Herbicidal Weed Control in Tannia Cocoyam (Xanthosoma sagittifolium)

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ABSTRACT

Sprouted corms of tannia (Xanthosoma sagittifolium) were grown at high density (1x0.5 m) with weeds controlled by a mixture of 4-5 kg/ha ametryne and 1 kg/ha paraquat, or by weeding with hand tools. The controls were an unweeded treatment at high density, and a hand-weeded treatment at the conventional spacing of 1x1 m.

Total yield (corms plus cormels) per hectare for the herbicide treatment was the same as for the hand-weeded treatment at the same high density, and higher than for the hand-weeded treatment at low density. Yet controlling the weeds by herbicide was only 46-55% as costly as control by hand.

Introduction

The control of weeds in cocoyams is a major operation in the production cycle. In most countries, weeding is with hand tools about three times during the season. With increasing labor costs, hand-weeding has become expensive and uneconomical, and the search for effective chemical methods of weed control has intensified.

Onwueme and Fadayomi (1980) developed an effective weed control package for yams using herbicides (ametryne and paraquat) and planting at high density. This combination eliminated hand-weeding altogether and produced the crop at reduced cost.

These experiments were conducted to determine if the same strategies could be adopted in developing a weed control package for cocoyams. Moreover, since yams and cocoyams are often intercropped, it would be beneficial if the same herbicide combination could be found effective for both crops. The objective of this study was to evaluate cocoyams when the crop is grown at high density and weeds are controlled with ametryne and paraquat.

Materials and Methods

Sprouted corms of tannia (Xanthosoma saggittifolium) each weighing about 250 g were planted 50 cm apart on ridges that were 1 m apart. Weeds were controlled with herbicides (Treatment A); or by hand weeding 2-4 times during the season (B); or the plot was left weedy throughout the season (C). An additional treatment (D)

used conventional wide spacing (i.e. low density) of 1x1 m with hand weeding. Herbicide application for treatment A in 1980 was a tank mix of ametryne (4 kg a.i./ha) plus paraquat (1 kg a.i/ha). In 1981, ametryne was at the rate of 5 kg a.i./ha, with paraquat at 1 kg a.i./ha. In each case, herbicides were applied 3 days prior to planting. Planting was in May each year, while harvesting occurred about 9 months later, after the plants had died back. Early in the season scarecrows were used to keep away birds that might dig up and consume freshly planted corms.

Field experimental layout was a randomized complete block design with 20 plants per plot in 1980; in 1981, 60 plants per plot for treatments A, B and C, and 30 plants for treatment D. The 1981 records included time required for various field operations and the heights of the plants at 5 months after planting.

Results

1980 Experiment

Weed fresh weights at harvest were significantly higher for weedy control than for the herbicide treatment, indicating effectiveness of the herbicides (Table 1). No significant difference was noted in weed fresh weight of the herbicide treatment and the hand-weeded controls.

Table 1: Weed fresh weight at harvest (1980).

Treatment	Weed weight (tons/ha)
Herbicide	1.28
Hand-weeded	0.84
Weedy	7.66
Hand-weeded, low density	0.51
LSD.05 = 3.39	

The corm, cormel and total yield for the experiment are in Table 2. Yield of the weedy treatment was significantly lower than of other treatments. This was true of corm, cormel and total yield. The corm and total yield for the herbicide treatment and the two hand-weeded controls did not differ significantly. However, the herbicide treatment produced a significantly higher cormel yield than the low density hand-weeded treatment.

Table 2: Cocoyam yields for 1980.

	Yield/ha (kg)			Yield/stand (g)		
Treatment	Corm	Cormel	Total	Corm	Cormel	Total
Herbicide	7,693.3	10,810.0	18,503.3	384.7	540.5	925.2
Hand-weeded	7,606.6	9,565.0	17,171.6	380.3	478.3	858.6
Weedy	2,240.0	1,528.3	3,768.3	151.3	92.6	243.9
Hand-weeded, low density	5,615.8	6,491.7	12,107.5	576.3	665.5	1,241.8
LSD.05	2,549.4	4,127.3	6,665.0	173.6	246.6	416.6

Corm, cormel and total yields per stand were significantly lower for the weedy control than for the other treatments (Table 2). Cormel and total yield per stand for the herbicide treatment and the two hand weeded treatments did not differ significantly. However, corm yield per stand was significantly higher for the low density hand-weeded control than for the herbicide treatment or the high density hand-weeded treatment.

1981 Experiment

Plant height measurement at 5 months after planting showed the mean heights for both herbicide treatment and low density hand-weeded control were the same (Table 3). This was significantly higher than the mean plant heights for the high density hand-weeded and the weedy treatments.

Table 3: Plant height at 5 months after planting (1981).

Treatment	Mean plant height(cm)
Herbicide	62.5
Hand-weeded	54.6
Weedy	51.1
Hand-weeded, low density	62.5
LSD.05 = 5.7	

Time required per hectare for the two weedings in the hand-weeded control treatments are in Table 4. Weed control by herbicide cost only 55% and 46% of what it cost to control the weed by hand weeding in the high density and low density plots, respectively (Table 5).

Table 4: Weeding time per hectare (1981).

Treatment	1st weeding (man-hours)*	2nd weeding (man-hours)	Total (man-hours)	Total (man-days)**
Hand weed, high density	148.08	185.11	333.19	42
Hand-weeded, low density	166.40	231.29	398.08	50

*One man-hour: The continuous working of an able-bodied person for 1 hour.

**One man-day consists of 8 man-hours.

The results show corm, cormel and total yields/ha of the herbicide treatment were significantly higher than those of the low density hand weeded control

(Table 6). No significant differences were noted however between the high density hand-weeded treatment and the herbicide treatment for corm, cormel or total yield. The weedy control treatment recorded a lower corm, cormel and total yield than the other treatments except in the low density hand-weeded control where corm yield was not significantly different. Yield per stand is in Table 6. The corm, cormel and total yields per stand were significantly lower for the weedy control than for any of the other treatments except the corm yield of the high density hand-weeded treatment. Corm, cormel and total yields per stand were significantly higher for the hand-weeded treatment at the low density than at the high density. However, no significant differences were noted between low density hand-weeded treatment and herbicide treatment with respect to corm and total yield per stand.

Table 5: Comparative costs of weed control for the various treatments.

Material/Operation	Cost/hectare (₦)* Herbicide	Hand-weed high density	Hand-weed low density
Herbicide (i) Ametryne	70.00	-	-
Herbicide (ii) Paraquat	22.22	-	-
Labor for spraying**	4.61	-	-
Use of knapsack sprayer	10.00	-	-
Labor for weeding**	-	193.62	230.5
Total	106.83	193.62	230.50

*1₦ ≃ 1.5 U.S. dollars.

**Labor cost was approximately ₦4.61 per man-day of 8 hrs.

Table 6: Cocoyam yields for 1981.

Treatment	Yield/ha (kg) Corm	Cormel	Total	Yield/stand (g) Corm	Cormel	Total
Herbicide	3,816.7	3,904.7	7,721.4	272.5	276.6	549.1
Hand-weeded	3,483.3	3,603.1	7,086.4	231.3	234.3	465.6
Weedy	2,243.4	1,657.6	3,901.0	165.8	121.0	286.8
Hand-weeded, low density	2,788.2	2,831.9	5,620.1	352.3	356.3	708.6
LSD.05	703.8	1,000.6	1,697.2	78.0	97.9	175.4

The generally low levels of yield in 1981 when compared with 1980 were probably due to the poorer soil used for the 1981 experiment.

Discussion

Results indicate that herbicide weed control was possible in tannia without any yield reductions when compared with hand-weeded plots planted at high or low density. The herbicide treatment controlled weeds throughout the season, so no

supplemental weeding was required. Consequently, the cost of controlling weeds in the plot was reduced to a fraction of what it is in conventional practice.

Herbicide use to control weeds in cocoyams is not new. Diuron and atrazine at 1-2 kg/ha has been recommended for tannia (Kay, 1973; Kasasian, 1971) while diuron, atrazine, trifluralin, ametryne, or nitrofen have been recommended for taro (Pena et al, 1971). However, in tannia and upland taro, supplementary weeding is usually necessary because of decreasing leaf area and insufficient ground cover near the end of the season. Closer spacing in these experiments tended to maintain complete ground cover throughout the season and make supplementary weeding unnecessary.

As mentioned earlier, the ametryne with paraquat herbicide combination provided weed control in yams (Onwueme and Fadayomi, 1980). Its usefulness in cocoyams as well implies that it can be successfully used where yams and cocoyams are intercropped. In that case, plant yams first, apply herbicides 3-4 weeks later, and then plant cocoyams an additional few days later.

References

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