Smartweed Seed Production and Availability in South Central Florida Wetlands

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Abstract: Seed collections were initiated to assess wildlife food availability and production by dotted smartweed (*Polygonum punctatum*) on a south central Florida marsh. The highest production consistently occurred in October despite wide fluctuation in total annual production. Seed remained available for use by wildlife in the soil throughout much of the year.

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The importance of smartweed (*Polygonum* spp.) as a wildlife food in the South is well documented (Singleton 1951, Martin et al. 1951, McGilvey 1966), and dotted smartweed (*Polygonum punctatum*) is a particularly significant waterfowl food in the region (Beckwith and Hosford 1957, Chamberlain 1960:23, Kerwin and Webb 1971, Stieglitz 1972, Landers et al. 1976). Because of its importance as a

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waterfowl food, managers have developed management techniques for smartweed. The roles of fire (Singleton 1951), grazing (Neely 1967), and drawdown chronology (Baldwin 1967, Burgess 1969, Meeks 1969, Fredrickson and Taylor 1982) have been investigated in some detail.

Although Martin and Uhler (1939) emphasized the importance of site specific seed production and availability data for the evaluation of habitat quality, such literature on dotted smartweed is not extensive (see Low and Bellrose 1944). This study was undertaken to assess the production and availability of seeds of dotted smartweed in a south-central Florida marsh.

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Methods

The study area was a 8.1-ha marsh located on a private cattle ranch in northwestern Okeechobee County, Florida. Such marshes are characteristically inundated from late summer through fall or winter, are small in size, and are numerous within the region. Most wetland plants in these marshes are adapted to fluctuating water levels associated with seasonal rainfall patterns. Common wetland plants included pickerelweed (*Pontederia lanceolata*), maidenhair rush (*Eleocharis albida*), dotted smartweed, lemon bacopa (*Bacopa caroliniana*), and maidencane (*Panicum hemitomon*).

Seed traps were used to measure dotted smartweed seed production during June 1979 through mid-February 1980, and during September through mid-November 1980. The 12-cm x 30-cm traps, designed after Davison et al. (1955), were placed on a 5-cm thick styrofoam to allow the traps to rise and fall with changing water levels. They were held in position by 2 rope straps affixed to opposite ends of the traps. PVC stakes inserted through each loop served as guides, maintaining the location of traps.

Seed production was sampled with 20 traps in dense stands of dotted smartweed along 2 perpendicular lines. Each line consisted of 5 stations located at 5-m intervals with the initial station randomly located. A trap was positioned 2.5 m on either side of each station and checked for seed at approximately 2-week intervals. Samples were air dried and sifted through 2.0-mm and 1.0-mm sieves. Seed were collected from the smaller-meshed sieve. All chaff was removed from the seed before weighing. Weights of seed for each trap were recorded to the 0.0001 g.

Vegetation within study plots was sampled at 24 randomly located stations utilizing the line intercept method (Canfield 1941). All live plant species contacting or beneath the calibrated edge of a rule at ground level were recorded and percent ground cover was determined.

Availability of dotted smartweed seed in the soil was determined along 5 permanent transects established perpendicular to the drainage system. Each transect was divided into quadrants with 1 randomly located sampling station per quadrant. Five core samples 8.9 cm in diameter were taken to a depth of 15 cm at each sampling station with a core device (W. Wegener and V. Williams, unpubl. rep., Fed. Aid Proj. F-29-5, Fla. Game and Fresh Water Fish Comm., 1976). Each sample was placed in a polyethylene bag and refrigerated until analyzed.

Soil samples were washed through 2.00-mm and 1.00-mm sieves and all material remaining in the smaller-meshed sieve was retained. Retained material was air dried, re-sieved, and seeds were removed. Refuse from sieves was examined under a variable power dissecting microscope to confirm removal of all seeds.

Water stage data were examined for annual differences. These data were obtained from the South Florida Water Management District for the period 13 June 1979 through 31 December 1980 (A. Goldstein pers. commun.).

Analysis of variance was performed on seed production data. The Waller-Duncan k-ratio t-test (Ray 1982:151) was utilized to determine if production for periods within years was different, and a Student's t-test (Ray 1982:217–221) was used to compare specific months among years. A randomized block analysis of variance (Helwig and Council 1979:277) was used to determine if differences between time and transects occurred for seed present in soil cores. A t-test for paired comparisons (Sokal and Rohlf 1969:331–332) was utilized to test for differences in the vegetative composition of plots between years. All seed weights are expressed as kilograms per hectare.

Results and Discussion

Smartweed Seed Production

Dotted smartweed seeds were found in at least 1 of the traps in all collections from June 1979 through February 1980. Total production for this period was 222.2 kg/ha. Seed fall from July through mid-September and mid-November through mid-February was minimal, representing less than 6.0 percent of all seed produced. Highest production ($F = 27.41$, k-ratio = 100) was recorded in the October samples (84.9 and 88.7 kg/ha). These combined samples (173.6 kg/ha) constituted 78.1 percent of the total measured production and were 8.3 and 9.4 times greater than those of September and November, respectively (Fig. 1).

The second-year samples were collected only from early September 1980 through mid-November 1980 due to the observed concentration of production during this period in 1979. Seed production during the fall of 1980 (119.5 kg/ha) was 43.7 percent less ($P < 0.01$) than the fall of 1979 (212.5 kg/ha). The same pattern of seed fall, however, was observed (Fig. 1). Seed production for October 1980 was 61.9 kg/ha, but this production was much less ($P < 0.01$) than that of October 1979 (173.6 kg/ha).

Differences in seed production between years were not readily explicable by vegetation or water stage data. Percent coverage of dotted smartweed plants were similar ($P > 0.10$) in 1979 (13.60%) and 1980 (11.75%). Grasses (Poaceae) in-

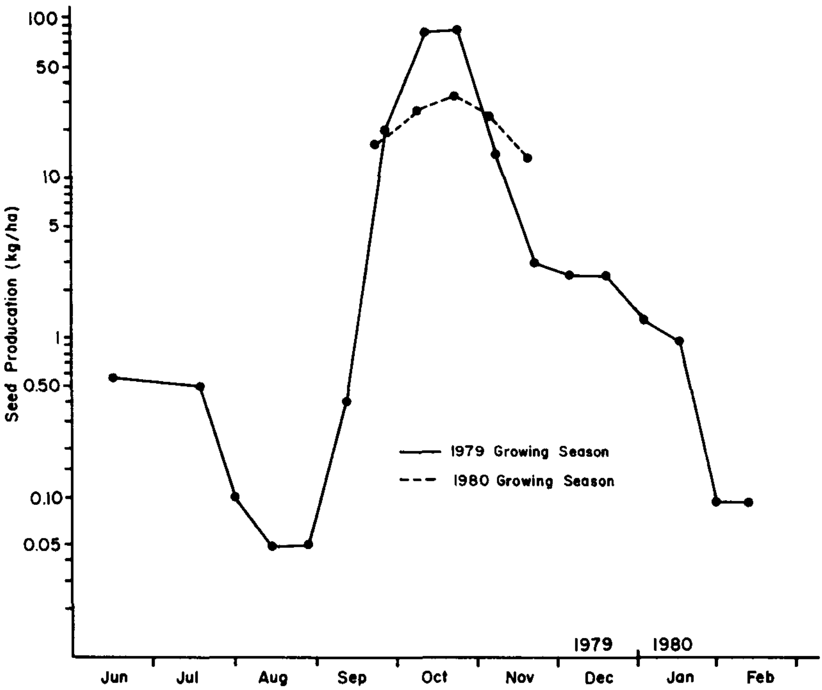

Figure 1. Smartweed seed produced biweekly from 15 June 1979 to 12 February 1980 and from 9 September to 19 November 1980, Okeechobee County, Florida.

creased ($P < 0.05$) from 0.60% in 1979 to 3.85% in 1980. Similarly, waterhyssops (*Bacopa monnieri*) was more abundant ($P < 0.05$) in 1980 (6.20%) than 1979 (0.85%). Meeks (1969) found that smartweed decreased after 3 successive years of early drawdowns due to competition from annuals. It is unlikely, however, that competition from grasses and waterhyssops could have affected smartweed seed production, particularly because unvegetated groundcover was similar ($P > 0.10$) in 1979 (62.45%) and 1980 (58.70%).

Water stage ranges from mid-June through October for 1979 (−40 to +64 cm) and 1980 (−36.0 to +55.0 cm) appear similar. Minimum stages were recorded during June and July while peak stages occurred during September in both years. Water stages on the study area rose quickly in mid-summer. Site conditions of the smartweed stands changed from very dry (stage −36 to −40 cm) to inundated with water to depths in excess of 15 cm within a 10-day period in 1979 and a 5-day period in 1980. Standing water remained on dotted smartweed stands from the time of initial flooding (4 August 1979 and 16 July 1980) through late October each year. Mean depths for September (30 and 27 cm) and October (9 and 7 cm) for 1979 and 1980, respectively, were also similar.

Two differences in the stage data between the 2 years were apparent. Consistently low water table levels prior to flooding in 1980 was in sharp contrast to water stages that fluctuated from very dry to moist soil conditions for a similar period in 1979. Additionally, the period from the initial flooding to depths >15 cm to 1 September 1979 was 20 days, and the mean daily water depth was 8 cm. For 1980, these parameters were 45 days and 18 cm. More dramatic changes in the site conditions during 1980 combinated with an earlier flooding date may have been sufficient to lower seed production in 1980. Fredrickson and Taylor (1982) indicated that shallow flooding following the establishment of smartweed stands was beneficial but prolonged overtopping and depths greater than 15-20 cm or more than ⅓ the height of the plants could retard growth. However, the observed differences in seed production may also simply reflect annual variation.

Smartweed Seed Availability

Quantifying smartweed seed in the soil during periods of high and low abundances provides an indication of year-round availability. Dotted smartweed seed was recorded at all stations and in 80% of the individual cores. Differences were observed in abundance of smartweed seeds for the site as a whole between June and December samples. The average quantity of seed for June 1979 and 1980 (17.0 kg/ha) was 36.6% less ($P < 0.05$) than in December 1979 (26.8 kg/ha). Neely (1956) measured the deterioration of 4 species of smartweed due to continued submergence in water for 90 days. The mean deterioration rate for this genus was only 10 percent, thereby suggesting the potential for accumulation of seed in the soil due to carryover from previous years' production. While carryover of seed from previous production may have occurred, accretion was not apparent during this study. Abundance of seed increased ($P < 0.05$) from June 1979 (16.0 kg/ha) to December 1979 (26.8 kg/ha); and declined in availability ($P < 0.10$) between December 1979 and June 1980 (18.0 kg/ha). Differences between June values were not detected ($P > 0.10$).

Davis *et al.* (1961) reported 8.2 kg/ha of smartweed seed in the top 0.6-1.3 cm of soil in fallow ricefields in Louisiana during November samplings and 5.6 kg/ha in subsequent samples taken in February. This represents a 35.4 percent decrease in the quantity of seed in the soil. While these gross values are considerably less than those in our study, the percent loss approaches those we observed even though our sampling occurred after a 6-month rather than a 3-month interval. Consumption by wildlife, trampling by livestock, deterioration, and changes in water conditions may account for declines in seed availability from December to June.

Large quantities of dotted smartweed seed were produced and available in the soil throughout the year at the study site. The ample production and persistence of dotted smartweed seeds accounts in part for the reported importance of this species as a wildlife food. Management for dotted smartweed rather than many of the marsh grasses should be considered when migratory and resident birds are the intended species. Unresolved questions concerning seed production fluctuations, however, underscores the need for more long-term studies on dotted smartweed.

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