LOW-INPUT AND HIGH-INPUT DRYLAND TARO WEED CONTROL IN HAWAI'I

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Abstract

Living mulches were compared to weed cultivation and herbicide weed control in dryland taro. The highest No.1 corm yields were harvested from the herbicide and the cultivation treatments. The living mulches tested were ineffective in controlling weeds eight weeks after planting, and poor final yields were attained. Although the highest cost item was cultivation labor, timely mechanical cultivation appears to be a workable alternative for the small family farmer with no hired labor. For the larger farmer with hired labor, proper use of herbicides, possibly in combination with mechanical cultivation, offers the most efficient means of weed control.

Introduction

A Rapid Rural Appraisal conducted by a Hawai'i-LISA team identified that weed control was a major bottleneck for dryland taro farmers. Yields are severely reduced if weeds are not adequately controlled. The herbicides Goal and Gramoxone have been recently registered for use in taro and have become widely accepted in dryland taro culture. As an alternative, the use of a living mulch may be a feasible solution to herbicide weed control. This technique has potential in a dryland taro system since weed control is critical only in the early growth phase. From our experience, if weeds do not grow above the level of the taro leaf canopy, yields are not dramatically reduced. The living mulch technique results in the reduction of herbicide buildup in the soil and possible associated ground water contamination. A living mulch would also aid in protecting the soil surface from erosion or compaction. The proper plant mulch must be matched to the taro system. The purpose of this trial was to compare living mulches as an alternative to herbicides in controlling weeds in dryland taro culture.

Materials and Methods

Colocasia esculenta (L.) Schott var. *Bun Long* was planted in test plots on the island of Hawai'i in Hilo soil at an elevation of 500 ft. Plants were spaced one foot apart within rows and three feet apart between rows in 9 ft x 24 ft plots. Each plot consisted of 20 harvestable plants surrounded by two border rows. Weed control treatments are listed in Table 1.

Table 1. Weed control treatments.

Treatment	Rate
No weed	
Mechanical cultivation with Mantis-20 and hand weeding	Monthly for the first three months.
Rye living mulch	20 lb per acre surface broadcast at planting
Oats living mulch	70 lb per acre surface broadcast at planting
Vetch/rye living mulch	20 and 10 lb per acre surface broadcast at planting
Herbicides:	
Goal 1.6 E	At planting - 1.21 liter per acre
Gramozone super	Postplant applications - 1.5 and 0.5 liter per acre

A total of 300 lb per acre of phosphorus was banded and tilled in 6-inch deep furrows prior to planting. Application of 560 lb nitrogen and 650 lb potassium per acre were divided into three equal doses and banded in furrows at preplant and side dressed at 2 and 4 months after planting.

The planting date was October 3, 1990, and the harvest date was July 8, 1991. Plants were grown under rain-fed conditions. Corm weights per plot were recorded, and the data reported were averaged over three replicates.

Results

The highest No. 1 corm yield and average corm weight were harvested from the herbicide and the cultivation treatments (Table 2, Figures 1 and 2).

The living mulches appeared to offer good ground cover in the early growth period, up to eight weeks after planting (Figures 3 and 4). Competition from the living mulches appeared evident after eight weeks. Weed pressure in the living mulch treatments started to increase (Figures 5 and 6), and the mulch coverage decreased (Figure 7). Further competition from a sorghum weed species was observed, and it dominated the middle growth stage, severely reducing taro yields in both the control and living-mulch treatments. Other weeds observed in this trial consisted

of *Ageratum,* Hilo grass, Spanish needle, California grass, *Sida, Crassocephalum*, Smooth amaranth, Nutsedge, *Drymaria*, Wiregrass, and Large crabgrass. Rainfall information during the nine-month growth period is presented in Figure 8.

Although the labor cost for the cultivation treatment (mechanical cultivation and hand weeding) was the highest expense item among the test treatments, good yield was attained (Tables 2 and Table 3). Properly timed mechanical weed cultivation would lower the labor cost in hand weeding and would be a workable alternative for the small family farmer with no outside farm labor.

Table 2. Weed control vs. average No.1 yield per acre and corm size.

Treatment	Average No. 1 lb per acre[1]	Average lb No. 1 corm[1]
Herbicide	26,910.4 a	2.3 a
Cultivation	22,360.8 a	2.1 a
Vetch/rye living mulch	8,929.8 b	1.7 a
Oats living mulch	8,324.8 b	1.5 a
Rye living mulch	8,058.6 b	1.1 a
No weed	3,533.2 b	1.1 a

[1] Column mean followed by the same letter are not significantly different at the $P<0.05$ level according to Duncan's New Multiple Range Test.

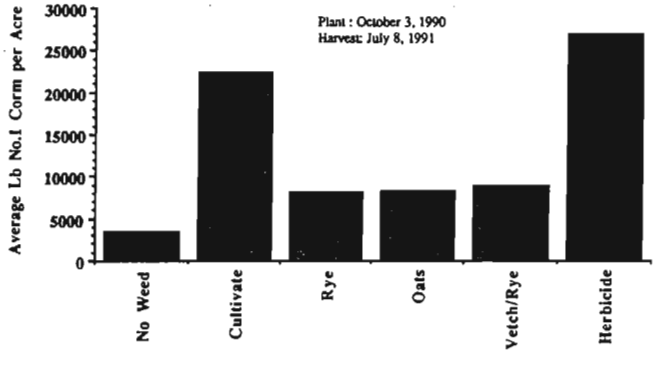

Fig. 1. Average No. 1 corm yield per acre.

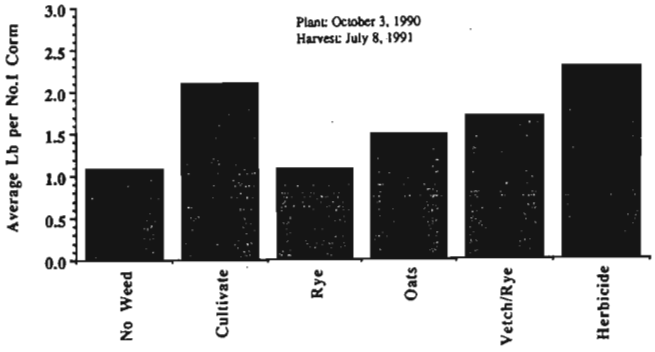

Fig. 2. Average No. 1 corm weight.

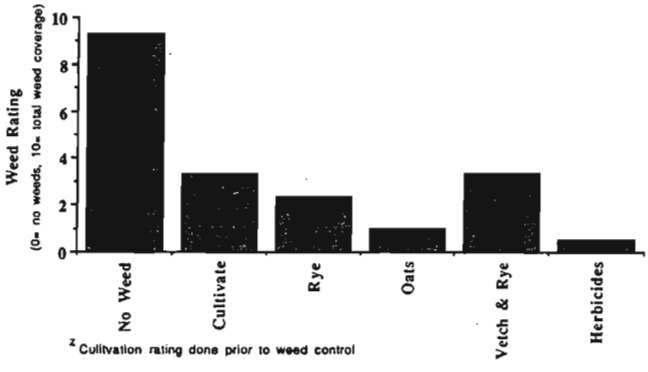

Fig. 3. Average weed coverage rating eight weeks after planting.

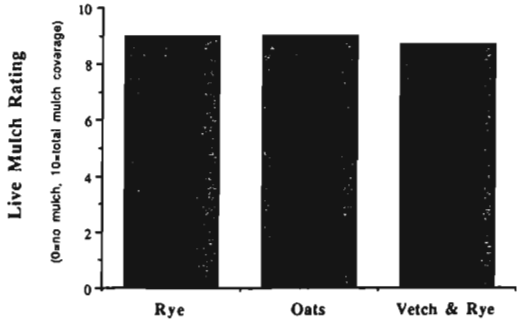

Fig. 4. Average live mulch coverage eight weeks after planting.

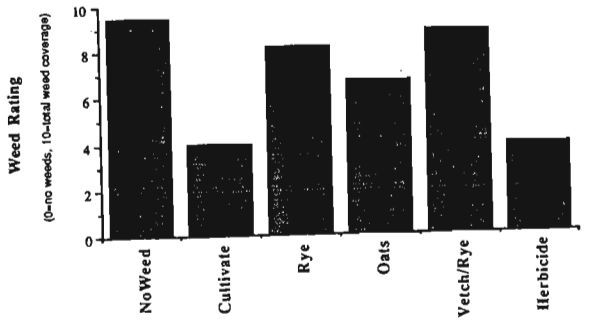

Fig. 5. Average weed coverage rating 18 weeks after planting.

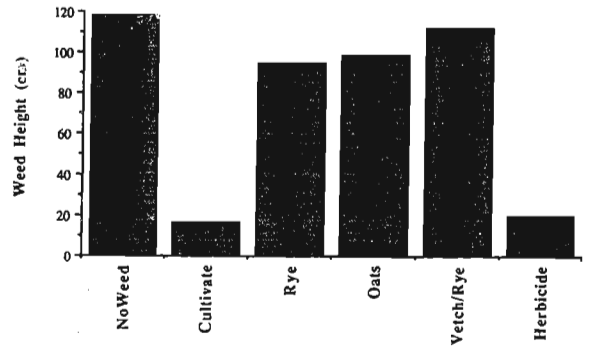

Fig. 6. Average weed height 18 weeks after planting.

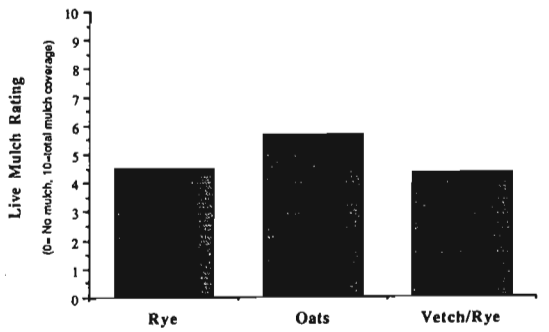

Fig. 7. Average live mulch coverage 18 weeks after planting.

Table 3. Weed control vs. treatment cost ($).

Treatment	Equipment	Labor[1]	Supplies[2]	Treatment cost[3]	Treatment cost less labor
No Weed	0	0	0	0	0
Cultivate/hand	285.00 (Mantis-20)	1,410.30	10.37	1,705.67	295.37
Rye	0	79.38	16.00	95.38	16.00
Oats	0	109.53	150.50	260.03	150.50
Vetch/rye	0	94.68	53.00	147.68	53.00
Herbicide	185.00 (Sprayer/gear)	204.75	46.29	436.04	231.29

[1] Cost per acre at $4.50 per hour wage.
[2] Cost on per acre basis.
[3] Treatment cost per acre.

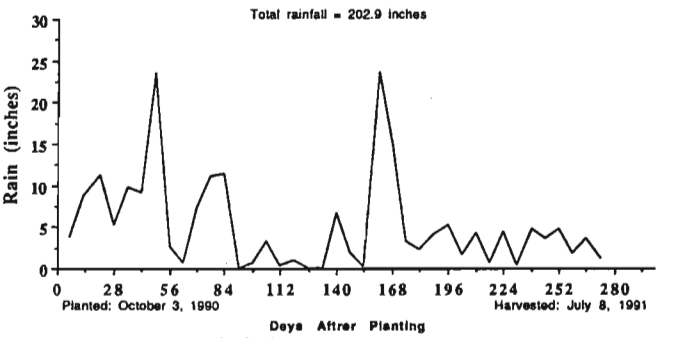

Fig. 8. Weekly rainfall.

Conclusions

The living mulches tested were ineffective in controlling weeds eight weeks after planting, and poor final yields were attained. The herbicide and the cultivation treatments achieved the highest No.1 corm yields. Mechanical cultivation may be a workable alternative for the small family farmer with no outside farm labor. Weed cultivation could be properly timed when weed pressure is low in order to increase efficiency and to lower hand weeding labor. For the larger farmer with hired labor, proper use of herbicides, possibly in combination with mechanical cultivation, offers the most efficient means of weed control.

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