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# Effect of Preemergence and Rope Wick Applications of Glyphosate on Rhubarb

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***Abstract.*** **Glyphosate [N-(phosphonomethyl)glycine] was applied to rhubarb (*Rheum rhaponticum* Linn. 'Victoria Red') as preplant sprays and rope wick applications. In 1982, the glyphosate sprays controlled weeds for 1 month. Rope wick applications controlled tall weeds for about 1 month, but new weeds grew. In 1983, more rhubarb plants emerged in the handweeded control and straw-mulched plots than in the herbicide-treated plots, partly ascribable to the previous year's treatments. Weed control effects from either glyphosate spray or wick-wipe application lasted about 1 month (as in 1982), and new weeds grew. The straw-mulched and the weeded control plots produced the largest plants and greatest yields in both years.**

Rhubarb is widely grown throughout the world, especially in northern climates, but only on a small scale when compared to many agricultural crops (3, 11). The major cultural information on growing rhubarb can be found in USDA publications (10, 12) and individual state extension circulars (2, 5, 6, 7, 9). These publications, however, contain little cultural information on weed control. Handweeding is the general procedure for weed control in home gardens, and it is assumed that the broad leaves of the rhubarb shade the soil so completely that weeds are not likely to be a serious problem (4). Herbicides can be helpful in controlling early weed growth for the commercial producer who is involved in forcing for an early market (1, 8). This research was conducted to determine if glyphosate could be used to control weeds in rhubarb and increase yield without causing crop injury.

The field was plowed in the fall of 1981, disced during the spring of 1982, and the plots were laid out as a randomized complete block design with 4 replications. The soil type was a Duffield silt loam with 2.2% organic matter and a pH of 5.8. Sprays of glyphosate were applied to 3 × 3.6 m plots with a compressed-air, pressurized, bicycle sprayer delivering a volume of 337 liter/ha at a pressure of 2.11 kg/cm$^2$. All preplant applications were applied at 1.4, 2.8, 5.6, or 11.2 kg ai/ha on 21 May 1982. The next day, 6 rhubarb 'Victoria Red' plants per plot were hand-planted in 2 separate rows. A tractor-mounted, hydraulically operated, height-adjustable, rope wick-wiper was used to apply glyphosate to separate plots 52 days after planting. The wick-wipe treatments consisted of a 33% (v/v) glyphosate solution and were applied when the weeds were 15 to 45 cm tall, and the rhubarb was 70 cm tall. Injury was avoided by covering the rhubarb plants with large plastic bags to prevent contact with the herbicide. Unweeded control, monthly handweeded control, and 15-cm thick straw-mulched plots were included in each replication. Monthly handweeding was performed after evaluating the weed control. Crop emergence, weed control, herbicide injury to crop, and final rhubarb plant size were evaluated during the 1982 growing season.

The same plots were retained in 1983, and glyphosate was sprayed on 5 May. Wick-wipe applications (33% v/v) were applied on 3 June and 21 July. The rhubarb plants were covered with plastic 19-liter flower pots to prevent the glyphosate sprays from contacting the emerged rhubarb plants. Large plastic bags were used to cover the fully grown plants during wick-wiping. Four plots were mulched with straw at the beginning, midway, and the end of the growing season in both years to maintain the 15-cm depth. Crop emergence, weed control, herbicide injury to crop, yield, and rhubarb plant size were obtained during the growing season.

Early emergence of rhubarb in 1982 was reduced significantly in the plots treated with 11.2 kg glyphosate/ha. There was no significant difference in emergence 17 days after planting.

The glyphosate sprays provided early season weed control during 1982, but new weeds germinated and grew. Applications of glyphosate by rope wick-wipe controlled weeds for 1 month; however, new weeds germinated and grew. Weed coverage was less in the weeded control plots and the straw-mulched plots than in any other treatments after 60 and 90 days. The major weeds in descending order of density were giant foxtail (*Setaria faberi* Herrm.), green foxtail [*S. viridis* (L.) Beauv.], yellow foxtail [*S. glauca* (L.) Beauv.], common lambsquarters (*Chenopodium album* L.), redroot pigweed (*Amaranthus retroflexus* L.), Canada thistle [*Cirsium arvense* (L.) Scop.], field bindweed (*Convolvulus arvense* L.), Pennsylvania smartweed (*Polygonum pensylvanicum* L.), and common purslane (*Portulaca oleracea* L.). Twenty-three other weed species were identified during the 1982 growing season.

No significant differences in crop phytotoxicity were observed among treatments 1 month after planting (less than 1%). Sixty days after treatment, there was significantly more crop injury in the plots sprayed with 2.8 and 5.6 kg glyphosate/ha (20% and 18%) and in the wick-wipe treatments (18%) than in either control (10%) or the straw mulch (10%) plots. Rhubarb that had been treated with 11.2 kg glyphosate/ha exhibited more visible herbicide injury to the crop 90 days after treatment than other treatments. Visible injury never exceeded 20% during the 1982 growing season.

The largest rhubarb plants were produced in the straw-mulched and the weeded control plots (Table 1). Larger plants were present in the wick-wipe treated plots than in those

Table 1. Rhubarb plant size during 1982 and 1983.[z]

| Treatment | Rate (kg/ha) | 1982[y] final | 1983[x] Months after treatment 1 | 2 | 3 | 1983 final |
|---|---|---|---|---|---|---|
| Unweeded control | --- | 1.2 c[w] | 3.8 d | 5.2 bc | 4.8 c | 4.1 bc |
| Weeded control | --- | 8.4 a | 8.5 a | 8.8 a | 6.8 ab | 8.7 a |
| Glyphosate spray | 1.4 | 1.2 c | 3.2 d | 4.2 c | 4.0 cd | 4.1 bc |
| | 2.8 | 1.6 c | 4.0 cd | 5.5 bc | 5.5 bc | 5.7 b |
| | 5.6 | 1.9 c | 4.8 bcd | 4.5 c | 4.2 cd | 4.9 b |
| | 11.2 | 1.4 c | 4.2 bcd | 4.2 c | 2.8 d | 3.0 c |
| Glyphosate wipe 33% v/v | --- | 4.2 b | 5.8 b | 6.5 b | 4.5 c | 8.0 a |
| Straw mulch 15 cm | --- | 9.4 a | 5.5 bc | 8.5 a | 8.0 a | 8.8 a |

[z]Plant size based on a scale of 0 (no plant) to 10 (largest plant in experiment). Data transformation not required.
[y]1982 final plant size evaluation, 1 Nov. 1982.
[x]1983 plant size evaluations: 28 Apr., 24 May, 21 June, and 29 Sept. 1983.
[w]Mean separation within columns by Duncan's multiple range test, 5% level.

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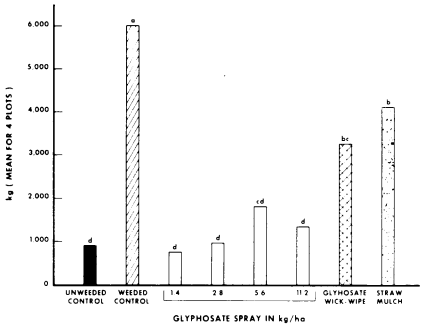


Fig. 1. Early (3 weeks) rhubarb yields for 1983.

that had received the glyphosate spray treatments or in the unweeded control. No rhubarb was harvested during the 1st growing season.

Early crop emergence during the 2nd year was significantly improved in the weeded control and straw-mulched treatments. During the 2nd emergence evaluation, more rhubarb plants emerged in the weeded control, straw-mulched, and 5.6 kg glyphosate/ha plots than in the unweeded control and 1.4 kg glyphosate/ha plots.

In 1983, there were fewer weeds in the straw-mulched plots 30 days after treatment than in other treatments with the exception of the 2.8 kg glyphosate/ha. At the 2nd evaluation of weed control, there were fewer weeds in the plots sprayed with 2.8, 5.6, and 11.2 kg glyphosate/ha than in either control, glyphosate wick-wipe, or the 1.4 kg glyphosate/ha treatments. The monthly weeded

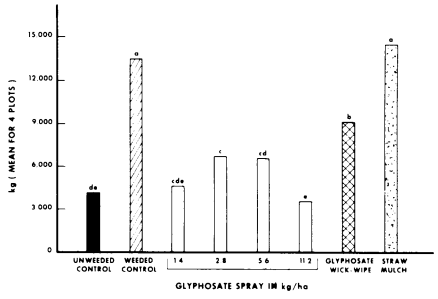


Fig. 2. Rhubarb yields for 1983.

control had not been handweeded at this 2nd evaluation. Ninety days after treatment, the weeded control contained fewer weeds than in all other treatments. Also after ninety days, fewer weeds had developed in the straw-mulched and the glyphosate wick-wiped plots (13 days after wipe 1) than in all glyphosate spray treatments and in the unweeded control.

At the fourth weed control evaluation (120 days after spray treatment), the glyphosate wipe treatments (5 days after wipe 2) contained fewer weeds than all other treatments. In addition to the weeds found in 1982, white heath aster (*Aster pilosus* Willd.) and dandelion (*Taraxacum officinale* Weber) were the major new weeds that invaded from adjoining fields. Wick-wipe applications, twice during the growing season, provided satisfactory weed control of the tall weeds such as foxtails, common lambsquarter, and redroot pigweed, but did not control low growing weeds such as carpet weed and common purslane.

There was greater injury visible in the weeded control plots than in 2.8 kg glyphosate/ha spray treatments 30 days after treatment, but the injury was not more than 20%. Sixty and 90 days after treatment, the 11.2 kg glyphosate/ha spray had caused more visible crop injury than was evident in any other treatment. One-hundred and twenty days after treatment the plants had recovered from previous visible injury symptoms.

The largest plants in the 1983 size evaluations were produced by the weeded control, straw-mulched, and wick wipe treatments. These 3 treatments aid in overwintering rhubarb plants (Table 1).

Significantly more rhubarb was produced in the weeded control than in all other treatments during the 1st 3 weeks (Fig. 1). The straw-mulched and wick-wipe plots produced higher yields of rhubarb than the unweeded control and 1.4, 2.8, and 11.2 kg glyphosate/ha sprays during the 1st 3 weeks.

Total rhubarb yields (10 weeks) were larger in the straw mulch and weeded control plots than in all other treatments (Fig. 2). Significantly more rhubarb was produced in the wick-wipe application plots than in any glyphosate spray treatments and the unweeded control plots during the full harvest season.

Satisfactory weed control, minimal phytotoxicity to the crop, large rhubarb plants, and improved yields are best obtained by the following treatments in descending order: straw-mulching of 15 cm; handweeding; wick-wiping; or applications of 2.8 or 5.6 kg glyphosate/ha sprays. Although it is necessary to cover the plants, larger yields of rhubarb are produced by wick-wiping than with glyphosate sprays.

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