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GROWER

NEW ENGLAND VEGETABLE AND SMALL FRUIT NEWSLETTER

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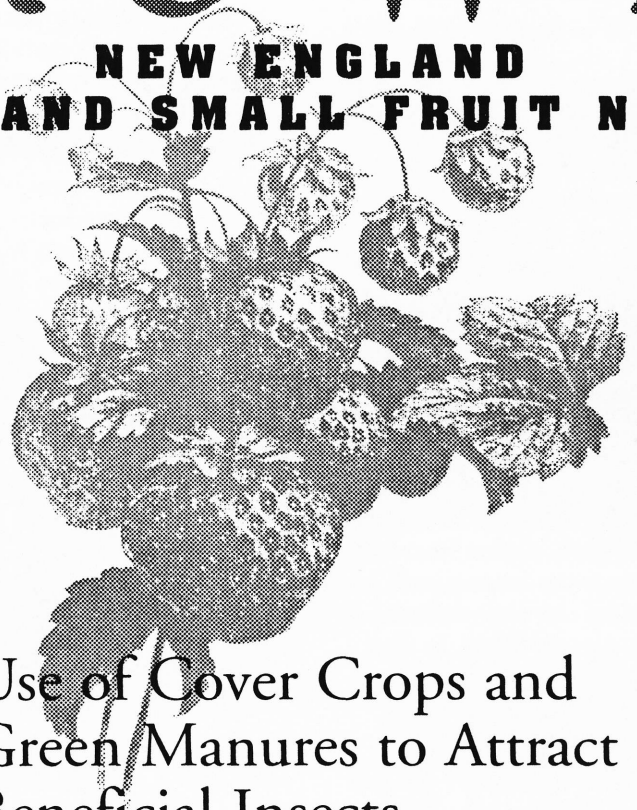

Use of Cover Crops and Green Manures to Attract Beneficial Insects

Jeremy Plotkin, Student
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Cover crops are an integral part of a sustainable vegetable system. Besides building soil fertility and suppressing weeds, they can affect a farm's insect community. Attention to the effects of cover crops on insect populations can result in improvements in insect management.

Manipulation of cover crops for insect pest control is a complicated proposition. It is never as simple as attracting beneficial insects and repelling pest insects. A given cover crop can be attractive to either pest insects or their predators for several reasons. Many cover crops provide a supplemental food source to insects in the form of nectar from their flowers. Cover crops can also provide shelter for insects. Insects

Continued

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Cover Crops

Continued from page 1

which obtain food or shelter from a cover crop can in turn act as a supplemental food source to predatory insects.

Insect interactions with cover crops can result in either positive or negative effects on the crop plant. Positive interactions include:

1. Cover crop is more attractive to pest than cash crop (referred to as trap cropping);

2. Cover crop makes cash crop more difficult to locate;

3. Cover crop is attractive to predators of insect pest; and

4. Cover crop provides nectar or other food source which sustains predator when pest insect is not present. This allows a higher population of the predator than possible on a food source of only the pest population.

Negative interactions include:

1. Cover crop provides habitat or food source for pest insect at a time when cash crop cannot support pest population and

2. Cover crop attracts predator insects away from cash crop.

Management implications are complicated by the fact that a cover crop could act as either a source, a sink or both for beneficial and pest insects. A cover crop which attracts pest insects away from a cash crop can cause disaster if mowed or plowed at the wrong time. This can cause the pests living in that field to be released into a neighboring crop field. Not mowing can be just as disastrous if the cover crop flowers and then senesces (Bugg 1992).

In spite of the complicating factors, some general strategies can be recommended. The simplest strategy is to provide a diverse array of vegetation so that the habitat for insects is as varied as possible. This can include selecting a set of cover and cash crops so that something is always flowering on the farm. Using more than one cover crop for a given cover crop niche is a good way to increase diversity. For instance, sudangrass and buckwheat are both good summer smother crops that have quite different insect associations. Rather than selecting one or the other, a grower might use both on different parts of the farm.

Another strategy is to plan cover crops so that they flower sequentially. One example is waiting until a stand of buckwheat has flowered before plowing in a rye/vetch stand. Growers could also extend the flowering season of a particular cover crop by mowing high or by mowing or plowing in portions, so as to leave some habitat in place at all times (Bugg, 1992).

Strip cropping (the practice of growing crops in adjacent strips) can do much to increase the spatial heterogeneity and to bring beneficial-attractant cover crops into closer proximity to the cash crops (Dufour and Greer, 1995).

A vegetable farmer in Wisconsin had a good deal of success in reducing insect problems by mowing less frequently and higher. He also plans to add permanent hedgerows approximately every sixty feet on his farm. This same grower estimated that twenty percent of his acreage was devoted to beneficial habitat (Cicero, 1993).

Additional levels of control can be achieved by growers who learn insect identification and monitor the population dynamics on their farm. For instance, cover crops could be planted that harbor beneficial insects and that die back or are mowed at just the time a nearby cash crop is particularly susceptible to invasion by pest species (Bugg 1992). Given the vagaries of weather and the double-edged nature of releasing insects into the system, this approach may be difficult to manage.

Insects Attracted to Common Cover Crop Species

The table below lists beneficial and pest insects that are attracted to or harbored by common cover crop types. It is important to note that beneficial and pest insect species are not absolute categories. For instance, a cover crop that supports a popula

Cover Crop	Beneficial Insects	Pest Insects
Buckwheat	Extrafloral nectaries attract parasitic wasps; ladybugs; tachinid and hover flies; and lacewings.	Tarnished plant bugs and aphids (aphids can act as a food source for beneficials).
Clovers (differences among the various clover species—see references for more details).	Parasitic wasps, big-eyed bugs, minute pirate bugs, ladybugs, tachinid flies and aphid midges.	Spider mites and flower thrips (flower thrips can prey on spider mite eggs and provide food for several predatory insects).
Hairy Vetch	Minutes pirate bugs; ladybugs; predatory and parasitic wasps.	Tarnished plant bugs.
Cereals	Ladybugs	Aphids

tion of aphids can sustain predatory insects at a time when the cash crop does not provide such prey. The aphids could also migrate to and damage the cash crop. Pest insects that can sometimes provide benefits to a cash crop are described in parentheses in the table (all information in table compiled from Bugg, 1990, Bugg, 1991, and Dufour and Greer, 1995).

Insect associations with cover crop plants provide yet another opportunity for a grower to manage pests through careful observation and attention to the details of pest populations. The simplest strategy is to plant cover crops which favor more beneficial insects than pest insects. More complicated schemes put specific cover crops next to cash crops that are benefitted by their insect associates. A high diversity of cover crop species can also help assure that there is habitat for predatory insects at all times.

Plant Species not Typically Used for Cover Crops which Attract Beneficial Insects

There are many other plant species which attract beneficial insects. Beneficial insect populations can be positively influenced by mixing some of these other species into the cover crop mix. Maintaining permanent strips of perennials at field borders, or as dividers between sections of a field, can also be advantageous. The flowers of the *Umbelliferae* family are attractive to beneficials, especially parasitic wasps. Caraway, dill and fennel all are members of that family which can be sold as herbs (Poncavage, 1991).

Many commercial flowers, especially those in the *Compositae* family (sunflowers, asters and goldenrods), are also attractive to ladybugs, pirate bugs, big-eyed bugs and spined soldier bugs. Gloriosa daisy, purple coneflower and black-eyed Susan are all examples of this family which are relatively easy to maintain in permanent beds and which are readily salable as cut flowers (Cicero, 1993). A number of beneficial-attractant cover crop mixes are commercially available (the most complete listing of them is in Dufour and Greer, 1995). A possibly cheaper alternative to these seed mixes could be to mix some flowering plant seeds into cover crop seed.

Conclusion

Both beneficial and pest insect populations can be managed through planting cover crops and other plants attractive to insects. Maintaining a healthy diversity of flowering plants throughout the farm and throughout the season can be a successful way to reduce insect pest problems. More complicated and probably more successful strategies include strip cropping and careful attention to cover crop/insect interactions. It is probably best to make cover crop decisions based on the benefits they provide to fertility and weed control, but integrating their effects on the insect community can provide one more level of control to the vegetable grower.

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Removing Customer Barriers to Buying More Fresh Product

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In May of 1996 in the Five-A-Day program, barriers to buying fresh produce were determined by customer survey and responses to eliminate or reduce those barriers were developed. A marketer can use the following information to reduce customer barriers and perhaps increase sales. The barrier will briefly be stated and some possible responses follow:

1. Boring

A. There are over 100 different fruits and vegetables in the produce section of most grocery stores, so there is a great deal of variety to choose from. There are even more options when you consider juices and dried fruits.

B. Recipe booklets on how to combine different fruits and vegetables in new and tasty ways would be a customer support.

2. Pesticides

A. Although there may be residual pesticides on fruits and vegetables, they have been found not to be harmful to humans.

B. When eating fruits and vegetables, be sure to wash them thoroughly.

C. The health benefits of fruits and vegetables far outweigh any possible risks of pesticide residue.

3. Difficult to Eat on the Run

A. Try drinking 100% fruit juices instead of coffee or colas.

B. Keep plenty of "prepackaged" fruits and vegetables on hand. Many fruits come in their own wrapping, like apples and bananas. Vegetables can be bought precut and prepackaged for easy eating.

4. Dislike/Don't Like Taste

A. There are over 100 different fruits and vegetables from which to choose. By trying these you may find some you like.

B. Try drinking fruit or vegetable juice or eating vegetables mixed with other foods such as meats or soups.

C. Make sure fruit is ripe, as it tastes better. Fruits taste better in season. Try adding fresh herbs to vegetables you don't like.

5. Don't Know How to Prepare

A. Providing recipes on how to prepare produce reduces this barrier.

B. Buy precut raw vegetables and try raw fruits.

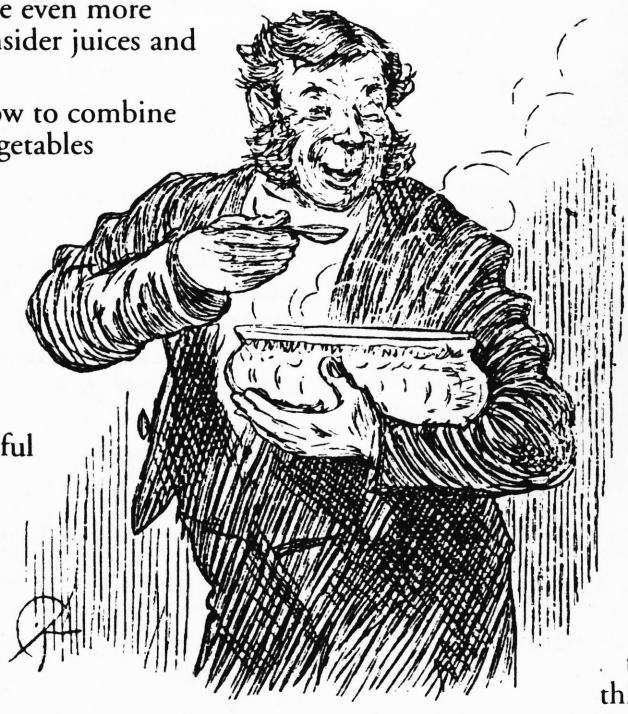
6. Too Much Effort/Too Hard

A. Try precut vegetables or dried fruits. Keep a bowl of fresh fruits in your home for easy snacking. Buy from fresh salad bars or choose menu items that come with fruits and vegetables.

7. Too Expensive

A. Substitute expensive meat items with fruits or vegetables; providing recipe booklets can be helpful.

B. Buy fruits and vegetables in season or on sale.



Try eating vegetables mixed with soups.

8. Household Doesn't Like Them

A. Ask your family to list the fruits and vegetables they do like; serve these more often.

B. Substitute fresh fruits or vegetables for "junk" foods as snacks. Sugar snap peas are an example.

C. Replace pops and colas with fruit juices.

9. Never Thought About It

A. What do you think about what I have shared with you thus far? Has this helped you to think more about eating fruits and vegetables?

B. How about setting a goal of adding just one fruit or vegetable to your diet each day? I have a booklet that will give you new ideas on how to do this.

10. Too Much Time/Planning

A. Buy precut fruits and vegetables.

B. Drink 100% fruit juices.

C. Vegetables can be microwaved. Information on microwaving vegetables can be provided.

11. Poor Quality at the Market

A. You may want to select mostly fruits and vegetables that are in season. Usually these are best buys in terms of quality and cost.

B. Try different markets such as your local farmers' market or farm stand.

12. Spoils Too Quickly

A. Buy fresh produce in the quantity that you will be able to eat in a few days.

B. Immediately after buying fresh produce, cut and store it so that you will have easy access to eating it.

C. Keep canned or frozen products on hand when you run low on fresh produce.

Salesmanship takes effort, but salesmanship will increase sales. Direct marketers can reduce consumer food selection barriers, improve diets and make the cash register jingle.

Select mostly fruits and vegetables that are in season.

Comments on the Food Quality Protection Act of 1996

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The Food Quality Protection Act of 1996 seems to be a mixed bag of blessings, curses and a few unknowns that should keep the lawyers gainfully employed for years to come.

The blessings are major ones. Gone is the Delaney clause and, with it, the notion that anything in life can be made risk free. In its place is a charge to EPA to determine that there is a certainty that no harm will result from aggregate exposure to a pesticide. Additionally, special safeguards are put in place where infants and children are concerned.

The law also provides for the establishment of uniform national tolerances (although states can choose to be stricter), movement toward international standards for residues and the expansion of incentives for minor use registrations. Also, proposed new uses for "safer" pesticides will be given expedited review under the new law.

By comparison, the curses seem minor. The situations in which the benefits of a pesticide's use may be used to justify the establishment of a tolerance are reduced. All existing tolerances must be reviewed during the next 10 years. This raises the possibility of the loss of some presently registered uses because the product does not meet the new standards or it is not sufficiently cost effective to go through the process.

Most new laws or regulations turn out to be better than the gloomiest estimates and worse then the best estimates. How we view the impact of the Food Quality Protection Act of 1996 five years from now will likely hinge on some provisions whose impacts are unknown.

Foremost among the unknowns is the provision for setting tolerances based on cumulative and aggregate effects of exposure to the pesticide and other substances with common mechanisms of toxicity. Does this apply to pesticides in the same chemical families, pesticide breakdown products, pesticides with entirely different chemistries that just happen to have the same site of action on the pest, or are we looking at aggregate effects of pesticides, dish detergents, auto polish, etc.? It is not clear now how this will be interpreted. As a particular pesticide nears its limit on aggregate exposure, will the manufacturers voluntarily drop registered uses to free up exposure to permit new registrations? If so, minor uses will surely suffer.

The other big unknown is the Right to Know provision. The effects of this could range everywhere from generating publications that no one reads to providing an endless source of concern for slow news days and television talk shows and forcing pesticide labeling decisions to be made based on public opinion rather than established guidelines.

The impact of the Food Quality and Protection Act of 1996 seems to be positive, but we need to follow the implementation steps closely. There is little recorded of the Congressional debate on this law that would be helpful in interpreting their interest in adapting it. Therefore, the possibility exists for the intent to be changed by bureaucratic interpretation. Follow the implementation closely.

Goal® Herbicide Receives Section 18 Label for Strawberries in Connecticut, Maine, Massachusetts and New Hampshire only.

The following Section 18 label was approved for use of Goal® herbicide for control of wood sorrel and field pansy in strawberries in Connecticut, Maine, Massachusetts and New Hampshire. The label does not apply in Rhode Island and Vermont. A copy of the label must be in the possession of the applicator at the time of treatment. A copy of the label, which expires December 31, 1996, follows:

Goal (oxyfluorfen) Herbicide

EPA Reg. No. 707-174

Strawberry in the states of Connecticut, Maine, Massachusetts and New Hampshire

Use of Goal (oxyfluorfen) in Strawberry

Goal may be used between November 12 and December 31, 1996 for control of wood sorrel and field pansy.

One application may be made by ground equipment only.

Application must be made to dormant crop. Since crop injury will occur if the crop is not dormant, applicator is instructed to delay application after November 12, as necessary, to ensure that the strawberry plants are dormant (no sign of new growth, red leaves, flat crop appearance). Dormancy requirements for strawberry are similar to those for 2,4-D.

Apply 1.25 to 2.5 pints (0.25 to 0.5 lb. of a.i.) of Goal 1.6E per acre in a single application over the top of dormant strawberry plants.

Application may be made to the entire field as a broadcast spray or a spot treatment may be used to treat only those areas where targeted weeds are present or are expected.

Caution must be taken to minimize spray drift and off-site movement.

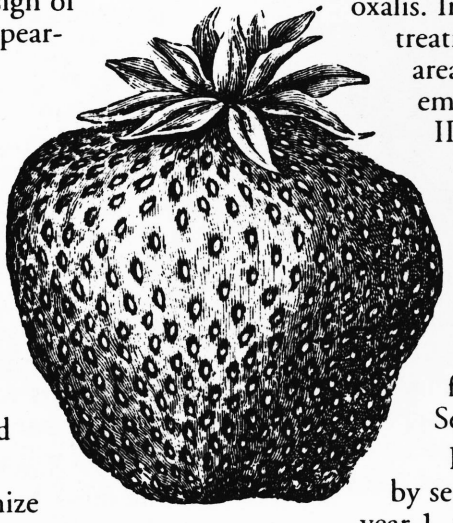
Follow the rotational crop restrictions on the federal label.

Recommendations for the use of this product are based on tests believed to be reliable; however, not all cultivars have been tested.

Buyer and user assume all risks of use and/or handling of this material when such use and/or handling is contrary to labeling instructions.

Handlers of Goal must wear a minimum amount of personal protection equipment such as coveralls, chemical-resistant gloves, chemical-resistant footwear plus socks, protective eyewear, chemical-resistant headgear for overhead exposure and a chemical-resistant apron when cleaning equipment, mixing or loading. The reentry interval (REI) is 24 hours. All applicable federal restrictions on the federally registered label will be followed.

See the federal label for all other application precautions, agricultural use requirements and replanting restrictions.



Additional Comments

Oxyfluorfen acts as both a postemergence and preemergence option for both field pansy and oxalis. In addition, by the recommended treatment period (Nov 12-Dec 31), any areas which require treatment will have emerged weeds. Therefore, growers and IPM scouts will be able to assess, with great accuracy, which areas required treatment. The preemergence activity of oxyfluorfen will inhibit additional weeds from emerging in those same areas. There would be no benefit in applying oxyfluorfen to fields or parts of fields which have no emerged field pansy or oxalis. (**Editor's Note:** See pages 10 and 11.)

Both field pansy and oxalis reproduce by seed. Prior to planting strawberries in year 1, there is no viable option for control of these species. If the field were to lie fallow the year prior to planting, frequent tillage would help reduce the weed seed population. This reduction over only one year, however, would not be significant in terms of future potential strawberry yield losses.

With the use of Goal, significant reductions in the weed seed population could be achieved over the five-year cycle. In this scenario, Goal would be used on an as-needed basis. Control of these species would prevent weed seed production. Also, the postemergence activity of Goal allows use only where these weeds have emerged and fits the IPM concept of using a pesticide only when necessary.

Farmers' Using PSNT to Modify Sweet Corn Production Practices

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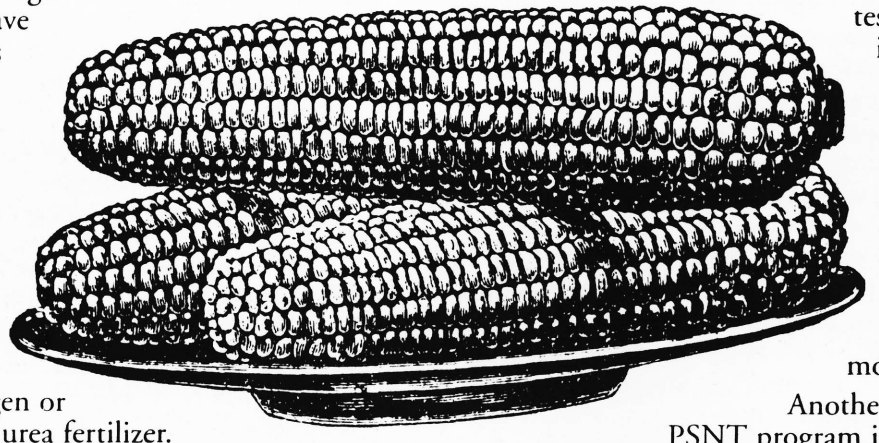
The 1996 Presidedress Soil Nitrate Test (PSNT) season started on June 12 and continued to July 26. Twelve sweet corn growers in Hillsborough County, New Hampshire, participated in the sweet corn PSNT program. These growers had eighty-one fields tested, representing a total of 394 acres of sweet corn.

The PSNT soil sample analysis indicated that 64.2% of the samples required no additional nitrogen. This represents 70.3% of the acres tested. The normal production practice would be to sidedress 50 pounds of actual nitrogen per acre. This would have equaled 19,700 pounds of actual nitrogen applied to the sampled acreage of 394 acres. The amount of actual nitrogen recommended for application to the sampled acreage was 4,481 pounds. This was a potential reduction of 15,219 pounds of actual nitrogen or over 33,000 pounds of urea fertilizer.



Besides the savings on nitrogen fertilizer, farmers have modified their fertility program. For example, one sweet corn grower's standard practice had been to:

Preplant: 500 lbs. of 20-20-20 commercial grade fertilizer

Planting: 200 lbs. of 10-20-20 corn starter fertilizer

Topdress: 150 lbs. of urea fertilizer when the corn was one foot in height

He has modified his program to:

Preplant: 60 lbs. of slow release nitrogen, plus potassium fertilizer

Planting: 200 lbs. corn starter fertilizer

Topdress: use PSNT program to determine if any additional nitrogen fertilizer is needed

This year only one field out of the 16 fields tested required any additional nitrogen. It should be noted that his regular soil tests indicated high levels of phosphorous. Therefore, other than the starter fertilizer, no other additional phosphorous was needed. The farmer felt that he saved over $2,000 dollars on fertilizer by using this new fertility program with no reduction in production.

Another farm used manure as a nutrient source. By using the PSNT program, no topdressed nitrogen fertilizer was needed on any of farmer's fields for the past two years. Prior to this, the farmer was topdressing 150 pounds of urea per acre to all the sweet corn acreage.

On a third farm, they used liquid nitrogen as a topdressing. They would apply 80 lbs. of actual nitrogen per acre to almost 100 acres of sweet corn when the corn was one foot in height. During the last four years using the PSNT program, they have reduced their application to 30 to 40 lbs. of actual nitrogen per acre. This past year, that would have been a savings of approximately $1,200.

With the observations and nitrogen calibration studies made during the last two years, the presidedress soil nitrogen testing procedure is appropriate for sweet corn production. The PSNT program can be used as a check system whenever the nitrogen fertilizer program is modified.

Another benefit of PSNT program is that farmers are in their sweet corn fields taking samples at the time of year that they normally would not be. Many growers have started to monitor their field's weed control so that they can then determine if cultivation or other weed control options are needed.

Through the use of the Presidedress Soil Nitrate Testing Program, growers can improve profitability on the farm and maintain the quality of surface and groundwater resources by:

1. Reduction in the use of preplant nitrogen applications to sweet corn land
2. Improvement in the manure, compost, crop residue and/or management practices used on the farm
3. Reduced need for sidedressed nitrogen
4. Reduce costs without risking sweet corn crop production.

Editor's Note: See page 12 for the Connecticut results.

Soils Basics

Part 1: Physical Properties of Soil

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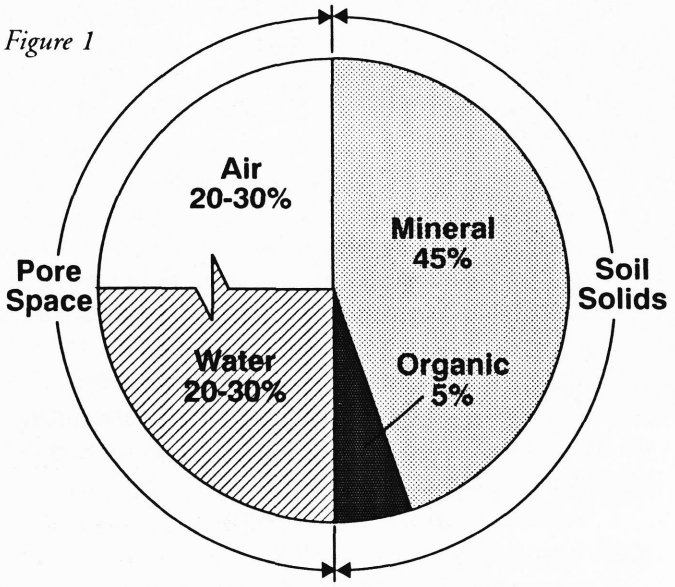
Soils are the most basic and most important resource we use in agriculture. Proper management of the soil is key to plant health and crop productivity. This is the first in a series of four articles about soils, their management and fertility. In the next few months we will address some of the most commonly asked questions about soils, organic matter, soil testing, fertility and management. We can begin this discussion in a number of ways. Let's start with the physical properties.

Soils are composed of solid particles which have spaces between them. The soil particles consist of tiny bits of minerals and organic matter. The spaces between them are called pore space and are filled with air and water. It is desirable for an agricultural soil to have about one-half soil particles and one-half pore space by volume. Ideally, organic matter will account for five percent or more of the weight of soil particles. Moisture content varies considerably with factors such as soil drainage and the amount and frequency of rain or irrigation. For most agricultural crops, conditions are best when the pore space is filled about equally with water and air (Figure 1).

Figure 1



Mineral soil particles are derived from rock which has been broken into smaller and smaller pieces over millions of years. This process is referred to as weathering and is caused by physical and chemical factors. Physical weathering is a result of mechanical activity. Wind, running water, falling rain, glaciers, freezing, thawing and root growth are typical abrasive forces which cause physical weathering. Chemical weathering results from the billions of chemical reactions that occur continuously in our soils. As some of the mineral components of rock are dissolved by water or acids, small fragments break off. Over time, rock material is converted to many tiny fragments. Microbes play an important role by creating many of the organic and inorganic acids which contribute to this process.

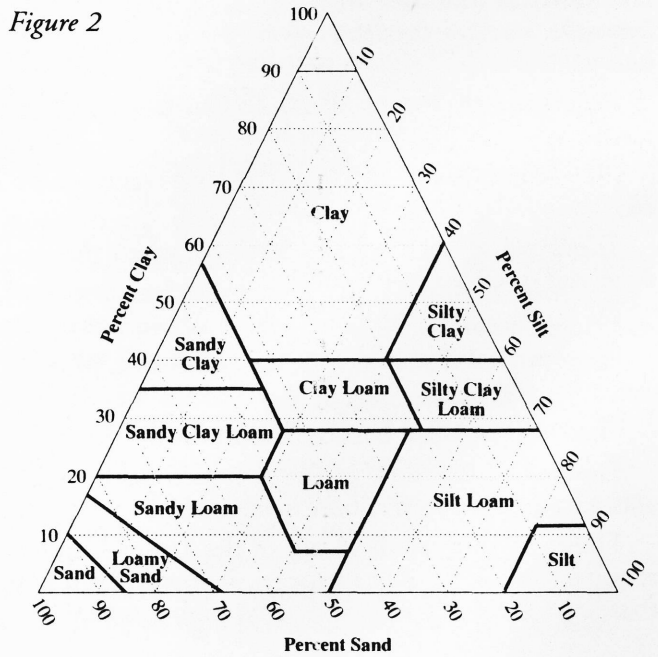
Table 1. Soil Texture

The particles of a soil are classified by size into sand, silt and clay. The classification of soil particle sizes is shown below.

Soil Particle Size Classes (diameter, mm)			
2.0	0.05	0.002	0
Gravel	Sand	Silt	Clay
Particles visible with the naked eye.	Particles visible under microscope	Particles visible under electron microscope	

Mineral soil particles vary considerably in size. These particles are grouped according to size. Beginning with the smallest sized particles, these groups are classified as clays, silts, sands and gravel (Table 1). Texture is the proportional amount of each of these groups. A soil textural class consists of mixtures of various size particles. The soil triangle (Figure 2) is used to determine the textural class of a soil according to its percentage of sand, silt and clay. These percentages can be determined from a mechanical soil analysis which can be done by most soil testing laboratories. To use the textural triangle, draw a line parallel to the appropriate arrows through the percent sand, silt and clay. These three lines will intersect at a point inside the triangle indicating the soil textural type. Note that the word loam does not refer to a specific group of particles but is used to describe mixtures of sand, silt and clay.

Figure 2



Soil texture is determined solely by the sizes of the mineral particles. Weathering can change the size of these particles but only over thousands or millions of years. For all practical purposes, the texture of the soil does not change, unless we truck in new soil, which is rarely practical in agriculture.

Soil texture has a major effect on the physical and chemical characteristics of soil. We'll discuss the physical effects now and talk about the chemical implications in another article. Sandy soils have rather large particles and large pore spaces (macropores). Clay soils have very tiny particles with very small pore spaces (micropores), but because there are many times more pore spaces, clay soils have greater total pore space than sandy soils. Capillary action is much greater in micropores than in macropores. Clay soils absorb and retain much more water than sandy soils but are typically poorly drained and not well aerated. Loams combine some of the moisture retention characteristics of the clays with the aeration of the sands and are widely considered the best agricultural soils. Sandy soils are coarse-textured are often referred to as light because they are easy to work. Clay soils are fine textured, and their particles will bond tightly together when they dry out after being wet. These soils can become very hard and difficult to work and are often called heavy. Keep in mind that the terms heavy and light refer to the ease with which the soil can be worked and not to its weight (a sandy soil actually weighs more than a clay soil).

So far, we have said nothing about organic matter. That is because a soil's texture is determined by the sizes of its mineral particles, not its organic particles. It sounds strange to most people that the word loam has nothing to do with organic matter. Although organic matter has nothing to do with soil texture, it is vitally important when determining soil structure.

While soil texture is of great importance, the grouping or aggregation of soil particles has a great deal to do with its productivity. Structure is the overall arrangement or aggregation of soil particles. Terms such as loose, hard-packed, granular and cloddy are among those used to describe structure. Soil structure can be modified by activities such as tillage; moisture level; freezing and thawing; root growth; earthworms and other soil inhabiting animals; and driving or walking on the surface.

Very sandy soils nearly always have a loose structure because they don't form aggregates or become hard-packed or cloddy . Fine textured soils can become hard packed. This condition interferes with root growth, inhibits movement of water into (infiltration) and through (percolation) the soil. The micropores in fine-textured soils can easily be filled with too much water to the exclusion of air, limiting the exchange of gases (oxygen and carbon dioxide). The macropores of coarse-textured soils facilitate infiltration and percolation of water and the exchange of gases, but they retain little water for crop use. By loosening and granulating a fine textured soil, we can improve water infiltration and percolation and gas exchange and still maintain the ability to retain water for plant growth. A granulated soil consists of granules that resemble crumbs. A granule consists of millions of clay or silt particles clumped together as aggregates. A well-granulated soil has micropores within the granules and macropores between the granules.

Natural activities including freezing, thawing and the movement of roots contribute to granulation of soils. Tillage when soil moisture is at proper levels is an effective way to cause granulation. Excessive tillage in an effort to prepare a fine seed bed, especially when soils are dry, will destroy soil aggregates. It is very easy to overwork a soil with a rototiller. Rain or irrigation can also destroy soil aggregates. We must, therefore, be aware of factors that influence the stability of soil aggregates.

It might seem as though granulation is a physical process, but biological processes are just as important. Earthworms pass soil through their digestive systems, adding viscous juices which bind particles together. Snails and other organisms leave a trail of slime behind them which acts as a glue. Organic matter is an important factor in the formation of soil aggregates and adds greatly to their stability. Soil organic matter, particularly humus, is a binding agent which holds clay particles together. It is often said that organic matter is the sticky stuff that holds soil particles together. There is a lot we do not know about these processes, but it appears that chemical unions occur between humus and clay particles. It seems clear that soil organic matter plays a major role in granulation. By increasing the stability of soil aggregates, the soil becomes easier to work and doesn't compact as easily.

Organic matter not only improves the structure of fine-textured soils, it is equally beneficial for coarse textured soils, but in a different way. These soils have a high proportion of macropores, facilitating gas exchange and water movement. However, due to a low proportion of micropores, these soils are not moisture retentive. This makes frequent irrigation a necessity during dry periods. Organic matter substantially increases the proportion of micropores, greatly improving the water holding capacity of a coarse-textured soil.

So far we have discussed the role of organic matter in the structure of soil. There's much more, and we will talk a lot more about organic matter in future articles. Next time, the subject will be soil fertility and interpreting soil tests.

Strawberry Weeds: Field Pansy

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Field pansy flowers and leaves closely resemble those of the garden flower Johnny-jump-ups. Flowers are cream to blue, often with both colors mixed in varying patterns within the flower. Flowers have five petals, with the lowest petal having a cup-like projection extending to the back of the flower. Leaf shape varies, with the lowest leaves being rounded and upper leaves being narrower at the base than at the tip of the leaf. At the base of each leaf, smaller, highly-divided sets of leaf-like stipules are found.

Field pansy plants are four to ten inches tall. They generally grow in groups in and among the strawberry plants.

Characteristics

Field pansy is a winter annual weed. This means that it is one of a class of plants which germinates in the late summer or fall, overwinters as a seedling or small plant and continues growth in the spring. Winter annuals cannot withstand hot weather and generally set seed and die as summer weather begins. Winter annuals are problem weeds for strawberry growers for several reasons. First, the lack of fall or spring tillage in strawberries means that the growth of winter annuals is not disturbed. Second, winter mulch provides protection for these weeds, and increases winter survival. Third, renovation does not affect winter annual weeds, as they have usually produced seed and died by the time renovation is performed. Renovation does disturb summer annual weeds (weeds which germinate in the spring and die in the fall), so winter annual weeds tend to become dominant in strawberries.

Field pansy is closely related to violets, pansies and Johnny-jump-ups. Field pansy seeds germinate in mid- to late-fall or in the early spring. Flowering begins in May and continues through early June. Seed capsules are brown and split open in dry weather, throwing large numbers of small brown seeds some distance from the plant.

Importance

Field pansy is low growing and probably does not compete significantly with strawberry plants for light. On some farms, however, this weed is present in such high numbers that it is clearly a significant nuisance. In addition, at very high numbers, field pansy may be competing with strawberries for moisture and nutrients. This weed spreads extremely quickly and is very hard to control. For this reason, it may be worthwhile to scout for this weed and eliminate it if it appears in strawberry fields. Elimination of this weed before it is able to produce seeds can prevent future problems.

Management

Chemical: There is no postemergence herbicide available at the present time to control field pansy in strawberries. Among the preemergence herbicides, only Dacthal has any effectiveness against field pansy. Even this control method, however, is imperfect. Dacthal has an extremely short lifespan in the soil, providing residual control of this weed for only four to six weeks. Because germination and emergence of field pansy continues throughout the fall, later-germinating weeds will escape control with Dacthal. Dacthal's high cost may make it difficult to justify.

Nonchemical: Field pansy can be controlled nonchemically with rotation, cultivation and hand control, or combinations of both. Cultivation will control weeds only between rows. Field pansy is most often found growing in and among strawberry plants, and weeds in this area must be removed by hoeing and hand pulling. Rotation can also be used to manage this weed. Winter annual weeds generally do not do well in most vegetable crops. Tillage in the fall and spring will destroy both fall- and spring-germinating weeds. Rotating out of strawberries for several years should greatly reduce the number of field pansy seeds in the soil. This should reduce the potential of this weed to build up to levels at which it reduces yields.

Integrating chemical and nonchemical controls: It may be possible to boost the effectiveness of Dacthal by controlling field pansy with cultivation and hand weeding until mid-September, then applying the herbicide. This should allow the Dacthal to control emerging seedlings through the end of the season. Any seedlings which escape control can be controlled by hand before mulch is applied in the fall or in early- to mid-spring. Control in the spring should preferably be completed before seed production begins in mid- to late-May. Management decisions with this weed will have to balance economics and the potential of this weed to reduce income. On farms where field pansy numbers are low or where the weed has recently invaded, it may be worthwhile to take extraordinary measures to eliminate this weed. Extra time spent hoeing and/or herbicide applications may prevent a small problem from increasing to one of major proportions. Where rotation is possible, this may be the most cost-effective way of coping with this weed.

Strawberry Weeds: Yellow Wood Sorrel

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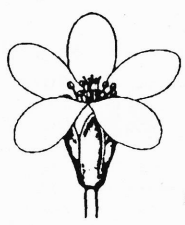
There are several species of yellow wood sorrel. All are similar in appearance. Leaves are a bright, light green and are divided in three heart-shaped parts. Although they are lighter green in color, leaves are otherwise quite similar to those of clover. Leaves are often folded downward, giving them the appearance of a closed umbrella. Flowers are a bright golden yellow, with four petals. Size and growth habit of the plant vary considerably. Plants generally grow upright but have weak stems and may creep along the ground. Entire plants are generally no more than eight inches tall. Yellow wood sorrel is most often found growing in and among strawberry plants.

Characteristics

Yellow wood sorrel is an extremely common weed in Massachusetts strawberry plantings. Plants are able to grow in and among strawberry plants, thriving in the shade cast by the strawberry leaves. This makes them difficult to kill with hand weeding, hoeing and herbicides. Yellow wood sorrel is low-growing and shallow-rooted, and probably does not compete with strawberries for light, but at extremely high densities, it may compete with the crop for water and nutrients. In addition, dense growth of this weed can make it hard for pickers to find fruit and may block air flow, making plants more susceptible to fungal diseases. Although this weed is fairly attractive, large quantities of it would probably be considered unsightly in a pick-your-own field.

In Massachusetts, the most frequently-found species of yellow wood sorrel is common yellow wood sorrel, *Oxalis stricta.* This species of yellow wood sorrel is a perennial. Common yellow wood sorrel is a simple perennial, meaning that it spreads only by seed. Plants pulled up will often have a thickened pinkish root, which enables it to survive the winter. Common yellow wood sorrel does not have runners. Seeds are contained in an upright pod which starts green, then matures to a light green or brown color. When the pod is dry, it will split open along seams, forcefully throwing its small, red-brown seeds from the plant. This enables yellow wood sorrel to colonize new areas of the field. Yellow wood sorrel spreads extremely quickly. Within a few years, a small infestation can fill an entire field.



Yellow wood sorrel is edible. The green seed pods, leaves and stems can be eaten in salads. Plants have a pleasant lemony taste and will quench thirst on hot summer days. Yellow wood sorrel contains oxalic acid, which can be toxic if consumed in large quantities.

Management

Chemical: Germination of seeds of yellow wood sorrel takes place over a long period through the year. This makes control with preemergence herbicides difficult. Sinbar is the only preemergence herbicide currently registered for use in strawberry which provides some control of yellow wood sorrel. At registered rates, however, control is usually less than adequate. Splitting the annual use rate of Sinbar into a renovation and late fall application is recommended. The late fall application should be made after plants become dormant. Some postemergence control can be obtained with 2,4-D. Plants will be controlled only if they are small and not hidden under strawberry foliage. The application should be made prior to mulching, over dormant strawberry plants. Strawberry plants are dormant when leaves have developed a reddish color and plants become flattened in appearance. A 2,4-D application prior to renovation is usually not effective, since plants have already produced and dispersed their seeds by early summer.

Nonchemical: Growers who do not yet have yellow wood sorrel should consider scouting for it on a yearly basis. Scouting can serve as an early warning signal for this and other troublesome strawberry weeds. Removing this weed by hand when it first appears in a strawberry bed can prevent a small problem from becoming a big one. Similarly, growers with multiple plantings may want to consider cleaning equipment when moving from infested fields to fields free of this weed. Small numbers of this weed can probably be eradicated from plantings through frequent and vigilant hand weeding. Rotating to crops other than strawberries for several years should also make a big dent in the population of yellow wood sorrel seeds in the soil.

Integrating chemical and nonchemical control: Combining chemical and nonchemical approaches may be the most economical way to attack yellow wood sorrel. Partial control can be obtained with

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Yellow Wood Sorrel

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the herbicides described above. Control of plants which escape these herbicides can be obtained with nonchemical measures such as cultivation, mulching, hoeing and hand weeding. Rotating to other crops as often and for as long as possible should also be of great help in reducing problems caused by yellow wood sorrel and many other strawberry weeds.

Connecticut Sweet Corn Growers Like PSNT

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Thirty seven sweet corn fields totaling 130 acres were sampled in 1996 for the Presidedress Nitrate Test (PSNT). Of the fields sampled, 75% tested above the 25 ppm threshold and required no N sidedressing. A further 8% tested between 20 and 25 ppm and received 10 lb./A N as a sidedressing. The balance tested in the 9 to 14 range and received the full 60 lb./A N sidedressing. 1996 was a severe test for the PSNT in Connecticut. The growing season was very wet and growers were concerned about leaching loss. The PSNT proved very accurate. Grower evaluations of yield and quality were positive at every site.

The savings from the use of PSNT were significant. Ninety eight acres were not sidedressed for a savings of 5,880 lbs. of N or 13,067 lbs. of urea or 17,818 lbs. of ammonium nitrate. At 30¢ per pound for N, that is a savings of $1,764 or about $18/A.

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