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Starter Solutions The Use Of Concentrated Fertilizers On Vegetables, Flowers, Fruits
And Ornamentals

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Starter Solutions

**THE USE OF CONCENTRATED
FERTILIZERS ON VEGETABLES,
FLOWERS, FRUITS AND
ORNAMENTALS**

●

By **STAFF MEMBERS**
of the
DEPARTMENT OF HORTICULTURE

●

**MICHIGAN STATE COLLEGE
COOPERATIVE EXTENSION SERVICE
EAST LANSING**

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STARTER SOLUTIONS

The Use of Concentrated Fertilizers on Vegetables, Flowers, Fruits, and Ornamentals

Water-soluble formulations of chemicals that contain over 50 percent of at least two of these nutrients—nitrogen (N), phosphate (P_2O_5), and potash (K_2O)—may be classified as “starter solution” fertilizers. These products are often superior to lower analysis fertilizers for flower, fruit and vegetable plants under special conditions or at certain stages in their development. They may cost several times as much per unit of plant nutrient as regular fertilizers and therefore are generally not recommended in large-scale, field operations.

Advantages of Concentrated Fertilizers

Greater Solubility in Water—

Starter solution fertilizers will dissolve completely in soft or low-lime water. In hard water, cloudiness may appear from precipitation of phosphate in the fertilizer by calcium in the water. To partially avoid this, the fertilizer may first be dissolved in rain or distilled water at the rate of one pint (pound) per gallon. One cup ($\frac{1}{2}$ pint) of this concentrated solution is then added to a gallon of water. The final dilution should approximate 3 pounds of fertilizer per 50 gallons of water.

By using fertilizers properly diluted in water rather than in the dry form, the tendency to over-fertilize with possible injury to tender plants is avoided. More thorough and even application to plant roots, especially at transplanting, is possible.

Greater Availability of Plant Nutrients—

Fertilizers in solution are immediately absorbed and utilized in promoting new growth of roots and tops. It has been repeatedly observed that plants receiving a starter solution at transplanting have a higher survival rate, and show renewed growth earlier, than plants which receive only water.

Less Accumulation of Harmful Salt Residues—

Low analysis fertilizers with less than 30 to 40 percent of N - P_2O_5 - K_2O are formulated with salts, a major portion of which is not required in large quantities by plants. These salts accumulate in the soil. Concentrated, water-soluble fertilizers contain a higher proportion of nutrients which are readily absorbed by plant roots, so that less residue is left in the soil after their use.

A high salt content in the soil solution increases the energy required to absorb water and may partially prevent the absorption of nutrients essential for best growth. Water moves into the plant quite easily if the salt content of the soil solution near the plant roots is relatively low. If it becomes fairly high, water absorption is reduced and growth is retarded.

If soluble salts become extremely high through the application of excessive fertilizer, water moves out of the plant, the crop wilts, and may finally die. Greenhouse operators have long been aware of the danger of building up high concentrations of salts in soils that are not leached by rainfall. Many have found it expedient to use only highly concentrated fertilizers to reduce salt accumulation to a minimum.

Uses for Starter Solution Fertilizers

In Plant Growing—

Growers of vegetable and flower plants for transplanting—in order to avoid spindly, tender plants—frequently use insufficient fertilizer. Plants become tough and woody and are so over-hardened that renewed growth is delayed when they are transplanted out-of-doors. The application of soluble fertilizer of the proper formulation during watering will avoid both of these troubles and produce plants with stocky, normal growth. For renewed and rapid growth of transplants, it is particularly advantageous to apply fertilizer in water to bedded, flatted, potted or banded plants 48 to 72 hours before field setting. Application should be equivalent to an ounce of fertilizer to 6 to 12 square feet of plant bed area.

In Greenhouse Crop Production—

Where excess salt residues are or may become a problem, concentrated soluble fertilizers should be applied either dry or through the watering system to greenhouse vegetables or flowers. The analysis should vary depending on the crop, its stage of development, temperature, season and amount of sunlight. The rate of application is reduced by one-half to two-third of the quantity of regular fertilizer that would otherwise be used.

In Transplanting—

Unless over-fertilized during an earlier stage of growth, transplanted annual crops and strawberries will be markedly benefited by the use of one ounce (two level tablespoons) of fertilizer per gallon of water at the time of field setting. Earlier maturity, higher quality and greater yields result. Observations have indicated that fruit trees are frequently aided in early growth by the addition of potash solutions, and occasionally by nitrogen, at time of planting. Woody ornamentals should also respond to starter solutions if planted in the early spring or late fall. The amount of starter solution will vary from less than one-half pint for small vegetable and flower seedlings to a gallon for large trees.

In Irrigation of Established Crops in the Field—

Starter solution fertilizers may be added to irrigation water by inserting an intake between the pump and the surface water source, or by injecting the fertilizer into well water. Most of the fertilizers listed at the end of this folder are suitable for application through irrigation systems and are generally cheaper than formulated brands. Nitrogen and potash chemicals are usually more effective than phosphate materials when applied through irrigation systems, because they are able to move more readily into the root area of the soil.

In Foliage Application—

Plants will absorb nutrients through their leaves. However, greater care must be exercised in using starter solutions on the foliage than in applying them to the soil. A level tablespoon (one-half ounce) per gallon of water may be safely sprayed on most crops.

In Home Gardens and Grounds—

The cost of concentrated soluble fertilizer is not as important to the home gardener as to the commercial grower. Although home gardeners may use liquid fertilizers and special formulations containing various minor elements, vitamins, and growth substances which purportedly stimulate plant growth, the extra cost is seldom justified. Commercial growers are advised to buy soluble concentrated fertilizers on the basis of their N - P₂O₅ - K₂O contents—not on the claims of the manufacturers of many specially fortified products, which may be doubtful.

A home gardener is often justified in using concentrated soluble fertilizers in small gardens and on perennial plantings around the house, because he is frequently handicapped by lack of adequate tools for properly incorporating dry fertilizers into the soil. Applying fertilizer solutions through a garden hose or with a watering can is much less work than spading or hoeing dry fertilizer deeply into the soil. Excessive amounts of high nitrogen materials should be avoided on most fruiting and flowering crops.

An application to total one pound per 100 square feet may be made at several stages of growth through the garden hose or with a watering can. About one-half to one ounce (one to two level tablespoons) of fertilizer per gallon of water is recommended.

Concentrated Fertilizer Materials and Formulation

There are hundreds of concentrated fertilizer formulations. Growers are advised to make their choice primarily on the basis of the cost of their nutrient contents. Listed below are compounds that can be procured from many chemical companies and fertilizer distributors. They may be used separately where complete N - P₂O₅ - K₂O mixtures are not warranted or desired.

Soluble Chemicals for Concentrated Fertilizers —

Chemical Name	Percent Composition		
	N	P ₂ O ₅	K ₂ O
Urea	46
Nitrate of Potash.....	13.5	..	46.5
Di-Ammonium Phosphate.....	21	54	..
Mono-Ammonium Phosphate....	12	61	..
Mono-Potassium Phosphate	52	35
Muriate of Potash.....	61

Readily Soluble Formulations —

A few formulations are listed below. Agricultural-grade chemicals may be procured in quantity at prices that make home-mixing feasible; however, commercial sources are usually as economical.

A. 10-52-17 — A high phosphate formulation for use in plant growing and as a starter solution at transplanting for tomatoes, peppers, and strawberries, etc. Use 1 ounce per gallon.

50 lb. Di-Ammonium Phosphate
50 lb. Mono-Potassium Phosphate

Approximate cost of materials \$15.00 per 100 pounds.

B. 16-33-16 — A medium phosphate formulation for use in plant growing and in transplanting cabbage, cauliflower, celery, cucumbers, melons and most annual flowering plants.

10 lb. Urea
35 lb. Nitrate of Potash
55 lb. Mono-Ammonium Phosphate

Approximate cost of materials \$12.50 per 100 pounds.

C. 24-20-15 — A high nitrogen formulation prepared from highly soluble materials for use on lawns, for some crops on sandy soils requiring an abundance of nitrogen, through irrigation or foliar feeding.

34 lb. Urea
33 lb. Potassium Nitrate
33 lb. Mono-Ammonium Phosphate

Approximate cost of materials \$11.50 per 100 pounds.

D. 15-15-30 — A high potash formulation for use on ornamentals and fruit trees at transplanting where phosphorus has proved to be of little benefit and nitrogen should be kept fairly low to avoid succulent growth in late fall.

17 lb. Urea
30 lb. Potassium Nitrate
26 lb. Mono-Ammonium Phosphate
27 lb. Muriate of Potash

Approximate cost of materials \$10.00 per 100 pounds.

Partial List of Commercially Formulated Concentrated Fertilizers —

Products of some fourteen companies are listed as representative of those offered by the fertilizer industry. Neither mention nor order of appearance is meant to imply any endorsement by Michigan State College.

GROUP I. HIGH PHOSPHATE FORMULATIONS.

Take Hold	10-52-17	Victor Chemical Works, Chicago 4, Ill.
Armour's A.S.P.F.	15-52-9	Armour Fertilizer Works, Chicago Hts., Ill.
Bonro	10-50-10	Swift and Company, Hammond, Ind.

GROUP II. MEDIUM PHOSPHATE MIXTURES.

Kap Co #1	15-30-15	Kelley Agricultural Products, McKeesport, Pa.
Plant Prod	15-30-15	Plant Products Company, Blue Point, N. Y.
Nu Way	15-30-15	Nu-Way Plant Food Company, Streator, Ill.
Dixco	15-30-15	Marion Chemical Company, Marion, Ohio
Hy-gro	13-26-13	McCormick and Company, Baltimore, Md.
VHPF	6-25-15	Miller Chemical & Fertilizer Corporation, Baltimore, Md.
Instant Vigoro	19-28-14	Swift and Company, Hammond, Ind.

GROUP III. FORMULATIONS OF APPROXIMATELY EQUAL N - P₂O₅ - K₂O.

Folium	20-20-20	Monsanto Chemical Company, St. Louis, Mo.
Nurish	20-20-20	Naco Fertilizer Company, Findlay, Ohio
Gro-Stuff	20-20-20	American Chemical Paint Company, Ambler, Pa.
Kap Co #3	20-20-20	Kelley Agricultural Products, McKeesport, Pa.

Dupont S.P.F.	19-22-16	E. I. Dupont de Nemours and Company, Wilming- ton, Del.
Ra-Pid-Gro	23-21-17	Ra-Pid-Gro Corporation, Dansville, N. Y.

Most of the above can be purchased in 1- to 5- or 50-pound packages.

There are many other formulations available in small package, bottled, or tablet form useful to the home owner with a few shrubs or potted plants. They are convenient to use and generally satisfactory, but too expensive for growers with sizeable plantings.

Liquid fertilizers for field application appear to be moving into volume production. To be competitive they should sell for the same price as dry materials on a plant nutrient basis. For example, 8-16-8 liquid fertilizers should cost four times as much per gallon as 16-32-16 dry fertilizers cost per pound. They will be as suitable as the dry materials for all uses suggested in the folder. On the basis of the above analyses a quart of liquid fertilizer will be equal to a pound of dry material and should be diluted 32 to 1 before using.