COMPARATIVE EFFECTS OF WEEDING METHODS ON COCONUT GROWTH

Rolinda L. Talatala-Sanico and Leo M. Laguna

The influence of manual ringweeding, covercropping and herbicide application (*glyphosate* at 0.36 kg/ha) either singly or in combination on coconut growth was compared. Covercropping with *Pueraria phaseoloides* was the most effective method in controlling weeds within 2 m from the coconut tree base and between rows. Glyphosate application was relatively less effective than the other weeding methods in checking weed growth and regrowth. However, the tallest coconut trees with the biggest girth circumference were observed in this treatment. The cover crop apparently eliminated the weeds but reduced plant height and girth circumference because it possibly competed with coconut for basic requirements. The results strongly suggest that treatment with glyphosate is the weeding method most beneficial to coconut growth and development.

INTRODUCTION

In the Philippines, coconut is one of the major export crops and is one of the most important sources of income for millions of Filipinos. In Eastern Visayas, majority of the people greatly depend on coconut as their source of livelihood. However, the average nut production (26 nuts/tree/year) in this region is very low (PCARRD 1980). Among the factors contributing to such low yield is the abundance of weeds in most coconut plantations.

Much effort has been spent by coconut farmers and researchers in identifying and controlling insect pests and diseases of coconut, yet little attention has been given to the presence of weeds in coconut plantations. Since weeds can grow rapidly and vigorously even in poor types of soil, their population must be reduced. Otherwise, they will strongly compete with coconut in nutrient uptake, and consequently decrease yield.

Since weeds can definitely stunt growth of coconut trees, it is imperative to employ weed control measures in coconut plantations. A variety of control methods are available, but Abad (1980) reported that handweeding is the most common method of weed control in coconut nurseries. However, if the area is too large and labor is costly, chemical control may be resorted to.

PCARRD (1983) claimed that cover crops should be planted as a measure to prevent weed growth and minimize erosion in places not intended for intercropping. Properly managed cover crops can also supply nitrogen for utilization of the coconut trees.

The above results strongly indicate that weeds in coconut plantations may be effectively controlled by using either cover crops, ringweeding, and/or herbicides. However, the effect of using these three weed control methods (singly or in combination) on the population of weeds and growth of coconut has not been quantified particularly in Eastern Visayas. Hence, this study was conceived and conducted.

Ms. Sanico is a professor and Mr. Laguna was a former research assistant at the Department of Plant Protection, Visayas State College of Agriculture, Baybay, Leyte 6521-A PHILIPPINES.

MATERIALS AND METHODS

A relatively flat field in Bunga, Baybay, Leyte was used as the experimental area. Coconut (*var. Tacunan*) seedlings were planted at a distance of 5 m between hills and 8 m between rows. The randomized complete block design with three replications per treatment was used. The weed control treatments were as follows:

a. Manual ringweeding (2 m from tree base)
b. Tropical kudzu (Pueraria phaseoloides) was planted as cover crop
c Herbicide [glyphosate, (N-phosphonomethyl glycine) at 0.36 kg/ha] for ringweeding
d. Herbicide for ringweeding + cover crop
e. Manual ringweeding + covercrop
f. Unweeded control

Manual and chemical ringweedings were done every 3 mo until 2 yr after transplanting. Weed population and weight in each plot, as well as the summed dominance ratios (SDR), were determined at 2 wk before and after treatment application from 18 to 24 mo after transplanting (MAT). Plant height was measured every 6 mo from 18 to 48 MAT and girth circumference from 30 to 48 MAT.

RESULTS AND DISCUSSION

The common weed species in the experimental area were *Calopogonium mucunoides* Desv., *Mikania cordata* (Burm. f.) B.L. Robinson, *Centrosema pubescens* Benth., *Stachytarpheta jamaicensis* (L.) Vahl., *Paspalum conjugatum* Berg. and *Borreria laevis* (Lam.) Griseb. The first three weeds were few but predominated over the other species until the end of the experiment due to their climbing, viny habit which possibly suppressed the growth of other weeds.

Table 1 shows that all weeding methods applied either singly or in combination effectively controlled the weeds occurring within 2 m from the coconut tree base. The unweeded control consistently obtained the highest SDR values. Considerable reduction in weeds at 2 wk after treatment was generally observed in all weeding treatments. However, covercropping with tropical kudzu (*Pueraria phaseoloides*) seems to be the most effective method in checking weed growth as indicated by the lowest SDR values in this treatment during the sampling period (18-24 MAT). Tropical kudzu could have shaded out and covered the weeds, reducing population and growth. Cabato (1972) made similar observations.

TABLE 1
Summed Dominance Ratios of Weeds Observed within 2 m from the Coconut Tree Base as Affected by Different Weeding Methods

TREATMENT[1]	SUMMED DOMINANCE RATIO (%)					
	18 MAT[2]		21 MAT		24 MAT	
	2 WBT[3]	2 WAT[4]	2WBT	2WAT	2WBT	2WAT
MRW	13.8	12.1	11.0	5.9	13.9	8.5
CC	1.7	1.8	1.6	2.4	0	0
H	43.9	25.4	27.8	30.0	16.8	5.0
H + CC	1.2	0.7	7.5	8.6	8.0	3.9
MRW + CC	12.4	9.6	16.0	13.8	35.8	24.0
UWC	27.0	50.4	36.1	39.3	25.4	58.6

[1] MRW = manual ringweeding, CC = covercropping, H = herbicide application (glyphosate at 0.36 kg/ha), UWC = unweeded control.
[2] MAT = months after transplanting.
[3] WBT = weeks before treatment application.
[4] WAT = weeks after treatment application.

TABLE 2
Summed Dominance Ratios of Weeds Observed between Rows of Coconut as Affected by Different Weeding Methods

TREATMENT[1]	SUMMED DOMINANCE RATIO (%)					
	18 MAT[2]		21 MAT		24 MAT	
	2 WBT[3]	2 WAT[4]	2WBT	2WAT	2WBT	2WAT
MRW	23.0	29.8	23.5	21.4	29.9	32.9
CC	2.7	1.3	0.7	0.9	0	0
H	51.2	14.7	50.2	55.9	49.2	24.2
H + CC	1.0	1.6	0.6	1.0	0	0
MRW + CC	0.9	5.0	2.2	0.6	0	0
UWC	21.2	47.6	22.8	20.2	20.9	42.8

[1] MRW = manual ringweeding, CC = covercropping, H = herbicide application (glyphosate at 0.36 kg/ha), UWC = unweeded control.
[2] MAT = months after transplanting.
[3] WBT = weeks before treatment application.
[4] WAT = weeks after treatment application.

TABLE 3
Plant Height of Coconut at Different Times after Transplanting as Affected by Different Weeding Methods

TREATMENT[1]	PLANT HEIGHT[2] (m)					
	18 MAT[3]	24 MAT	30 MAT	36 MAT	42 MAT	48 MAT
MRW	3.00^{b}	3.84^{ab}	4.63^{ab}	5.30^{b}	5.50^{b}	6.27^{ab}
CC	2.74^{d}	3.57^{b}	4.26^{b}	5.19^{b}	5.34^{b}	6.00^{b}
H	3.32^{a}	4.11^{a}	5.06^{a}	6.03^{a}	6.13^{a}	6.67^{a}
H + CC	2.90^{cd}	3.90^{aL}	4.60^{ab}	5.06^{b}	5.19^{b}	6.00^{b}
MRW + CC	2.96^{cd}	3.79^{ab}	4.65^{ab}	5.54^{ab}	5.65^{ab}	6.29^{ab}
UWC	2.04^{e}	2.68^{c}	2.96^{c}	3.71^{c}	3.96^{c}	4.61^{c}

[1] MRW = manual ringweeding, CC = covercropping, H = herbicide application (glyphosate at 0.36 kg/ha), UWC = unweeded control.
[2] Averages of five trees per replication and three replications per treatment. In a column, means followed by a common letter are not significantly different from each other at 5% level, DMRT.
[3] MAT = months after transplanting.

Application of glyphosate at 0.36 kg/ha was less effective than the other treatments in controlling weeds. Weed regrowth always occurred in this treatment as evidenced by the high SDR values at 2 wk before treatment in each sampling period. On the other hand, combination of glyphosate and covercropping was effective initially at 18 MAT but became less effective at later sampling periods. This may be attributed to the possible detrimental effect of glyphosate not only on weed growth but also on tropical kudzu. Glyphosate is a very broad spectrum, relatively non-selective herbicide which is very effective on deep-rooted perennial species, and on annual and biennial species of grasses, sedges, and broadleaves (WSSA 1983). Since glyphosate was applied as a postemergence spray in this study, it certainly injured tropical kudzu as well. The combination of manual ringweeding and covercropping could have produced similar effect on weed occurrence. It is very possible that the cover crop was unintentionally injured during manual ringweeding. This effect was expressed in higher SDR values at 21-24 MAT in this treatment combination than in manual ringweeding alone.

The weed situation between the rows of coconut was different from that near the coconut tree base because these areas were not directly exposed to the weeding treatments. Relatively higher weed SDR values were noted in manually ringweeded and glyphosate applied plots as in the unweeded plots (Table 2). As expected, the first two methods applied near the tree base did not affect the weeds between the rows. However, the treatments involving covercropping, either singly or in combination, provided very effective weed control in these areas. Since the treatment combinations did not actually involve any treatment except covercropping alone, then effective weed control can be attributed only to the ability of tropical kudzu to creep and invade the open spaces between coconut trees. This resulted in shading out and, consequently, death of weeds. Hence, covercropping can effectively control not only the weeds close to the coconut but also between the rows.

The coconut trees responded differently from the weeds as shown by the data on plant height (Table 3).

Glyphosate application which was less effective than the other treatments in controlling weeds seemed beneficial to coconut growth. The tallest trees were observed in plots treated with this herbicide. On the contrary, covercropping with *Pueraria* which provided almost excellent control of weeds apparently hampered coconut growth since very short trees next to the unweeded control were noted in these plots. These results suggest that tropical kudzu as the cover crop competed not only with the weeds but also with the coconut. It successfully competed with the weeds resulting in effective weed control but its competitive effect on coconut was expressed in reduction in growth particularly in plant height. In this respect, glyphosate application has an obvious advantage over covercropping. This treatment facilitated regular control of new growth and regrowth of weeds minimizing coconut-weed competition. Hence, better growth of coconut as exhibited by taller trees was obtained in this treatment.

In the other three treatments, the trees were intermediate in height between those from covercropped and glyphosate-treated plots (Table 3). In the treatment combinations with covercropping, the additional herbicide treatment or manual ringweeding decreased the inhibitory (competitive) effect of tropical kudzu on coconut. Thus, the coconut trees in these plots were generally taller than those subjected to covercropping alone.

The girth circumference of coconut was statistically similar in all weeding treatments (Table 4). The unweeded control trees had the smallest girth circumference. Despite the absence of statistical differences among treatments, the inhibitory effect of covercropping on growth specifically on girth size was very apparent. The trees in the glyphosate-applied plots still exhibited the biggest girth circumference. These results indicate that covercropping whether alone or in combination can hinder coconut growth and development through competition between tropical kudzu and coconut. On the other hand, glyphosate at 0.36 kg/ha indirectly favored growth and development of coconut through its regular elimination of weeds.

TABLE 4
Girth Circumference of Coconut at Different Times after Transplanting as Affected by Different Weeding Methods

TREATMENT[1]	GIRTH CIRCUMFERENCE[2] (m)			
	30 MAT[3]	36 MAT	42 MAT	48 MAT
MRW	0.91[a]	1.15[a]	1.19[a]	1.26[a]
CC	0.88[a]	1.06[a]	1.14[a]	1.18[a]
H	1.00[a]	1.22[a]	1.28[a]	1.31[a]
H + CC	0.93[a]	1.13[a]	1.22[a]	1.29[a]
MRW + CC	0.94[a]	1.13[a]	1.20[a]	1.31[b]
UWC	0.52[b]	0.69[b]	0.79[b]	0.96[b]

[1] MRW = manual ringweeding, CC = covercropping, H = herbicide application (glyphosate at 0.36 kg/ha), UWC = unweeded control.
[2] Averages of five trees per replication and three replications per treatment. In a column, means followed by a common letter are not significantly different from each other at 5% level, DMRT.
[3] MAT = months after transplanting.

CONCLUSION

The above results imply that not only the weeds but also the crop should be considered in the choice and recommendation of a suitable weeding method. The recommended method should not only provide effective control of weeds but should also allow the crop to attain optimum growth and development without damage. PCARRD (1983) claimed that covercropping can prevent soil erosion and add N to the soil. Apparently in this study, such possible beneficial effects of the cover crop were nullified by the growth inhibition of coconut caused by competition of tropical kudzu.

REFERENCES

ABAD, R.G. 1980. Weeds in coconut and their control. WSSP Newsletter 8(1):3-5.

CABATO, F.H. 1972. Covercropping in coconut plantation. In: Coconut Production, 32-37 R.G. Emata. Manila UCAP.

PHILIPPINE COUNCIL FOR AGRICULTURE FORESTRY AND NATURAL RESOURCES RESEARCH AND DEVELOPMENT (PCARRD). 1980. Data series on coconut statistics in the Philippines. XIV. Los Baños, Laguna: PCARRD.

_____. 1983. The Philippines Recommends for Coconut. PCARRD, Los Baños, Laguna: PCARRD.

WEED SCIENCE SOCIETY OF AMERICA (WSSA). 1983. Herbicide Handbook, 5th ed., 258-263. Champaign, Illinois: WSSA.