



Figure 1. Adult springtail (40x magnification).

Springtails

in Sugarbeet:

Identification, Biology, and Management

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Introduction

Springtails are tiny, wingless, primitive animals commonly placed into the insect order Collembola. They are so unusual that some experts classify them as non-insects. Springtails are one of the most abundant and diverse animal groups on earth with over 6,000 described species and an estimated eight times as many remaining to be identified.

The springtails have worldwide distribution and occupy a diverse habitat range that includes soil, algae, old snowbanks, beaches, caves, cisterns, vacant bird nests, tropical rain forest canopies, tidal pools, deserts, the surfaces of freshwater ponds and streams, and even the frozen terrain of Antarctica. However, they are most abundant in warm, moist environments. Economically important species in North Dakota and Minnesota sugarbeet fields are the soil-inhabiting springtails.

Soil-inhabiting springtails are usually regarded as beneficial to soil health because they assist with decomposition of soil organic matter and can have a positive impact on soil structure. In addition to decaying organic matter, common food sources are the spores and hyphae of soil-borne fungi, including those of certain strains of the potato and sugarbeet pathogen *Rhizoctonia solani* Kuhn. Also, they have often been used as indicator species in insecticide persistence and environmental quality studies. However, under optimal environmental conditions, severe springtail infestations can develop and cause significant harm to cultivated plants.

Description

Springtails can vary in color from white to yellow, orange, metallic green, lavender, gray, or red. A tiny tube on the abdomen, the collophore, is common to all springtails. The collophore is mostly needed for maintaining optimal water balance but also functions in some species as a sticky appendage for adhering to surfaces. The name "springtail" refers to an unusual forked organ, the furcula, that arises near the posterior end of some species. It enables them to jump when disturbed. The furcula is usually folded forward along the underside of the body and held in place with a clasp called the tenaculum. To jump, the springtail releases its furcula and flings itself through the air. Some can jump up to 20 times their body length.

The soil-inhabiting springtails most commonly observed causing damage to sugarbeet in the Red River Valley lack the springing apparatus and do not jump. They are blind due to absent or reduced-functioning eyes. Their body color varies slightly between white and cream, and they range in size from 1/32 to 3/32 inch (0.8 to 2.4 mm) long from the tips of their antennae to the posterior end of their abdomen (Figure 1). Males and females are indistinguishable to the untrained individual, and juveniles look very similar to adults.

Biology and Life History

Springtails that commonly infest sugarbeet fields in the Red River Valley are semiaquatic. That is, they are adapted to and reproduce more rapidly in soil moisture levels at or near saturation. Some species overwinter in the soil as eggs. However, most spend the winter below the soil surface as resting adults. The springtail life cycle begins in the egg stage. Females deposit their microscopic eggs individually or in small batches (typically five to 50 per



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batch) within the upper two inches of soil. Juveniles begin feeding soon after hatching and develop through several stages, or instars, before reaching adulthood. The soil-inhabiting springtails that cause problems in North Dakota and Minnesota sugarbeet fields are suspected to produce more than one generation per year. The actual number is unknown and probably varies with the availability of resources, prevailing weather patterns, and associated soil moisture conditions in a given year.

Injury and Symptoms

Although feeding may occur on mature sugarbeet roots, injury is most apparent and harmful in seedlings. Below-ground injury can range from a few brown feeding punctures to extensive scarring damage that results in the root turning almost entirely brown to black in color (Figure 2a).

Above-ground symptoms of springtail injury to sugarbeet seedlings include wilting plants (Figure 2b) and reduced plant stand in areas where a soil insecticide was not applied at planting time (Figure 3).

Management

Fields at Risk: Although outbreaks are difficult to predict, certain weather patterns and soil characteristics increase the likelihood of an economically significant springtail infestation. Generally, fields with fine-textured soils (i.e., clay or silty clay) are more likely to have problems than those with coarse soils. Since decaying organic material is a preferred food source, high organic matter content in soil will also be more conducive to population buildups. Early-planted fields, especially where cool and wet soil conditions persist during early spring, will be at risk for springtail injury. Drought conditions can force the insect into an inactive state and the risk of crop injury will be minimal. Producers should also be aware of the high potential for damaging infestations in fields that had springtail problems during previous growing seasons.

Chemical Control: Currently, no insecticide is specifically labeled for springtail control in sugarbeet. Manufacturers are, therefore, not legally bound to guarantee acceptable control. Also, insecticide performance data needed to base a recommendation on is not available. Historically, most economic losses from springtails in the Red River Valley have been reported in fields where no planting-time soil insecticide was applied. Most observations suggest that adequate control may be achieved by applying an organophosphate soil insecticide at planting; however, the material must be registered for use in sugarbeet for the application to be legal.



Figure 2. Sugarbeet injury from springtails: a) seedling root with extensive feeding scars; and b) young wilting plant due to severe below-ground injury.



Figure 3. Reduced sugarbeet plant stand due to springtail feeding injury.

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