



MILKWEED SEED PRODUCTION TRIALS FOR THE XERCES SOCIETY

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ABSTRACT

Milkweed seed production trials for the Xerces Society's Project Milkweed were conducted to provide initial seed increase, as well as, technology development in field cultural practices, seed harvest and cleaning. Three species of milkweed, *Asclepias speciosa*, *Asclepias latifolia* and *Asclepias asperula*, of southwest US origin were grown as greenhouse seedlings and out planted into field rows with weed barrier fabric. *Asclepias speciosa* yielded an impressive amount of seed in the third growing season and exhibited pod maturation that extended over 3-month period. *Asclepias latifolia* produced large numbers of flower heads in the second and third growing seasons, but a paucity of seed pods even with the presence of a diverse and abundant pollinator population. *Asclepias asperula* produced low vigor seedlings and had low survival in the field. A system using compressed air to separate the seed and floss from the pods was fabricated that allowed efficient separation of seed from the floss with air-facilitated hammer-milling.

INTRODUCTION

As outlined by the Xerces Society's Project Milkweed, "milkweeds (*Asclepias* spp.) are the required host plants for caterpillars of the monarch butterfly (*Danaus plexippus*) and thus play a critical role in the monarch's life cycle. The loss of milkweed plants in the monarch's spring and summer breeding areas across the United States is believed to be a significant factor contributing to the reduced number of monarchs recorded in overwintering sites in California and Mexico. Xerces is working with the Los Lunas Plant Materials Center (LLPMC) to conduct an initial seed increase of select milkweed species. The seed stock produced will be transferred to private, native seed producers for commercial-scale production."

MATERIALS AND METHODS

The Xerces Society sponsored efforts to collect seed of three species which might be most appropriate for New Mexico growing conditions:

- *Asclepias speciosa* (ASSP)
- *Asclepias latifolia* (ASLA4)
- *Asclepias asperula* (ASAS)

Details on the seed supplied in the fall 2011 are provided in Table 1. The LLPMC produced transplants of these three species in peat pots because of concerns about poor root-ball integrity. The peat pots were filled with a soilless mix (two parts Sunshine # 1 Mix, one part perlite, 0.3 lbs. of Osmocote® Plus 15-9-12 per cubic foot of mix), sown in late January 2012, hydrated for several days (Figure 1), and then placed in cold storage (40° F) on 1/27/2012 (Figure2).

The *Asclepias latifolia* (ASLA4) and *Asclepias asperula* (ASAS) seed was cold stratified for 54 days, and the *Asclepias speciosa* (ASSP) seed for 69 days.



Figure 1. Newly-seeded peat pot trays *Asclepias latifolia* (ASLA4) being hydrated by a mini-sprinkler system, January 2012.



Figure 2. *Asclepias speciosa* (ASSP) seedling trays being cold stratified in plastic bags to prevent moisture loss.

Asclepias speciosa (ASSP) and *Asclepias latifolia* (ASLA4) had good seedling vigor, but *Asclepias asperula* (ASAS) had poor vigor from the time of emergence until the time of field planting (Figures 3 and 4).



Figure 3. *Asclepias latifolia* (ASLA4) seedlings emerging on 3/30/2012, nine days after the end of cold stratification.



Figure 4. *Asclepias* seedlings in peat pots on June 13, 2012. Low survival and vigor of *Asclepias asperula* (ASAS) evident in the foreground. *Asclepias latifolia* (ASLA4) in the middle, and *Asclepias speciosa* (ASSP) seedlings in the background.

Table 1 provides information about the three species of seed provided by the Xerces Society.

Table 1. Seed provided by Xerces Society in the fall of 2011 for milkweed seed production trials and propagation information.

Species	<i>Asclepias speciosa</i>	<i>Asclepias latifolia</i>	<i>Asclepias asperula</i>
PLANTS Symbol	ASSP	ASLA4	ASAS
PM Accession No.	9066949	9066950	9066951
Collection Location	Northern New Mexico	Outside Albuquerque and Santa Fe, NM	East-central Arizona
Weight of Seed Provided by Xerces Society Ounce (Grams)	10.74 (305)	1.0 (28.3)	0.405 (11.5)
Approximate Number of Seed per Ounce per Xerces	4,200	3,500	4,400
Approximate Number of Seed Provided	45,000	4,400	1,800
Number of Peat Pots Sown	1,080	1,080	1,008
Date into Cold Stratification	1/27/12	1/27/12	1/27/12
Date out of Cold Stratification	4/5/12	3/21/12	3/21/12
Approximate Number of Seedlings Outplanted	1,000	1,000	600

The seedlings were planted into Dewitt Weed Barrier Pro (white) fabric on July 11, 2012. White fabric was chosen to reduce the chance of scorching the young plants as might occur if black fabric were used and came into contact with the seedlings. Holes were cut into the fabric using a sharpened cylinder. The planting holes were made with a small gas-powered auger. Before the peat pots were planted, one teaspoon of Osmocote Plus 15-9-12 with Minors was placed in the bottom of each planting hole. The final planting layout consisted of two rows of each species with approximately 1,000 plants of *Asclepias speciosa* (ASSP), 1,000 plants of *Asclepias latifolia* (ASLA4), and 600 plants of *Asclepias asperula* (ASAS) (Figure 5). The *Asclepias asperula* (ASAS) plants lacked vigor after out-planting with only a few plants emerging in the spring of 2013, and even fewer flowering in the summer of 2013. The other two species grew well during the summer and fall of 2012 and throughout the growing season of 2013. Figure 6 shows the field in June 2014.



Figure 5. Two weeks post planting. *Asclepias speciosa* (ASSP) left two rows, *Asclepias latifolia* (ASLA4) middle two rows, *Asclepias asperula* (ASAS) right two rows.



Figure 6. *Asclepias asperula* (ASAS) left two rows background, *Asclepias latifolia* (ASLA4) middle two rows; *Asclepias speciosa* (ASSP) right two rows on June 13, 2014.

RESULTS AND DISCUSSION

During the summer of 2013, *Asclepias speciosa* (ASSP) produced very few flowering heads, whereas, *Asclepias latifolia* (ASLA4) produced a large number of flowering heads. However, *Asclepias latifolia* (ASLA4) heads failed to produce many seed pods, and many of these pods were infested by weevil larvae. There was considerable pollinator activity on *Asclepias latifolia* (ASLA4) with great numbers of tarantula hawk wasps (*Pepsis formosa*) (Figure 7). No seed pods of *Asclepias asperula* (ASAS) were observed. Overall, the seed production results in 2013 were disappointing. Pests evident included oleander aphids (Figure 8), small milkweed bugs, and larvae of a weevil, possibly milkweed stem weevil (Borders and Lee-Mader 2014).



Figure 7. Tarantula hawk wasp (*Pepsis formosa*) were very common on *Asclepias latifolia* (ASLA4) during the 2013 and 2014 flowering season (photo taken July 5, 2013)

Because of seed pod damage by weevil larvae on the earliest maturing pods, Pyganic (OMRI listed pyrethrin) was sprayed on the foliage early in the morning during late June 2014 to control adult weevils. This spraying was done after the *Asclepias speciosa* (ASSP) and *Asclepias latifolia* (ASLA4) had finished blooming. This treatment seemed effective at reducing weevil damage to *Asclepias latifolia* (ASLA4) the seed. During the summer of 2014, *Asclepias speciosa* (ASSP) produced large numbers of flowering heads and seed pods (cleaned bulk seed 30.7 lbs.). *Asclepias latifolia* (ASLA4) produced a large number of flowering heads but only a modest number of seed pods (cleaned bulk seed 2.8 lbs.). There were 87 *Asclepias asperula* (ASAS) plants with seed pods during early July 2014 (Figure 9), and only a few plants were still surviving without pods (cleaned bulk seed 0.46 lbs.).



Figure 8. Oleander aphids on *Asclepias latifolia* (ASLA4), July 5, 2013



Figure 9. *Asclepias asperula* (ASAS) pods on June 30, 2014

The seed pod harvest for ASAS peaked between June 30 and July 8, 2014 with pods ripening (i.e., pod splitting) between June 23 and July 21, 2014. ASAS yielded about 2.4 g of seed per plant (87 plants with pods). *Asclepias latifolia* (ASLA4) pod harvest peaked between October 1 and October 23, 2014 with the pod ripening period extending from September 22 until October 31. *Asclepias latifolia* ASLA4 yielded only 1.2 g of seed per plant assuming the stand count was approximately 1000 plants. The average daily harvest of pods (presented as air-dry weight) for *Asclepias speciosa* (ASSP) is shown in Figure 10. The harvest extended from July 22 to November 7, 2014 with the peak period in late October. *Asclepias speciosa* (ASSP) yielded about 13.9 g of seed per plant assuming a stand count of 1,000.

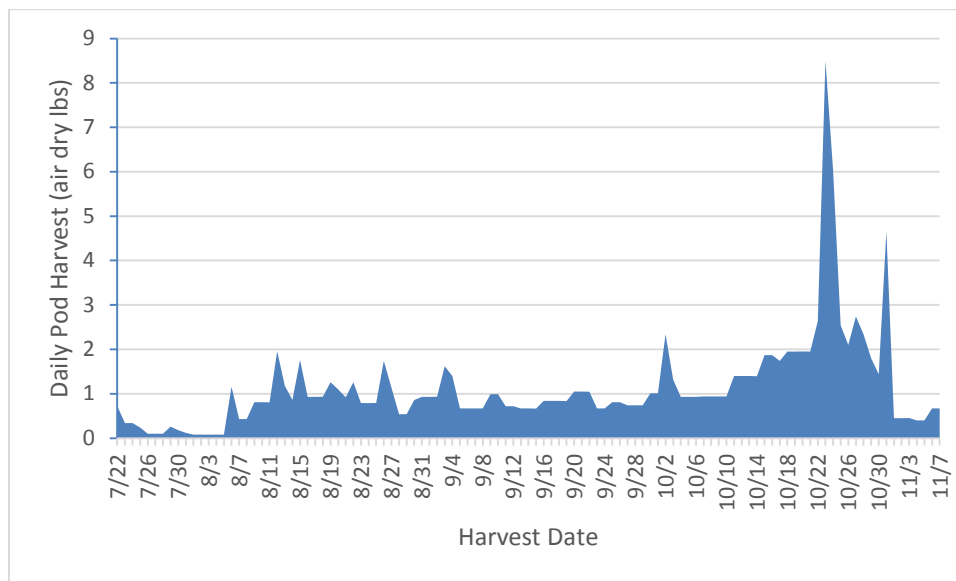


Figure 10. *Asclepias speciosa* (ASSP) pod harvested during 2014 at the LLPMC, daily pod harvest based on air-dried pods.

The pie chart (Figure 11) shows that 48% of the harvest occurred from mid-October to early-November. From mid-August through early-October, each 10-day period yielded from 6% to 9% of the total harvest.

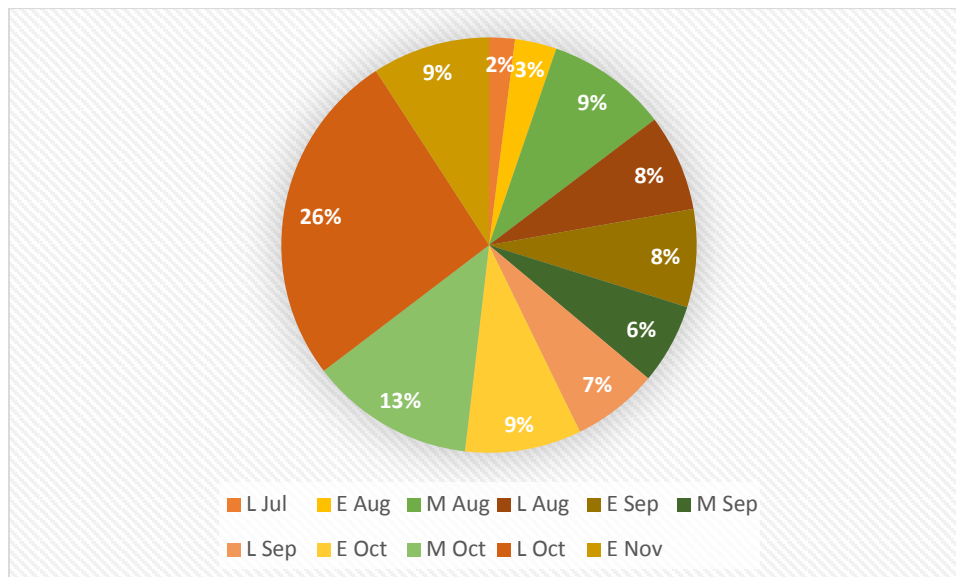


Figure 11. *Asclepias speciosa* (ASSP) pod harvest during 2014 at the LLPMC; % of total pod harvest per 10-day period based on air-dried pods.

The abrupt onset of flowering for *Asclepia speciosa* (ASSP) between 2013 and 2014 may indicate a maturation requirement to flower and set seed. It will be interesting to see if a similar requirement may manifest itself for *Asclepia latifolia* (ASLA4) pod production. Despite heavy flowering and numerous pollinators, this species did not set appreciable seed in 2014.

The following cleaning methods were used for the three species:

- *Asclepia latifolia* (ASLA4) seed cleaning was accomplished by hand-separating the pods from the floss and seed, and then feeding the floss and seed into a hammermill (Borders and Lee-Made 2014). We used a $\frac{3}{8}$ -inch screen, a medium rotor speed of 6 (from 1 being the lowest to 10 being the highest, equivalent to about 1,600 rpm), and a medium-high fan speed of 8 (from 1 being the lowest to 10 being the highest). This hammermill set-up efficiently separated seed from floss. The resulting seed was easily cleaned using a two-screen cleaner with air (screen sizes #8 and #18). The pod separation method was very labor intensive, and so we developed an alternative method of removing the floss and seed from the pod as described below.
- *Asclepia speciosa* (ASSP) and *Asclepia asperula* (ASAS) seed cleaning was accomplished with a system that used a compressed air-jet to dislodge the seed and floss from the pod (Figure 12). The seed and floss mixture was hammermilled as previously described for *Asclepia latifolia* (ASLA4), and the resulting seed was easily cleaned using a two-screen cleaner with air (screen sizes #9 and #14 for *Asclepia speciosa* (ASSP), and sizes #8 and #18 for *Asclepia asperula* (ASAS)).

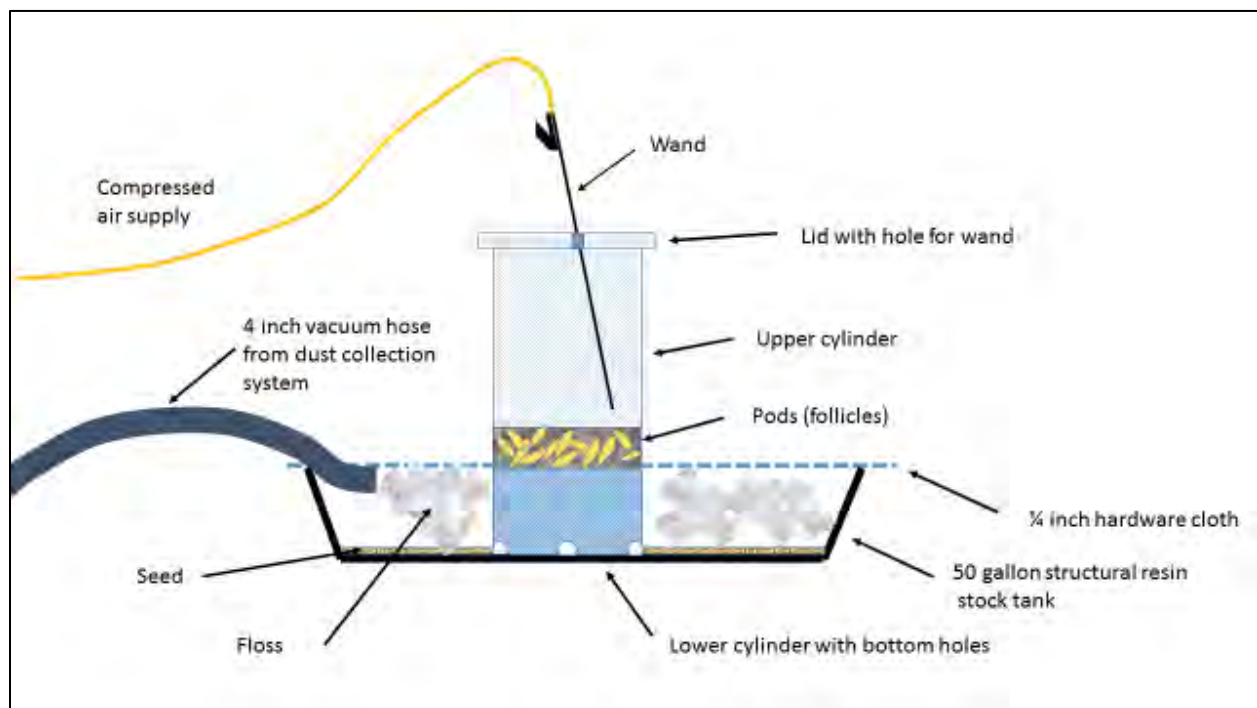


Figure 12. Compressed air jet and screen used to separate pods from seed and floss.

Future milkweed seed cleaning will use a modified version which should be more efficient at the separation of seed and floss from pods (Figure 13).

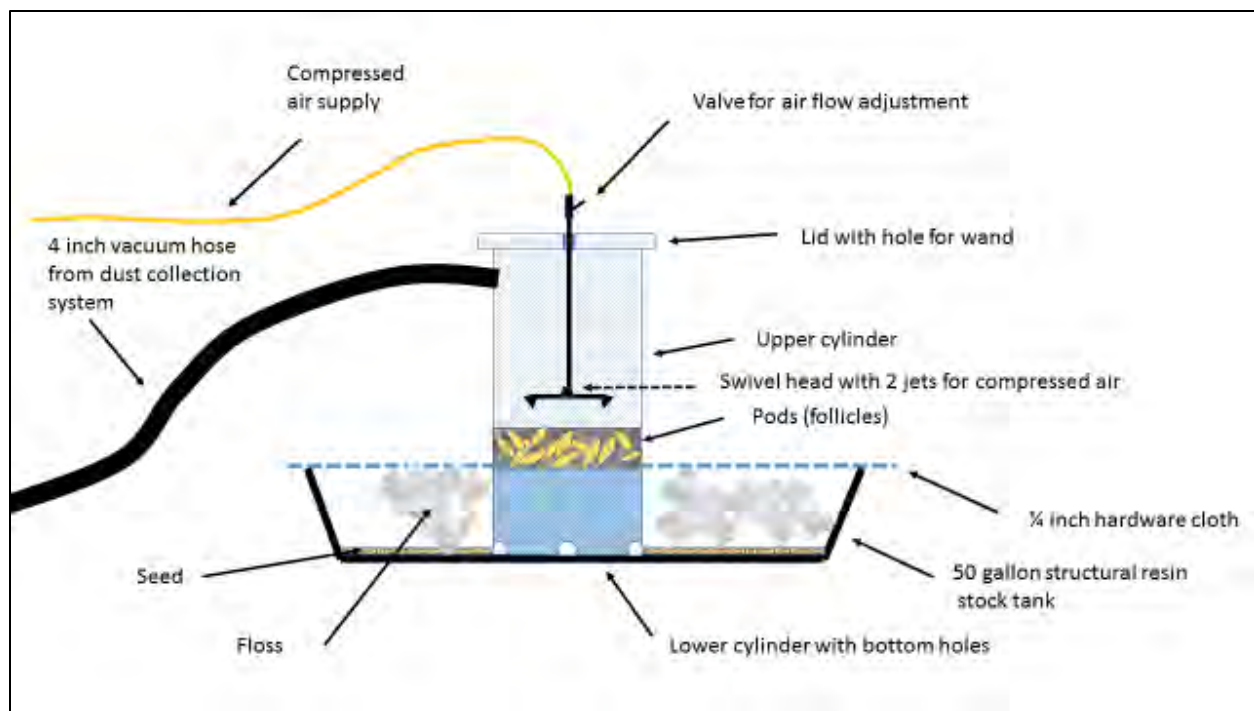


Figure 13. Conceptual system to more efficiently separate floss and seed from pods utilizing an improved air-jet configuration and vacuum floss removal.

CONCLUSION

The most important finding of this trial was the capability to produce significant amounts of seed from a small amount of acreage, at least for some milkweed species. To maximize seed harvest, at least in the case *Asclepia speciosa* (ASSP), the prolonged pod ripening season (more than three months) would necessitate every-other-day-harvest from August through early-October, and a daily harvest from mid-October until early-November. If harvest were limited to just the peak period of mid-October to early-November, about half of the seed would not be harvested.

The abrupt onset of flowering and seed-set with *Asclepia speciosa* (ASSP) would indicate maturation requirements for some milkweed species. The poor survival and vigor of *Asclepia asperula* (ASAS) might indicate poor adaptation to the soils and climate at the LLPMC. If *Asclepia asperula* (ASAS) were to be evaluated again, an attempt would be made to out-plant larger and more vigorous stock. Because of the abundant amount of flowering, the abundant and diverse amounts of pollinators, and the vigorous vegetative growth, the lack of seed-set by *Asclepia latifolia* (ASLA4) continues to mystify.

And finally, the use of compressed air to dislodge seed from pods and to remove the floss from the seed shows promise as a cleaning technique. This will require drying the pods without tight-packing them to facilitate opening of the pod.

LITERATURE CITED

Borders, Brianna and Eric Lee-Mader. 2014. Milkweeds: a conservation practitioner's guide. The Xerces Society for Invertebrate Conservation. Portland, OR. 143 p.

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