MILKWEED SEED PRODUCTION

John M. Row[1] and Chip Taylor[2]

USDA-Natural Resources Conservation Service, Plant Materials Center, Manhattan, KS 66502, USA[1]

and Monarch Watch, University of Kansas, Lawrence, KS 66045, USA[2]

INTRODUCTION

Milkweed habitat has declined due to intensive agricultural practices and conversion of land to biofuel production and urban development. The Manhattan Plant Materials Center (PMC) in Kansas teamed up with Monarch Watch and Westar Energy to increase milkweeds available for monarchs since they depend on these plants for survival. Establishing monarch way stations provides resources necessary for monarchs to produce successive generations and sustain their migration. Without milkweeds throughout their spring and summer breeding areas in North America, monarchs would not be able to produce the successive generations that culminate in the migration each fall. Similarly, without nectar from flowers, fall migratory monarchs would be unable to make their long journey to overwintering grounds in Mexico. The need for host plants for larvae (Fig. 1) and energy sources for adults applies to all monarch and most butterfly populations. Seeds of swamp milkweed (*Asclepias incarnata* L.) (ASIN) and green antelopehorn (*A. viridis* Walter) (ASVI2) produced by the PMC will be used by the Westar Energy "Green Team" for conservation projects. ASIN was selected because it will grow on wetter sites and ASVI2 was selected because it grows on drier upland sites. Both of these plants produce large volumes of nectar and are used extensively by bees and other pollinators (Fig. 2). The PMC began establishment of seed production plots of ASIN and ASVI2 (Fig. 3) in 2012.

Fig. 1 ASIN foliage supports Monarch larva

Fig. 2 ASIN flowers attract moths and bumble bees too

Fig. 3 ASVI2 with follicles

Objectives: Evaluate plant production, harvesting, and seed cleaning techniques for these species; fulfill the need to generate seeds and plants for pollinator initiatives; publish results of this study

PROCEDURE

Seeds of ASIN (Fig. 4) and ASVI2 were direct seeded to 288-cell plug trays (Fig. 5) filled with PRO-MIX plug and germination medium (PRO-MIX 'PGX') one seed per cell and over-wintered in a dormant state in the PMC's plant cooler for 12 weeks. The trays were moved to the greenhouse in the spring once seedlings began to immerge as temperatures were rising in the cooler. Seedlings taken from a germination test (Fig. 6) were transplanted to 72-cell plug trays (Fig.7) and moved to the greenhouse a few days after incubation in a laboratory incubator at 25/15 C alternating temperature and 8 hours of light. Seedlings of each species (Fig. 8) were transplanted to four different plot situations: Conventional Planting (CP), White Single-row Weed Barrier (W-SR-WB), Black Double-row Weed Barrier (B-DR-WB), and Raised Bed No Weed Barrier (RB-N-WB) using a waterwheel planter (Fig. 9). The ASIN had to be sheared several times before planting with a minimum of 2 to 4 leaves remaining on the seedlings after shearing to reduce plant stress and make handling the seedlings easier.

Fig. 4 Seeds of ASIN

Fig. 6 ASIN seedlings at 28 days, 25/15 C

Fig. 5 ASIN in 288-cell plug trays at 38 days in greenhouse, planted 1 seed per cell

Fig. 7 ASVI2 seedling transplants to 72-cell plug trays

Fig. 8 Milkweed seedlings ready for field planting

Fig. 9 ASIN planting into B-DR-WB, 15" in-row X 17" between-row spacing

A device for separating the seeds from the floss and follicles was fabricated out of metal components (Fig. 10) patterned after a similar seed cleaning device designed by Monarch Watch.

Fig. 10 Three-piece seed separator with trash barrel housing

Fig. 11 ASIN power driven seed separator with vacuum attachment

RESULTS

In 2012, the PMC set out 710 ASIN (Fig. 9) and 480 ASVI2 plants. ASIN flowered the establishment year and produced seed. ASVI2 produced few flowers late and is expected to produce seed the second year after establishment. It matures earlier in the season and did not have enough time to develop into mature plants the establishment year. ASIN seedling production was more successful than ASVI2 seedling production (Table 1). Germination in the 288-cell plug trays was 74% and 71% for the ASIN and ASVI2, respectively. A total of 1,253 milkweed seedlings were produced and 1,193 of them were planted out.

Table 1. Seedling production of *Asclepias incarnata* and *A. viridis* at Manhattan, KS

Species	Direct Seeded to 72-Cell Plug Trays	Lab Transplants to 72-Cell Plug Trays	Green House Transplants	Total Seedlings
A. incarnata	71	211	428	710
A. viridis	73	60	410	543

Fig. 12 First flowers on ASIN B-DR-WB, 53 days after planting (DAP)

Fig. 13 ASIN on B-DR-WB, 60 DAP

Fig. 14 ASIN B-DR-WB, follicle production at 100 DAP

Table 2. Seedling survival under 3 different plant production regimes in initial plantings for *Asclepias incarnata* and *A. viridis* at Manhattan, KS, 28 August 2012.

Species	W-SR-WB	B-DR-WB	CP
	% Stand		
A. incarnata	100	99.5	83.1
A. viridis	64	59	33.7

Follicles were gathered daily during the harvest period which began 20 September as a few follicles began to open in the conventional plot. In the peak of harvest 15 October to 26 October follicles (Fig. 15) were harvested twice a day. The first ripe follicles in the plasticulture were found 11 October. Follicles were kept separate by field setting throughout harvest and throughout the seed cleaning process. The bulk harvest was dried down in a forage drier at low heat and forced air until dry, after which bulk weights were obtained. Seed yield was 8.65 pounds gleaned from 16.83 pounds of bulk material. The percentage of clean seed varied by plot as the harvest season progressed, large groups of follicles were harvested en masse thus including more pedicels and stalks. The overall yield was 51.3 percent clean seed, Table 3. High winds were a problem for ASIN causing stem breakage and lodging resulting in many follicles at or near ground level by late summer; in some cases insects weakened stems.

Fig. 15 ASIN CP, follicles opening during peak harvest at 125 DAP

Table 3. Seed production of ASIN under 4 different plot situations at Manhattan, KS

Plot	Bulk Weight (lbs)	Clean Seed Weight (lbs)	% Clean Seed	Seed Yield (lbs/ac)
CP	5.6	3.25	58.0	216.7
W-SR-WB	3.87	1.85	47.8	276.4
B-DR-WB	6.3	3.0	47.6	167.6
RB-N-WB	1.06	0.55	51.9	137.5
Total Production	16.83	8.65	51.3	169.6

Fig. 16 Full chamber of bulk material after several rotations of the separator

Fig. 17 Separations after separator operation, seed (L), trash (R)

Fig. 18 Floss collected in vacuum cleaner

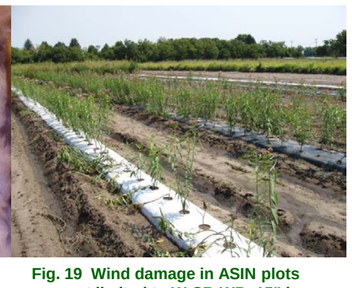

Fig. 19 Wind damage in ASIN plots was not limited to W-SR-WB, 15" in-row spacing (L)

CONCLUSIONS

ASIN seed production is feasible; however, less labor intensive harvesting methods need to be worked out and refine seed cleaning procedures.

For more information about The Manhattan Plant Materials Center visit our Website at http://plant-materials.nrcs.usda.gov/kspmc

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