THE BIOLOGY OF CANADIAN WEEDS. 42.
Stellaria media (L.) Vill.

ROY TURKINGTON, NORMAN C. KENKEL, and GAIL D. FRANKO


This paper provides a summary of biological data on Stellaria media (L.) Vill., commonly known as chickweed. It is found throughout most of the world and is present in all Canadian provinces and both territories, being particularly abundant in British Columbia and eastern Canada. Chickweed is a weed of grain fields, young pastures, lawns, and gardens, and can be controlled by the use of several common herbicides.

La Stellaire moyenne, aussi connue sous le nom de Mouron des oiseaux (Stellaria media L.), se rencontre dans presque toutes les parties du monde et elle a colonisé toutes les provinces et les deux Territoires du Canada. Elle est particulièrement abondante en Colombie-Britannique et dans l’est du Canada. La Stellaire est une mauvaise herbe des céréales, des jeunes pâtures, des pelouses et des jardins. On dispose contre elle de plusieurs bons herbicides.

1. Names

The species is occasionally referred to as Alsine media L. (Löve and Löve 1975). The authority for the name Stellaria media is often cited as ‘‘(L.) Cyrillo’’ rather than ‘‘(L.) Vill’’ (Hitchcock and Cronquist 1973; Hultén 1970; Taylor and MacBryde 1977). This is an error in the attribution of the authority for the transfer of the epithet media from Alsine to Stellaria (Burnat 1892).

2. Description and Account of Variation
(a) S. media is an annual or winter annual with a slender tap root; diffusely branched stems, either decumbent or ascending (Fig. 1), 5–40 cm, round in cross section with a single line of hairs down each internode; leaves opposite, broadly oval and pointed, entire, glabrous; lower leaves 3–20 mm, stalked, the petiole with a single line of hairs; upper leaves to 25 mm, sessile; flowers solitary in the leaf axils, or from few to many and borne in axillary or terminal cymes, star-shaped (hence Stellaria) (Fig. 2B), 5 mm in diameter on short peduncles; sepals 5, separate, hairy, 4.5–5 mm; petals 5, white, deeply bifid, shorter than sepals; styles 3; stamens 3–10; anthers red-violet; capsules longer than sepals, opening by 6 teeth to release an average of 8–10 seeds; seeds (Fig. 2A, C, D) 0.9–1.3 mm across, yellowish to dark brown, flattened, almost circular, sometimes narrowed to base, with 5–6 rows of low protuberances, maturing rapidly; flowers produced throughout the growing season.

A chromosome number of 2n = 20 II has been reported from the Queen Charlotte Islands (Taylor and Mulligan 1968) and from Ontario (Mulligan 1961). Mulligan (pers. comm.) has unpublished counts of S.
Fig. 1. *Stellaria media* (L.) Vill. (A) 5-wk-old adult plant and (B) 10-day-old seedling.

Fig. 2. *Stellaria media* (L.) Vill. (A) seed, (B) flower, (C) seed × 130, (D) seed coat × 544.
Fig. 2. *Stellaria media* (L.) Vill. (C) and (D) taken with scanning electron microscope.
media from four locations in Ottawa; all formed 20 bivalents at metaphase I of meiosis. Counts of \( 2n = 28, 36, 40, 42 \) and 44 have been reported from Eurasia with \( 2n = 40 \) predominating (Federov 1974; Löve and Löve 1975; Moore 1973).

(b) *Stellaria media* is similar to *Cerastium fontanum*, *C. arvense* and *S. graminea*, but it differs from all these in its distinctive pattern of pubescence, i.e. a single line of hairs down the stems and petioles.

(c) *S. media* expresses a high degree of phenotypic plasticity and genotypic flexibility (Sinha and Whitehead 1965), varying in size, habit, hairiness, length of petals, number of stamens, and number, size, and surface details of seeds.

Using such characteristics as calyx and corolla length, number of stamens, and the shape of petals, Béguinot (1921, cited in Matzke 1932) described 32 varieties of *S. media*.

Kraft (1917) observed a reduction in the number and size of petals in plants of both poor and very rich soils.

Matzke (1932) observed that flowers with from 2 to 10 stamens may occur on the same plant. Reinöhl (1903) reported that light and moisture determine the number of stamens in chickweed, but there has been no subsequent evidence to support this finding.

Peterson's (1936) transplant study showed clear ecotypic differentiation into arctic/subarctic populations and Mediterranean populations. Germination is delayed in the former with subsequent rapid development and sparse vegetative growth. The latter germinate almost immediately, develop over a longer growing season and have luxuriant vegetative growth. Peterson (1936) also distinguished between maritime (rapid germination) and continental forms (delay before germination).

(d) Figures 1 and 2 show the main diagnostic features of a flower, seed, seedling, and 5-wk-old plant of *S. media*.

3. Economic Importance

(a) Detrimental — In Canada, *S. media* is a weed of grain fields and other cultivated areas and pastures. It can be a major contaminant among some crops; e.g. on Westham Island in the Fraser Delta, it has > 15% cover among raspberry and strawberry crops, and from 80 to 100% cover in barley and potato crops. Comparable data are not available for elsewhere in Canada. *S. media* competes with crop plants by shading and smothering young seedlings with its mat-like growth (Fryer and Makepeace 1977). Mann and Barnes (1950) reported a 66-80% loss in a barley crop due to chickweed competition for root space. Barley and chickweed roots grow at the same level but the chickweed roots grow faster. When grown together the weed can absorb nitrogen more readily than barley.

In England, O'Leary (1973) surveyed 5300 fields of spring and winter cereals and found chickweed to be the most abundant weed. *S. media* seeds are contaminants in seeds of wheat, barley, rye, oats, timothy, rape, swede, mustard, fodder beets, sugar beets and kale (Fryer and Makepeace 1977).

*S. media* is capable of accumulating nitrates to potentially toxic levels (Case 1957), and grazing of the weed may cause digestive disorders in sheep and goats (Carruthers 1903). It harbors viruses and fungi which overwinter between crop plantings (Converse and Stace-Smith 1971), as well as aphids and nematodes which transmit viruses to crop plants (Fryer and Evans 1968). In some cases, viruses may be transmitted via the seeds of *S. media* (Provvidenti 1975).

(b) Beneficial — Chickweed “can prevent soil erosion, preserve soil structure and regulate fertility” (Fryer and Makepeace 1977). It is a source of food for animals, the plant being eaten by hogs and rabbits (Spencer 1940) and the seeds by birds (Hatfield 1970). Man sometimes uses the plant for salads (Grieve 1959).

In Switzerland, chickweed is used in weed
control! Infestations of *Convolvulus arvensis* and *C. sepium* in vineyards are suppressed by chickweed. The chickweed itself is not a problem (Stalder et al. 1973).

(c) Legislation — *S. media* is listed as a noxious weed in the Noxious Weeds Act of Alberta and Manitoba. It is named in the Canada Seeds Act and Regulations (Anonymous 1967), where the percentage of the weed seed affects the grade of grass mixtures.

4. Geographical Distribution

The distribution of *S. media* in Canada and adjacent Alaska is shown in Fig. 3. It is found from Vancouver Island to Newfoundland, and from the United States border to the MacKenzie delta at 69°N. It is more common in B.C. and eastern Canada than in the prairies (Groh and Frankton 1946, 1948).

It is found widely on every continent, from Spitzbergen at 79°N (Hultén 1970) to the Subantarctic islands at 60°S (Walton 1975). While it is generally absent only from the most arctic regions and very dry areas, it is common in the tropics only at high elevations, e.g. 1300 m in Kenya.

5. Habit

(a) Climatic requirements — Chickweed generally prefers cool temperatures; Walkey and Cooper (1976) reported an optimum of 22° C for laboratory populations. However, it can obviously tolerate cold conditions since its range extends into the Arctic and Subantarctic regions. It does best in moist regions, persisting and even flowering throughout the winter in cool, moist climates such as in southwestern B.C. (Kenkel, unpublished). But it will not flower during winter months if the temperature remains below 2° C (Moss 1914). It cannot tolerate

![Fig. 3. The distribution of *Stellaria media* (L.) Vill. in Canada and part of Alaska from specimens in the herbaria of the Biosystematics Research Institute, Ottawa, University of Saskatchewan, University of Alberta, and University of British Columbia. The solid line represents the northern limit of distribution as shown by Hultén (1970). Note that a few specimens have since been collected north of Hultén's line. The values below the map represent the frequency of the species as recorded in longitudinal belts by two Canadian Weed Surveys (Groh and Frankton 1946, 1948).](image-url)
dry conditions, and during hot, dry summers will die back (Roberts and Dawkins 1967).

Chickweed prefers partially shady conditions such as found near buildings (King 1966) and under the cover of row crops. It is often found growing in gullies, track marks, etc. which provide a suitable microclimate of moisture, humidity and shelter.

(b) *Substratum* — Chickweed grows on most types of soil (Salisbury 1974) but does best on moist, heavy (King 1966), high nitrogen soils (Roberts 1962) such as found in chicken coops and cow barns (King 1966) and on the guano rocks of the Scilly Isles (Lousley 1971). It prefers a pH of 5.2–8.2 (Lefevre 1956) but has been found on soils with a pH of 4.8. At these levels growth is reduced, often due to aluminum toxicity (Buchanan et al. 1975). Aluminum concentrations greater than 2 ppm cause toxicity symptoms (Gilbert and Pember 1935).

(c) Communities in which the species occur — *S. media* grows in young or disturbed communities such as cultivated areas, young pastures, gardens, lawns and waste places. Some of the crops with which it grows are listed in Section 3a. The only data on weedy associates in Canada are from the Fraser Delta. There, *S. media* grows with *Matricaria matricarioides* (L.) Porter, *Polygonum lapathifolium* L., *Senecio vulgaris* L., *Amaranthus retroflexus* L., *Chenopodium album* L., *Capsella bursa-pastoris* (L.) Medic., *Agropyron repens* (L.) Beauv. and *Poa annua* L.

6. History

*Stellaria media* is native to Europe and seeds of the species have been found in preglacial and mesolithic deposits in Britain (Salisbury 1964). It is believed to have been in Greenland from the 1400’s to 1721, before the period of European settlement (Pedersen 1972). How or when the species was introduced to N. America is not known, but in 1672, Josselyn (cited by Rousseau 1968) recorded the species in New England. It was common when collected by Holmes in Montreal in 1821, and Cochran identified it in Nova Scotia in 1829. St. Cyr collected it on the Isle d’Anticosti in 1882 (Rousseau 1968) and it was listed as a farm weed in Canada by Clark and Clark (1909).

7. Growth and Development

(a) Morphology — “The ability of *Stellaria media* to have achieved such success ... can only be attributed to the remarkable intrinsic variability which is attested in so many features ... (and) ... is paralleled by a physiological variability” (Salisbury 1964).

Like most weedy annuals, *S. media* has numerous, small, easily dispersed seeds and it has the additional advantage of being able to flower and set seed throughout the year. Dry weight distribution studies (Turkington, unpublished) show that chickweed allocates only 6% of its total dry weight to roots while channeling 76% into stem and leaves, an advantageous strategy for colonizing.

Under suitable conditions — partial shade, rich, damp, disturbed soil — the stems of *S. media* will root at the nodes (Frankton and Mulligan 1970). This is an advantageous characteristic to the species in newly disturbed habitats.

(b) Perennation — Chickweed is able to grow at 2°C when most plants cannot (King 1966). In colder environments it overwinters as seed; in mild climates, it is a winter annual, being able to overwinter after fall germination. This has been reported from England (Heathcote and Byford 1975) and has been observed in southwestern B.C. (Kenkel, unpublished). Peterson (1936) describes ecotypes that are adapted to cold winter temperatures.

(c) Physiology — Individual plants living through the winter show a shift in storage physiology from summer starch to winter sugar. High concentrations of sugar sap in winter ensure a high osmotic value in cells,
preventing ice crystal formation (Salisbury 1974).

(d) Phenology — Chickweed is a day-neutral species (Fryer and Makepeace 1977). Under suitable conditions, flowering takes place throughout the year as does maturation and shedding of seed. During the winter, flowers tend to be without petals, and are self-fertilized (King 1966). Although seeds will germinate at any time of the year under suitable conditions, most germinate and establish early spring and late fall (Roberts and Dawkins 1967).

Caspers (1977) followed the seasonal changes of caloric values and ash content of the aboveground portion of chickweed. Generally, caloric values are highest in February and lowest between August and October. Ash contents are highest in October and lowest in February.

(e) Mycorrhiza — No mycorrhizal associations have been reported.

8. Reproduction

(a) Floral biology — *S. media* is cleistogamous and almost homogamous (Salisbury 1974), self-pollinated (Mulligan and Kevan 1973) and self-fertilized (Mulligan and Findlay 1970). Mulligan and Kevan (1973) reported that no insects visited the flowers in their studies, an expected result in cleistogamy; but in European studies, Proctor and Yeo (1973) reported visits by ichneumon wasps, and Knuth (1908) recorded visits by members of the Diptera, Hymenoptera and Thysanoptera. Gilkey (1957) reported that bees are attracted by the flower fragrance.

(b) Seed production and dispersal — The mean weight of 1000 chickweed seeds has been reported as 0.362 g (Whitehead and Sinha 1967) and 0.505 g (King 1966). The number of seeds per fruit ranges from 1 to 20 (Salisbury 1964) although 10 is average. Franko (unpublished) counted an average of 9 seeds per fruit with a top value of 18 in a study at the University of British Columbia. The numbers of seeds per plant range from 500 (Long 1938) to 2500 (Salisbury 1964), and the number of seeds per hectare ranges from 5.1 million to 15 million (Long 1938; Roberts and Dawkins 1967).

Seeds are dispersed in a number of ways: by footwear, through the digestive tracts of birds, cattle, horses and pigs (Salisbury 1964), by ants (King 1966) and by wind (Grieve 1959). The seed is also dispersed as a contaminant in pasture mixtures or seeds of other crops.

(c) Viability of seeds and germination — Shed seeds of chickweed have 90–100% viability. Champness and Morris (1948) found that seed viability is highest in acid, waterlogged soils. A high proportion of total emergence occurs within the first few months after dispersal (except in dry summers (Roberts 1964). Fryer and Makepeace (1977) found 95% germination, and Toole and Brown (1946) found 97% viability 1 yr after shedding. Roberts (1964) dry-stored seeds for several months, then planted them, and after 3 yr found that 70.6% emerged, 5% were dormant and 24.4% were not accounted for. Toole and Brown (1946) reported 22% viability after 10 yr and Fryer and Makepeace (1977) claimed that a proportion of seeds will survive more than 60 yr when deeply buried under grass. Seeds subject to severe oxygen starvation (partial pressure $O_2 < 8$) will remain in a dormant condition (Mullverstedt 1963).

Although many of the results regarding germination are conflicting, certain general features are evident. The optimum constant temperature for germination is between 12°C and 20°C, and while germination can take place at 2°C or even less, a cold treatment will often induce a light requirement. High temperatures are inhibitory and germination does not occur when the temperature exceeds 30°C. Daily alternations of temperature enhance germination. Germination of freshly harvested seeds does not seem to be
promoted by light, and strong illumination may inhibit it. After-ripening occurs both in dry and in moist storage, but seeds that have been buried for some time in soil require exposure to light before germination can take place (Roberts and Lockett 1975). Baskin and Baskin (1976, 1979) found that high temperatures promote after-ripening and that a green “safe” light used with dark controls was sufficient to stimulate germination. However, the wavelength responsible for this stimulation may have been blue (400–500 nm) or yellow-orange (550–600 nm) rather than the green (500–550 nm) per se. For emergence, the optimal depth of burial is 1.0 cm and the maximum depth is 2.0 cm (King 1966).

(d) Vegetative reproduction — Under suitable conditions, chickweed will root at the nodes of prostrate stems (Frankton and Mulligan 1970).

9. Hybrids

Stace (1975) reported a hybrid between *S. media* and *S. neglecta* in Britain, but this has yet to be verified. Whitehead and Sinha (1967) pointed out that the incidence of crosses within different entities in the *Stellaria media* complex has lead to taxonomic problems.

Peterson (1933, 1936) reported artificial intra- and interspecific crosses within the *Stellaria media* complex. The intraspecific crosses had a very low rate of fertility. In most cases, interspecific crosses yielded no F₁. However, *S. media* (2n=42) × *S. neglecta* yielded sterile F₁ and *S. media* (2n=42) × *S. neglecta* var. grandiflora (2n=44) yielded an F₁ with 2n=43 (fertility of 64%).

10. Population Dynamics

The flowers of *S. media* are ephemeral and open only for 1 day (Salisbury 1974), during daylight hours in bright weather (Grieve 1959). It flowers and sets seed throughout the year with two main flushes of germination, early spring and late fall. It grows most rapidly just after germination but dies back as dry, hot summers or cold winters set in. The mean life span is 5–7 wk with 4–5 of this being required to reach flowering (Sinha and Whitehead 1965). There are usually one or two generations per year but sometimes three (Salisbury 1964). Population density may be quite high and a count of 668 chickweed plants/m² was recorded in an area between potato and barley crops on Westham Island in the Fraser Delta.

Chickweed is a pioneering species and grows most rapidly in open areas. It is quick to colonize bare patches in fields and can grow at lower temperatures than most grasses (Naber and Luten 1972). It is, however, a poor competitor (Lawson 1972) and is soon out-competed in growing swards, although it is persistent in grazed pastures (Schulz 1970). Chickweed may, however, be a successful competitor when its mat-like growth form smothers the seedlings of other species.

Chickweed often exists as a solitary plant which may spread up to 1.5 m, or as small patches in gardens. But, under suitable conditions it may form a continuous expanse e.g. 80–100% cover in a 2-ha barley field on Westham Island, B.C. (Franko, unpublished).

11. Response to Herbicides and Other Chemicals

The following information has been synthesized from information produced by the Canada Weed Committee (1977), the weed control series of the B.C. Ministry of Agriculture (Anonymous 1977), and the Ontario Herbicide Committee (1978).

*Stellaria media* is resistant to foliar applications of 2,4-DB or MCPB, Bromoxynil + MCPA (1:1) and Dichloroprop + 2,4-D (1:1). It is somewhat resistant to 2,4-D, 2,4,5-T and MCPA. The weed is controlled by Fenoprop (1.2 kg/ha), Mecoprop (1.2 kg/ha), Dicamba (0.42 kg/ha), Dicamba + Phenoxy (1:3 at 0.56 kg/ha), Linuron + MCPA (1:2 at 0.84 kg/ha),
Pronadime (0.84 kg/ha) and Chloroxuron (5.6 kg/ha).

12. Response to Other Human Manipulations
Close mowing controls chickweed (Muenscher 1955) and the population of viable seeds in the soil is greatly reduced after the second year of vegetable cropping (Roberts 1962). Roberts and Dawkins (1967) reported a 56% decrease in numbers of chickweed seeds in areas ploughed four times per year, compared to a 30% decrease in undisturbed plots. A June ploughing will cause a 100% increase in the number of summer seedlings.

Good drainage is an effective control measure (Clark and Fletcher 1909).

*Stellaria media* is an effective competitor against cabbage seedlings, but an early spring weeding allows the cabbage to become established before the weed reestablishes (Lawson 1972). Like most weeds, chickweed is favored by manuring (Roberts 1962) and by grazing when grown with grass (Schulz 1970).

13. Response to Parasites
Table 1 lists the parasites which are associated with *Stellaria media* in Canada and adjacent parts of the U.S.A. In all cases the mature plant is attacked. In other localities, Tomlinson and Walker (1973) found that cucumber mosaic virus affects chickweed, giving the leaves a mottled appearance; but viral infections are often symptomless in chickweed (Converse and Stace-Smith 1971). Viral transmission is via pollen (Tomlinson and Carter 1970) or via seed (Provvidenti 1975). The virus can also be transmitted by aphids from the chickweed to the crop plant (Provvidenti 1975).

Adam and Todd (1974) reported that chickweed is a host for the potato rot fungus (*Phoma exigua var. foveata*) and can transmit the fungus to a potato crop.

Viruses, fungi, aphids, and nematodes often overwinter on chickweed plants and

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**Table 1.** Some of the parasites known to be associated with *Stellaria media* in Canada and adjacent parts of the U.S.A.

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Adam and Todd (1974) reported that chickweed is a host for the potato rot fungus (*Phoma exigua var. foveata*) and can transmit the fungus to a potato crop.
are capable of infecting the crop plants sown the following season (Converse and Stace-Smith 1971).

Cooper and Harrison (1973) found that tobacco rattle virus infection in a potato field was dependent upon host preference of the vector nematodes (Trichodorus sp.). Increased weeding of S. media served only to increase the incidence of the virus on the potato. The authors concluded that the vector nematode prefers chickweed as a host, but will feed alternatively on the potato crop when the chickweed is not available.

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