The Noronha Elaterid Light Trap (NELT) that attracts click beetles in fields.

A focused effort to manage wireworms in the Golden Triangle Area of Montana

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Wireworms, larvae of click beetles, pose a major threat to the wheat and barley production in Montana. These larvae live beneath the ground and cause damage to affected plants by feeding on germinating seeds, roots and young seedlings. They may kill plants directly or create wounds that allow establishment of diseases. The unpredictable behavior of wireworms makes the assessment and control of wireworms complicated and often unsatisfactory. Since the earlier accessible effective chemical Lindane is no longer available, the demand for a reliable and effective control method is increasing. Growers, with wireworm pressure, require the effective control method to help achieve an optimum crop yield.

Since 2014, we have been collecting wireworms from various farms in Pondera, Flathead and Teton Counties. We have found three species of wireworms, namely Limonius californicus, Hypnoidus bicolor, and Aeolus mellillus predominately present in wheat fields in all three of these counties. Montana faces a very cold winter season with average lowest temperature of 10–13° F. This extreme weather causes wireworms move 4–5 feet below the soil surface. During spring, after soil temperature warms to 50° F, larvae come up to around 6 inches below the soil surface and start feeding on the plant roots.

In 2012 entomologists/insect ecologists at the Western Triangle Agricultural Research Center (WTARC) begin studying strategies, including cultural and biological control, to manage populations of wireworms in Golden Triangle area. We have been researching the effectiveness of entomopathogenic fungus (insect killing fungus) and nematodes (predatory nematodes) to manage wireworm populations. To achieve this, we establish field trials and routinely conduct laboratory experiments. We have found that laboratory experiments require a large number of wireworms. Since, the availability of wireworms in fields is unpredictable, we try to collect wireworms from grower's fields during spring and summer season (May–August) and keep the wireworms in small plastic cups with germinating wheat seeds and store them in incubators at a maintained temperature (±60° F) and humidity (±65%) for our experiments. The major constrain we face is availability of wireworms in the off-season. Keeping this constraint in mind, this year we have established a metal chamber at WTARC. This chamber is 6 ft. long × 3 ft. wide × 8 ft. high. It is positioned in the soil for rearing of wireworms and other soil-dwelling insects. The chamber is made

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Wireworm growth chamber established at the Western Triangle Agricultural Research Center spring of 2018.

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up of galvanized metal sheets of 1/8-inch gauge. The bottom of the chamber has an insulated double layer of small size metal mesh (>1 mm), to avoid insects escaping the environment. The chamber is dug 7 feet deep in the ground and the remaining 1 feet is above the soil surface. The chamber is filled with soil. During the winter the larvae can move down in the soil and during spring and summer, once the soil temperature warms, they can move up, replicating an actual field situation.

For rearing the wireworms, we will be following two methods. One method involves collection of adult click beetles from the field during the spring. For collecting click beetles, we will be using sweep nets and solar traps (Figure-2). As shown in the Figure-2, the Solar trap (The Noronha Elaterid Light Trap-NELT) consists of a solar panel with battery attached to a bulb. The battery charges with sun light falling on the solar panel during day time. A cup with soil and honey is placed below the bulb. At night time, the bulb lights up in absence of natural sun light and click beetles get attracted to the light emitted from the system. After 10–12 days we collect the click beetles from cup. The collected beetles will be fed on 10% honey solution and yeast mixture for 24 hours. They will be transferred into cages with growing wheat plants and other preferred plants such as peas, until they lay eggs. Later, on the once the larvae hatch, they can be transferred to the metal cage. The second method involves collection of larvae from the field and transferring them to the chamber. The transferred larvae, over time, will pupate into adults and begin laying eggs. Hopefully the eggs will hatch into larvae. To collect the larvae we will use stocking traps made up of wheat and barley seeds. The traps will be soaked for 24 hours to make the seeds sprout. Sprouting seeds release CO2 which attract wireworms. The traps will be buried into a 5–8 inch deep hole and covered with black plastic to provide an amenable environment for wireworms. Traps will be collected after about 15 days of establishing them in field. Traps with wireworms will be processed in Berlese Funnels at WTARC (Figure 3) and collected wireworms will be released in the chamber.

This project will greatly aid in the obtaining of larvae for laboratory studies and will also enable the study of the intriguing life cycle stages of click beetles, which are still unstudied. Since all the reported three species have varied life cycle in terms of number of instars, the rearing will enable us to study the life cycle of all three species. The study of life cycle will include the eggs and hatching time, number of larval instars, and time taken to molt from one stage to another. Other unknown behavioral aspects such as their feeding and oviposition preference, and movement in the soil will also be explored by using this rearing facility. In conclusion, by imitating the field conditions, we plan to study biology and behavior of wireworms along with our main objective of rearing these insects for laboratory studies to find effective management options for wireworms in Montana.

Barbershop Music Appreciation Day

Date When celebrateed: July 13th

Barbershop Music Appreciation Day is a day to relax and enjoy the sweet voices of the Sweet Adelines, or a Barbershop Quartet.

Edna Mae Anderson of Tulsa, Oklahoma invited some women to her home to sing on July 13, 1945. Their husbands were members of the Society for the Preservation and Encouragement of Barber Shop Quartet Singing in America (SPEBSQSA). The ladies wanted to participate in the singing fun and enjoyment. On that evening, the "Sweet Adelines" were born. The group later became Sweet Adelines International., which now boasts hundreds of groups and thousands for members.

Today is a great day to listen to barbershop music. Better still, join a Barbershop Quartet, or the Sweet Adelines.

The Origin of Barbershop Music Appreciation Day:

Barbershop Music Appreciation Day was created in 2005 by Sweet Adelines International. It was started to mark the 60th anniversary of the founding of their organization. This organization boasts over 300 choruses, and 15,000 singers.

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When mowing grass on a slope, mow up and down, not sideways. About ninety-five Americans are killed each year because of not knowing this.