

Herbicides for perennial weed control in raspberry

Final Report

Principal Investigator: Dr. Douglas Doohan, Department of Horticulture and Crop Science, OSU

Key personnel: Allison Robinson and Amanda Douridas

Take-home message

Quinstar (quinclorac) is a synthetic auxin herbicide recently registered for use on brambles and blueberry. Quinstar controls several important perennial weeds such as field bindweed and Canada thistle; weeds that are otherwise nearly impossible to control in established plantings. With funding from the Ohio Vegetable and Small Fruit Research and Development Program, the OARDC Weed Lab and OSU Extension worked together during 2020 and 2021 to evaluate Quinstar's ability to control honeyvine milkweed, a species that is not listed on the product label but one that is very problematic for some bramble growers. Champaign Berry Farm of Urbana and Mauer Farms in Wooster cooperated by allowing experiments to be conducted in their raspberry fields.

Bramble tolerance to early fall and early spring applications at Champaign Berry Farm was excellent; no injury was observed. However, at Mauer Farms, primocane chlorosis and stunting was observed after the late-spring application. Results showed that Quinstar+Chateau and Quinstar+Sinbar applied in fall followed by a spring application of Quinstar could provide good suppression of honeyvine milkweed. Quinstar+Chateau and Quinstar+Matrix provided good control of Canada thistle and goldenrod that persisted through harvest.

Feedback from our farmer cooperators indicate that further research is needed to confirm these results. Different application timings and application methods need to be evaluated to determine best practices to control perennials in raspberry. For 2022 we plan to evaluate over-the-top broadcast applications in mid-July to early-August, and include Surflan and Princep in the tank-mixes with Quinstar.

Methods

Experiments were established at the Champaign Berry Farm in Urbana, and at Mauer's Fruit Farm in Wooster to evaluate herbicide tank mixes to control perennial weeds in raspberry. The experimental design was a randomized complete block with four replications. Four herbicides were tested in a tank mix with Quinstar (quinclorac), and Quinstar was also applied by itself. Herbicides tank-mixed with Quinstar were Callisto (mesotrione), Chateau (flumioxazin), Matrix (rimsulfuron), and Sinbar (terbacil). Treatments were applied during fall and spring. All treatments included a crop oil concentrate.

Treatments were sprayed in early fall before frost on 9/30/20 at the Champaign Berry Farm (Site 1), and in spring on 5/21/21 at the Mauer Farms (Site 2) when plants were in early bloom and emerged weeds were an average of 1 to 2 feet high. Plots at Site 1 were treated again in early spring before any crop growth had started on 4/2/21 with a single application of Quinstar at 0.375 lb ai/A. Plots at Site 1 were established in a section of the farm that is heavily infested with honeyvine milkweed. Plots at Site 2 were established in an area infested with Canada thistle, goldenrod and other perennials.

Visual assessment of weed control and crop injury were made at 1, 2 and 4 weeks after the treatments (WAT) were applied. Since honeyvine milkweed at Site 1 had not emerged at 4 weeks after the spring application, three more evaluations were made at 2 weeks intervals to capture honeyvine milkweed emergence.

Results

Site 1: No injury was observed after the fall and spring treatments applications. Honeyvine milkweed control in the fall was best with the tank-mix of Quinstar+Chateau, averaging about 70% three weeks after the early fall application, however, control was incomplete and it was clear that more research would be needed. Quinstar by itself did not provide good suppression with either application timing. Honeyvine milkweed control by early summer of 2021 was still quite obvious in plots treated with Quinstar+Chateau and with the Quinstar+Sinbar tank-mixes.

Observations from Mike Pullins indicate some suppression in seed production after applying Quinstar. The ability of Quinstar to prevent seed production should help in time to reduce the weed problem.

Table 1. Honeyvine milkweed response to fall and spring treatments at Champaign Berry Farm (Site 1).

Trt No.	Treatment	Rate	% control Honeyvine milkweed					
			9/30/2020	10/7/2020	10/21/2020	6/2/2021	6/16/2021	6/30/2021
1	Untreated		0 c	0 b	0 b	4 a	16 a	21 bc
2	Callisto	6 fl oz/a	23 bc	23 b	50 a	5 a	10 a	25 bc
	Quinstar	0.375 lb ai/a						
	COC	2 pt/a						
3	Chateau	6 oz wt/a	70 a	63 a	69 a	6 a	13 a	43 ab
	Quinstar	0.375 lb ai/a						
	COC	2 pt/a						
4	Matrix	4 oz wt/a	30 b	16 b	51 a	8 a	20 a	23 bc
	Quinstar	0.375 lb ai/a						
	COC	2 pt/a						
5	Sinbar	2 lb/a	20 bc	21 b	53 a	6 a	21 a	56 a
	Quinstar	0.375 lb ai/a						
	COC	2 pt/a						
6	Quinstar	0.375 lb ai/a	23 bc	21 b	58 a	5 a	10 a	13 c
	COC	2 pt/a						

Note: Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls).

Site 2: The mid-spring applications to advanced stage raspberry shoots resulted in stunting, chlorosis and some tissue death when Quinstar was tank-mixed with Callisto, Chateau or Matrix. Quinstar+Sinbar and Quinstar by itself caused slight, transient injury soon after application but primocane growth was unaffected. Four weeks after the application, primocanes had still not emerged in plots treated with Quinstar+Callisto or Quinstar+Matrix. Primocanes in plots treated with Quinstar+Chateau were stunted. We had planned to evaluate the extend of the injury observed after the spring application by measuring cane growth by the end of the season, but the crop had to be terminated due to disease pressure before we were able to collect the data.

Quinstar+Chateau and Quinstar+Matrix provided between 50 - 80% control of Canada thistle and 70% control of goldenrod that persisted through harvest. Goldenrod showed epinasty and severe stunting, however it was not completely controlled and remained in the field. Weed distribution across plots was not uniform and goldenrod was only established in two reps, and statistical analysis was not possible. The inconsistent weed distribution caused data to vary a lot and further research would be required to confirm the tank-mixes efficacy on Canada thistle and goldenrod.



Figure 1. Injury observed after late-spring application of Quinstar in tank-mix at Mauers Farm 2 WAT.

Table 2. Crop injury after late-spring application of Quinstar in tank-mix; and % control of Canada thistle at Mauers Farm (Site 2).

Trt. No.	Treatment	Rate	% Crop Injury			% control of Canada thistle		
			1 WAT 5/31/2021	2 WAT 6/9/2021	4 WAT 6/23/2021	1 WAT 5/31/2021	2 WAT 6/9/2021	4 WAT 6/23/2021
1	Untreated	.	0 c	0 c	0 b	0 c	0 c	0 a
2	Callisto Quinstar COC	6 fl oz/a 0.375 lb ai/a 2 pt/a	10 a	18 a	29 a	50 a	3 c	38 a
3	Chateau Quinstar COC	6 oz wt/a 0.375 lb ai/a 2 pt/a	6 b	9 b	25 a	30 b	10 c	50 a
4	Matrix Quinstar COC	4 oz wt/a 0.375 lb ai/a 2 pt/a	10 a	9 b	21 a	20 b	80 a	25 a
5	Sinbar Quinstar COC	2 lb/a 0.375 lb ai/a 2 pt/a	0 c	5 bc	10 ab		50 b	60 a
6	Quinstar COC	0.375 lb ai/a 2 pt/a	0 c	5 bc	13 ab	13 bc	13 c	53 a

Note: Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls).