

CROP TALK

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Nitrogen Application Technology in Winter Wheat

Joanna Follings, Cereals Specialist, OMAFRA

With an ever growing selection of options for nozzles and streamer bars, many growers are asking the question, what should I outfit my sprayer with for winter wheat liquid fertilizer applications? Well, it depends on what are you trying to accomplish.

If the goal is to push your winter wheat management and improve yields, then the accurate and uniform application of liquid nitrogen is key. Selecting the appropriate sprayer technology can have a huge impact. Using a Twitter poll, we learned that growers use many methods:

- 3, 5, 6 or 7 hole streamer nozzles
- Flood nozzles
- 3 or 5 hole streamer bars

Let's look at some of the options and consider why you might choose one technology over another.

Air Induction, Conventional Flat Fan or Flood Nozzles

Let's get this one out of the way first. Air induction (AI), conventional flat fan and flood nozzles are a no-go when it comes to applying 28% UAN in winter wheat. Dr. Peter Sikkema (University of Guelph) demonstrated that when 28% UAN was applied with an AI nozzle there was an increase in visual crop injury (Table 1).

He also showed that injury increased substantially when tank mixed with herbicides and when nitrogen applications were delayed (Table 2). So, while AI nozzles are great for herbicide applications, they are not suitable for 28%. Growers should consider fall weed control to avoid the need for spring herbicide applications.

Table 1. Potential yield loss associated with applying UAN 28% as an overall broadcast treatment using flood jet or TeeJet nozzles.

Application Combination	Visual Injury	Yield
200 L/ha water (18 gal/acre[1] water)	0%	6.4 t/ha (95 bu/ac)
150 L/ha water + 50L/ha UAN (13.4 gal/acre water +4.5 gal/acre UAN)	3%	6.4 t/ha (95 bu/ac)
100 L/ha water + 100L/ha UAN (9 gal/acre water +9 gal/acre UAN)	5%	6.1 t/ha (91 bu/ac)
50 L/ha water + 150L/ha UAN (4.5 gal/acre water +13.4 gal/acre UAN)	7%	6.1 t/ha (91 bu/ac)
200 L/ha UAN (18 gal/acre UAN)	9%	6.0 t/ha (89 bu/ac)

[1] 1 gallon (Imperial) = 1.2 U.S gal
Source: Sikkema, University of Guelph (RCAT), 2008–2013 (OMAFRA Pub 811: Agronomy Guide).

Table 2. Crop injury (%) and yield (bu/ac) of winter wheat following an application of 28% UAN (400 L/ha) alone with air induction nozzles and tank mixed with various herbicides compared to an untreated control that received the same amount of nitrogen.

Treatment	Herbicide rate/ac	Injury (%)	Yield (bu/ac)
control (unsprayed)	——	0	105
28% UAN alone	——	6	105
28% UAN + Infinity	0.33 L	9	104
28% UAN + Buctril M	0.4 L	8	103
28% UAN + Estaprop XT	0.48 L	9	102
28% UAN + Refine M	12 g + 0.36 L	17	99

Source: Dr. P.H. Sikkema, 3 trails from 2008-2010, University of Guelph (Ridgetown Campus) – Additional information on tank mixing with herbicides can be found here: http://fieldcropnews.com/2012/03/when-i-apply-28-uan-to-winter-wheat-can-i-also-add-a-herbicide/

Streamer Nozzles

Streamers significantly reduce crop injury when applying UAN 28% in winter wheat. Growers in Ontario are using a range of 3, 5, 6 and 7 hole nozzles. These nozzles provide even coverage and minimize burn compared to flat-fan or flood nozzles; however, boom height can have an impact on crop injury. This is particularly important with 3 and 6 hole streamer nozzles. If there are significant variations in boom height (e.g. uneven emergence, uneven land, or a boom with excessive sway and yaw), significant crop injury can occur. This is exacerbated by hot and dry conditions.

The damage is the result of non-uniform coverage. Streamers deliver spray in a triangular shape. If the boom is too low gaps in the spray pattern reduce coverage. If the boom is too high the crop may receive increased overlap, resulting in crop injury. Therefore, these nozzles are an excellent option for apply UAN 28% to winter wheat crop (Figure 1) as long as boom height can be managed effectively.

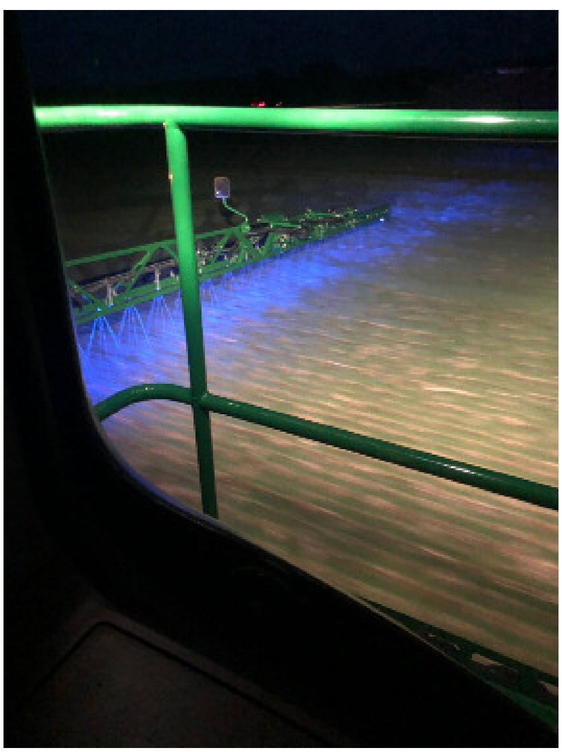

Figure 1: UAN 28% being applied uniformly to winter wheat using 3 hole streamer nozzles. Photo courtesy of Jim Patton**.**

Figure 2: Chafer streamer bar. Photo courtesy of Alex Zelem.

Streamer Bars

Streamer bars (Figure 2) may be the best choice. Streamer bars deliver liquid nitrogen to the crop vertically. This allows for even distribution across the winter wheat crop at various boom heights, often permitting great speed. Research performed in Kentucky showed that streamer bars produced a 2.8 bu/ac yield advantage compared to 3 hole streamer nozzles, and a 4.9 bu/ac yield advantage over 7 hole streamer nozzles. Read more here: http://www.needhamag.com/innovative_product_sales/stream_bars_for_uniform_liquid_fertilizer_application.php.

Some may argue those are not significant yield advantages, but most Ontario growers would argue differently. Streamer bars provide uniform coverage no matter the state of emergence, boom height, topography or even wind conditions. Streamer bars can be adapted to most sprayers and are available in 15″ or 20″ spacing. The only caveat is that they can be fragile and can make folding the boom difficult.

Other Ways to Reduce Burn

In addition to proper nozzle selection there are a few things you can do to reduce the risk of crop injury from N applications.

- Avoid applications of 28% when the crop is stressed or during hot and dry conditions.
- If conditions are more conducive for crop injury, increasing water volumes or applying less N can also help reduce burn significantly.

At the end of the day it is important to remember the end goal – maximize yield potential. If we can deliver UAN 28% as uniformly as possible to a standing winter wheat crop while minimizing crop injury, the 100+ bu/ac wheat crop will be well worth the effort.

The Latest on Corn Nitrogen Response: Weather, N Uptake in Modern Hybrids and Late Application

Jake Munroe, Soil Fertility Specialist – Field Crops, OMAFRA

Research in much of Ontario has shown a clear benefit to sidedressing nitrogen in corn. By applying N closer to the period of maximum uptake, you provide the nutrient when it's needed and minimize the risk of losses from leaching or denitrification.

There may now be several other reasons to move away from an "all upfront" approach and to split your nitrogen application in corn.

Weather impacts on nitrogen response

Recent research has shown that growing season precipitation can drive yield potential and response to nitrogen in corn. Dr. Nicolas Tremblay of Agriculture and Agri-Food Canada (AAFC), analyzed data from 51 nitrogen response studies across North America, including Ohio and Quebec. He concluded that "abundant and well-distributed rainfall" is a major driver of nitrogen response of corn in both fine (e.g. clay loam) and medium textured soils. Abundant and well spread out rainfall in the weeks prior to and following sidedressing resulted in a greater response of corn to nitrogen.

Dr. Bill Deen at the University of Guelph has found that optimal corn N rates from 2000-2017 at Elora have been affected by mid-June to mid-July rainfall. Generally speaking, greater amounts of rainfall have resulted in higher maximum economic rates of nitrogen (MERN) values. Interestingly, this relationship was not observed for trials prior to 2000. Recent results from the long-term corn nitrogen response trial at Elora (2009-present) have shown MERN values as low as 118 lbs/acre, up to 230 lbs/acre N. Growing season rainfall – and crop nitrogen demand – has been the main determining factor.

Together, these results suggest that an in-season rate adjustment, based on current and forecasted conditions, may be a wise approach.

Post-silking nitrogen uptake
Nitrogen uptake in corn accelerates starting around V5 (Figure 1). As corn moves into reproductive growth following tasseling, a portion of nitrogen is moved, or remobilized, from plant tissue to meet the grain demand. Soil nitrogen uptake also continues during reproductive growth stages.

It's also important to consider how modern corn hybrids take up nitrogen. Newer hybrids take up a greater proportion of their total nitrogen following silking – 36% vs. 30% in older hybrids (before 1991). Also, a larger percent of grain nitrogen in newer hybrids comes from soil uptake after silking compared to N remobilization from stalks and leaves. In fact, as N stress increases, newer hybrids are able to increase nitrogen uptake after silking – something that older hybrids weren't able to do.

Research from 2014-16 at Purdue found that delaying the last 40 lbs/acre of N to the V12 stage did not negatively impact yield, but did increase the efficiency of nitrogen uptake. Josh Nasielski, a PhD student with Bill Deen at the University of Guelph, found that waiting until V13 to sidedress the full N rate for corn did not hurt yield in 2017 at Elora. In his trial, a generous top-up at V13 of a pre-plant rate of 70 lbs N/acre supplied enough N in time to maximize yield compared to an all upfront application.

A new approach to nitrogen
With high clearance equipment available and later nitrogen uptake in modern corn hybrids, Ontario farmers now have the flexibility to apply N later into the season.

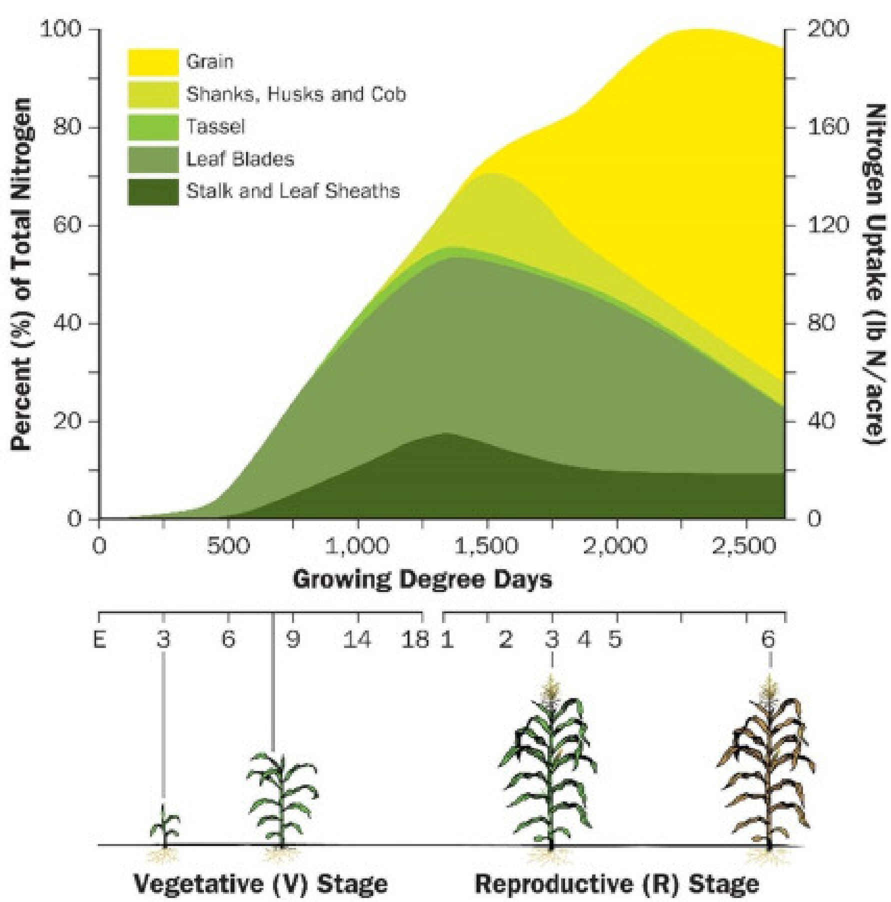

Figure 1: Corn nitrogen uptake (*Adapted with permission from Iowa State University Extension)*

A recently completed OSCIA Tier Two project in Eastern Ontario found that late N application increased corn yield at some sites compared to earlier application in 2017, likely due to very wet growing season conditions. In 2016, however, there was no yield advantage to late applied nitrogen.

Despite the mixed results to date on late N applications, the practice provides the opportunity to more accurately assess in season rainfall and growing conditions. By doing so, you can make rate adjustments to better reflect the crop's yield potential and nutrient demand.

Tried and true
In Ontario, the Corn Nitrogen Calculator is an excellent starting point to determine your N rate. It provides a recommendation based on decades of Ontario N trials and accounts for background factors such as soil type and previous crop. By combining it with a split application that allows you to fine-tune rates for in-season conditions, you're on your way to better matching crop demand and maximizing your nitrogen dollar.

Growing Degree Days and Insect Development

Tracey Baute, Field Crop Entomologist, OMAFRA

Insect development is directly tied to temperature not calendar dates. Each stage of the insect requires a certain amount of growing degree day (GDD) accumulation to advance from one stage to the next (eg. egg to 1st instar lava). There is also a minimum temperature (base temperature) that must be reached for their development to begin, as well as a maximum temperature that, once reached, hinders or stops their development. Calculating daily degree days based on these development requirements allows us to predict when to expect a certain stage of the insect that is best suited for scouting or management.

All GDD models use the same equation to calculate daily degree days but the base temperature and biofix date (the start date for which we should begin calculating the daily degree days each year) are specific for each insect. We cannot just take the daily degree day calculations for European corn borer and use it to predict western bean cutworm development, for example.

The Daily GDD equation is: $((T\ max + T\ min) \div 2) - T\ base$

T max = the daily maximum air temperature

T min = the daily minimum air temperature

T base = the GDD base temperature for the organism being monitored

To determine the GDDs of a given insect, it starts with basic research. The bulk of the work is done by rearing the insect in a number of growth chambers, each set at a different constant temperature to monitor their development. This helps determine what the appropriate base temperature and maximum temperatures are for that insect. Since constant temperatures do not occur in the real world, additional research is done in the field, monitoring both the insect development and daily maximum and minimum temperatures. These studies often also determine what the biofix date is. When the research has been done elsewhere it requires validation to determine if it is also accurate at predicting the pest in Ontario's climate. There is often more than one GDD model to compare with (Table 1). Always pay attention when GDD model are coming from the US, as they are often calculating their degree days in Fahrenheit instead of Celsius degrees.

Table 1. Examples of GDD Requirements for Specific Insect Pests

Insect	T Base (°C)	Annual Start Date (Biofix)	Reference
Alfalfa weevil	9	April 1st	Harcourt 1981 Peterson and Meyer 1995 Beauzay et al. 2013 Soroka 2015
Black cutworm	10.4	Begin when cumulative trap catch of 9 or more moths over 2-day period	Troester et al. 1983 Story et al. 1984 Showers et al. 1985 Kullik et al. 2005
Cereal leaf beetle	8	January 1st	Guppy and Harcourt 1978 Blodgett et al. 2004 Philips et al. 2012 Evans et al. 2014
European corn borer	10	April 1st	McLeod 1976 Boivin et al. 1986

The original research on growing degree days for alfalfa weevil was done here in Ontario (Harcourt 1981). There are now several GDD models used in North America, many using at least part of the original Ontario research (Table 2). Research will need to continue as our climate changes and impacts the start dates of these models.

Table 2. Accumulated Degree Day Requirements for Alfalfa Weevil Development

Alfalfa Weevil Stage	Accumulated Degree Days (Base 9°C) Start Date April 1st	
	Soroka 2015	Harcourt 1981
Egg Hatch	155-167	Peak hatch at 155
1st Instar	176-206	+ 42 (= 197)
2nd instar	218-243	+ 42 (= 239)
3rd Instar – Major Feeding	260-280	+ 46 (= 285)
4th Instar – Major Feeding	306-331	+ 58 (= 343)
Pupation	N/A	+ 39 + 80 (= 462)
Adult emergence	N/A	N/A

Growing degree day calculations come in handy especially when the growing season is far from "normal". In some years (like this spring) we can accumulate daily GDDs very quickly, especially when the nights are also warm. Planting delays result in the insect getting ahead of crop development. Once the crop finally emerges, the insect might already be in its most damaging stage. If there is a significant delay in planting, the crop may escape any injury if it does not emerge until after the damaging stage of the insect has passed (Table 3). Based on this year's GDDs up to May 27th, feeding should begin in fields from Harrow to Vineland, while from Guelph to Eastern Ontario egg hatch about to start.

Table 3. Accumulated Degree Days (Base 9°C) for Various Ontario Locations in 2018

Location	Accumulated Growing Degree Days as of May 27th- Start Date April 1st	Predicted Alfalfa Weevil Stage
Harrow	199	1st instar
London	191	1st instar
Guelph	122	Nearing egg hatch
Vineland	167	Egg Hatch ending, 1st instars begin
Peterborough	109*	Nearing egg hatch
Kemptville	140	Nearing egg hatch

Weather data obtained from Environment Canada
*missing data for one or more days

General Guidelines for Scouting Alfalfa

Christine O'Reilly, Forage and Grazing Specialist, OMAFRA

Scouting is an important part of growing quality forage. Just like other field crops, scouting alfalfa helps growers stay ahead of emerging problems, correctly time harvests, and make better decisions when planning future crops.

Plant counts should be done spring and fall (Table 1). These can be done when the alfalfa is dormant. The spring count is a good time to dig up some plants and assess root health. Stem counts are useful for predicting yield potential, and these should be done in spring when there is 15-20cm (6-8") of growth (Table 2). If the number of plants or stems per square foot is too low, consider over-seeding with grasses to improve yields or rotating that field out of alfalfa.

Table 1. Assessing alfalfa stands using the plant count method

Age of Alfalfa Stand	Desired plant count per square foot
New Seeding	20+ plants
Year 1	12 to 20 plants
Year 2	8 to 12 plants
Year 3	5 plants

Table 2. Assessing alfalfa stands using the stem count method

Stems per square foot	% of Maximum Yield
55 or more	100%
40 to 50	75 to 92%
Less than 40	Stand is too weak to keep

Scout alfalfa fields weekly from when the crop breaks dormancy until after the last harvest of the year. Walk the field in a zig-zag or “W” pattern, and take a different route each week to observe more of the field over the growing season.

Alfalfa development is predicted using Base 5°C Growing Degree Days (GDD). To calculate GDD:

1. Add the daily maximum and minimum temperatures together.
2. Divide by 2 to get an average daily temperature.
3. Subtract 5 from your daily average to get the daily accumulation of growing degrees. If the answer is negative, assume it is 0.
4. Add the daily accumulation to a running total for the season.

Take care when referencing alfalfa GDD information from the United States; their GDDs are in degrees Fahrenheit, which change the reference numbers for alfalfa staging. To convert to Base 5°C: divide the Base 42°F GDD by 9, and then multiply by 5.

I prefer CHUs, why can’t I use them on alfalfa? The Ontario Crop Heat Unit (CHU) system was designed to predict corn development. Corn is a warm-season grass, and its development occurs at relatively high temperatures. Soybean growers are often able to use CHUs because soybeans are a warm-season legume, and use the same photosynthetic process as corn to produce sugar. Alfalfa is a cool-season crop; it uses a different photosynthetic pathway than corn and soybeans, and has different temperature tolerances. This is why Base 5°C GDD is a more accurate method of estimating crop stage for alfalfa.

Alfalfa generally does not grow until it receives at least 200 GDDs. For maximum (dairy) quality, first-cut alfalfa should be harvested at 390 GDD, before 10% bloom. Waiting will increase yields, but feed value starts to decline.

Crops pressured by insects, pests, and diseases have less vigour and anything that affects alfalfa leaves can reduce yield and feed value. OMAFRA’s Publication 811: Agronomy Guide for Field Crops has a Forage Scouting Calendar on page 104, which serves as a guideline to insect, pest, and disease activity in alfalfa in southern and eastern Ontario. The guide also describes scouting techniques for different forage pests starting on page 336 of Chapter 15: Insects and Pests of Field Crops. Some pest development is also modelled using GDD; however those models may use a different temperature base. For example, alfalfa weevil development is estimated on a Base 9°C GDD model, so the number of GDDs at a location on the same date will differ than those given for alfalfa (Base 5).

The goal of weed control in alfalfa is to increase both the quantity and quality of feed. New seedings are most sensitive to competition from weeds; however, identifying weed pressures in an old stand can influence the next crop in the rotation. Chemical weed control is most effective in spring or fall.

To reduce the risk of winter injury in alfalfa, plants need 500 GDDs between the final harvest and the first killing frost. This gives the alfalfa time to build root reserves that will carry it through the winter and allow for rapid green-up and growth the following spring. In situations where forage supplies are tight, a final cut could be taken with less than 200 GDDs remaining in the season, as the alfalfa will not be able to regrow before the frost.

The Many Mysteries of Soil Organic Matter

Sebastian Belliard, Soil Management Specialist – Field Crops, OMAFRA

Organic matter is arguably the most important component of soil. For almost any soil-related problem, organic matter seems to be the answer. Degraded soil structure? Needs organic matter. Poor water infiltration or retention? More organic matter. Low soil nutrient supply? Add organic matter. Climate change? Put that carbon (i.e. organic matter) back into the soil where it belongs! So, how does it work?

Much remains to be discovered about soil carbon dynamics. It would take many pages to address all the relevant factors. Instead, this article and those that follow will address some commonly-held misconceptions, as well as the directions in which recent research would point a carbon-concerned soil manager.

Conventional wisdom used to be that stable soil organic carbon (SOC) was made up of humus, the result of secondary synthesis of decomposing plant material into chemical structures so complex they were difficult to break down, or what scientists call “recalcitrant”. However, over the past 20 years or so, advances in analytical techniques have made it clear that humus, as it was traditionally defined in soil science, doesn’t actually exist in the soil at all, but was the result of the chemical extraction process in the lab(Lehmann et al., 2008; Lehmann and Kleber, 2015; Schmidt et al., 2011). That discovery caused quite a stir in the soil science community, which began searching for a new framework to explain the mechanisms of soil carbon stabilization that can incorporate all the evidence.

At this point you might be thinking, “That’s fascinating and all, but you better be getting to the point of how this relates to me and my farm”.

One of the most widely-accepted mechanisms for organic carbon accumulation in the soil is its physical protection through what is called occlusion. That is the scientific way of saying that the organic matter is made inaccessible to hungry microbes that are otherwise fully capable of decomposing it. This happens through the process of soil aggregation (Figure 1). Here is where we get to soil management on the farm, as aggregation is highly dependent on management (Figure 2).

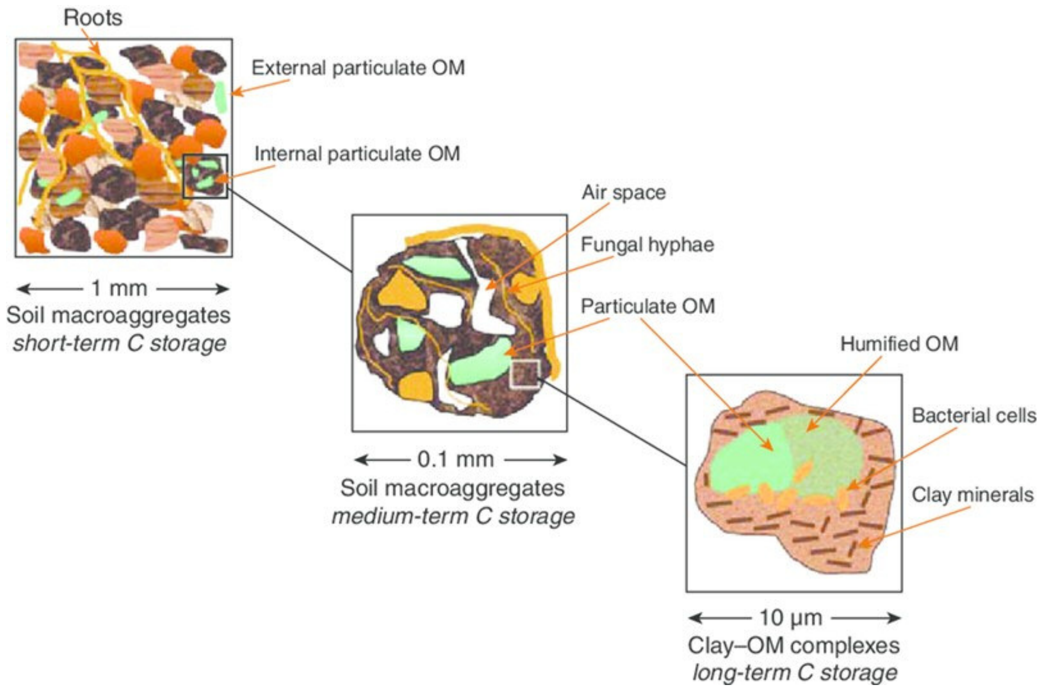

Figure 1. Soil aggregates and associated SOC storage time scale. (Tivet et al., 2013)

Occlusion and long-term (decades to centuries) organic matter protection happens mostly at the micro-aggregate scale. Macroaggregates also contribute, but only hold SOC for years to decades at most (von Lutzow et al., 2006). It’s fairly common knowledge that microaggregates are pulled together by the action and byproducts of fungal hyphae and plant roots to create macroaggregates, but what is less commonly known is that within stable macroaggregates, new microaggregates form and physically protect organic matter in their structure (Six et al., 2000). Soil disturbance (i.e. tillage) destroys macroaggregates, disrupting this critical process. Reducing soil disturbance to a minimum is the first step on your path to increasing organic matter levels in your soils.

However, as many long-term no-tillers will know, simply removing the disturbance is not a golden ticket to higher organic matter; we need to be adding it as well. That’s because the formation of aggregates and the organic matter they contain is highly dependent on soil microbes and their byproducts, and they need food to work.

We cannot think of soil systems without considering plants. Plants are the primary pathway for carbon inputs into the soil, and much of that carbon flows through root exudates. These are mostly relatively simple compounds that are used by microbes around plant roots in what is called the rhizosphere. Recent evidence shows that plant roots rich in soluble compounds have a positive impact on water-stable macroaggregates, mostly likely through stimulation of soil microbes (Poirier et al, 2017). Microbes can transform these simple compounds into the many forms of carbon found in soil (Kallenbach et al., 2016). This is one reason why there’s so much talk recently around maximizing living roots in the soil.

The question then becomes: “Which plants do I grow if I want to improve soil aggregation?” That question brings us to the fascinating and rapidly expanding research into plant functional root traits; the specific architectural, physiological, chemical, and symbiotic characteristics of plant roots and how they influence the plant-soil system. Just like carbon dynamics, there’s still a lot to be learned, and many species’ root traits remain uncharacterized. Add to that the variety-level differences that can exist and we’re a long way off from a complete picture, but here are a few things to know.

Root-associated microbes are very significant players in soil aggregation. Mycorrhizae promote microaggregate formation by producing glues and binding agents, and their network of hyphae bring microaggregates and larger soil particles together into macroaggregates.

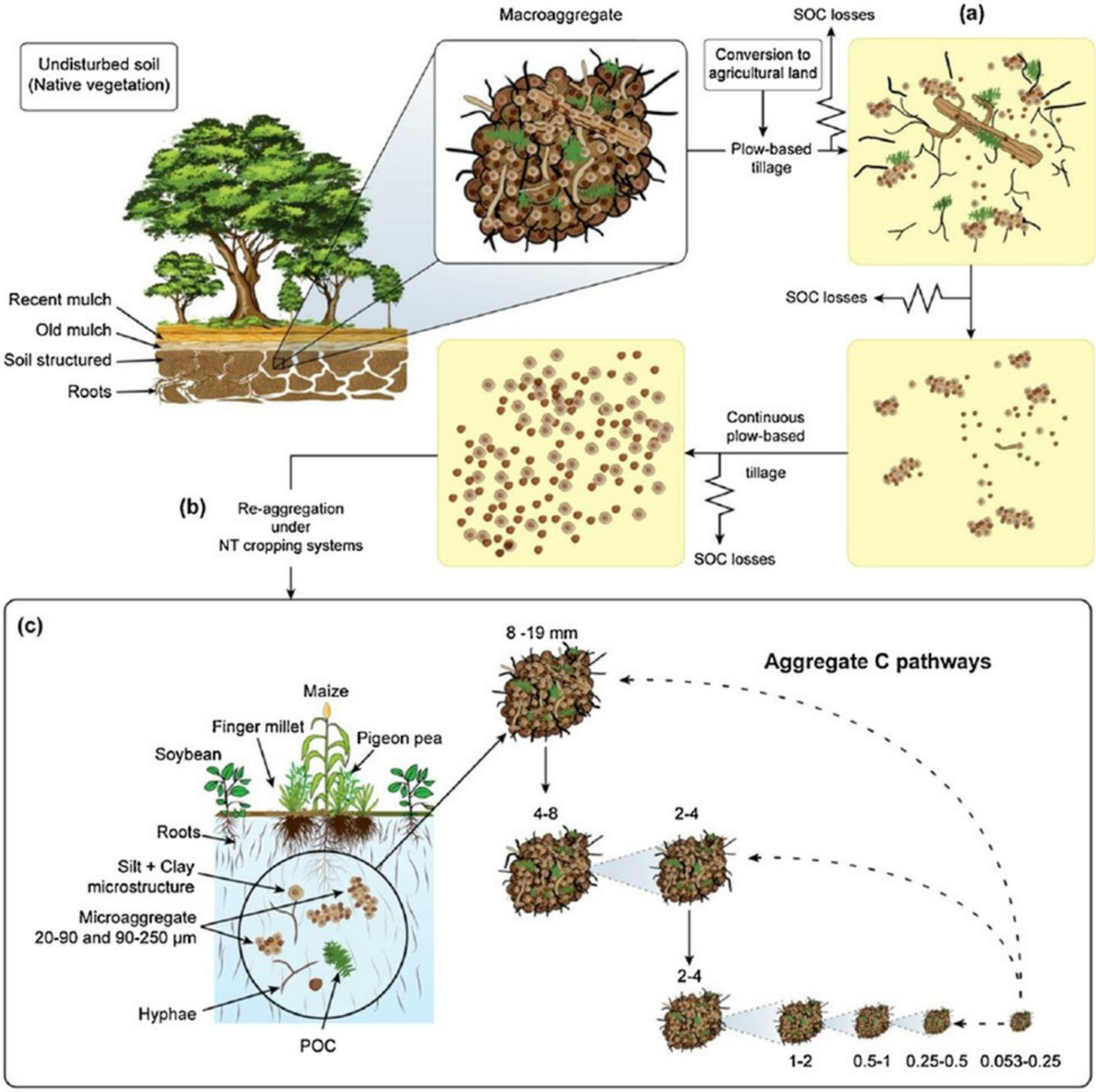

Figure 2. Management impacts on soil aggregation and SOC stocks. (Tivet et al., 2013)

Legumes (specifically their rhizobial partners) promote aggregation through the production of binding agents. This effect has been shown to be stronger in soils low in organic matter (Tisdall and Oades, 1982), which explains why macroaggregation is improved more in subsoil than topsoil under legume forage (Sainju et al., 2003).

However, legumes typically have less fibrous root architecture than grasses, which are associated with greater macroaggregation in topsoil (Angers and Caron, 1998). For example, ryegrass has high root length density (length of roots per volume of soil), and was found by Materechera et al. (1992) to result in stronger, denser and more stable soil macroaggregates enriched with SOC compared to peas and wheat. Phacelia has very high root length density (RLD) near the surface, which could explain why it's been indicated as having great benefits for topsoil structure. Cereal rye also has high RLD, almost twice as high as vetch, with mustard somewhere in between (Bodner et al., 2009). Root length density is correlated with root diameter, and other experiments have found that the positive impact of many fine roots is higher in soils with low organic matter levels.

There are many mysteries to be unraveled in the quest for higher soil organic matter. The belowground characteristics of the plants we choose to include in our cropping systems is an important piece of the puzzle, and as research progresses we should be able to use this kind of information to make better decisions about which cash or cover crops to include to achieve our soil management goals. These are exciting times, stay tuned!

For a complete list of references please visit the posting of this article on FieldCropNews.com .

Can Double Cropping Winter Canola and Soybean Kill Two Birds With One Stone?

Dr. Eric Page, Research Scientist in Weed Ecology, and Sydney Meloche, Weed Science Technician, AAFC Harrow Research and Development Center

Soybean production in southwestern Ontario is increasingly challenging because of the presence of multiple glyphosate resistant weed species. Essex, Kent and Lambton counties have the unfortunate distinction of being home to 4 glyphosate resistant weeds: Canada fleabane, common ragweed, giant ragweed and waterhemp, all of which are very difficult to control in soybean when glyphosate is no longer an option. Canola production in Ontario also faces significant challenges, primarily in the form of swede midge and clubroot. Although there appears to be little overlap in the issues facing these crops, a winter canola – soybean double crop could in theory kill two birds with one stone, allowing canola production to escape swede midge pressure while helping to stem soybean yield losses in longer season regions of the province.

Figure 1. Flowering winter canola hybrids on April 20th 2017 in Harrow (from left: Inspiration, CC17070, Mercedes). Hybrids in the photo were planted on September 13th 2016.

In a similar manner to fall seeded cover crops, winter canola is ideally suited to compete with winter annual and early emerging weeds, such as Canada fleabane and the ragweed species. The early resumption of growth in the spring means that winter canola has the potential to suppress the germination, growth and reproduction of these hard to control weeds. Weeds that do emerge and grow in-crop are also likely to be killed when winter canola is harvested in late June or early July, well before these species are normally capable of dispersing mature seed. In a planned double crop sequence, weed control practices would occur mid-summer between the fall and summer seeded crops which would allow for a wider range of herbicides to be used in a burndown style application. At this time of year, the majority of weed emergence flushes have passed and, thus the weed pressure facing the summer soybean crop can be managed through a narrowing of row spacing, an increase in the plant population density and, if needed, in crop herbicide application.

From a canola perspective, fall seeded, winter hardy biotypes offer the easiest escape from swede midge pressure. In southwestern Ontario, winter canola reached 50% flowering between April 24 and May 19 2017 (depending on plant date and hybrid) meaning that the vulnerable stages of canola development occurred well before overwintering swede midge could emerge from the soil in late May or early June. Similarly, the advancement of the reproductive phase of development in winter vs spring canola meant that all but our last plant date (i.e., Oct 17, 2016) avoided feeding damage from other insect pests including lygus and seedpod weevil.

Although we have yet to work out all of the agronomic issues involved with implementing a winter canola-soybean double crop, the early results are promising. In our 2016/17 planting date trial, winter canola hybrids reached physiological maturity from June 21 to July 12 and yielded between 3400 and 5800 lbs/ac with an average of 4700. A separate but similarly structured planting date trial conducted over the past two years indicated that a summer soybean crop planted during the first 3 weeks of July could yield between 2800 and 3400 lbs/ac for a 00.2 maturity group soybean and between 3500 and 5000 lbs/ac for a 3.3 maturity group soybean. Bearing in mind that these results reflect small plot research trials conducted in the most southerly county in the province, the economics of a winter canola – soybean double crop are likely to be favourable throughout the rest of southwestern Ontario. In fact, on-farm experience in Oxford County in 2015 and 2016 indicated that double crop soybean following canola was economically viable even without reducing the relative maturity of the seeded variety.

In the coming years our research will build on these initial planting date/variety trials to address more complex questions such as how to best fit a winter canola-soybean double crop into existing corn-soy-wheat rotations, how to deal with other known pests of winter canola including slugs and how to manage the preceding crops' residue to ensure stand uniformity when seeding winter canola. If any of our current or future research topics are of interest to you, please don't hesitate to contact us (eric.page@agr.gc.ca); we are always looking for farmer feedback and engagement.

Farmers interested in learning more about winter canola production in southern Ontario can attend a tour at the AAFC Research Station in Harrow on June 21, 2018 from 1:00-3:00. Please pre-register for the event at www.ontariocanolagrowers.ca .

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