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Implementation of Periodic Mowing in the Management of 'Stevens': An Alternative to Sanding or Pruning?

Carolyn DeMoranville

University of Massachusetts - Amherst, carolynd@umext.umass.edu

Hilary Sandler

University of Massachusetts - Amherst, hsandler@umass.edu

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Title: Implementation of Periodic Mowing in the Management of 'Stevens': An Alternative to Sanding or Pruning?

Project duration: 4/1/08 -- 4/1/12

Principal Investigators: Carolyn DeMoranville and Hilary Sandler
UMass-Amherst Cranberry Station
P.O. Box 569, East Wareham, MA 02538
508-295-2212 x25 (CD) and x21 (HS); Fax: 508-295-6387
carolynd@umext.umass.edu; hsandler@umext.umass.edu

Cooperators: MA Cranberry growers (Beaton, Makepeace, Gates, Morse Brothers); UMass Cranberry Station technical staff

Abstract: A two-part study was initiated in 2008. The first part of the study involved the selection of five commercial 'Stevens' bogs (with plans to add up to 5 more in 2009) to determine rate of cropping recovery following mowing. Mowed bogs were compared to unmowed companion beds under similar management. Bogs were mowed in the spring and biomass was evaluated in the fall. After 5-6 months, all mowed bogs had reduced biomass and reduced upright density per unit area compared to that on their unmowed companion bogs; this reduction was statistically significant at 2 of 5 (biomass) and 3 of 5 (upright density) sites. These sites will be followed for up to five years to determine rate of recovery. In the second part of the study, replicated trials were established on mowed or pruned vines (cv. Stevens) at the Rocky Pond Bog, Miles Standish State Forest. Three rates of Devrinol 50DF or Casoron 4G were applied to the vines after pruning or mowing treatment; untreated plots were also included in the study. Vines were evaluated three times after herbicide application and no vine injury was seen. In general, plots that received herbicides had reduced percent weed cover, with low to moderate

rates of Devrinol and moderate to high rates of Casoron giving the best control. No significant treatment effect was noted in the pruned plots for any yield parameter (e.g., bbl/A, percent flowering uprights) or upright measurement. However there was a trend for higher yield in the plots that received Devrinol, perhaps related to the observed weed control.

Research objectives:

1. Evaluate 'Stevens' sites that are mowed and compare to unmowed sites, following yield over a four-year period, conduct economic analysis.
2. Compare mowing and pruning at Rocky Pond Bog. Develop weed management protocols for mowed vine areas.

Timetable:

Objective 1. Spring 2008. We will identify 10 locations where mowing is planned in 2008 and where the grower is willing to provide yield and management history and data for the following 4 years. These locations will be paired with 'control' beds -- same grower and similar management except for mowing. We will collect the following information: 1) previous yield (4 years); 2) biomass removed in the mowing; 3) yield for 2008-2011; 4) upright density and % uprights flowering in 2008 and 2010 (6 inch dia. rings; 10 per site); 5) fertilizers used from 2006-2011; and 6) grower anecdotes regarding pest pressures. These sites will be monitored for 4 years. *We were only able to secure 5 sites in 2008, we will search out the remaining 5 in 2009.* 2009-2011. Yield and fertilizer data and ring samples will be collected as outlined.

Winter 2011-12. Conduct economic analysis for the 4-year period.

Objective 2.

Spring 2008. At the North bog at Rocky Pond, we will mow a portion of the bed and prune the remainder of the bed using a mechanical pruner that removes ~ 0.25-0.5 ton/acre. Vine density

and yield will be evaluated for four years by sampling 10 randomly selected areas in each treatment. A replicated experiment will be established to evaluate vine injury and regrowth and weed management efficacy of preemergence herbicides applied in the year of mowing. We will compare 3 rates each of Devrinol DF and Casoron 4G and untreated controls. Vines will be visually rated for injury, vine density and yield will be evaluated as described above, and weed cover will be estimated. *The herbicide experiment was conducted in both the mowed and pruned areas. In addition to evaluation within the plots, random ring evaluations (10) of the non-plot pruned, mowed, and untreated areas will begin in 2009 when all bog areas are producing crop.* Growing seasons 2009-11. Random vine and yield samples will be collected annually from mowed and pruned areas.

Summary of accomplishments

Objective 1. Evaluate 'Stevens' sites that are mowed and compare to unmowed sites, following yield over a four-year period; conduct economic analysis.

Five paired sites were identified in 2008. Grower records are being collected regarding biomass removed, yield, and fertilizer practices and are not reported at this time. Upright and yield data were collected and are presented in Tables 1 and 2. Samples (10) of vines from 6-inch diameter areas at each mowed and companion unmowed bog were evaluated for biomass, upright density and percent flowering uprights. Five to six months after mowing, the mowed bogs had less biomass and fewer uprights per area than that on the companion control bogs (Table 1). The decrease was statistically significant at 2 of 5 (biomass) and 3 of 5 (density) pairs. Only the control bogs had flowering uprights. It will be interesting to follow the impact on yield in 2009. We evaluated yield at the control bogs using foot square sampling (10 per bog). These data will be compared to actual grower yields (bog-scale). Interestingly, yield among the four control

Stevens bogs was variable, predominantly due to variation in fruit number (Table 2). However, if one looks at number of fruit per flowering upright, all four sites had similar fruit set -- approx. 1 berry per flowering upright. Further, berry weight was roughly similar at all sites. Therefore, variation in yield was accounted for predominantly by variation in numbers of flowering uprights that was determined by upright density and percentage of uprights that flowered. It is apparent that this study will provide useful information regarding controlling factors in crop yield in addition to allowing us to follow the impact of mowing.

Objective 2. Compare mowing and pruning at Rocky Pond Bog. Develop weed management protocols for mowed vine areas.

Portions of Rocky Pond North side was mowed or pruned 8-9 April 2008. A randomized complete block study (7 treatments with 4 replicates) was established in both mowed and pruned areas. Plots were 2 x 2 m in size. Ring samples were taken (28 April) from each plot in the pruned area prior to herbicide application. Statistical analysis indicated that there were no initial differences between treatments prior to the start of the experiment (see Table 4, top section).

Herbicide treatments were applied 30 April. Three rates of Devrinol 50DF were applied by CO₂-powered backpack sprayer, simulating 400 gal water per acre. Casoron 4G was applied at three rates, delivered to the vine canopy by a hand-held shaker. Irrigation was applied for approximately 2 hr after application. Conditions were mostly sunny, 55°F with a light breeze.

Plots were visually assessed for any indication of vine damage on 7 May, 22 May, and 12 June. Photographs were taken periodically but no vine injury was noted at any date nor at the time of actual rating assessment (see Table 3). Weed cover was assessed on 2 July (as well as vine injury ratings). Weed cover was higher in the untreated mowed plots compared with the Devrinol mid-range treatment (Table 3). In the pruned area, plots treated with the high rate of

Casoron and the low and mid rates of Devrinol had less weed cover than the untreated plots (Table 3). The most common weed species present were sedges (*Scirpus* and *Cyperus*) with some rushes and grasses also present. Additional analysis indicated no real difference in control between the herbicides; however, applying any rate of either herbicide was better than leaving the weeds untreated.

Ring samples (to assess upright distribution and dry weight) were collected on 4 September. Yield samples were collected from the pruned plots over the period 6-10 October. No differences were noted between treatments for any measured parameter in the pruned plots (see Table 4 and 5). Yield was very variable so that, despite large numeric differences among treatments, statistically all plots were similar in yield. However, looking at the data trends, yield was greatest in the plots treated with Devrinol. This could be associated with improved weed control with herbicide treatment. The low yield in the highest rate Casoron plots is notable even if not significant. Plots will be re-treated in 2009 and data will be collected as in Year 1.

Data and analysis from the first year of the replicated trial indicated no vine injury associated with using labeled rates of Casoron or Devrinol after mowing or pruning. It should be noted that 3 weeks elapsed between the time of pruning or mowing and the application of the herbicides.

Table 1. Upright data from control plots and treated (mowed) sites. Samples collected Fall 2008. Values are the mean of ten replicates. Vines were mowed Spring 2008.

Grower sites	Treatment	Date collected	Total Dry Weight (g)	Total Number Uprights (28 in ²)	Flowering Uprights %
Grower 1	Mow	10/8/2008	4.31	58	0
	Control	10/8/2008	4.63	68	33
		p-value	NS	NS	<0.001
Grower 2	Mow	10/10/2008	6.66	76	0
	Control	10/10/2008	7.69	88	34
		p-value	NS	NS	<0.001
Grower 3 a	Mow	10/1/2008	5.97	67	0
	Control	10/1/2008	8.08	103	39
		p-value	NS	0.008	<0.001
Grower 3 b	Mow	10/1/2008	5.56	76	0
	Control	10/1/2008	8.08	103	39
		p-value	0.039	0.029	<0.001
Grower 4	Mow	9/15/2008	4.42	94	0
	Control	9/15/2008	10.33	127	35
		p-value	<0.001	0.002	<0.001

Pairwise comparisons evaluated by t-tests, P<0.05. Control for mowed 3a and 3b was the same bog.

Table 2. Yield parameters at control sites. Values are the mean of ten replicates.

Site	Date collected	Weight per berry (g)	Total number of berries (per ft ²)	Yield (bbl/A)
Grower 1	10/8/2008	1.67	115	154
Grower 2	10/10/2008	1.69	165	238
Grower 3	10/1/2008	1.75	183	284
Grower 4	9/15/2008	1.57	224	321

Note - no crop on mowed bogs; control site for grower 3 was used for 2 mowing sites (3a and 3b).

Table 3. Percent weed cover and cranberry vine injury rating for pruned or mowed cranberry vines treated with various rates of preemergence herbicides. Vines were mowed or pruned 8 April 2008 and herbicides applied 30 April 2008. Visual ratings were made 2 July. Values are the mean of four replicates.

Main Trmt	Herbicide	Rate (lb/A)	Rating	
			Weed cover	Vine injury
Mowed	Casoron 4G	33	3.75 a	0
	Casoron 4G	66	3.00 ab	0
	Casoron 4G	99	2.50 ab	0
	Devrinol 50DF	6	2.25 b	0
	Devrinol 50DF	12	2.75 ab	0
	Devrinol 50DF	18	3.25 ab	0
	Untreated	0	3.75 a	0
		P-value	0.024	n/a
Pruned	Casoron 4G	33	1.75 ab	0
	Casoron 4G	66	1.75 ab	0
	Casoron 4G	99	1.25 b	0
	Devrinol 50DF	6	1.25 b	0
	Devrinol 50DF	12	1.25 b	0
	Devrinol 50DF	18	1.75 ab	0
	Untreated	0	2.25 a	0
		P-value	0.016	n/a

Means followed by similar letters are not significantly different according to Tukey's HSD test, P=0.05.

Rating scales used:

Weed Cover

- 1 = < 10%
- 2 = 11-25%
- 3 = 26-50%
- 4 = 51-75%
- 5 = 76% +

Vine Injury

- 0 = healthy
- 1 = minor
- 2 = mid
- 3 = heavy
- 4 = dead/gone

Table 4. Upright data from pruned and herbicided plots at Rocky Pond.
 Vines were pruned 8 April 2008. Herbicides applied 30 April 2008.
 Samples collected 28 April and 4 September 2008.
 Values are the mean of four replicates.

Post-pruning, evaluation of uprights produced in previous year				
Herbicide	Rate (lb/A)	Total Dry Weight (g)	Total Number Uprights (no/28 in ²)	Flowering Uprights (%)
Casoron 4G	33	7.50	65	29
Casoron 4G	66	9.68	75	19
Casoron 4G	99	9.30	89	39
Devrinol 50DF	6	10.61	106	44
Devrinol 50DF	12	9.84	82	30
Devrinol 50DF	18	6.88	55	22
Untreated	0	8.37	72	38

Pre-harvest, evaluation of current season growth				
Herbicide	Rate (lb/A)	Total Dry Weight (g)	Total Number Uprights (no/28 in ²)	Flowering Uprights (%)
Casoron 4G	33	6.61	79	23
Casoron 4G	66	7.69	80	16
Casoron 4G	99	5.38	68	11
Devrinol 50DF	6	7.14	96	21
Devrinol 50DF	12	8.51	103	29
Devrinol 50DF	18	6.96	80	24
Untreated	0	6.74	78	17

No significant differences between treatments for any parameter.

Table 5. Yield parameters for pruned vines treated with various rates of preemergence herbicides. Vines were pruned 8 April 2008 and herbicides applied 30 April 2008. Fruit were harvested 24 September 2008. Values are the mean of four replicates.

Herbicide	Rate (lb/A)	Weight per berry (g)	Total number of berries (per ft ²)	Yield (bbl/A)
Casoron 4G	33	1.97	74	136
Casoron 4G	66	2.01	98	170
Casoron 4G	99	1.95	46	82
Devrinol 50DF	6	2.04	122	204
Devrinol 50DF	12	2.05	120	210
Devrinol 50DF	18	1.93	118	193
Untreated	0	2.02	72	135

No significant differences between treatments for any parameter.