A QUICK METHOD FOR EVALUATING HERBICIDE EFFICACY ON *PANICUM REPENS L.*

(Suatu metoda cepat untuk menilai daya bunuh herbisida terhadap *Panicum repens L.)*

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Abstrak

Suatu metoda cepat untuk menilai daya bunuh herbisida terhadap *Panicum repens* diuraikan di sini. Dengan metoda ini dimungkinkan untuk menentukan secara lebih cermat ketahanan sebenarnya pada tingkatan sel dari *P. repens* terhadap empat herbisida yang dicoba.

Daya bunuh atau daya penekanan tumbuh glifosat terhadap tunas rizom *P. repens* adalah kira-kira 16 kali lebih besar daripada dalapon dan lebih besar lagi dibanding asulam dan amitrol.

Abstract

A quick method to evaluate the efficacy of herbicides on *Panicum repens* is described. This method enables us to determine more acurately the innate tolerance at the cellular level of *P. repens* towards the four herbicides tried in this experiment.

The efficacy of glyphosate to kill or suppres growth of *P. repens* rhizome buds was about 16 times that of dalapon, and even more as compared to asulam and amitrole.

Introduction

Some experiments to control **P. repens** under field condition have shown that rather high doses of herbicides were required to get a sufficient degree of control. Orsenigo and Weldon (1963) reported that a fairly good control of **P. repens** was obtained on ditchbanks in South Florida with one or two treatments of dalapon at 20 lb/ac. Kretchman (1962) also reported that persistent use of repeated applications of 2.0 — 2.5 lb/ac dalapon after a minimum of 3 series of treatments with 3 — 4 months between the series has given 75% kill, which he thought was not adequate for **P. repens** in Citrus groves. Later Ryan (1965) reported that the substituted uracil-terbacil at 4 — 6 lb/ac applied 2 — 3 times a year will maintain control of **P. repens** in Citrus without adverse effects on the crop. Cooks, et al, (1969)

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claimed to obtain a commercial accept-able level of control in sugar cane with 2 lb/ac asulam plus 16 oz/ac wetting agent combined with ioxynil/ 2.4-D for a period of two months for most grass weeds and he suggested that **P. repens** also appeared to be very susceptible to asulam treatments. Experiments at WRO., using well established pot plants also showed a high degree of tolerance to several of the herbicides evaluated (Parker, 1972). From experiments with several herbicides and herbicide mixtures at four Tea estates in West Java, Soedarsan et al, (1974) concluded that **Panicum repens** is a hard to control weed. Only glyphosate at 2,0 kg a.i/ha,applied 4 — 6 times in a year and a mixture of MSMA, 2,4-D and dalapon (1,08 kg a.i/ha, 0,7 kg a.i/ha, 3,7 kg a.i/ha) applied 7 times in a year, could give satisfactory control of this grass.

Failure of herbicide treatments in fiels and pot experiments where the herbicide is applied with a sprayer to the leaf-surface may be due to lack of retention and penetration of to innate tolerance at the cellular level.

The quick method described here, enables the innate tolerance at the cellular level to be assessed. Where phytotoxicity is high in this test, but low following conventional application, manipulation of formulation and application technique can be justified in order to improve performance. In this method the herbicide is injected into one node rhizome fragmants. An advantage of **P. repens** rhizomes for this purpose is that they have a hollow pith so that the injected liquid remained in the cavity and can be absorbed by the rhizome tissue. Another advantage of this methos is that a known quantity of herbicide can be applied, and expressed as units weight per units weight of fresh rhizome tissue, and used to describe actual activity of a herbicide.

The assessment of the effect of the herbicide is simple as the length of the shoot arising from the rhizome bud is easily measured.

Material and Methods

Fresh rhizomes were collected from well established **P. repens** plants of the Ceylon clone, and one node fragments were cut. The rhizomes were not very uniform in thickness and the size of buds. Intact non growing buds were chosen. The one node fragments obtained were weighed and separated into two group a. between 350 — 500 mg and b. between 500 — 650 mg. The a group were given 0.01 ml and the b group were given 0.015 ml of the herbicide solution for each treatment using an Agla microsyringe. Five fragments from a. and five from b. group made up the 10 replicates for each treatment.

The one node fragments were treated in the proxinal end with an Agla microsyringe, and allowed to absorb the herbicide in an incubation room overnight at 23°C in the dark. The one node fragments were placed in alluminium trays lined with wet "Kim wipe" paper tissues and put at an angel of about 45°C against a test tube with the proximal end facing upwards. The following morning the fragments were planted in nutrent peat contained in trays, which were placed in the tropical greenhouse.

The herbicides tested were dalapon, asulam, aminotriazole and glyphosate at three concentrations. For the first three herbicides the concentrations employed were 50 Ug/ml, 200 Ug/ml and 800 Ug/ml and for the glyphosate a lower concentration was used : 2.8 Ug/ml, 11.25 Ug/ml and 45.0 Ug/ml. Tergitol non ionic wetter was added to give a concentration of 0.2%. Two sets of control were included.

Visual assessments of symptoms were made during the growing period, but the main assessment was made at about four weeks after planting by measuring the length of the shoots from soil surface to the highest leaf tip. After an additional week the surviving plants were counted and total fresh weights taken.

Results

The highest dose of glyphosate resulted in a 100% kill of the rhizome buds so this dose is not included in the analysis. Even with the lowest dose of glyphosate a significant shoot-growth suppression was obtained (Table 1).

With asulam and aminotriazole only the highest dose showed a significant growth suppression, while for dalapon the highest and middle dose did show a significant shoots growth suppression.

An additional observation on time between planting and emergence of shoots from the peat-surface gave results tabulated in table 2.

Table 1. : **Mean shoot lengths and transformed values of one node rhizome fragments as affected by four herbicides.**

No.	Treatments	Mean shoot length in cm (= X)	$\log_{10}(X + 0.1)$
1.	Control 1	9.02	0.870
2.	Control 2	10.88	0.899
3.	Dalapon 1.2 Ug/g fr wt	4.52	0.405
4.	Dalapon 4.7 Ug/g fr wt	1.33	—0.010
5.	Dalapon 18.8 Ug/g fr wt	0.52	—0.579
6.	Asulam 1.2 Ug/g fr wt	13.09	0.970
7.	Asulam 4.7 Ug/g fr wt	5.54	0.518
8.	Asulam 18.8 Ug/g fr wt	1.30	—0.050
9.	Amitrole 1.2 Ug/g fr wt	11.15	0.755
10.	Amitrole 4.7 Ug/g fr wt	8.74	0.720
11.	Amitrole 18.8 Ug/g fr wt	1.69	0.159
12.	Glyphosate 0.07 Ug/g fr wt	2.19	0.063
13.	Glyphosate 0.28 Ug/g fr wt	0.34	—0.549
14.	Glyphosate 1.1 Ug/g fr wt	0.00	—
		SE	±0.175
		$LSD_{0.05}$	0.489

Table 2 **The effect of four herbicides on the number at 3 times after planting, and final fresh weight of shoots.**

No.	Treatments	Total sht fr.wt.g. 24 days	Number of shoots emerged		
			8 days	12 days	24 days
1.	Control 1	1.32	6	8	9
2.	Control 2	1.58	8	10	10
3.	Dalapon 1.2 Ug/g	0.77	9	9	9
4.	Dalapon 4.7 Ug/g	0.18	5	8	8
5.	Dalapon 18.8 Ug/g	0.08	3	3	4
6.	Asulam 1.2 Ug/g	1.92	5	10	10
7.	Asulam 4.7 Ug/g	0.63	7	10	10
8.	Asulam 18.8 Ug/g	0.15	3	6	8
9.	Amitrole 1.2 Ug/g	1.89	8	9	9
10.	Amitrole 4.7 Ug/g	1.16	8	10	10
11.	Amitrole 18.8 Ug/g	0.14	6	8	9
12.	Glyphosate 0.07 Ug/g	0.25	3	7	8
13.	Glyphosate 0.28 Ug/g	0.03	4	5	6
14.	Glyphosate 1.1 Ug/g	0.00	0	0	0

The result in table 2 show that none of the herbicides except glyphosate at the highest dose stopped shoot emergence though growth often delayed especially at the higher doses. However, the fresh weights of shoots at 24 days and shoot lengths in table 1 indicate that shoots made little growth especially at the higher doses.

Symptoms of glyphosate on shoots were visible at the middle dose, showing some slight chlorosis on emerging tips or on the basal part of a leaf. A rolling of the leaf blade seems also to be asociated with glyphosate treatment. It was also observed that in some fragments more than one shoot developed from one bud, but they remain very short. The same multiple shooting of buds was also observed on the dalapon and asulam treated fragments, with the highest dose. The highest dose of aminotriazole caused a severe chlorosis of the emerging shoots while some chlorotic stripes were visible on some leaves of the middle dose of dalapon treated fragments. In later stages leaf tips in all the high dose treatments become necrotic. The lowest dose of dalapon caused a dwarf appearance of the shoot but for asulam and aminotriazole there was no difference compared to the controls.

Discussion

This injection method of herbicide application in rhizome fragments or stem fragments which bear a vital growing point, like buds, seems to be a very convenient and reliable methos of testing herbicide performance. Anatomical observation of the cell layer adjecent to the inner cavity showed that there is no cuticle layer, so that herbicides or other chemicals, put into this cavity may enter the tissue/cell more readily and reached the active site of growth quicker. Although it is still difficult to tell how much of the herbicide is actually involved in killing the bud, at least one can know the exact amount that is available in the tissue.

Dalapon seems to be quite active. The lowest dose (1.2 Ug/g fr wt) gave an almost significant suppression of shoot growth and the middle and highest dose caused definitely a significant growth suppression. Asulam and aminotriazole, only showed a significant shoot growth reduction at the highest rates. Even these growth reductions were not as great as those caused by the highest dose of dalapon. but it does not mean that the two first mentioned herbicides were less active than dalapon. Aminotriazole at the highest dose in this case, still allowed some shoot growth, but all the shoots were entirely chlorotic and did not survive. Glyphosate at a much lower level than the other herbicides showed a significant growth suppression at all three doses. With the highest dose (1.1 Ug/g fr wt) there was no shoot growth at all. The buds did swell at the beginning but died-off later without being able to reach the peatsurface. The middle dose (0.28 Ug/g fr wt) caused a severe shoot growth suppression. Here, again many of the buds were swollen and stopped growing but some side shoots were formed which also stopped to grow after a while. A simmilar appearence was obtained with the highest dose of dalapon and asulam, a multiple sprouting bud. The lowest dose of glyphosate (0.07 Ug/g fr wt) did show a significant shoot growth suppression but did not stimulate the development of multiple sprouting.

It is difficult to make a direct comparison of the activity of the herbicides but from the mean shoot lengths it may be assumed that the degree of activity of glyphosate 0.28 Ug/g fr wt is about the same order as dalapon 18.8 Ug/g fr wt, and glyphosate 0.07 Ug/g fr wt is about the same as dalapon 4.7 Ug/g, asulam 18.8 Ug/g and amitrole 18.8 Ug/g fr wt. This conclusion is not entirely true because the shoots treated with the highest dose of amitrole were all chlorotic and died off a later stage. This situation was also true for the highest dose of asulam and dalapon so that from this point of view (the killing effect) the highest dose of all four herbicides were about the same. The middle dose of dalapon (4.7 Ug/g fr wt) was about the same as glyphosate 0.28 Ug/g fr wt but the middle doses of asulam and amitrole were lass active. In a field experiment comparing glyphosate versus dalapon for alang-alang control. Soedarsan et al. (1975) found that 3 kg a.i/ha and 2x2 kg a.i/ha, gave results comparable to dalapon treatment at a total dosage rate of 25.5 kg a.i/ha, which means that at the operational level the efficacy of glyphosate was only 8 times that of dalapon. Assuming that this will also be true for **P. repens** the efficacy of glyphosate at the cellular level is two times that at the operational level which suggest that something could be done to make glyphosate more effective at the operational level.

If the number of emerging shoots was to be used as a parameter to asses herbicide performance it would be difficult to choose the proper period to do the assesment. It seems that assesment at a shorter period after planting would be more suitable for this purpose because at a later stage the number of emerging shoots leveled off.

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