RUTGERS COOPERATIVE EXTENSION AT THE NEW JERSEY AGRICULTURAL EXPERIMENT STATION

PLANT & PEST ADVISORY

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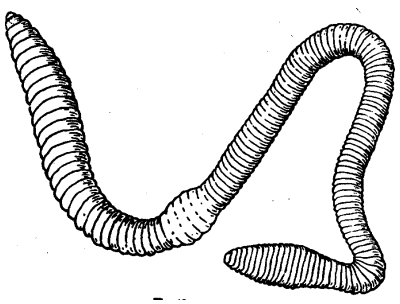

INSIDE

Digging for Dirt on Earthworms

Reprinted from Journal of Natural Resources Life Science Education, Vol. 30, 2001.

Ever wonder why there are not native Canadian earthworms? It turns out the last Ice Age wiped out any native species in Canada. Also of interest is that the sightless and earless earthworms avoid hungry birds by sensing the vibrations of the birds on the surface. And, earthworms can freeze solid and still live, as long as the freeze occurs slowly.

While the feats and fortitude of earthworms may seem trivial to some people, they are serious business in farming. Eileen Kladivko is a soil physicist in Purdue's Department of Agronomy. Kladivko became interested in earthworms after seeing the benefits such annelids had on soil tilth and friability. She receives several calls each year from farmers asking about the benefits of earthworms in agriculture.

Hard-Working Worms

Earthworms are sometimes called *nature's plow* due to their ability to tunnel through the soil. Shallow-dwelling species - redworms, greyworms, fishworms, among others - create shallow, random burrows near the soil surface, burrowing about 3 feet per week. Nightcrawlers dig vertical burrows that can reach 6 feet or more into the soil. Field populations can run as high as half-a-million earthworms per acre, tunneling 250 miles each week, says Dennis Linden, soil scientist with USDA's Agricultural Research Service in St. Paul, MN.

The shallow tunnels create space for air and water in the soil, while the vertical burrows improve drainage and water infiltration.

Earthworms also eat organic matter and plant residue in the soil, excreting it in more usable forms. Their excrement is rich in phosphorus, potassium, calcium, magnesium, iron, and sulfur; they also convert mineralized forms of nitrogen, phosphorus, and potassium into more soluble, readily available forms for plant uptake.

As they feed on crop residues, worms distribute nutrients and humus through the soil profile and mix organic and inorganic soil components, says Kladivko. That's why soils with active worm populations tend to exhibit greater moisture-holding capacity, better soil structure, and more stable pH.

In his research, Linden is looking at yet another benefit that annelids provide: carbon sequestration. By taking organic matter under-

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Earthworm Trivia

1. In a recent experiment on a farm in California, soil with worm castings increased tomato production by 10%, and soil with both worms and castings produced 33% more tomatoes than soil with no amendments.

2. Studies at the School of Agriculture in Switzerland's Ebenrain-Sissach revealed that worm castings had seven times as much available nitrogen as the surrounding soil, and an average of 2 to 4.5 times as much available potassium.

3. The life expectancy of earthworms is generally 4 to 8 years.

4. Earthworms are an excellent source of nutritional protein, comparing favorably to dried soya meal and fish meal. Such a food product would be prohibitively expensive to produce. Fortunately.

5. Earthworm burrows increase water infiltration, and earthworms also increase moisture-holding capacity by increasing water-stable aggregates in the soil. Some burrows have been found to travel as deep as 50 inches below the soil surface.

6. Earthworms are active in the spring and fall; during the summer and winter, they escape extreme temperatures by burrowing deeply or by entering resting states, which are similar to hibernation.

7. Pyrethroids, such as Force insecticide, are harmless to earthworms under field conditions.

8. An acre of well-fertilized, low-lying pasture can support one million worms. Many no-till crop fields are home to half-a-million worms per acre.

9. No, earthworms do not come to the surface after heavy rains to avoid drowning. The surface water and high relative humidity keeps them from dehydrating, and being above ground makes it easier for them to mate and migrate.

10. To encourage earthworm populations, experts recommend that growers reduce tillage, leave plenty of surface residue, and apply ample fertilizer.

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ground, the worms keep carbon from releasing into the atmosphere, where it would bind with oxygen to form carbon dioxide.

Worm Preservation

With all of that free labor, it pays to give earthworms a boost. Here are some pointers from the experts: 1) leave plenty of surface residue; 2) reduce tillage; 3) apply ample fertilizer, especially manures and sewage sludges; and 4) choose your soil insecticide carefully.

Planting Worms?

The agronomic benefits earthworms deliver beg the question of whether growers should seed their fields with earthworms. Kladivko says the answer is usually no.

"It's not something that I can as yet recommend," she says. "I tried it in 14 different fields. It worked in a couple of fields and didn't work in others. The cost is maybe a couple of hundred dollars an acre and is a one-time thing, so I might consider it if I had a field that should have nightcrawlers but doesn't."

She says most inquiries come from no-till and low-till farmers. "I think that's the result of two things. One is that when growers switch to no-till, they're aware that they should see more earthworms. And if they don't, they call me," she says. "The second is that when they switch to no-till or minimum tillage, they become more interested in soil tilth and how earthworms can help."

Rather than seeding fields with nightcrawlers, Kladivko recommends that growers work to provide the conditions under which nightcrawlers flourish. Those include leaving plenty of residue above ground, reducing tillage, and rotating occasionally into legumes like soybean or alfalfa.

If you do choose to seed your fields, you should do it only with nightcrawlers, says Kladivko. "Shallow-dwelling worms will be there already if the conditions are right. And if the conditions aren't right, nothing you can do will keep those worms there."

Rounding up Nightcrawlers

To seed your fields, you'll need to harvest some nightcrawlers. The worms are active in late spring and late fall; they can be found above ground after heavy rains. Recruit some neighborhood kids to help you. Then seed them in waterways or directly into fields with plenty of residue. Mark those areas carefully. Then come back periodically over the next year or two and look for the distinctive mounds of earth that nightcrawlers build.

Such practices are common in a few areas of the world, says Kladivko. Most notably, New Zealand farmers transplant sod from worm-rich pasture into other pasture, which is especially conducive to earthworms because it is not tilled.

For more information on earthworms, contact your county extension office.

Submitted by Joseph R. Heckman, Ph.D., Specialist in Soil Fertility. ❑

Potash Terminology and Facts

Reprinted from Agri-Briefs, from the Agronomists of the Potash & Phosphate Institute, Winter 2001-2002, No.7.

Ever wonder where the term potash originated? Of course, potash is now commonly used in reference to potassium fertilizers. But, in colonial days it referred to a crude potassium carbonate salt that was produced by leaching wood ashes and drying or evaporating the leachate in iron pots...hence pot ash. Early settlers used this salt as a source of potassium fertilizer and for soap and glass making, wool scouring, and cloth dyeing. In fact, the first patent issued in the US was for a process to extract potash from wood ashes.

In fertilizer terminology, potash refers to potassium oxide, or K_2O. For example, a fertilizer with 0-0-60 analysis will contain 60 percent K_2O equivalent by weight. This is somewhat confusing since the fertilizer material doesn't actually contain K_2O, and plants do not take up K_2O. It's simply the standard that has been adopted and used for some time now. Occasionally, in scientific literature, percent potassium is used instead of percent K_2O. To convert potassium to K_2O, multiply by 1.2; multiply K_2O by 0.83 to convert to potassium.

Potash fertilizers range from 20 to 62 percent K_2O. They are all water-soluble and therefore agronomically effective. They consist of potassium in combination with chloride, sulfate, nitrate, and other elements. Common potash fertilizer sources include,

- Muriate of potash (MOP), or potassium chloride (KCl)
- Sulfate of potash (SOP), or potassium sulfate (K_2SO_4)
- Sulfate of potash magnesia, or potassium-magnesium sulfate (K_2SO_4 2Mg SO_4)
- Saltpeter, or potassium nitrate (KNO_3)

In addition to potassium, these fertilizers provide other needed nutrients. For example, MOP contains 60 to 62 percent K_2O and about 45 percent chloride. Sulfate of potash contains 50 to 53 percent K_2O and about 18 percent sulfur. Sulfate of potash magnesia contains 20 to 22 percent K_2O and sulfur and 10 to 11 percent magnesium. Potassium nitrate contains 44 percent K_2O and 13 percent nitrogen.

Muriate of potash is by far the most commonly used of the potash fertilizer sources. It comes in red, white, and colors in between. The question is sometimes asked, "Does the color of MOP make a difference in its agronomic effectiveness?" The answer is an emphatic *No.* Some crops may be sensitive to the chloride in MOP. Therefore, SOP or potassium nitrate may be the best source for crops such as potatoes, tobacco, fruit trees and others with low tolerance to chloride. Sulfate of potash magnesia is routinely used wherever there is a need for at least two of the three nutrients in that material.

Potassium is a major essential nutrient in crop production. Where it is deficient in the soil or where crop demands during specific growth stages exceed the soil's ability to supply adequate potassium, it must be supplemented through fertilization. All potassium fertilizers are agronomically effective and in most cases will perform similarly. Crop sensitivities, the need for accompanying nutrients, and market availability are factors that should be considered when selecting the best source for a specific situation.

Submitted by Joseph R. Heckman, Ph.D., Specialist in Soil Fertility. ❑

New Jersey State Winning Yield for Sorghum Production

Everett A. Chamberlain, Warren County Agricultural Agent

2001 Sorghum Yields

Grower	Acres in Field	Herbicides	Insecticides	Acres Harvested	Date Harvested	Field Moisture	Hybrid Harvested	Tillage System	Bushel Yield at 15.5% Moisture
Ron Sigler	10	Bicep 2	None	5.2607	11/09/01	15.0	Pioneer 84G62	No-Till	112.1231

National Corn Grower Certified Yields Recorded by Producers in Warren County

Everett A. Chamberlain, Warren County Agricultural Agent

2001 Corn Yields									
Grower	**Acres in Field**	**Herbicides**	**Insecticides**	**Acres Harvested**	**Date Harvested**	**Field Moisture**	**Hybrid Harvested**	**Tillage System**	**Bushel Yield at 15.5% Moisture**
Sam Santini		Degree 2.3 qt	Lorsban 8 lb	1.5758	10/16/01	22.2	Dekalb DKC63-03	Conventional	251.8121 (recheck)
Sam Santini		Degree 2.3 qt	Lorsban 8 lb	1.3240	10/16/01	22.5	Dekalb DKC63-03	Conventional	246.6573 (1st check)
Russ Woolf	12	Bicep II Magnum 1.75 qt Prowl 1.5 pt	None	1.2830	10/19/01	22.1	Pioneer 33Y18	Conventional	230.9609
Clara Santini		Degree 2.3 qt	Lorsban 8 lb	1.2737	10/16/01	19.1	Dekalb DK525BTY	No-Till	225.7681
Michelle Santini	75	Harness Xtra 2 qt Prowl 1 pt	Lorsban 8.6 lb	1.5068	10/12/01	22.4	Dekalb DKC57-40	No-Till	224.8493
Chris Santini		Degree 2.3 qt	Lorsban 8 lb	1.2623	10/16/01	23.0	Dekalb DK589RR	Ridge-Till	224.3017
Stephanie Santini		Degree 2.3 qt	Lorsban 8 lb	1.2651	09/28/01	23.5	Dekalb DK589RR	No-Till	220.8186
Bauke Tjalma	12	Prowl 1 qt Bullet 3 qt	Lorsban 8 lb	1.4252	10/23/01	16.2	Pioneer 33A14	Conventional	209.4985
Santino Santini		Degree 2.3 qt	Lorsban 8 lb	1.2661	10/16/01	22.0	Dekalb DK580RR	Ridge-Till	208.0456
Santino Santini		Degree 2.3 qt	Lorsban 8 lb	1.2648	10/16/01	22.9	Dekalb DKC61-24	Ridge-Till	207.6599
Woolf Farms	35	Bicip II qt Magnum 1.75 Roundup Ultra Max 1.6 pt	Force 3G 4.8 lb	1.2775	10/26/01	21.5	Sygenta N70-D5	No-Till	202.8359
Alice Tjalma	12	Prowl 1 qt Bullet 3 qt	Lorsban 8 lb	1.7059	10/23/01	16.7	Pioneer 33Y09	Conventional	199.9864
Stewart Smith	10			1.4125	10/18/01	22.4	Pioneer 33A14	No-Till	196.6717
Bauke Tjalma	10	Roundup 1 qt Bullet 3qt Prowl 1 qt	Lorsban 8 lb	1.3243	11/09/01	21.1	Sygenta N70-D5	No-Till	188.8587
Bauke Tjalma	10	Prowl 1 qt Bullet 3 qt	Lorsban 8 lb	1.5179	10/23/01	16.6	Dekalb DKC61-24	Conventional	182.0640
Nancy Bilyk	25	Harness Xtra 2.4 qt	Regent 5 oz	1.3464	11/09/01	19.7	Sygenta 7210	No-Till	179.9802
Ron Sigler	16	Gramoxone 0.48 qt Basis Gold 14 oz Clarity 4 oz	Pound 8 oz Kernel Guard Supreme 1.5 oz	1.3047	10/17/01	20.0	Pioneer 33A14	No-Till	166.1202
John Bilyk	25	Harness Xtra 2.4 oz	Regent 5 oz	1.4008	11/09/01	18.2	Sygenta N64-L5	No-Till	161.6604
Jacob Bilyk	12	Harness Xtra 2.4 qt	Regent 5 oz	1.2865	10/12/01	21.7	Sygenta NX7210	Conventional	147.3980

Field Crops Update

Donna Foulk, Program Associate in Field Crops IPM

Potential of Corn for Energy

With corn prices remaining low, markets for corn as energy products are becoming increasingly attractive. In addition to using corn to produce ethanol as a fuel additive, corn can be used directly as heating fuel.

According to Dennis Buffington, Penn State University Department of Agricultural engineering, corn is a more economical heating fuel than propane or wood pellets, at current prices. Dr. Buffington has developed a web site, http://energy.cas.psu.edu/energyselector, to compare various alternatives and prices to shelled corn.

Corn can be burned in central or outside furnaces to heat whole houses, workshops, or businesses. A number of manufacturers now make stoves that burn corn and are very similar to pellet stoves. In fact, some stoves can burn wood pellets or corn and other grain crops. Shelled corn, used as a fuel, should be 15% moisture or less and free of fines. In most stoves, corn is automatically augured into a small burn chamber, and the heated air is blown into the room. The Ontario Ministry of Agriculture, Food and Rural Affairs has produced a good fact sheet on Burning Shelled Corn as Fuel. The publication can be found on the web at www.gov.on.ca/OMAFRA/english/crops/facts/93-023.htm.

Many farmers have recently purchased corn-burning stoves, and several are investigating stove dealerships and plan to sell stoves and the corn they produce on the farm. The marketing advantages are numerous: using corn for fuel helps support USA agriculture, promotes a renewable, environmentally friendly energy source, and helps reduce dependency on foreign oil.

Canada Thistle

Ask any farmer about their most troublesome weeds, and Canada thistle ranks near the top of everyone's list. Canada thistle is a very persistent, invasive species with impressive survival capabilities.

- One large Canada thistle plant can produce 5,000 seeds. Seeds will be viable if the flowers have been open 8-10 days after blooming. Viable seeds will not be produced if plants are moved during the week they bloom.
- Seeds can remain viable for twenty years, and can germinate on the soil surface or when buried 3″.
- The root system of Canada thistle enables it to spread rapidly. Pieces of roots as small as 1″ can produce new shoots. Creeping roots provide food and numerous buds develop on roots below the plow layer.
- Removing shoots and damaging plants stimulate new growth from underground buds. Buds can produce new shoots a year or more after the top growth has been destroyed.
- New seedlings only 20-30 days old can regenerate new shoots from their roots if the shoot is destroyed.
- Tillage can easily spread pieces of roots into uninfested areas.

Yield Reduction

It is difficult to estimate yield reduction caused by Canada thistle, since it typically grows in patches in fields. In areas where infestation is heavy, corn yields can be reduced up to 81%.

Thistle also produces toxic substances that are released in soil and inhibit growth of certain plants, such as wheat and alfalfa.

Canada Thistle Control

Cultivation: Cultivation alone can be used to starve the roots if the shoots are repeatedly destroyed. This requires cultivation every 10-15 days for two years.

Crop competition can be effective, if a vigorous crop is established. Alfalfa and forage grasses have been the best competitors due to repeat cuttings.

Herbicides provide the most effective control option. The best time to treat thistle with foliar herbicides is after the first flower bud forms and before it flowers, or late summer when thistles are moving food reserves to the roots.

Conditions needed for good performance of foliar applied mobile herbicides include:

1. Adequate soil moisture in surface soil and subsoil.
2. Green leaves undamaged by frost, drought, insects or disease.
3. Shoot height is at least 10″ tall in June and at least 8″ tall in fall.
4. Flowers are not fully opened.
5. Thistles have not been recently disturbed by tillage.
6. No mowing or cultivation should be done 10 days after application.

Results from experiments conducted in Nebraska indicate that herbicides applied in September generally provide 15-20% more control than herbicides applied in June.

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Results from Canada Thistle Control Studies Conducted in Western Nebraska

Herbicide	Rate commercial product/acre	Time of Treatment	% Canada thistle shoot control 1 year after treatment
Banvel	1 qt	June	81
		September	86
Banvel + 2,4-D	1 qt + 1 qt	June	54
		September	69
Roundup	2 qt	June	20
		September	80
Stinger	0.3 pt	June	45
		September	57
Stinger	0.6 pt	June	75
		September	73
Stinger	1.3 pt	June	90
		September	92

Note: Be sure to check the label for recommended rates in our area.
Persistence is the key to successful Canada thistle control. Multiple herbicide treatments are necessary.

Corn Herbicides and Their Effectiveness on Canada Thistle Source: Penn State Agronomy Guide

Herbicide	Canada thistle
Soil-applied	
Atrazine[1]	7
Atrazine + Princep	7+
Postemergence	
2,4-D	7+
Accent	6
Banvel	8
Atrazine[1]	6
Beacon	7
Stinger	9
Laddok	8
Marksman	8+
Accent + Banvel	8
Beacon + Banvel or 2,4-D	8+
Exceed + Banvel or 2,4-D	8+
Permit + Banvel or 2,4-D	8+

Performance ratings:
10 = 95-100%
9 = 85-95%
8 = 75-85%
7 = 65-75%
6 = 55-65%
N = Less than 55% or no control

Sources
Canada Thistle, University of Nebraska
Control of Canada Thistle, Purdue University

Introducing!!

A New Web Site Developed for Farmers and Crop Consultants in Northeast New Jersey and Eastern Pennsylvania

Location: **www.cropmaster–icm.com**
Developed by: **Rutgers and Penn State Extension Agents in the Penn Jersey Extension Partnership**

Featuring:

- Crop scouting schedules for alfalfa, soybeans, corn, and small grains
- Rapid links to crop management information
- Weekly crop reports and emergency pest alerts
- Links to current pesticide tables and charts
- Easily obtainable information about specific crop pests

This site is a very valuable and "user-friendly" source of information.

We would like to include your scouting information on the weekly grain and forage crop alert section of the site, and feature your farm or business as the source of the information. Please contact us by telephone at 908-475-6503, or e-mail us at fields@cropmaster-icm.com.

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