Seasonal Fluctuations In Weed Emergence On The Central Coast

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Lack of progress in developing new vegetable herbicides coupled with the potential loss of old ones (Bell et al. 2000) has prompted an urgent need for the development of integrated weed management strategies for vegetable crops. The development of these strategies requires knowledge of weed biology. One approach in this direction is to study seasonal variations in weed emergence so that weed management inputs can be optimized according to the timing and severity of likely weed emergence. To study seasonal variations in weed emergence and seed germinability, permanent quadrats were set up in vegetable fields near Salinas, California. At intervals of 1.5 months, i.e., half-season, from September 21, 1999 to September 20, 2000, field weed emergence was counted and soil core samples were taken. Soils were placed into trays and incubated in growth chambers at approximated 5 cm soil temperatures for 1.5 mo (Table 1). At the end of this period, remaining ungerminated seeds were extracted using methods described in Ball and Miller (1989). The total number of seedlings that germinated in the growth chamber and the number of viable seed extracted from the soil cores were used to determine seasonal variations in seed germinability. Germinability is defined as the potential for a seed population to germinate. Results indicated that some weed species emerged in specific seasons, while other species emerged all year. Annual blue grass (*Poa annua*), and southern brassbuttons (*Cotula australis*) germinated primarily in the fall and winter (Table 2). In contrast, hairy nightshade (*Solanum sarrachoides*), and common purslane (*Portulaca oleracea*) germinated at the highest levels during the late spring and summer months. At least some fraction of the burning nettle (*Urtica urens*), common chickweed (*Stellaria media*), common groundsel (*Senecio vulgaris*), henbit (*Lamium amplexicaule*), and shepherdspurse (*Capsella bursa-pastoris*) seedbank population was able to germinate during each half-season of the year.

Typically weeds fall into categories of summer and winter annuals (Alrich and Kremer, 1997). However, we have observed a class of continuously germinating weed species that includes burning nettle, common chickweed, common groundsel, henbit, and shepherdspurse. Crops such as broccoli, cauliflower, lettuce and spinach are planted throughout much of the year on the central coast of California. It would appear that central coast vegetable fields harbor well-adapted weed species that are capable of emerging in any month that crops are planted. Knowledge of weed emergence cycles may aid in the development of improved weed management systems for vegetables. For example the development of season-specific weed management recommendations may result in better herbicide selection based on the expected weed spectrum by season. Season-specific weed management systems may result in increased herbicide use efficiency and production cost savings.

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Table 1. Photoperiods and mean daily maximum and minimum half-season 5 cm soil temperatures in arable lands at Salinas, California.

Half-season	Photoperiod[1]	Temperature (°C) [2]	
		day	night
21 Sep-5 Nov (early fall)	7:00-18:30	25	6
6 Nov-20 Dec (late fall)	7:00-17:00	20	5
21 Dec-3 Feb (early winter)	7:00-17:00	20	-1
4 Feb-20 Mar (late winter)	6:30-18:00	20	2
21 Mar-5 May (early spring)	6:30-20:00	25	3
6 May-20 Jun (later spring)	6:00-20:00	25	9
21 Jun-5 Aug (early summer)	6:00-20:00	28	14
6 Aug-20 Sep (late summer)	6:30-19:30	28	14

[1] coinciding with daylength at Salinas, California, of the median date of the period covered (i.e., 14 October, 29 November, 14 January, 28 February, 14 April, 29 May, 14 July, and 29 August for early fall, late fall, early winter, late winter, early spring, late spring, early summer and late summer, respectively)

[2] based on temperature data recorded by HOBO Pro Series at 5 cm depth in soil for the duration from 1 July 1998 through 20 September 1999 in arable lands at Salinas, California

Table 2. Seasonal distribution of seedling emergence at two field sites in the Salinas valley from September 21, 1999 to September 20, 2000.

	Emergence percentage by half-season [1]							
Species	Early fall	Late fall	Early winter	Late winter	Early spring	Late spring	Early summer	Late summer
Annual bluegrass	29	4	37	16	0	0	5	9
Burning nettle	10	3	32	2	23	5	20	5
Common chickweed	19	6	34	5	11	3	19	3
Common groundsel	5	8	19	1	24	13	11	19
Common purslane	0	0	0	0	17	18	45	20
Hairy nightshade	4	1	0	0	28	18	48	1
Henbit	8	6	24	1	6	15	31	9
Shepherdspurse	13	4	22	6	25	4	24	2
Southern brassbuttons	12	0	69	13	0	0	0	6

[1] The eight half-season germination percentages sum to 100%, i.e., the total annual germination percentage of each species