively charged sites on organic matter. This means that potassium is likely to be leached from soil mixes more rapidly than calcium or magnesium. For this reason, the potassium status should be checked by periodic soil testing. It is also important to mention that high soil levels of magnesium and/or calcium decrease the plant's ability to obtain potassium.

Adequate quantities of potassium are either mixed with the soil in dry form or used periodically as a liquid application. The deficiencies of this element are not likely to

occur in bedding plants. However, do learn to recognize potassium deficiency. The symptoms first appear on the older leaves as an interveinal chlorosis near the leaf margins. In some plants, the first sign of potassium deficiency is a white speckling or freckling of the leaf blades. The chlorosis develops from light yellow to tan, becoming brown, and finally drying to a "scorch." High soluble salt levels may increase the severity of potash deficiency symptoms. These symptoms are sometimes also evident in young leaves.

Common soluble potash fertilizers are Potassium nitrate 12-0-44, 0-0-62, and 20-20-20. Fertilizers like Potassium sulfate 0-0-50 are more suited for use for dry application.

CALCIUM

Enough quantities of calcium-containing fertilizers are incorporated into soil mixes so that a deficiency of calcium is unlikely to occur in your bedding plants. However, a low soil pH can cause a calcium deficiency. Where the acidity of the soil mixture is slightly less than pH 6.0, it is recommended that agricultural lime or dolomitic limestone be added.

MAGNESIUM

Magnesium is necessary for chlorophyll formation and also plays a role in the phosphate metobolism of plants. Imbalance between magnesium and calcium leads to magnesium deficiency. Deficiencies of this element have not been observed on young bedding plants in southern Alberta, but in case it occurs, one spray application of 10 pounds of magnesium sulfate (Epsom salts) per 100 gallons of water should be enough for the plants. The deficiency symptoms are recognized on newly mature leaves as a loss of green color between the leaf veins, followed by increasing chlorosis. This may start at the leaf margin or tip and progress inward between the veins. The leaves curl in some plants and premature defoliation may occur.

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MICRONUTRIENTS

Iron, copper, zinc, manganese, boron, and molybdenum are called micronutrients because they are needed in very small quantities. Their availability to plants is affected more by soil pH than by any other single factor. Excessive levels of iron, manganese, zinc and copper seldom occur above pH 6.0, and deficiencies are unlikely to develop below pH 7.0. Thus, deficiencies or excesses of most of the micronutrients can be corrected by adjusting soil pH.

Iron deficiency is bedding plants has been observed. It is very seldom due to a lack of iron in the soil. It may be caused by many factors including incorrect pH, low temperature, lack of aeration (too much water), nematodes, salt toxicity, or anything that interferes with normal root health.

A foliar spray of Iron Chelate at 4 ounces per 100 gallons will help the plants stay healthy, while correcting the condition which caused the deficiency.

COMPLETE FERTILIZERS

After the seedlings have emerged in the seed flat and/or the young plants become established in the transplant container, complete fertilizers can be applied. Dry fertilizer is more difficult to apply uniformly than liquid, but it can be done. It is important to wash off any dry fertilizer from the leaves or flowers immediately following applications since burning will generally occur. Examples of more popular analyses of dry fertilizers are 5-10-5, 5-10-10, etc., which can be broadcast over plants in flats or other container-grown stock at two to three pounds per 100 square feet.

Applying fertilizers in a liquid form is by far the easiest method of application. There are many analyses available, all rather high in fertilizer nutrients. Examples are 10-52-17, 10-40-10, 20-20-20, 15-30-15, etc. Any of these soluble fertilizers, when used according to the manufacturer's instructions, will supply the necessary elements at more than the minimum needs. There is no one particular analysis that is superior, nor is there any specific analysis for an individual plant species. Wash off liquid fertilizers to prevent burning of the leaves or flowers.

Whether the fertilizer to be applied is in dry form or in liquid form when purchased makes no difference as to its effectiveness.

SLOW RELEASE FERTILIZERS

These types of fertilizers provide nutrients over a period of time. They can either be mixed in the soil or applied as a top-dressing. This makes it necessary only to water the soil rather than apply dry or liquid fertilizer periodically. The most popular slow release fertilizers are Osmocote and MagAmp. Osmocote 14-14-14 will last from three to four months. MagAmp 7-40-6 will also last for three to four months, which is long enough for the majority of bedding plants sold in flats or smaller containers. MagAmp and Osmocote must be mixed uniformly in the soil; otherwise, some plants may get too little fertilizer and others more than desired.

The MagAmp is pelletized and slowly dissolves in the soil. Use ten pounds per cubic yard. This material may be mixed with the soil prior to steam sterilization, since heat has not been found to accelerate the process of dissolving the fertilizer. It is also safe to mix the materials in a supply of soil three to four weeks prior to use. If an overdose is applied, there is no method of removing the fertilizer from the soil other than by very thorough watering each time the soil requires water.

The Osmocote fertilizer is resin-coated and depends upon soil moisture penetrating the granule to put the fertilizer in solution. As water continues to enter, the fertilizer solution is "squeezed" out. Mix 13 pounds per cubic yard of the 14-14-14 formulation or 10 pounds of the 18-9-13 formulation. Unlike MagAmp, the Osmocote should not be mixed with the soil prior to steam sterilization, since heat accelerates the process of release, causing the fertilizer content of the soil to be too high for the young plants. Similarly, do not mix the material in soil that will not be used within a few days, because Osmocote will start releasing fertilizer as soon as it comes into contact with moist soil. Mixing devices that have a hammer-mill type action have been found to break and crack the coatings. Therefore, mixers that give this type of action should not be used.

If fertilizer is to be injected in addition to using either MagAmp or Osmocote, it is recommended that half the rate of MagAmp or Osmocote stated above be used.

DEFICIENCY SYMPTOMS OF SOME NUTRIENTS IN BEDDING PLANTS

Following is a simple description of nutrients' deficiency in bedding plants. It may help you in an early diagnosis.

Nitrogen:	Leaves and plants yellow and small.
Phosphorus:	Leaves dark green, may turn purple with tip burn.
Potassium:	Tips of older leaves chlorotic; may spread over entire leaf.
Calcium:	Stunted growth, poor roots.
Magnesium:	Interveinal chlorosis; premature defoliation.
Sulfur:	Pale green leaves, particularly on young ones.
Iron:	Interveinal chlorosis on new growth.

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Please make your room reservations for the conference early. EPCOT will bring thousands into the city and accommodations will be scarce if you do not plan ahead.