Planting

Soil Fumigation

Soil fumigation has an important role in controlling damping-off and other diseases, insects, weeds and nematodes in seed-beds and greenhouses.

The following rules must be followed to achieve satisfactory results:

1. The soil temperature at 15 cm depth must be 13°C or higher for successful treatment with most chemicals.
2. Soil must be in a loose condition so that penetration is complete. Sods, lumps and organic materials must be thoroughly broken up.
3. If organic materials (manure, compost, etc.) are to be used, they must be incorporated before treatment so that recontamination does not occur.
4. The soil must be moist, but not wet.

When soil is sterilized with steam or fumigated with chemicals, the number of soil microorganisms is greatly reduced for the first few days, then it rises and eventually exceeds that of untreated soil. The sterilizing or fumigating destroys a large part of the dense population of soil microbes, and the first organisms to return after treatment meet no severe competition. Thus, if plant pathogens are among the first to recolonize the soil, they develop rapidly and cause severe disease losses. It is therefore important to the grower that every effort is made to prevent disease organisms from gaining entrance to the soil. Pathogens can gain entrance to the soil by:

1. Planting infested seeds or plants.
2. Wind-blown or water-splashed pathogens.
3. Irrigating with dirty water.
4. Movement of infested soil.
5. Using contaminated tools, containers, footwear, etc.

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Basamid

Basamid controls nematodes, root diseases, soil insects and some weeds. Distribute 30 to 50 g/ m^2 or 325 to 500 kg/ ha (130 to 200 kg/acre) evenly on the soil surface. This can be done by hand (wearing rubber gloves) or by means of a fertilizer spreader. Incorporate to a depth of 15 to 20 cm and seal the soil by irrigation and packing or by covering with plastic sheets. The soil must be aerated before seeding can take place.

Note: The amount of time required for fumigation and aeration of the soil depends upon the soil temperature. Follow manufacturer's directions. Do not use when soil temperatures are below 6° C.

Vapam

Vapam will control a wide range of diseases, nematode, weeds and other soil pests. For nematode and disease control, the pest must be in the treatment zone and soil temperature should be from 16º to 32º C. Weed control results will vary. Weed control is better if the soil temperature is over 16º C and if high rates are used.

Rates vary from **Vapam**: 550 to 900 L/ha (220 to 360 L/acre); **Vapam HL**: 410 to 670 L/ha (165 to 270 L/acre). Before injecting **Vapam /Vapam HL**, cultivate thoroughly and keep the soil moist. Immediately after application, irrigate with 40 L water/10 square metres to seal the surface. The low rate is often recommended for good disease and nematode control and some weed suppression. Higher rates are recommended in high organic matter soils but not in light, sandy soils. Very high rates may upset the soil microorganism population resulting in seedling injury due to a temporary nitrite or ammonia buildup.

Three weeks is the recommended time from application to planting. Before planting, soil samples from three inches below the soil surface should be taken from several locations for germination tests to ensure that there are no harmful residues. **Vapam /Vapam HL** breakdown is slower in cold wet conditions, in which case a longer aeration period is required. Consult the label and the distributor or applicator for more information.

Seed Treatment

General

Most seeds should be treated with a protectant fungicide to protect them against decay in the soil and damping-off of young seedlings.

In addition to this, certain kinds of seeds require special treatment to kill any parasitic fungi or bacteria that may be present in or on the seed, unless the seed has already been treated by the seed company. An insecticide-fungicide mixture seed treatment should not be applied more than three months before planting.

For methods of application and quantities to use, see label directions on container. Nearly all seed treatments recommended are made up in two ways—(a) for dust treatment and (b) for slurry. **The slurry treatment is safer for the operator and gives better coverage**.

Treat seed in a separate location removed from livestock, feed and crop storage areas.

To ease the flow of seed through drills or planters, add 25 g of graphite per 20 kg of seed.

Note: *Seed treated with either fungicides or insecticides must not be used for food or fed to livestock.*

Seed treatment with fungicides and insecticides does not necessarily ensure freedom from all plant diseases and insects, but it is one effective means of ensuring a clean start.

Hot Water

Certain vegetable crops such as tomato, pepper, eggplant, spinach, cole crops and rutabagas can be freed of seed-borne diseases by hot-water-seed-treatment. In most cases, hot-water-treated seed can be purchased from your seed supplier.

Chemical

Insect Control: Large-seeded crops including **beans, corn and peas** should be treated with an insecticide registered to control seed corn maggot.

Disease Control: All vegetable seeds should be treated with a registered fungicides to reduce losses due to seed decay and damping off.

Most vegetable seed is pre-treated by the supplier. If it is necessary to treat your own seed, use commercial seed treatments according to the manufacturer's directions.

Vegetable Transplants

(Adapted from Ontario Vegetable Production Recommendations, 2006-07, OMAFRA Publication 363. © Queen's Printer for Ontario, 2006. Reproduced with permission.)

Trays

Most commercial vegetable transplants are grown in plastic trays, usually in the range of 30 to 288 cells per tray. Various types and sizes are available. In general, larger cells are used for early crops. They produce a bigger, more mature transplant, resulting in earlier yields. They are also more expensive to produce. Smaller cells are used for mid-to-late season crops. They are cheaper to produce, but smaller cell volume makes water and nutrient management critical

Tray Disinfection

For transplants grown under contract, the terms may specify that new trays be used for each crop. In other cases, growers may choose to use trays for more than one season. To prevent contamination from field soil pathogens, do not take trays of transplants out to the field for planting out. Instead, pull the plants in the greenhouse and place them in tubs that will fit onto the transplanter.

Trays must be thoroughly sanitized before being reused. They must also be structurally and chemically able to withstand both the disinfection treatment and another season of handling. There are two effective options to sanitize used trays:

Solarization

Stack trays and cover them with cloth or plastic. Leave them in the greenhouse during the summer. The heat will super dry the disease organisms, while allowing some non-disease organisms to survive to act as biological control agents. Use square-celled trays, to minimize the amount of growing media left in the trays from the previous use.

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Chemical Disinfectants

Wash trays individually to remove particles of growing media. After washing, it is accepted practice to wash, dip or spray trays with a solution of **D.C.D.** or **Virkon** according to manufacturer's recommendations. Chlorine bleach can also be used.

Caution: Bleach residues on trays can damage the seedlings. Dipping bulk lots of trays into a cleaning solution has not proven successful.

Although not recommended by OMAFRA, a disinfectant such as a quaternary ammonium compound (QAC) could also be used as a tray disinfectant. Choose a QAC which is a registered product that is hard water tolerant, has organic tolerance (*i.e.* works in the presence of some organic residues), is safe on equipment and has been developed for use in an agriculture environment.

Propogation Media

A soil-less medium is recommended for germination and growing of vegetable transplants.

Growing media must be:

- sterile (free of insects, pathogens, nematodes, weed seeds)
- uniform
- well-drained
- lightweight
- convenient for storage and handling
- non-crusting
- able to hold water well
- free of large pieces of bark or twigs

Commercial mixtures

Available mixes, generally, contain peat moss, perlite, vermiculite and a wetting agent. Some also contain fertilizer (nutrient charge). The fertilizer content of different mixtures may vary greatly. It is important to know the nutrient content of the growing media in order to manage the fertilizer program. Avoid mixtures containing slow-release fertilizer or high nutrient charges. They can restrict the flexibility of a fertilizer program.

Alternatively, growers can prepare their own mix. One example is as follows:

Sphagnum peat moss	1.0 m^3
No. 3 vermiculite	1.0 m^3
Dolomite lime # 65	4.0 kg

For best control of plant growth and hardening, no fertilizer should be added to the mix. Fertilize as required at each watering with a complete, dilute nutrient feed such as 0.5 to 1.0 g/L of 20-20-20 (with minor nutrients). See Management During Growth and Development Fertility section (this chapter) for more details.

Wetting of dry peat moss is a slow process and is more easily accomplished using hot water or a wetting agent. Once thoroughly wet, the peat moss will absorb water rapidly in subsequent irrigations.

Seeding and Germination

Vegetable transplants are generally sown one seed per cell, usually at a depth of about twice their diameter. Aim for quick, uniform germination. Best results can be obtained by:

- watering trays with warm water (27°C - 28°C) immediately after seeding
- placing trays in a germination chamber, maintained at the optimum temperature for that crop
- moving trays out of the germination chamber as soon as the seed coat has cracked and the shoot begins to emerge

Management During Growth and Development

It is difficult to raise multiple crops within the same greenhouse if they have different environmental requirements (temperature, ventilation, light, water, fertility). If possible, grow crops with dissimilar requirements in different areas of the greenhouse where they can be managed as required.

Temperature

Warm-season vegetable crops such as tomatoes, peppers, eggplant and vine crops are susceptible to chilling injury when the transplants are exposed to temperatures above freezing, but below 10°C for an extended period of time. Chilling causes stunting of growth and can have long-lasting effects on field establishment and fruit set.

Where possible, place warm season crops close to or over heating tubes, to give them a warmer environment. Try to situate cool season crops (*i.e.* rutabagas and cole crops) closest to ventilation windows in the greenhouse.

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Watering Transplants

Plug transplants should be watered thoroughly in the morning and "spot watered" as necessary in the afternoon. Avoid watering late in the day, as disease problems increase when plants remain wet overnight. Use chlorinated water if possible. Disease organisms can be present in surface or wellwater sources. Water should be in the 15°C - 20°C range to prevent shocking the plants.

The amount and frequency of watering will vary depending on cell type, growing media, greenhouse ventilation and weather conditions. **Water thoroughly and moisten the entire plug, to promote root growth to the bottom of the plug.** Allow the plug to dry down before watering, but do not let the plant wilt severely.

Fertility

Vegetable transplants are usually fertilized with soluble fertilizer, applied in the irrigation water. Use fertilizers that supply most of the nitrogen in nitrate form. Avoid fertilizers with a high concentration of urea.

A high concentration of phosphate (P_2O_5) may promote excessive seedling elongation. Use a fertilizer with a low-to-medium phosphate concentration, or use a fertilizer with no phosphate for most feedings and apply a high-phosphate fertilizer once every four or five feedings to promote growth. Do not withhold phosphate completely, as this will delay field establishment.

Vegetable crops vary in their response to fertilizer. The feeding program must be modified for different crops. Adjust the fertilizer program based on the nutrient content of the growing media, the water analysis and the cell size (large cells require less fertilizer).

Toxicities and Deficiencies

Nutrient deficiencies are more common than nutrient toxicities. Many growers are very cautious about overfertilizing for fear of "burning" the roots or stems.

Phosphorus-deficient transplants show very definite purple colouration along the stem and underside of leaves. Plants that have too little nitrogen will have pale-green foliage. Too much nitrogen will result in very white stems and dark-green leaves.

Hardening-Off

Prepare transplants for the harsher environment of the field by hardening them off. This is especially important for early-season plantings.

Reduce greenhouse temperatures to harden-off transplants. Warm-season crops should not be hardened at temperatures below 13°C. Cool-season crops can be hardened at lower temperatures. Certain cole crops can be susceptible to "bolting" or "buttoning" in the field if the transplants are exposed to prolonged temperatures below 10°C.

Slightly reduce water, as part of the hardening process. Do not let plants wilt excessively. They must be actively growing for good field establishment. Increasing air movement around the transplants assists in the hardening process.

If there is no risk of frost, consider holding plants outside for several days before field planting. This allows them to become acclimated to field conditions while they are still in their trays. Select a location that is exposed to full sunlight but is protected from drying winds. Check plants regularly and water as required.

Do not harden off plants by withholding fertilizer, as this can result in nutrient deficiencies and delay field establishment. Slow-to-establish plants are more susceptible to insects, diseases and poor growing conditions.

Disease and Insect Management

The primary means of controlling disease on vegetable transplants is by seed treatment, sanitation and by managing the greenhouse environment to suppress disease development. See the Seed Treatment section (this chapter) for more information.

Certain transplant or greenhouse crops should not be raised in close proximity, as one may act as a source of disease or as an alternate host for insect vectors. Avoid growing tomato transplants close to greenhouses used for flowers or greenhouse cucumbers. Pepper and tomato transplants should not be raised in the same greenhouse complex.

Insects such as aphids and thrips may transmit disease into and within the greenhouse. To monitor for thrips and aphids, hang sticky traps close to the seedling canopy.

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Herbicide Injury

Sprayer equipment dedicated to herbicide use should not be used to apply fungicides or insecticides. Herbicide contamination may cause serious damage to greenhouse plants.

Avoid herbicide spraying of weeds outside the greenhouse during the growing season. Herbicide mist or fumes may drift or be drawn into the greenhouse. Transplant trays left outside on headlands may be inadvertently sprayed. Trays stored near herbicides can also absorb fumes. Once contaminated, trays cannot be cleaned effectively.

Precision Seeding of Vegetables

Precision seeding allows growers to produce uniformly spaced crops. It reduces or eliminates thinning; it reduces the quantity of seed needed to plant a unit area and it promotes uniformity of size and maturity.

Precision seeders will only give satisfactory results if they are used correctly. Improper use will lead to poor plant spacing and low uniformity and yield.

Land Preparation

Seed beds must be of fine tilth, without trash and must be lightly packed. Excessive compaction is undesirable but a well-compacted soil allows soil moisture to rise uniformly through capillary action, thereby promoting uniform seed germination.

Graded Seed

When using non-pelleted or "raw" seed, it is essential that the seed be graded by size. Some suppliers can provide graded seed but grading must be within close limits. When using the Stanhay seeder, the largest seed must pass easily through the holes in the belt and no more than two of the smallest seeds should pass side-by-side through the same size hole. Small quantities of seed can be graded at home or in the shop by using a series of sieves. Seed of cole crops (broccoli, Brussels sprouts, cauliflower, cabbage), radish, bean, onion, rutabagas and turnips have been successfully graded. Of these, onions present more of a problem because of their irregular seed shape.

Crops that are difficult to precision plant as raw seed include beets, carrots, lettuce, onions and parsnips. These seeds should be coated (pelleted).

Pelleted Seed

Pelleted or coated seed is available from most seed companies. Seed coatings vary in formulation and in volume applied to seeds. Most pelleted seed in an individual lot is fairly uniform in size and can be used as recommended. Pelleted seed must have a high germinating capability. Seeds with a low germination count defeat the purpose of precision seeding and should not be pelleted.

Seed Germination

Seed viability varies according to plant species, age and seed lot. Normally, pelleted seed has a germination of 80% or over. Most Brassica crops have over 90% germination but seeds of crops such as parsnips can be as low as 70%. In other words, only 7 out of every 10 seeds will produce a plant even under ideal conditions.

Field Factor

Planting conditions are seldom ideal. The soil may be too wet or too dry, too cold or too warm, too loose or too packed. If soil conditions are good, most seeds will germinate; if poor, fewer will emerge.

The field factor is used to estimate soil conditions and the effect these conditions will have on seed emergence. Under ideal conditions a field factor of 0.9 can be applied. Under normal conditions a factor of 0.7 is common. Under poorer conditions the factor can be 0.5 or 0.6 or even lower.

The field factor must be applied to viable seeds only. If a germination count of 80% was given and a field factor of 0.7 applies, only 56% of the seeds sown will emerge from the ground

$$(0.8 \times 0.7 = 0.56 \text{ or } 56\%).$$

If the germination count was only 70% and the field factor 0.6, only 42% of the seed will produce plants.

If a precise stand is required under these conditions, seeding should be done with a belt that will drop 2 seeds per hole rather than just one.

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Table 5.1 Seeds Per Gram, Seeding Depth and Days to Emergence

Crop	Seeds Per Gram	Seeding Depth (mm)	Days to Emergence @ 20°C
Asparagus	50	25	15
Bean, snap	2 - 3	40	11
Beet	50	15	6
Broccoli	320	5	6
Brussels sprouts	280	5	6
Cabbage	300	5	6
Chinese cabbage	250	5	6
Carrot	900	5	7
Cauliflower	350	5	6
Celery	1800	3	7
Corn, sweet	4 - 8	40	7
Cucumber	40	20	6
Eggplant	200	15	13
Lettuce	700	5	3
Melon	40	25	8
Onion	280	15	5
Parsley	550	5	14
Parsnip	200	15	14
Pea	3 - 6	25	8
Pepper	150	5	13
Pumpkin	4	25	8
Radish	125	15	4
Rutabaga	280	5	2
Spinach	90	20	6
Tomato	350	5	8
Watermelon	10	25	12

Adapted from Ontario Vegetable Production Recommendations, 2002/03 and Knott's Handbook for Vegetable Growers, 4th Ed.

Table 5.2 Number of Plants Per Hectare at Various Spacings

	Space Between Plants Within Rows (cm)						
Space Between Rows (cm)	10	15	30	45	60	75	90
30	333,330	222,220	111,110	74,070	55,560	44,440	37,040
45	222,220	148,150	74,070	49,380	37,040	26,630	24,690
60	166,670	111,110	55,560	37,040	27,780	22,220	18,520
75	133,330	88,890	44,440	29,630	22,220	17,780	14,810
90	111,110	74,070	37,040	24,690	18,520	16,460	12,350
110	90,910	60,610	30,300	20,200	15,150	12,120	10,100
120	83,330	55,560	27,780	18,520	13,890	11,110	9,260

Reprinted from Ontario Vegetable Production Recommendations, 2002/03.

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Table 5.3 Row Length Per Hectare or Per Acre at Various Spacings

Distance Between Rows (cm)	30	45	60	75	90	110	120	150
Metres of Row Per Hectare	33,325	22,222	16,666	13,310	11,111	9,091	8,333	6,666
Metres of Row Per Acre	13,330	8,889	6,666	5,324	4,444	3,636	3,333	2,666

Adapted from Ontario Vegetable Production Recommendations, 2002/03.

Plasticulture

Many vegetable crops, especially heat-loving crops such as cucurbits, peppers, tomatoes and eggplant, can be planted and harvested earlier if plastic mulches and row covers are used singly or in combination. The use of agricultural plastics (plasticulture) accelerates early growth by increasing soil and/or air temperatures. Further advancement of the crop is achieved by using plug or soil block transplants. Fertigation is essential in plasticulture for attaining consistently good quality and yield. Growers should consider the price of plastics, fertigation equipment and the value of the crop in their decision to use plasticulture.

Plastic Mulches

In addition to raising soil temperature, plastic mulches control weeds, conserve soil moisture, and maintain the soil in good tilth. There are many types of ground-covering mulches available. Most are made of polyethylene. Clear plastics transmit solar radiation (sunlight) which heats the soil directly but enables weeds to grow. Weed growth under clear plastic reduces soil heating by absorbing and reflecting solar radiation. Weeds may also lift the mulch away from its soil anchor, and may compete with the crop for water and nutrients. In hot sunny areas such as the Okanagan, enough heat may build up under a clear mulch to kill weeds. Clear plastic mulch is not recommended for the Fraser Valley. Black plastic absorbs solar radiation then radiates and conducts heat to the soil surface. Weeds will not grow under black plastic but soil heating is indirect and less efficient than with clear plastic. Wavelength selective mulches combine the advantages of black and clear mulches. These plastics absorb the light wavelengths weeds need to grow but transmit other wavelengths that heat the soil directly. Locally available brands of wavelength selective mulch differ in their light absorption and transmission capabilities and may differ in effectiveness. Most are more expensive than black plastic. Photodegradable mulches are not recommended because a portion of the mulch remains in the soil and does not break down.

Trickle irrigation tape is installed under plastic mulch, either buried in the soil or directly on the soil surface (see "Fertigation," this chapter). The mulch should be applied over convex raised beds to help shed rainwater. Raised beds also result in improved soil drainage and higher soil temperatures. The mulch should be laid with a tractor-drawn applicator that fits the mulch tightly over the bed and buries about 15 cm of each side edge of the mulch with soil.

Commercial transplanters are available for planting plugs or soil blocks through plastic mulch. If transplanting by hand, cross cuts can be made with a blade, or holes can be melted with a propane torch.

Row Covers

Row covers placed over crops increase the canopy air temperature by preventing convective heat loss and by shielding the crop from winds. Some are also effective as a barrier to airborne insect pests. There are two types: floating row covers that are applied directly over and in contact with the crop; and mini-tunnels that are supported over the crop with metal hoops.

Materials

Row covers are manufactured of polyethylene, co-extruded polypropylene/polyamide, spun-bonded polyester or polypropylene, or woven plastic fabrics. Polyethylene covers must be slitted or perforated for ventilation. Spun-bonded, co-extruded or woven fabrics are self-ventilating. These fabrics come in several thicknesses and choice should depend on the heat and cold sensitivity of the crop.

Floating covers

These are most suited to vine crops or crops whose shoot tips are not prone to rubbing damage. Application of floating row covers should be loose enough to allow plant growth but snug enough to minimize rubbing damage in windy areas. The edges of the cover should be anchored with soil or other heavy material. A tractor-mounted applicator can be used to lay and anchor floating row covers.

Mini-tunnels

The wire hoops that support mini-tunnels should be made from No. 9 galvanized wire and should be inserted at least 15 cm into the soil. A small loop 15 cm from each end of the hoops is useful for controlling the insert depth and for securing the plastic cover. Hoop spacing should be 1 to 1.5 m, depending on the expected wind force. The tunnels are usually made of 2 mil clear polyethylene. If clear poly is used, it should be perforated after it is applied. Insufficient ventilation can result in excessive air temperatures and crop damage. Two 6 cm diameter holes on either side of the tunnel peak at each hoop will provide sufficient ventilation for most spring days. On hot days, lifting and securing one or both sides of the tunnel can provide additional ventilation.

Once placed over the hoops, the tunnel edges must be buried with soil or secured to the small ground-level loops in the hoops. Additional security may be provided by applying nylon string over the cover, zig-zagging it from one side to the other while passing it under the ground-level loops. Another method is to place additional metal hoops over the plastic. The ends of the tunnel plastic can be anchored by burying them at least 1 m away from the end hoops.

Disease and insect control

Row covers can shield crops against some flying insect pests, reducing or eliminating the need for insecticide sprays. Spun-bonded covers have provided good short-term control of cabbage root maggots and carrot rust fly.

Diseases, on the other hand, may be worsened by row covers because of the softer plant growth and restricted air circulation. Diseases to be concerned with include late blight, powdery mildew, gray mold, and white mold. For crops at risk, the covers should be lifted or removed during prolonged wet weather.

Row cover removal

Row covers must be removed at flowering from crops requiring insect pollination (cucurbits). For other crops, remove the covers when temperatures exceed the optimal for growth or fruit set, or when plants begin to push on the sides of the covers.

Frost Protection

The ability of row covers to protect plants from frost depends on the material used, the severity of the frost, and on climatic conditions. On still, cold nights, the temperature under clear polyethylene may fall below the outside temperature. The presence of condensation on the inside of the row cover will absorb some of the radiation and re-emit it downward providing some frost protection.

Crops

Plasticulture may improve production of many crops but input costs and returns must be carefully considered. Crops which have been successfully grown under plasticulture include: globe artichokes, carrots, celery, cole crop transplants, corn, cucumbers, early potatoes , early spinach, eggplant, herbs and medicinal plants, lettuce, melons, peppers (green and coloured), summer squash (including zucchini), and tomatoes.

Fertigation

Plasticulture growers should fertigate their crops to ensure good return on investment in plastic, transplants and labour. To fertigate, a trickle irrigation system is used to deliver nutrient enriched water at low pressure and flow rate to the soil at or near the root zone. By continually

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replenishing the water used by the crop, and by feeding the appropriate balance of nutrients when needed, optimum yield and quality can be attained.

A trickle irrigation system consists of a filtration system, flow meter, mainline, header lines, pressure reducing valves, and lateral lines with attached or built-in emitters. Fertigation requires an additional attachment of a chemical injector of some type. Growers should refer to the "BC Trickle Irrigation Manual" (BCAGRI), or consult with a specialist at one of the local trickle irrigation equipment suppliers for design information. A successful system design is one that considers crop characteristics, soil type, water quality, and field shape and topography.

The schedule for nutrient application should be tailored to each crop and field. A soil test is necessary to determine the requirements for P, K, Ca, Mg, S and micronutrients. Nitrogen should be applied according to crop requirements, adjusting for soil type. In general, less nitrogen is needed when it is delivered by fertigation than when it is applied as a granular fertilizer. Growers should watch their crops for symptoms of nitrogen deficiency and, when necessary, add more nitrogen to the fertigation water. Clogging or plugging of emitters can be prevented by using soluble forms of nitrogen (urea or ammonium nitrate) and by chlorinating the system once a month with a 10 to 50 ppm chlorine solution. Chlorinate more frequently if the flow rate decreases.

Crops can be trickle irrigated as needed between fertigations to ensure optimum growth and productivity. Tensiometers can be used to determine when soil moisture levels are too low. Most crops should be irrigated when the soil moisture tension reaches 25 centibars. Water should be applied to wet the entire root zone of the crop.

The following example of a fertigation schedule (Table 5.4), showing monthly injections, has been used successfully to grow cucurbits, peppers and eggplants on a silt loam soil at Agassiz. Soil tests showed deficiencies in sulfur, boron and zinc. Gypsum, at 227 kg/ha, was incorporated into the beds before mulching to satisfy sulfur and calcium requirements. Between fertigations, additional trickle irrigations were applied up to two times per week when necessary. On soils of coarser texture, injections should be more frequent but with lower rates of fertilizer at each application.

For more information on fertigation, consult the booklet "Chemigation Guidelines for British Columbia" which is available from BCAGRI and the Irrigation Industry Association of BC (IIABC), Tel. (604) 859-8222.

Table 5.4 Example of Fertigation Schedule

Date	Fertilizer	Rate (kg/ha)
May 15	0-53-34	30
	34-0-0	10-20
June 1	34-0-0	20-40
	MgSO4	60
	ZnSO4	2.2
	Solubor*	0.8
July 1	34-0-0	42-83
	Solubor*	0.8
August 1	34-0-0	20-40
	MgSO4	60
	ZnSO4	2.2
Sept. 1	34-0-0	20-40
	Solubor*	0.8
Oct. 1	34-0-0	10-20
	MgSO4	60
	ZnSO	2.2

* **Caution**: *Boron should not be applied to cucurbits unless deficiency is indicated by a soil test.*

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Cleaning Root Cellars, Storage Buildings, Bins

Where storage diseases have occurred, clean out the storage area and tote bins, removing all soil, rotted vegetable matter, etc., and drench the floor, walls, ducts and bins with one of the following:

Quaternary ammonium compounds (Quats - ie. dimethyl benzyl ammonium chloride) may be used according to the manufacturers' directions, provided the areas to be treated are first cleaned and washed.

Or **Chlorine bleach** (sodium hypochlorite). Surfaces must be cleaned first or soil will inactivate the chlorine.

Or **Hydrogen Peroxide**.

Ask your chemical supplier for their advice in choosing a sanitizer. To determine if a chemical is recognized by the Canadian Food Inspection Agency (CFIA) for use on food contact surfaces, check their website at www.inspection.gc.ca/english/ppc/reference/v1e.shtml.

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