Carfentrazone-ethyl activity on aquatic weeds and wild rice tolerance in Minnesota - 2002.

Becker, Roger L. and Henry J. Schumer. Experiments were carried out at Grand Rapids, Minnesota to determine weed control efficacy and wild rice (*Zizania palustris*) tolerance to carfentrazone-ethyl. Efficacy of carfentrazone-ethyl was determined on co-existent common water plantain and giant burreed established in 2000 and 2001 in a research paddy. Cultivated wild rice was not present. At the time of application in 2002, plant population densities were virtually solid giant burreed, approximately 10 to 20 plants/m^2, with scattered common water plantain interspersed at approximately 0.5 to 5 plants per/m^2. Wild rice tolerance was determined in a weed free paddy to avoid confounding with weed competition. This site was fall tilled in 2001. Four row plots (10 ft long rows on 12 in row spacing) were established by transplanting in early June. The variety was 'Petrowsky Purple' . 40 lbs/A of urea nitrogen was applied at planting. Seed yields were measured from the middle two rows end trimmed to 8 ft. All herbicide treatments were applied with a CO_2 backpack type sprayer delivering 20 gpa at 35 psi with 11002 flat fan nozzles. All experiments had a randomized complete block design with four replications and plot size 6 feet wide by 10 feet long. Application data and results are presented below.

Application Data

Date	7/12/02
Air Temp (°F)	72
Sky	partly cloudy
Wild Rice	
Size (inch)	12 inches above water
Stage	vegetative
Giant Burreed	
Size (inch)	24-36
Stage	flower to pod
Common Water Plantain	
Size (inch)	--
Stage	vegetative to early scape emergence

This was the third and final year of repeating identical treatments. Statistically, efficacy on common water plantain was similar from 0.2 to 0.4 lb ai/A with the addition of 0.25 lb ai 2,4-D 6 DAT (July 18 rating) and at 62 DAT (September 12). The questionable gain in efficacy for the increased cost of increasing the herbicide rate suggests the economically viable rate would be 0.2 lb ai carfentrazone-ethyl + 2,4-D as seen in the 2000 trial. The addition of 2,4-D did improve the efficacy of carfentrazone-ethyl on common water plantain comparing the 0.2 lb ai rate with or without the addition of 2,4-D by 6 DAT, similar to the 2000 trial but contrary to the results of the 2001 study. This benefit of adding 2,4-D was no longer apparent by 62 DAT this year, however. Common water plantain was at the target treatment stage of vegetative to early scape emergence similar to the 2000 study, while in 2001, plantain was beyond the ideal stage for treatment ranging from vegetative to mid-flower stage of development. Plantain was understoried in the dense canopy of giant burreed in this study which may have reduced control compared to the 2000 and 2001 trials where common water plantain was understoried in the comparatively more open wild rice canopy and burreed was in a separate trial in 2000 and 2001.

Efficacy on giant burreed was statistically similar at rates of 0.2 to 0.4 lb ai carfentrazone-ethyl + 0.25 lb ai 2,4-D and at 0.2 lb ai carfentrazone-ethyl applied alone with necrosis ranging from 75 to 88 % by 6 DAT, and was similar at rates of 0.05 to 0.4 lb ai carfentrazone-ethyl + 2,4-D by 62 DAT (all rates tested with 2,4-D). The addition of 2,4-D to carfentrazone-ethyl did not improve the efficacy of carfentrazone-ethyl on giant burreed by 6 DAT as seen in the 2000 and 2001 studies. However, by 62 DAT, the addition of 2,4-D did show improved control of burreed compared to the use of carfentrazone-ethylalone which was not the case with later ratings in previous trials. Burreed was at the vegetative to immature seed development stage when treated this year. As with plantain, the questionable improvement in control gained by rates of carfentrazone-ethyl higher than 0.2 lb ai do not justify the additional costs. As in 2000 and

2001, it appears that 2,4-D used alone had little effect on giant burreed and does not clearly show advantages when tank-mixed with carfentrazone-ethyl unless other 2.4-D susceptible species are present. The effect on burreed crown and rhizome survival the following season will be determined in 2003.

In the tolerance study, necrosis was severe from carfentrazone-ethyl injury, unlike the past two seasons where necrosis was slight to nonexistent. Necrosis increased as the rate of carfentrazone-ethyl increased ranging from 10 % to 35 % necrosis of leaf tissue with 0.05 to 0.4 lb ai/A carfentrazone-ethyl, respectively, 6 DAT. Stunting also increased as the rate of carfentrazone-ethyl increased ranging from 7 to 25 % growth reduction 6 DAT. Adding 2,4-D did not alter leaf necrosis or growth reduction injury, but did show a nonsignificant trend for increased growth reduction at 14 % compared to 21 % growth reduction comparing 0.2 lb ai carfentrazone-ethyl without 2,4-D to the addition of 0.25 lb ai/A 2,4-D, respectively. Wild rice stand was poor with varied populations such that yield data collected showed no significant differences (data not shown). Plots were sprayed mid-day with no rain close to application and no dew or abnormally high humidity at application. Wild rice leaves were aerial, beyond the floating stage, thus the cause for the high rate of necrosis is not readily apparent. This was the first use of the liquid EC formulation where the water dispersable granule was used in 2000 and 2001. Both formulations were not compared in the same trial. Formulation work on other crops does not indicate that crop tolerance should have been altered. Rates used on wild rice are up to 50 times higher than typically used on commodity crops such as corn. At these rates, the water dispersable granule was very difficult to dissolve, and caused nozzle plugging. This season with the EC formulation, was the first time the trials were sprayed without application problems. However, efficacy on plantain and burreed were comparable to past results, leading me to conclude rates of the active ingredient applied were similar in the three studies such that inadvertent differences in the rate of product applied can not explain the high level of cultivated wild rice injury in 2002 either. (Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul).

Table. Carfentrazone-ethyl activity on aquatic weeds and wild rice tolerance in Minnesota - 2002. (Becker et al.)

		Wild rice tolerance (7/18)		Aquatic weed necrosis			
				ALSPA		SPGEU	
Treatment	Rate	Necrosis	Growth Reduction	7/18	9/12	7/18	9/12
	(lb ai/A)	----------	----------	(%)	----------	----------	----------
Carfentrazone	0.2	20	14	31	19	75	34
2,4-D dimethylamine	0.25	3	2	11	11	17	35
Carfentrazone-ethyl+ 2,4-D dimethylamine	0.05 + 0.25	10	6	16	23	52	50
Carfentrazone-ethyl+ 2,4-D dimethylamine	0.1 + 0.25	16	8	35	29	66	55
Carfentrazone-ethyl+ 2,4-D dimethylamine	0.2 + 0.25	27	21	44	60	78	66
Carfentrazone-ethyl+ 2,4-D dimethylamine	0.3 + 0.25	32	24	46	56	80	59
Carfentrazone-ethyl+ 2,4-D dimethylamine	0.4 + 0.25	35	24	52	65	88	71
Untreated		5	1	0	0	0	0
LSD (0.05)		7	8	13	14	23	21