การใช้สารเคมีกำจัดวัชพืชในสวนสับปะรด

Preemergence Weed Control in Pineapple[1]

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Although in Thailand pineapple is not as important as banana, citrus, durian and rambutan, it provides income to farmers in areas where the growing of other crops is generally not feasible. The production of this crop may possibly expand in the future, particularly if pineapple is processed. As with other crops, one of the major problems in cultivation of pineapple is the control of weeds. In Thailand, the growers have been accustomed to the time consuming practice of weeding by hand. Mechanical implements may be useful for the control of weeds when the pineapple plants are small, but may injure the plants during the advanced stages of growth. The use of paper mulch has proved effective in Hawaii (Collins, 1960).

In recent years a considerable amount of literature has accumulated in the use of preemergence herbicides in controlling annual weeds of crops including the pineapple (Klingman, 1961). Manuel (1962) reported that monuron and simazine provide satisfactory control of weeds in pineapple. Silvy (1962) demonstrated that besides monuron and simazine, diuron produced good results. Because information on the use of herbicides in pineapple plantings in Thailand is lacking, experiments were initiated beginning August, 1963 to determine the herbicidal effects of simazine, atrazine, monuron and diuron on annual weeds and to establish their phytotoxic effects, if any, on the pineapple. the results of investigation are reported herein.

MATERIALS AND METHODS

The experiments were conducted on sandy loam soil at the Sirracha Student Training Farm of Kasetsart University. The major weeds encountered in this area are *Euphorbia himalayansis*, *Amaranthus* sp., *Dactyloctenium aegyptiacum*. *Boerhaavia diffusa* and *Digitaria adsendens*. The minor weeds are *Portulaca oleracea*, *Alternanthora frutescens*, *Gomphrena himalayansis*, *Abutilon indicum*, *Passiflora foetida* and *Tridax procum bens*. The land was prepared well and freed of weeds before planting the Smooth Cayenne pineapple.

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In the first experiment, pineapple suckers were planted during the rainy season on August 16, 1963, and the plots treated on August 17, 1963. The experiment comprised 3 replicates. Individual plots were 4 by 4.5 meters and each consisted of 24 pineapple plants. Simazine and atrazine at the rates of 1, 2 and 4 lbs./acre and monuron and diuron at 1.6, 3.2 and 6.4 lbs./acre of active ingredient in 100 gallons of water were applied at a pressure of about 25 psi, utilizing a knapsack sprayer equipped with 2 teejet fan nozzles. The second expriment was conducted in the location with the same design as that of Exp. 1. The herbicides used were identical to those used earlier, but the concentrations of every herbicide were uniformly 2, 4 and 8 lbs./acre. The treatments were made during the cool season on January 18, 1964.

In the third experiment the pineapple suckers were planted on August 15, 1964. The plots were treated during the early part of the rainy season on July 4, and treated again toward the end of the rainy season on October 14. Before treatment, shallow cultivation was provided to eliminate the germinated weeds. Four replications and the 4 by 4.5 meter plots were used.

RESULTS

In the first experiment, simazine and atrazine at 4 lbs./acre and monuron and diuron at 6.4 lbs./acre gave complete weed control for 2 months after application (Table 1, Fig. 1). Good to excellent control was obtained at concentrations of 2 and 4 lbs./acre of simazine and atrazine and 3.2 and 6.4 lbs./acre of monuron and diuron. Four months after treatment all plots were completely reinfested with weeds. There was no apparent injury to the pineapple plants.

Table 1. The effect of preemergence herbicides in pineapple planting during the rainy season.

Treatment	lbs./acre	Degree of weed control* 10/16/63	12/15/63
Simazine	1	2.3	1.0
	2	3.7	1.0
	4	4.0	1.0
Atrazine	1	2.3	1.0
	2	3.8	1.0
	4	4.0	1.0
Monuron	1	2.2	1.0
	3	3.7	1.0
	6.4	4.0	1.3
Diuron	1.6	2.0	1.0
	3.2	3.7	1.0
	6.4	4.0	1.3
Control	Non-weeded	1.0	1.0
Control	Hand-weeded	4.0	1.0

* 1=poor, 2=fair, 3=good, 4=excellent

Fig. 1. Unweeded control on left-front, herbicide treatments at 2 months after application on right and back.

The second experiment conducted during the cool season gave excellent weed control for 3 months with all four herbicides at the higher concentrations of 4 and 8 lbs./acre (Table 2). Even the lowest concentration of 2 lbs./acre

Table 2. The effect of preemergence herbicides in pineapple planting during the dry season.

Treatment lbs./acre		degree of weed control *	
		4/17/64	6/21/64
Simazine	2	3.3	1.0
	4	4.0	1.5
	8	4.0	1.8
Atrazine	2	3.1	1.0
	4	4.0	1.2
	8	4.0	1.3
Monuron	2	3.0	1.4
	4	4.0	2.0
	8	4.0	3.9
Control – – non-weeded		2.2	1.0
Control – – hand weeded		4.0	4.0

* 1=poor, 2=fair, 3=good, 4=excellent

provided satisfactory control for the same period. By the fifth month, however, a considerable number of weeds had appeared and the degree of control was rated poor to fair with the exception of monuron and diuron at the highest coucentration of 8 lbs./acre which still maintained good to excellent control. Compared to the previous experiment, the herbicides in this test gave a longer period of effective control. This is probably due to the seasonal difference. The dry season is unfavorable for weed growth and also there is less run-off or leaching of the herbicides during this season.

Evaluation of the condition of the plants was not made due to the variation within plots and the infestation of nut grass in some plots. However, it was observed, that monuron at 8 lbs./acre resulted in the purpling of the pineapple leaves.

In the third experiment (Table 3), the higher concentrations of all herbicides produced good to excellent control 2 months after the application of herbicides, while the lowest concentration of 2 lbs./acre gave fair to good control. In 3 months the effectiveness of the higher concentration was generally reduced to between fair and good control, while that of the lower concentration was poor, and weed control was no longer satisfactory.

Table 3. The effect of repeated application of preemergence herbicides in pineapple planting.

Treatment lbs./acre	Degree of control*							Condition of plants*
	8/8/64	9/12/64	10/7/64	11/21/64	12/18/64	1/16/65	2/16/65	2/16/65
Simazine 2	3.8	2.1	0.7	0.5	–	–	–	–
4	3.9	3.3	2.5	1.1	–	–	–	–
2+2	3.6	2.6	1.2	3.9	3 0	1.8	1.3	2.6
4+2	3.7	3.2	2.4	3.9	2.8	2.0	1.7	3.0
Atrazine 2	3.9	2.7	0.9	0.8	–	–	–	–
4	3.9	3.1	1.9	1.2	–	–	–	–
2+2	3.8	2.8	0.9	3.7	2.7	1.5	1.5	2.5
4+2	3.9	3.5	2.1	3.9	3.3	2.6	2.3	3.2
Monuron 2	3.8	2.7	1.2	0.6	–	–	–	–
4	3.9	3.3	2.9	2.0	–	–	–	–
2+2	3.8	2.8	1.3	3.8	2.8	2.1	1.8	2.7
4+2	3.9	3.4	2.5	3.9	3.5	2.9	2.7	3.2
Diuron 2	3.9	2.3	0.9	0.8	–	–	–	–
4	3.9	3.2	2.3	2.0	–	–	–	–
2+2	3.9	2.7	1.0	3.8	2.9	2.3	2.1	2.8
4+2	3.9	3.0	2.1	3.9	2.8	2.5	2.3	2.9
Control--non-weeded	1.4	0.0	0.0	0.0	0.0	0.0	0.0	1.4
Control--weeded	1.4	2.0	2.3	1.0	2.5	3.3	3.0	2.4

* O = no control or very poor, 1=poor, 2=fair, 3=good, 4=excellent.

Soon after the repeated applications all treatments produced nearly complete control of weeds for a month and good control for 2 months. At the third months, however, only 4+2 lbs./acre of atrazine, monuron and diuron gave fair to good control, and the degree of control was maintained for another month. At 4 months the 2+2 lbs./acre treatments were ineffective. Atrazine, monuron and diuron applied initially at 4 lbs./acre and 3 months later at 2 lbs./acre gave a satisfactory degree of control for a period of 7 months after the initial treatment in July.

no adverse effect of any herbicide was observed (Table 3). The slight differences in the condition of plants observed among the treatments suggest that weed competition was a factor, for there appeared to be a correlation between the degree of weed control and the vigor of the plant. The growth of the pineapples during the period of the experiment was generally poor due to inadequate water supply during the dry season.

DISCUSSION

The results of the tests show that the four herbicides used, i.e. simazine, atrazine, monuron and diuron, at the concontration of 2 lbs./acre gave fair to good control for 2 months after treatment during the wet season, while the higher concentrations produced good control for 2 months and fair to good control for 3 months after application. Manuel (1962) obtained satisfactory control for 2 months after treatment with simazine and monuron at 2.4 and 6 lbs./acre. He indicated, however, that monuron was more effective in controlling weeds. The results in Exp. 2 and 3 show that monuron and diuron gave a longer residual effect than either simazine or atrazine during the dry period of the year. At 8 lbs./acre, monuron and diuron maintained nearly complete control for a period of 5 months (Table 2).

For repeat applications a 3-month interval between applications may be too long, particularly if 2 lbs./acre is used initially, for this concentration considerable weed growth appeared after 2 months. On the other hand, with the initial application of 4 lbs./acre, fair to good weed control was obtained for the third month. The second application of 2 lbs./acre following the initial application of 4 lbs./acre produced satisfactory weed control for a period of 7 months. Thus, if 2 lbs./acre is used during the rainy season, the interval between applications should be 2 months, while an initial 4 lbs./acre can be followed by 2 lbs./acre in 3 months.

Most of the grasses are more resistant than the broadleaves. *Dactyloctenium aegyptiacum* is stoloniferous and grows

rapidly once established. It would be desirable to spot-weed the few plants of grasses that are not completely controlled with herbicides.

None of the herbicide treatments showed any phytotoxic effects on the pineapple except monuron at 8 lbs./acre which produced purplish leaves. However, the plant growth did not appear to be affected. Manuel (1962) also observed intense anthocyanin formation on the leaves of the pineapple and some retardation of growth when treated with monuron at 6 lbs./acre.

The state of vigor of the plants in the weeded control was lower than in the rest of the treatments. This is probably due to the disturbance of and mechanical injury to the pineapple plants through the weeding operation. The plants usually took from one to four weeks, especially during the dry season, to recover from the effects of weeding with hoe.

SUMMARY

1. Tests on the herbicidal effects of simazine, atrazine, monuron and diurou in pineapple plantings were conducted on sandy loam soil at the Sirracha Student Training Farm.
2. Simazine, atrazine, monuron and diuron at 2 lbs./acre gave satisfactory control of weeds for a period of 2 months after treatment in the wet season. At the higher concentration of 4 lbs./acre, fair to good control was maintained for 3 months. The herbicides were effective for a longer period during the dry season.
3. Atrazine, monuron and diuron at 4 lbs/acre followed in 3 months at 2 lbs./acre produced satisfactory control of weeds for a period of 7 months.
4. Monuron and diuron showed a longer residual effect than simazine and atrazine, particularly during the dry season.
5. No apparent phytotoxic effects on the pineapple plant were detected, except for monuron at 8 lbs./acre which resulted in purpling of the leaves.
6. Hoe-weeding in the dry season caused injury to the pineapple plants.

สรุป

จากการทดลองในการกำจัดวัชพืชของ simazine, atrazine, monuron และ diuron ในความเข้มข้นต่าง ๆ กัน และฤดูกาลที่ต่างกัน ในแปลงปลูกสับปะรดในที่ดินปนทราย ที่ไร่ฝึกนิสิตศรีราชาพอสรุปได้ดังนี้

1. Simazine, atrazine, monuron และ diuron เข้มข้น 2 ปอนด์ ต่อเอเคอร์ (0.36 กิโลกรัมต่อไร่) ให้ผลเป็นที่น่าพอใจ โดยที่กำจัดวัชชพืชได้ตลอด 2 เดือนหลังจากที่ฉีดลงบนดิน ความเข้มข้นที่สูงขึ้นไป (มากกว่า 4 ปอนด์ ต่อ เอเคอร์ หรือ 0.72 กิโลกรัมต่อไร่) ปรากฏว่าให้ผลพอใช้จนถึงดีตลอดระยะเวลา 3 เดือน ทั้งนี้เมื่อฉีดในฤดูฝน ถ้าเป็นฤดูแล้ง ช่วงการให้ผลจะนานกว่านี้

2. Atrazine, monuron และ diuron เข้มข้น 4 ปอนด์ต่อเอเคอร์ (0.72 กิโลกรัมต่อไร่) แล้วฉีดตามด้วยความเข้มข้น 2 ปอนด์ต่อเอเคอร์ (0.36 กิโลกรัมต่อไร่) ใน 3 เดือนต่อมาให้ผลในการกำจัดวัชชพืช เป็นเวลา 7 เดือน

3. Monuron และ diuron แสดงให้เห็นว่ามีผลตกค้างอยู่ในดินได้นานกว่า simazine และ atrazine โดยเฉพาะอย่างยิ่งในฤดูแล้ง

4. ไม่ปรากฏว่าต้นสับปะรด แสดงอาการที่ผิดปกติโดยชัดแจ้ง อันเนื่องจากผลของยาแต่อย่างใด นอกจาก monuron 8 ปอนด์ต่อเอเคอร์ (1.44 กิโลกรัมต่อไร่) ทำให้ใบสับปะรดเป็นสีม่วงมากขึ้น แต่ไม่กระทบกระเทือนต่อความเจริญของต้น

5. การใช้จอบถางหญ้าในแปลงสับปะรดในหน้าแล้ง มักทำให้ต้นเฉาโทรมไปนานหลายอาทิตย์ บางทีร่วมเดือนกว่าจะฟื้นตัวจนเหมือนเดิม

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