

Wheat Stem Sawfly Parasitoid: *Bracon cephi*

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Introduction

In South Dakota, wheat stem sawflies, *Cephus cinctus* (Norton) (Hymenoptera: Cephidae), are considered a minor pest. Previous surveys of wheat in South Dakota revealed limited detection of the wheat stem sawfly. One potential explanation for this is reduced wheat acreage compared to historical records. Rand et al. (2014) determined that wheat stem sawfly population outbreaks are dependent on the availability of wheat fields. An additional explanation may be the presence of parasitoid wasp species in South Dakota.

There are nine identified parasitoid wasp species that attack wheat stem sawfly larvae in native grasslands (Nelson 1953, Davis et al. 1955). Of the nine identified species, only two attack wheat stem sawfly larvae in wheat (Morrill et al. 1998). Of the two species, *Bracon cephi* (Gahan) (Hymenoptera: Braconidae) is considered the predominant species in wheat (Morrill et al. 1994). This parasitoid is an idiobiont ectoparasitoid, meaning that it feeds on the external surface of the host (Somsen and Luginbill 1956). Previous research from Montana found that *B. cephi* can effectively suppress wheat stem sawfly larvae (Morrill et al. 1998). In South Dakota, previous studies have observed parasitism rates that varied from 0% to as high as 76-100% (Rand et al. 2014). The observations of parasitized wheat stem sawfly larvae were concentrated in Harding, Perkins, and Walworth counties (Rand et al. 2014).

Identification

Adult characteristics (Runyon et al. 2001)

- Orange body color with head and thorax sometimes darker (Figures 1 and 2)
- Females with ovipositor visible when at rest
- First metasomal suture is crenulate
- Origin of wing vein 'r' near middle of stigma
- Second submarginal cell is long with a ratio of 3RSa to r between 2-3
- Body ranges from 4-6 mm in length



Figure 1. *Bracon cephi* adult. Photo courtesy of H. Goulet.



Figure 2. Dark head and thorax color variant of *Bracon cephi* adult. Photo courtesy of Patrick Wagner.

Larva characteristics (fully developed) (Nelson and Farstad 1953):

- 13 body segments
- No legs
- Non-segmented antennae

Pupa characters (Figure 3)

- White to gray color
- Cylindrical shape and attached inside wheat stem



Figure 3. *Bracon cephi* cocoon. Photo courtesy of Govinda Shrestha.

Lifecycle

There are two generations of *B. cephi* reported in North America (Nelson and Farstad 1953). The adult males of the first generation of *B. cephi* begin emerging from wheat stubble in early June with the females emerging during the last week of June (Nelson and Farstad 1953). The second-generation adults begin emerging during early August and remain active through the end of September or until the first hard frost (Nelson and Farstad 1953). Prior to finding infested wheat, the female *B. cephi* require approximately three weeks for egg

maturation (Nelson and Farstad 1953). Females search wheat stems for wheat stem sawfly larvae and paralyze the larvae prior to laying eggs on or near the host. Each female lays two to four eggs daily (Nelson and Farstad 1953).

The eggs take approximately one to two days to hatch (Nelson and Farstad 1953). Each egg is 0.9 mm in length (Nelson and Farstad 1953). The larvae of *B. cephi* have five instars and, upon completing the last instar, spin a silken cocoon inside the wheat stem (Nelson and Farstad 1953). The larvae overwinter in the stem and pupate in the same cocoon the following spring, which lasts approximately six days (Nelson and Farstad 1953). The adults emerge following pupation and chew through the wheat stem (Nelson and Farstad 1953).

Parasitism Success

Parasitism rates by *B. cephi* increase immediately after rainfall (Nelson and Farstad 1953). Success of the parasitoid varies based on the emergence period of the second generation (Holmes et al. 1963). If emergence occurs too late, population numbers of *B. cephi* often decline the following year (Holmes et al. 1963). Parasitism after harvest can occur but is less common (Holmes et al. 1963). In addition, parasitized wheat stem sawfly larvae are more likely to be cannibalized if more than one larva is present in a single stem (Robert 2006).

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