

CROP TALK



OMAF Field Crop Specialists—Your Crop Info Source

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What Happened To Soybeans This Year?

by Horst Bohner, Soybean Specialist, OMAF, Stratford

With good corn and edible bean yields this year the question must be asked, "what happened to soybeans?" Soybean yields were extremely variable. Although some regions harvested up to 55 bushels per acre, the overall crop was disappointing. In some cases, yields were a total disaster of less than 10 bushels per acre. Seed size was extremely small in some cases. The provincial average will likely be 15 to 20% lower than long term averages.

What took many by surprise is that fields appearing to have a potential of over 40 bushels per acre in August sometimes yielded 30 bushels per acre or less. This problem was not isolated only to Ontario. Low soybean yields right across the U.S. Mid-West helped rally prices this fall.

What Went Wrong?

Before answering this question lets be sure to emphasize that each field had a unique set of circumstances. In most cases the real culprit was a combination of accumulated stresses

1. Late Planting

Although some soybeans were planted during May, much of the Ontario crop could not be planted until June due to wet spring conditions. May is the month to plant soybeans for maximum yield potential. Please see Table 1.



Ontario Ministry of Agriculture and Food, Crop Technology Branch

Table 1. Effect of Planting Date on Yield, Plant Height, Maturity

Planting Date	Yield (bu/ac)	Plant Height (cm)	Days to Maturity
May 10	54	109	137
May 24	48	112	125
June 3	47	112	119
June 13	44	93	112

Ablett, Ridgetown College, University of Guelph.

A cool wet spring, along with poorer seed quality also resulted in slow emergence and thin plant stands. Seed quality was poorer this spring due to last year's dry conditions. Thin stands have a greater impact on final yields when seeding is delayed, as it was this year. Because of wet spring conditions many fields were planted into less than ideal soil conditions, which further reduced stands and root growth. Poor root growth resulted in the plant having less ability to deal with other stresses later in the season, especially lack of moisture.

2. July Conditions

Cloudy days during the early part of the summer meant less sunlight for photosynthesis. Along with cool nights in July, this slowed reproductive growth and interfered with flowering. Although plant height was considerable, pod set was surprisingly light in some fields.

3. Moisture Stress

In the southwestern part of the province, August and early September was extremely dry. Although sporadic showers in July kept the crop from suffering during early plant development, moisture stress soon became evident during August. August is extremely important to soybean development when plants need considerable moisture to fill pods.

4. Soybean Diseases

Soybean Cyst Nematode (SCN) symptoms were more evident this season than they have been for a number of years. Cyst numbers were high due to some dry years, as well as a lack of crop rotation. SCN has continued to move across the province into new fields. SCN has now been found in fields as far east as Peel Region.

Where moisture was sufficient plants were extremely tall and lush, but this did not translate into yield. Tall growth was partly due to later planting, since early June planted beans are usually taller than early May planted soybeans. These taller plants are more prone to diseases, like white mould. White mould caused considerable damage where moisture was adequate for the disease. A cool wet spring was also ideal for root rot development and caused major plant losses in diseased fields.

5. Soybean Aphids

Soybean aphid populations were quite low in most of the province until about mid-August. At that time, populations increased rapidly and aphids could be found right across the province. Yield impact due to aphids was most apparent where plants were already moisture or disease stressed. In some fields heavy aphid levels along with dry conditions resulted in poor pod and seed development, as shown in Figure 1. Some pods contained only tiny shrunken seeds.

One thing is clear from this years' experience - soybeans already stressed due to a lack of moisture or disease cannot tolerate high levels of aphids without yield loss.

Figure 1 - Poor Seed Development



The Good News

The good news is price! Soybean prices continue to climb, based on strong world demand and U.S. exports. Ontario prices have pushed through the \$10 per bushel mark and appear to be headed upward!

Building Soil Organic Matter With Manure

by Adam Hayes, Soil Management Specialist,
Field Crops, Ridgeway, OMAF

There has been a lot of talk about nutrient management and the development of Nutrient Management Plans. There have been comments that some growers may avoid using manure to avoid doing Nutrient Management Plans. Manure has significant fertilizer value but it can also supply vital organic matter to the soil. Manure is one of the few ways to bring in an "outside source" of organic matter. We are also hearing more about greenhouse gases these days. Increasing soil organic matter levels is a way of sequestering (storing carbon) in the soil. Carbon in the soil can help make up for greenhouse gas emissions.

Soil Organic Matter

Soil organic matter exists in three pools in the soil. These pools are often described as the living, the dead and the very dead. Organic matter cycles between these pools. Crop management practices have the greatest influence on the living and the dead organic matter. As part of the cycle, organic matter is gained and lost. Additions to the soil are generally in the form of plant residues, manures and other organic materials. Organic matter is lost through soil erosion and burned off or oxidized through tillage.

Bringing In Manure

If you plan to use manure to build soil organic matter it is important to know the characteristics of the manure. There are several types of manure and many different feeding and bedding systems that impact its composition. Table 1 illustrates some of the differences in dry matter content.

Table 1. Manure - % Dry Matter Content

Manure Type	Dairy	Beef	Poultry (layers)	Hog
Solid	20	28	20	9
Liquid	6	6	10	6

What does it take to maintain or increase soil organic matter levels with manure? A long-term study was setup in Vermont to look at the impact of manure on soil properties. The research was conducted on a clay soil in a continuous corn silage rotation. This lack of rotation and the crop returns very little crop residue to the soil. Solid dairy manure was added at 3 different rates and conventional tillage was used. Table 2 shows the results.

The 20 tons/acre/year rate was sufficient to counter the impact of continuous cropping a crop with few residues returned. Organic matter levels were maintained and the pH was kept close to the original level. Dairy and poultry manures have liming effects. This rate of manure supplied more nutrients than the crop removed. The organic matter additions improved soil aggregation, thereby increasing pore space.

How much organic material was being added at the 20 ton/acre rate? The dairy manure used had 13% dry matter, so 5,200 lbs. of solids were added. After decomposition about 25% of this would be added to the organic matter pool. In a 6 inch soil sample depth this would add about 0.065% organic matter per year.

The management of the field in this study is close to a worst case scenario. Cropping systems that return residues to the soil, protect the soil from

Table 2. Effects of 11 Years of Manure Additions on Soil Properties

	Original Levels	None	10 (Tons/ac/yr)	20 (Tons/ac/yr)	30 (Tons/ac/yr)
Organic Matter	5.2	4.3	4.8	5.2	5.5
CEC (me/100g)	17.8	15.8	17.0	17.8	18.9
PH	6.4	6.0	6.2	6.3	6.4
P (ppm)	4.0	6.0	7.0	14.0	17.0
K (ppm)	129	121	159	191	232
Total pore space (%)		44	45	47	50

Magdoff and Amadon, 1980

erosion, and the use of no-till or reduced till would not require as large an organic matter addition to maintain or increase soil organic matter levels.

There are other organic materials that can be added to the soil and influence different management systems. This will be discussed in future articles this winter.

Nutrient Management Act & Biosolids Application

by Michael Payne, Field Crop Nutrition Specialist, OMAF, Stratford

The Ontario Nutrient Management Act that was passed in June 2002 had its first set of regulations enacted on September 30th, 2003. For the most part, the regulations deal with livestock manure storage, handling and utilization, particularly on large and new livestock operations. But there are some parts of the regulations that will directly impact municipal sewage biosolids and industrial biosolids and residuals.

There are four regulations that directly impact the land application of biosolids and residuals:

1. requirement for a 20 metre (66 feet) buffer along all surface water;
2. banning of the use of high trajectory guns for land application;
3. banning of land application of sewage biosolids only from December 1st to March 31st;
4. and banning of sewage biosolids application where the soil is snow-covered or frozen.

Setbacks from Surface Water

The minimum 20 metre setback from the top of the nearest bank of any surface water applies to all non-agricultural source materials (regulated wastes) land application situations, regardless of the application method, timing or cropping practices. In situations where the site conditions, application methods or other restrictions as set out in the Certificate of Approval (C of A) for the system or site dictate a different separation distance, the most restrictive separation distance must be followed. In other words, if the C of A requires a 50 metre setback then the required setback is 50 metres, but if the C of A requires only a 10 metre setback then the required setback is 20 metres as per the Nutrient Management

Regulations (Ontario Regulation 267/03).

The regulation defines surface water as:

- (a) a natural or artificial channel that carries water continuously throughout the year, or intermittently, and does not have established vegetation within the bed of the channel except vegetation dominated by obligate or facultative hydrophilic plants,
- (b) a lake, reservoir, pond or sinkhole, or
- (c) a wetland as defined in Ontario Regulation 140/02 made under the *Oak Ridges Moraine Conservation Act, 2001*.

The following are not surface water for the purposes of the Regulation:

- (a) Grassed waterways
- (b) Temporary channels for surface drainage, such as furrows or shallow channels that can be tilled and driven through.
- (c) Rock chute spillways
- (d) Roadside ditches that do not contain a continuous or intermittent stream
- (e) Temporarily ponded areas that are normally farmed
- (f) Artificial bodies of water intended for the storage, treatment or recirculation of runoff from farm-animal yards and manures storages.

High Trajectory Irrigation Guns

High trajectory irrigation guns for the application of any non-agricultural source materials with greater than 1% solids are banned. These are irrigation guns capable of spraying liquid more than 10 metres. Although these systems tend to reduce the risk of soil compaction when compared to other application systems, the uniformity of application and application rates are very difficult to control.

Winter Application, Snow & Frozen Soil

The Regulation prohibits the land application of sewage biosolids during the period beginning December 1 of one year and ending on March 31 of the following year, regardless of field or weather conditions. The Regulation also prohibits land application of sewage biosolids on snow covered or frozen soil at any time. Snow covered soil is defined as soil with a layer of snow on the surface that has an average minimum depth of 5 centimetres. Frozen soil means soil that is consolidated by the presence of frozen moisture in the soil, in any layer with a minimum thickness of 5

centimetres, where the layer is located within the top 15 centimetres of the soil.

Certificates of Approval

All non-agricultural source materials (regulated wastes) still require a systems and/or a site Certificate of Approval prior to land application and all restrictions as set out in the C of A still apply. In cases where the current site or systems C of A differs from the regulatory requirements of Ontario Regulation 267/03, the most restrictive applies. In other words, even if the C of A allows the use of a high trajectory gun, the regulations under the Nutrient Management Act 2002 prevail and the gun can not be used. If the current C of A prohibits land application from early November until April 1 but the Nutrient Management Act regulations would allow that application in November, the C of A is the most restrictive and therefore the material cannot be applied in November.

Nutrient Management Plans

The requirement for a farm to have a Nutrient Management Plan is one of the focal points of the Nutrient Management Act. At the present time, farms receiving non-agricultural source materials (regulated wastes) are not required to have a Nutrient Management Plan unless or until they are required to have a Plan under Ontario Regulation 267/03. As of September 30, 2003, only new livestock farms (greater than 5 Nutrient Units) and existing farms expanding to 300 Nutrient Units or greater are required to have a valid and /or approved Nutrient Management Plan. Existing farms that currently produce 300 Nutrient Units or greater are required to have a valid and approved Nutrient Management Plan by July 1, 2005. If non-agricultural source materials are to be applied to farms required to have a Nutrient Management Plan, the biosolids must be identified within the plan, included as a nutrient source and used appropriately.

Sound Agronomic Principles & Practices

It is highly recommended that the utilization of sewage biosolids and all nutrient sources on agricultural land be based on sound agronomic principles and practices. The objective of any nutrient application is to meet the crop nutrient requirements with minimal residual and minimal loss to the environment or below the root zone. Only through proper nutrient management and appropriate application practices can the risk of

off-site movement and potential water contamination be minimized.

Understanding A "SCN Soil Test"?

by Albert Tenuta, Field Crop Pathologist, OMAF, Ridgetown and Tom Welacky, Field Biologist, Agriculture and Agri-Food Canada, Harrow

The weather, late planting, aphids, root rots and soybean cyst nematode (SCN) are just some of the challenges soybean producers had to face this year. The result was another tough year for many. As the more experienced farmers (another way of saying older) will tell you, with all the advances that have gone on recently we are still very dependent on the weather. Although we may not have any control on the weather, we can reduce the impact of some of these other challenges. This is especially true for soybean cyst nematode and it begins with soil testing. Taking the sample and understanding the results of a SCN soil test is critical to managing this devastating disease.

Negative Test Results

So what do the results mean? If they came back as negative, this may not necessarily mean you do not have SCN. Since the laboratory processing procedures are not 100% efficient, not all cysts will be extracted from the soil. This is especially true for fields with low levels of SCN that may be below detectable levels. Another possible reason for a negative soil test is the natural variability within the SCN field population. The samples may have been collected from parts of the field that were not infested with SCN. On their own, soybean cyst nematode moves very little (2 - 4 cm per year) and although tillage will quicken their dispersal, SCN populations tend to build up (aggregate) in certain areas of the field. To minimize SCN field variability and thus increase the accuracy of the sample, increase the number of soil cores and reduce the area (acres) represented per sample.

Either way, the good news is that if SCN is present it most likely is at low levels. A follow-up test in three or four years would still be recommended. Scouting for cysts on the roots and for SCN field symptoms such as yellowing, stunting, death, etc is also recommended whenever a soybean crop is planted.

Positive Test Results

If SCN cysts and eggs are detected, at any level, than a rotation scheme that incorporates non-host crops and resistant varieties needs to be followed. If nothing is done yields of susceptible varieties will be reduced and SCN populations will increase rapidly. The year following detection it is best advised to plant a non-host crop that will reduce the population. For example, when a preplant SCN egg count exceeds 50 eggs per 100 grams of coarse textured (sandy soils) or 100 eggs per 100 grams of fine textured silt (clay soils) a resistant variety should be planted. A simpler approach would be to use SCN resistant varieties in all fields that the nematode has been detected.

The following table rates your SCN risk and potential yield loss based on SCN population levels.

Table 1: Rating your SCN Risk

SCN Population (Eggs per 100 grams of soil)	RISK Rating	Potential Yield Loss	Rotation
0 - 500 (Coarse Sandy Soils)	LOW RISK	0 to 20 %	4 Year
0 - 1000 (Fine Textured Silt or Clay)	LOW RISK	0 to 20 %	4 Year
> 1,000 (Coarse Sandy Soils)	HIGH RISK	20 to 50 %	6 Year
> 2,000 (Fine Textured Silt or Clay)	HIGH RISK	20 to 50 %	6 Year
> 10,000 (all soil types)	Resistant Variety May Be Damaged	50 to 100 %	Non-Host

Source: Welacky, Anderson and Tenuta

Remember that resistant varieties are not immune and their yield can be reduced by nematode root damage and lack of nitrogen fixing nodules when SCN egg counts exceed 10,000 eggs per 100 g of soil. Although it is most likely that a resistant variety will still out yield a susceptible variety the affect is enhanced when the crop is under stress. To minimize economic impact it would be best if a non-host crop could be planted.

Management of SCN begins with identification. A "SCN soil test" is an effective tool to identify those fields that are infested with this very destructive pest. Knowing the SCN population levels, will assist in determining which management practices should be used. The soil test also provides a benchmark for future comparison. The effectiveness of your management strategies is best evaluated when compared over time to the original field levels (benchmark). If numbers have dropped substantially, this would indicate that your strategy is working. Remember though, a proper evaluation should begin with a SCN soil test.

Fall Fertilizer Tune-Up

by Keith Reid, Soil Fertility Specialist, OMAF, Stratford

Believe it or not, the end of the growing season is the best time to start planning for next year. Have you done everything to make next year a success?

1. Start with This Year's Crop Records

Are there some fields, or parts of fields, that didn't do as well as the rest? Can you identify what the problem was in those areas? It may be weeds, insects, disease, or compaction, or it may be a nutrient deficiency. Be sure you have identified what the cause of yield loss was, and make plans to correct the appropriate problem.

2. Soil Testing

It is impossible to do better than guess at a fertilizer program, without knowing what is in the soil. It's a little like writing a check without knowing how much is in your checking account... occasionally, a check will bounce. If you don't have soil test results that are less than three years old, it is time to check your balance!

3. Manure Testing

There is tremendous variation in the nutrient content of various manures. Checking what is in your manure pile, or tank, only makes sense.

4. Legume Credits

Have you plowed down a decent stand of alfalfa or clover? The nitrogen fixed by these legume crops is real, and should be counted in your fertilizer planning.

5. Know What You Need

Applying too little fertilizer will mean you lose yield. Applying too much will waste money, and may cause environmental harm. Use your soil test results to plan how many nutrients you need to apply to each field for optimum yields.

6. Use All The Nutrient Credits

Once you have determined your total nutrient requirements, deduct all of the credits from manure, legumes, or any other nutrient additions that you have made to the field. The actual fertilizer you will need is the net amount after all these deductions have been made.

7. Plan your Applications

Put some thought into a fertilizer program that will make the best use of the fertilizer you are applying. Generally, most of the phosphate should be applied as a starter, if it can be managed at all, along with a small amount of nitrogen. Nitrogen and potash can be broadcast onto the soil surface. Maximum nutrient uptake may require splitting applications, but the benefits to multiple trips over the field have to be balanced against the cost. The optimum fertilizer program for each farm will be a little bit different.

Rut Recommendations

by Greg Stewart, Corn Specialist, OMAF, Guelph

In the past, I have talked and written about the potential for deeply tilled soils (in the range of 6 – 14 inches via the chisel plow or disk-ripper) to be more susceptible to compaction when exposed to high axle loads, high inflation pressures and wet soils. In some cases these disturbed sub-soils may re-compact worse than they were in the first place. More recent research out of West Virginia has added some points to this discussion worth considering.

Compaction In No-till Fields

Heavy axle load compaction of no-till soils may indeed be less problematic than if the same axle load ran over tilled soils. However the potential for the following years beans or corn to be severely affected by fall compaction and rutting, even within the no-till system, is significant. Some shallow tillage to reduce fall soil compaction may be necessary. This tillage generally does not need to

be very deep, as often the compaction within these soils will be confined to the soil surface. In many cases, where fall soil moistures remain high, this shallow tillage may be best left to the following spring.

Three other points should be made in the face of doing some tillage where no-till had been planned:

1. no-till soils, with the aid of some tillage may recover quite rapidly from a moderate compaction incident,
2. longer term soil benefits that had been developed because of no-till are not wiped out by a single tillage event and
3. the subsequent return to no-till is likely to be equally successful as where no-till was practiced continually.

Compaction In Tilled Fields

Where compaction and rutting has occurred on tilled soils it appears that the tillage required to improve soil conditions may need to be more intensive (deeper). In cases where compaction was severe, the recovery (from a crop yield perspective) may be longer than in reduced tillage scenarios that had higher load bearing capacities. In these cases, fall tillage to a depth close to what was traditionally used may be the best short term solution. In the longer term these fields should be monitored for soil compaction problems, as additional deep tillage may be required.

Dealing With Low Test Weight Corn

by Greg Stewart, Corn Specialist, OMAF, Guelph

The growing seasons of 1992 and (to a lesser extent) 2000 resulted in low test weight corn at harvest. Some producers will also be dealing with low test weight corn from the harvest of 2003.

Previous research trials have indicated that lower test weight corn had significant energy content and relatively little additional corn was required to arrive at feeding values equivalent to normal test weight corn (see Table 1). Using these values, dockage for low test weight corn can be calculated. The resulting potential dockage is generally lower than traditional discounts applied to low test weight corn (Table 2). These adjusted values should be considered when feeding or seeking to set a fair value on low test weight corn.

Table 1. Feed weight adjustments for low test weight corn.

Test Weight (lbs/bushel)	Pounds required to equal 1 pound of 56 lbs/bushel test weight corn
56	1.000
55	1.004
54	1.009
53	1.013
52	1.017
51	1.022
50	1.026
49	1.030
48	1.035
47	1.039
46	1.044
45	1.049
44	1.053
43	1.058
42	1.063

Source: Gwen McBride, OMAF. (Based on analysis of corn samples from 1992 growing season.)

Table 2. Grain corn test weights and potential dockage based on feeding value.

Generally, corn test weight does not significantly

Grade	Test Weight Minimum (lbs/bushel)	Potential Dockage based on Feeding Value.	
		\$/bushel	\$/tonne
3	51.3	.056	2.21
4	49.7	.075	2.95
5	46.5	.114	4.49

affect pig growth until it drops below 45 lbs/bu. Research has shown that adding 2 - 3% oil or fat to diets made with very low test weight corn (*below 45 lbs/bu*) will help improve performance. But it will not return it to the level achieved with normal test weight corn (*56 lbs/bu*).

Post-Season Monitoring of Corn Rootworm

by Gilles Quesnel, Field Crop IPM Specialist, OMAF, Kemptville

Corn rootworm damage can shave precious bushels off your corn yields and turn harvest into a nightmare. There is still time to walk through your fields to check for rootworm damage to corn plants.

Corn plants that are lodged or appear to be "goosenecked" often point to corn rootworm damage. Pull out some of these plants and look for pruned and tunnelled roots to confirmed rootworm damage. Roots from harvested fields can also be pulled and examined. Checking for "goosenecking" and root damage does not provide you with threshold numbers, but will give you the opportunity to assess your fields for potential rootworm damage next year.

Life Cycle

Corn rootworm damage is caused by larvae feeding on and within the roots from mid-June to mid-July. The adults then emerge from the soil in late-July and deposit eggs in the soil until a killing frost in the fall. The eggs overwinter and hatching begins in early June, continuing the cycle.

Fields At Risk

Corn fields at risk of corn rootworm damage next year are fields which:

- were in corn this year,
- are a heavy soil type (clay),
- had more than one rootworm beetle per corn plant in late August, and/or
- had "goosenecked" plants with pruned and tunnelled roots.

Damage In First Year Corn

Rootworm damage has been observed in first year cornfields in some U.S. States, including parts of Michigan and Ohio. Beginning in the early 1990's, in areas where a strict corn-soybean rotation was followed, a selection was made for a new variant of western corn rootworm (WCR) that lays at least a portion of its eggs in soybean fields. With the strict corn-soybean rotation, larvae hatching from eggs laid in soybean fields emerge in first year corn fields, where they can cause root injury, lodging, and yield reduction. In affected areas,

monitoring procedures have been developed for WCR in soybean fields to determine the need for a soil insecticide in first-year corn. The monitoring usually involves the use of Pherocon® AM yellow sticky traps to determine the presence and density of western corn rootworms in soybeans fields during the month of August.

WCR Variant Not Detected Yet In Ontario

To date, similar monitoring in parts Ontario has not detected the presence of the new western corn rootworm variant. After investigating a few isolated cases of lodging in first year cornfields, Dr. Art Schaafsma, of the University of Guelph, Ridgetown, states that “there is no convincing evidence that the western corn rootworm variant is in Ontario”. With the absence of the variant, crop rotation remains our best control strategy for corn rootworm.

Anthracnose - Ever Present Risk In Edible Beans

by Brian Hall, Alternate Production Systems Specialist, OMAF, Stratford

Edible bean producers have experienced above average yields and excellent quality on all bean types in 2003. However, the year was marked by the appearance of anthracnose in a number of white bean and black bean seed and commercial fields. This is a warning to stakeholders in the industry to follow practices to ensure anthracnose never becomes a problem here, as it has been in other regions of North America.

Anthracnose is not a new disease to Ontario. The introduction of races of the disease not yet present in Ontario caused sudden and severe outbreaks in 1976 and 1993 . A thorough seed inspection program, use of DCT seed treatment, and the development of resistant varieties has practically eliminated the disease. This disease can infect all bean types. If severe, anthracnose causes major yield reductions or loss in quality. Yield and pick losses of over 70% have been documented.

The most striking symptom is rusty brown spots on infected pods that can spread to seed. This causes discolouration and results in reduced grades.. Anthracnose overwinters in infected seed and then develops in the next year’s crop. Further development of the disease is favoured by

prolonged periods of moderate temperature, high humidity and /or rainfall during the growing season. Rainy weather favours this disease, as spores are splashed from diseased areas and carried in wind-borne water droplets or by surface water throughout the field. The disease can be spread by the movement of people, animals and equipment when plants are wet.

There are over 20 known races of anthracnose. All races of the disease cause the same plant symptoms. Plant breeders have developed varieties resistant to the most prevalent races present in Ontario. Variety reaction to the races of anthracnose are listed annually in the OMAF factsheet, “*Performance Trials for Dry Edible Beans*”.

Growers are encouraged to follow these accepted practices for the control of anthracnose:

- Plant certified seed treated with DCT. Use DCT seed treatment on untreated seed.
- Planting clean seed, no matter what the source, is critical to controlling the disease.
- Avoid entering edible bean fields with equipment or on foot when plants are wet.
- Clean equipment with bleach solution between fields. This is extremely important for seed growers.
- Follow recommended crop rotations with a minimum of two years , but preferably three or more years between edible bean crops.
- Scout fields during the late vegetative to pod fill stage, and if signs of the disease are present, apply a protectant fungicide. “Headline” is a new fungicide registered by BASF, for control/ protection of anthracnose on dry beans. Refer to the product label for information on application and use.
- Any suspicious seedlots can be tested for anthracnose for a nominal fee of \$35 + GST per sample. A 1 lb. representative sample should be sent to:

Canadian Food Inspection Agency
Ottawa Lab Carling
960 Carling Avenue
Ottawa, Ontario
K1A 0C6
613 -759-1288 (lab)
Contact: Dr. Jim Sheppard

Fine Stemmed Alfalfa Varieties?

by Joel Bagg, Forage Specialist, OMAF, Lindsay

We sometimes hear about the use of "fine stemmed" alfalfa varieties to improve forage quality and intake. The term "fine stemmed" is rather subjective and difficult to measure. Provincial and State Forage Variety Trials don't measure the "fine stemmed" trait. Some producers use anecdotal information and their own experience to select "fine stemmed" varieties.

Influenced By Many Factors

"Fine stemmed" is influenced largely by maturity. A few days difference in cutting date can have a big effect. It can also be influenced by plant density (seeding rate), age of stand, stems per square foot (> 40), fertility, disease and insect resistance, etc. There are also some varietal differences. High yielding alfalfa needs to have some degree of structure (stem diameter) to support a greater mass of leaves. And don't forget that excessive leaf loss during cutting, raking and baling can result in "stemmy hay". Stem fineness receives less attention in early-cut haylage programs.

Fibre & Fibre Digestibility

"Fine stemmed" is not the only contributor to forage quality. "Fine stemmed" is an indirect contributing factor in fibre (Neutral Detergent Fibre, NDF) and fibre digestibility (Neutral Detergent Fibre Digestibility, NDFD or Cell Wall Digestibility, CWD). These can be measured in the lab. The same is true for traits that can increase the leaf to stem ratio - multifoliolate expression, leaf size, auxiliary stem branching and leaf disease resistance to keep the leaves from falling off. Lignification of the xylem tissue in mature alfalfa stems significantly decreases fibre digestibility.

Cutting Delays

Early-cut alfalfa is finer stemmed and higher forage quality than later-cut alfalfa. But weather and mechanical delays, as well as shear volume can frequently result in some of the crop being harvested with less than optimum quality. Dry hay systems often requires a larger harvest window than haylage. Plant breeders are trying

to develop varieties with a slower decrease in forage quality in order to widen the harvest window. Research shows there are typically 8-10 points of genetic difference in Relative Feed Value (RFV) among alfalfa varieties. When put in perspective, cutting delays can result in much larger differences. All varieties will drop to 100 RFV eventually, but some a bit sooner than others.

Seeding some high quality varieties as well as some standard varieties could be used to spread the first-cut harvest window. The standard varieties could be harvested first while the high quality varieties could be cut later.

Variety Trials

Lowering NDF and increasing NDFD increases both Digestible Energy and intake, which are very important in high producing dairy cows.

The Ontario Forage Crops Committee led the way in 1991 by evaluating varieties based on NDF and NDFD. It may have been ahead of its time, but was probably underutilized by many dairy producers. Variety forage quality evaluation was discontinued recently because of the cost of obtaining the laboratory data. Data was not available for all varieties, but in the 2002 Forage Variety Performance Brochure, there were 5 or 6 varieties listed that were winners (statistically significant) for both NDF (lower fibre) and NDFD (higher fibre digestibility). Wisconsin has a similar program that uses NDF and NDFD to index alfalfa varieties for quality. Milk Per Ton calculations rank for quality, while Milk Per Acre calculations combine both quality and yield. Most forage seed companies market some alfalfa varieties that they consider their "forage quality" varieties.

Strategy

If high quality, fine stemmed alfalfa is a priority, we can manage for that by earlier cutting. However, at first-cut time the optimum harvest window is often narrow, particularly for dry hay systems. Seeding some high forage quality alfalfa varieties, as well as some standard varieties can be used to help spread the first-cut harvest window.

Phosphorus Leaching?

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The focus of nutrient management is minimizing the off-site movement of nutrients into the environment. Conventional wisdom has said that phosphorus binds so tightly to the soil that the only pathway for P loss to the environment is through soil erosion. Recent research is challenging this view.

Phosphorus in the soil solution exists as the negatively charged phosphate ion, but unlike nitrate it does not leach easily with the downward movement of water. Phosphate is extremely reactive and binds with aluminum, iron, calcium and other elements, which are present in all soils at relatively high levels. This causes the P to form new chemicals in the soil that bind tightly with the soil clay and organic matter.

Even though this phosphorus is tightly bound to the soil, we can still get what appears to be leaching loss, or downward movement of these materials into the soil profile and potentially to surface water through tile outlets or lower to ground water.

Studies conducted in Finland and the US by Martin Shipitalo of USDA in Ohio and Visa Nuunen of MTT Agrifood Research of Finland demonstrate what can happen. Essentially, they found that soil particles, with the attached phosphorus, could be carried by water that flows in cracks and through earthworm borrows to lower levels of the soil profile.

Using a blue dye applied to the soil surface, they were able to show that soil particles could move through cracks in the soil down into the profile. If a compacted layer was encountered at the bottom of the plow layer, the water/dye combination could move considerable distance laterally from where it found the plow pan. Once this water/dye found an earthworm burrow, it could move rapidly

downward in the soil profile. They further studied the concentration of earthworm burrows in the field and found that a much higher concentration of burrows were found above the tile drains than in the regions between the drains. They suggested that this was because the area above the tiles would have more air available for the earth worms since water would be rapidly draining downward toward the tiles in this area. A direct result of this is a large increase in the rate of water infiltration above the tiles, as shown in the following table. This further suggests that the rapid movement of any P enriched soil down through the profile will be greatest in the areas over tile drains. With the use of the blue dye, they identified 106 burrows per metre square at 10 cm above the tile drain suggesting that rapid movement to tile drains could occur.

Following this study, they poured a fiberglass resin down the earthworm burrows. Once this had hardened, they excavated the soil in the test area and washed away remaining soil. The hardened fiberglass channels were left intact. They found that cracks allowed water to infiltrate into the soil, but that earthworm burrows carried the water from the plow layer positions either directly to or in close proximity to the tile drains. The sediment that was found around the tile drains was found to be from the surface soil, which was further evidence of surface soil movement down into the soil profile.

This work demonstrates that the movement of P down through the profile is not true leaching as we see with Nitrogen, but rather a preferential flow through large cracks and earthworm channels. It does show that Phosphorus can move through the soil profile to tile drains and be susceptible to loss through tile outlets into surface waters.

This suggests that farmers should find ways to disrupt these channels that may conduct soil and nutrients from the soil surface deeper into the soil profile. This may be done by light tillage or even timing of fertilizer applications that minimize the presence of significant cracks at the soil surface.

Infiltration of The Bulk Soil Above And Between Tile Lines

	# of tests	Infiltration Rate in mm per hour			# of Earthworm Burrows/m ²
		Avg.	Minimum	Maximum	
Above Tiles	40	172.1	7.5	486.9	4.5
Between Tiles	38	79.7	2.8	236.9	2.1