Tea Q. 51 (4), 180-184, 1982. Printed in Sri Lanka

CHEMICAL CONTROL OF ILLUK (*IMPERATA CYLINDRICA*) (*L.*) BEAUV.)

S. Sandanam, N. Punyasiri, K. L. S. D. Perera and A. K. Gamage

(*Tea Research Institute of Sri Lanka, Talawakele, Sri Lanka*)

An experiment carried out with 3-year old Illuk (*Imperata cylindrica*) grown in pots in a glass house showed that a single application of glyphosate, as 1 or 2% solution, gave an almost 100% control as assessed visually by scoring. A high degree of control of rhizomes, by way of kill and suppression of rhizome regeneration, was achieved with glyphosate at these concentrations. A single application of Dalapon at 22.4 Kg/ha in 667 litres of water and Dalapon-paraquat sequential spray (Dalapon 5.6 Kg/ha and paraquat 0.568 litres/ha) gave about 50% control up to 6th week followed by a decline, the degree of control reaching about 30% by the twelfth week, as assessed visually. Determination of dry weight of plant parts at the end of twelve weeks after spraying showed that Dalapon and Dalapon-paraquat sequential spray did not reduce rhizome weight significantly. Addition of a surfactant to the spray solutions did not materially alter the degree of control achieved with any of the treatments.

INTRODUCTION

In a previous investigation (Sandanam and Jayasinghe, 1977) the effectivenes of various manual and chemical methods to control Illuk grass (*Imperata cylindrica*) were studied. Of the chemical methods Dalapon-Paraquat sequential spray (Dalapon 5.6 + Paraquat 0.28 Kg a.i./ha) was found to be as effective as dalapon at a high rate (22.4 Kg a.i./ha). These treatments, however, had to be repeated at appropriate intervals to achieve effective control over a period of 38 weeks. Since Glyphosate is well known to effectively control several perennial grasses an experiment was conducted to compare the degree of control achieved with a single application of Glyphosate with that achieved with dalapon-paraquat sequential spray. Since the foliage of Illuk grass is coarse and difficult-to-wet, the effect of the addition of a surfactant (surfactant N) was also studied.

MATERIALS AND METHODS

The experiment was conducted with 3-year old Illuk plants in cement pots (25 cm inside diameter) in a glass house at the Tea Research Institute, St. Coombs (1200 m.a.m.s.i.) during the period May-October 1982. There were 11 treatments with 5 replicates arranged in a randomized complete block design.

The treatments were :

1. Glyphosate — 0.5% solution
2. Glyphosate — 1.0% solution
3. Glyphosate — 2.0% solution
4. Glyphosate — 0.5% + surfactant N

5. Glyphosate — 1.0% + surfactant N

6. Glyphosate — 2.0% + surfactant N

7. Dalapon — 22.4 kg/ha in 667 litres of water

8. Dalapon — 5.6 Kg/ha in 667 litres of water + 0.568 litres/ha of Paraquat in 560 litres of water 3 weeks later

9. Dalapon — 22.4 kg/ha + surfactant N

10. Dalapon — 5.6 Kg/ha + surfactant N and 0.568 litres/ha of Paraquat, 3 weeks later

11. Control — untreated

Surfactant N was incorporated to obtain a concentration of 0.1% in the spray fluid. The plants were arranged in 5 blocks of 12 uniform plants in each. Prior to spraying one plant from each block was selected at random for assessment of initial weight of shoot, rhizomes and roots. The herbicide solutions were made up at the above concentrations and 15 ml of the appropriate solution was sprayed per plot using a chromatogram sprayer. All sprays were done on 23rd May 1982. Paraquat for Dalapon-paraquat sequential treatment was sprayed on 14th June 1982. For each treatment the percentage control of the grass relative to the untreated plots (0 = no effect, 100 = complete kill) was assessed by visual scoring done at weekly intervals. Regeneration, if any, as reflected by growth of green shoots, was considered decline in control. At the end of 12 weeks (*ie* on 18th August 1982) the plants were carefully removed out of the pots, washed free of soil particles and separated into shoot, root and rhizomes. Any surface water was removed by gently pressing the plant parts between layers of blotting paper. Dry weight of plant parts were obtained by drying the material at 105°C for 24 hours. The statistical significance of the data was evaluated by the use of Duncan's multiple range test.

RESULTS AND DISCUSSION

Visual Estimate of Control

Visual estimate of control by the various treatments is presented in Fig. 1.

It is clear from Fig. 1 that all levels of glyphosate gave better control than Dalapon or Dalapon-paraquat sequential spray. 1% and 2% glyphosate solutions did not very much differ in their effects while 0.5% Glyphosate solution gave a slightly lower degree of control. The Maximum degree of control achieved with dalapon at 22.4 Kg/ha was about 50% at the third week after spraying; the control thereafter declined to about 20% by the 12th week. Dalapon at 5.6 Kg/ha gave a control of about 25% at the third week, while at the 4th week it rose to about 70% which was the result of the scorch by paraquat spray. From the 6th week onwards control declined reaching about 25% at the 12th week. The results of the visual estimate of control in the present investigation confirms the previous finding (Sandanam and Jayasinghe, 1977) that dalpaon-paraquat sequential spray using a lower dose of dalapon was as effective as the high dose of dalapon (22.4 Kg/ha). However, it differs from the previous finding in that the degree of control achieved in both treatments did not exceed 70% at any time. This is perhaps due to the fact that in the present investigation only one spray was given during the experimental

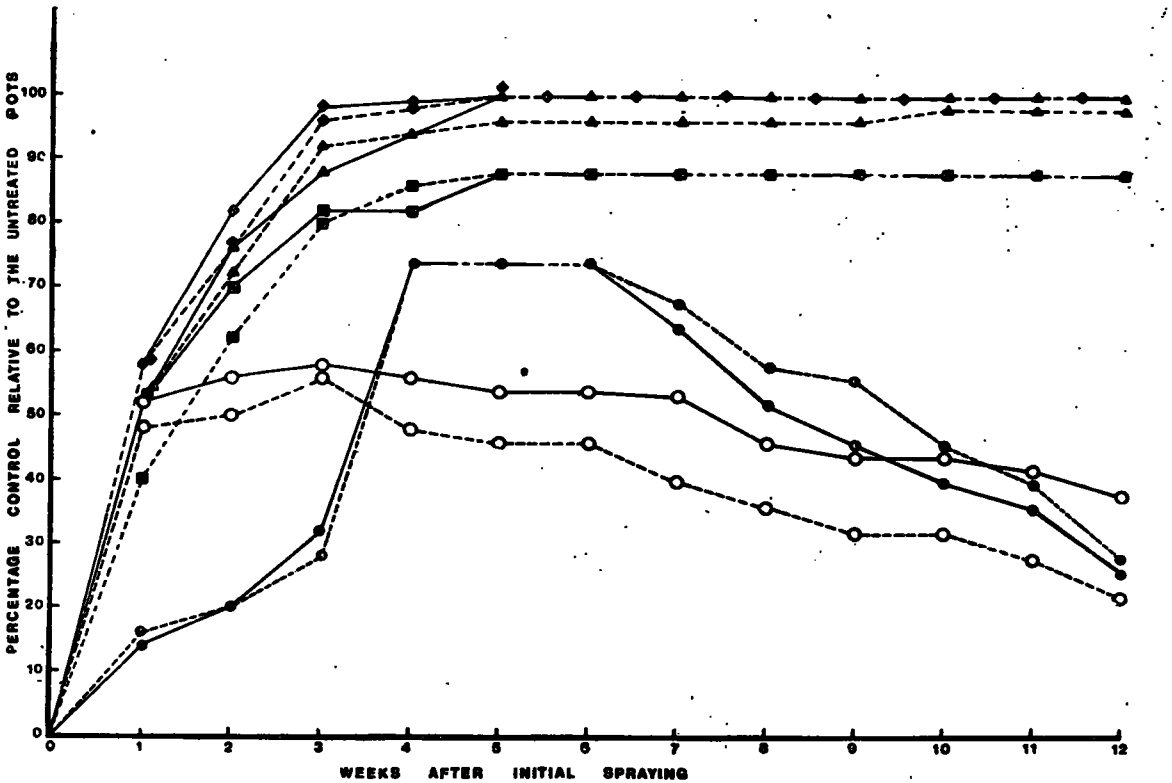

Fig. 1.—Effect of chemical methods of control on top growth as assessed by visual scoring.

■.....■ *Glyphosate 0.5%;* ▲.....▲ *Glyphosate 1%;*
■.....■ *Glyphosate 2%;* ■——■ *Glyphosate 0.5% + Surfactant;*
▲——▲ *Glyphosate 1% + Surfactant;* ▲——▲ *Glyphosate 2% + Surfactant*
○.....○ *Dalapon 22.4 Kg;* ○——○ *Dalapon 22.4 Kg + Surfactant*
●——● *Dalapon-Paraquat sequential treatment*
●——● *Dalapon-Paraquat sequential treatment + Surfactant.*

period while in the previous investigation sprays were repeated. Such repeat applications may be necessary with these herbicides to cause growth inhibition and exhaustion although it has been suggested that control by growth exhaustion could be more effective than by growth inhibition (Santiago, 1980). The addition of surfactant N did not alter the degree of control in all glyphosate treatments while there was a slight improvement in control in the presence of the surfactant in both dalapon treatments. This difference was greater at the higher rate of dalapon (Fig. 1). This is perhaps due to better penetration of the chemical.

Estimate of control based on dry weight of plant parts

TABLE 1 — *The mean height and number of shoots and the dry weight of plant parts before spraying*

Height of shoots	— 1.32 m
Number of tillers	— 38.2
Number of leaves	— 82.2
Dry weight of shoots	— 98.52 g
Dry weight of rhizomes	— 20.62 g
Dry weight of roots	— 37.20 g

TABLE 2 — *Effects of the control measures on the dry weight of plant parts*

		Dry weight (grams)		
	Treatment	*Shoots*	*Roots*	*Rhizomes*
1	Glyphosate 0.5%	108.10 ab*	15.04 a	21.34 d
2	Glyphosate 1%	86.79 a	16.94 a	15.90 abc
3	Glyphosate 2%	103.21 ab	12.72 a	11.84 ab
4	Glyphosate 0.5% + Surfactant	102.26 ab	15.43 a	18.18 cde
5	Glyphosate 1% + Surfactant	87.64 a	15.58 a	13.98 ab
6	Glyphosate 2% + Surfactant	93.97 a	10.20 a	10.88 a
7	Dalapon — 22.4 Kg/ha	127.05 bc	43.66 b	29.20 f
8	Dalapon 22.4 Kg/ha + Surfactant	130.70 bcd	39.28 b	24.50 def
9	*Dalapon - Paraquat sequential spray	144.83 cd	37.59 b	22.18 cde
10	Dalapon - Paraquat sequential spray + Surfactant	161.18 de	40.25 b	27.33 ef
11	Control	194.54 e	55.79 c	31.18 f

*Dalapon-paraquat sequential spray = Dalapon 5.6 Kg/ha and paraquat 0.568 l/ha sprayed 3 weeks later.

Statistical significance (at P=0.05) was evaluated by the use of Duncan's Multiple Range Test Values followed by same letters are not significantly different from each other.

Although visual estimates of control may give some idea of the degree of control achieved it can sometimes be deceptive in terms of "real control" which lies in the control of rhizomes. The dry weight of plant parts 12 weeks after the treatments were imposed are given in Table 2. In terms of the effect on shoot the degree of control of the grass as shown by visual estimate of control differed from that shown by dry weight of shoot. Table 2 indicates that although by visual estimate Dalapon+surfactant appeared to give a significantly higher degree of control compared with Dalapon alone, in terms of shoot dry weight there was no difference between the two treatments. Therefore the addition of surfactant could have initially enhanced absorption by dalapon and caused scorch which is scored as more effective control whereas translocation may have been insufficient to kill rhizomes. Such high dose of dalapon causing scorch and impeding translocation is known (Klingman, 1961). In terms of shoot dry weight the degree of control achieved at the different levels of glyphosate did not differ from each other. The

Dalapon paraquat sequential spray treatment showed the highest dry weight of leaves being second only to the control possibly due to regeneration. Of greater importance is the effect on dry weight of rhizomes. There was a clear trend to indicate that the dry weight of rhizomes was lowest at the highest level (2%) of glyphosate tested (Table 2). The dry weight of rhizome in Dalapon at higher level and Dalapon-paraquat sequential spray did not differ very much although it appeared to be higher in the Dalapon treatment in the absence of surfactant. In general the addition of surfactant did not materially alter the degree of control or rhizomes in any of the treatments.

The difference in dry weights of rhizomes noted could be due either to kill the rhizomes present at the time of treatment or due to suppression of rhizome regeneration or both. In glyphosate treatments in general the final dry weight of rhizomes was lower than the initial weight except in treatment 1. The difference in dry weight between the initial and final assessment were + 3 to — 11, — 22.9 to — 32.2, — 42.6 to — 47.1 per cent in 0.5%, 1% and 2% glyphosate respectively. Such a reduction could be due to both kill of rhizomes and suppression of regeneration. In the untreated control rhizome dry weight had increased by 51% during the experimental period and the increase in dalapon and dalapon-paraquat sequential spray ranged from 7.5 to 41%. Thus the dalapon treatment appeared to have reduced rhizome regeneration only slightly. Dalapon at 22.4 Kg/ha is generally phytotoxic to tea and therefore repeat applications may not be desirable if it is to be used in tea fields. Therefore, Dalapon-paraquat sequential spray using only 5.6 Kg/ha Dalapon seems promising especially if repeat applications could be made. However, glyphosate seems more effective even at a concentration of 1%. Since glyphosate is more expensive than Dalapon or Paraquat, the choice may depend on cost of control and degree of control achieved with repeat application of dalapon and paraquat.

ACKNOWLEDGEMENTS

Thanks are due to Mr. T. Thevadasan, Officer-in-Charge, Statistics Division, TRI for his help in the analyses of the data.

REFERENCES

KLINGMAN, G. C. (1961). In: Weed control as a science, 156-158. John Wiley & Sons Inc., New York, London 421 p.

SANDANAM, S. & JAYASINGHE, H. D. (1977). Manual and chemical control of *Imperata cylindrica* on tea land in Sri Lanka. PANS 23 (4): 321-426.

SANTIAGO, A. (1980). Geneaological aspects of the *Imperata* weed and practical implications. Proc. of BIOTROP Workshop of Alang-alang, Bogor (1976), 23-24.