WEED CONTROL IN CASSAVA

SCREENING OF NEW CHEMICALS USED AS PRE-EMERGENT HERBICIDES FOR CASSAVA AND EFFICIENCY OF WEED CONTROL

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Chemical weed control is well-known as the way to manage plant production for replacing manpower in a large producing area and even in small farms Pre-emergent herbicide is looked up to be useful and important for first period of growth in many crops, as to stop or reduce the competition between weeds and desired crops However, there are some new chemical products from various companies used as pre-emergent herbicides for various crops and even in cassava the correct ways and rates of application have not yet worked out for the latter crops For this reason, the present study was done to identify some of these chemical products for pre-emergence with potential use as selective herbicides and to test the efficiency of weed control in cassava

OBJECTIVES

- -Identify new chemicals for pre-emergence with potential use as selective herbicides in cassava
- -Test the weed control efficiency and selectivity for cassava relative to standard herbicides

MATERIALS AND METHODS

Variety	CM 849-1
Density	10 x 10^3 plants/ha (1 x 1 m spacing)
Planting position	vertical
Planting system	Ridges at 1 m distance
Stake length	20 cms
Experimental design	Split-plot design with main treatment = Doses and sub-treatment herbicides Single plot size was 6 x 5 m and total area occupied was 2,430 m^2
Treatments	9 herbicides x 3 doses x 3 reps =81 plots

Herbicides	1 Goal 2. MBR 23709 2-S 3 MBR 20457 2-S 4 NC 20484 EC 40 (Schering Ag) 5. NC 20484 EC 40 (Fbc Ltd) 6 Mefluidide 2-S 7 Karmex + Lazo (Diuron + Alachlor) - Standard treatment 8 Manual weed control 9. Weedy check
Doses	The commercially recommended doses, twice the recommended and four times the recommended doses were applied
Seed Treatments	Stakes were dipped for 10 min in a solution of 2 33 g Dithane M 45 1.25 g Manzate 2 00 g $ZnSO_4$ 5.00 g/liter Malathion (4% WP)
Fertilization	50-50-100-10 kg/ha of N, P_2, O_5, K_2O and Zn were applied at planting

PEST AND DISEASES CONTROL

No application of fungicide or insecticide

THE FOLLOWING OBSERVATIONS WERE MADE

1- Damage index at 14-21-28-35-42-49 days after planting - scale 0-10 (0 = no damage, 10 = death of plant)

2- Weed control percentage at 14-21-28-35-42-49 days after planting Scale 0-100 (0 = no control, 100 = complete control) Count of weeds separately for species (gramineae - broad leaf)

with a 0 25 m^2 frame

3- Plant height (cm)

4- Plant Development (to detect possible delay Days to first fully expanded leaf

5- Plant perishability after one month by counting plant death

SUPPLIES NEEDED

Cassava stakes 2,430 + 20% = 2,916 stakes

FERTILIZER

N (Urea, 46% N)	= 12 15	KgN	= 26 41	Kg Urea
P_2O_5 (TSP, 42% P_2O_5)	= 12 15	KgP_2O_5	= 28 92	Kg TSP
K_2O (KCL, 50% K_2O)	= 24 30	KgK_2O	= 48 60	Kg KCL
Zn ($ZnSO_4$, 20% Zn)	= 2 43	KgZn	= 12 15	Kg $ZnSO_4$

HERBICIDES According to recommended doses and treatments, see Tables 1 and 2

TABLE 1 Doses to be used

	PRODUCTS	FORMULATION	Doses to be used: Kg of Active Ingredient/hectar 1x	2x	4x	Doses to be used: Liter or kg of commercial product/ha 1x	2x	4x
1	Goal	240 g/1	0 5	1 0	2 0	2 08 1	4 16 1	8 32 1
2	MBR 23709 2-S	240 g/1	1 0	2 0	4 0	4 16 1	8 32 1	16 64 1
3	MBR 20457 2-S	240 g/1	1 0	2 0	4 0	4 16 1	8 32 1	16 64 1
4	NC 20484 (Schreing Ag)	400 g/1	2 0	4 0	8 0	5 00 1	10 00 1	20 00 1
5	NC 20484 (Fbc Ltd)	400 g/1	2 0	4 0	8 0	5 00 1	10 00 1	20 00 1
6.	Mefluidide 2-S	240 g/1	0 5	1 0	2 0	2 08 1	4.16 1	8 32 1
7	Karmex	800 g/kg	1 2	-	-	1 50 kg	-	-
	+	+	+			+		
	Lazo	480 g/1	1 2	-	-	2 50 1	-	-

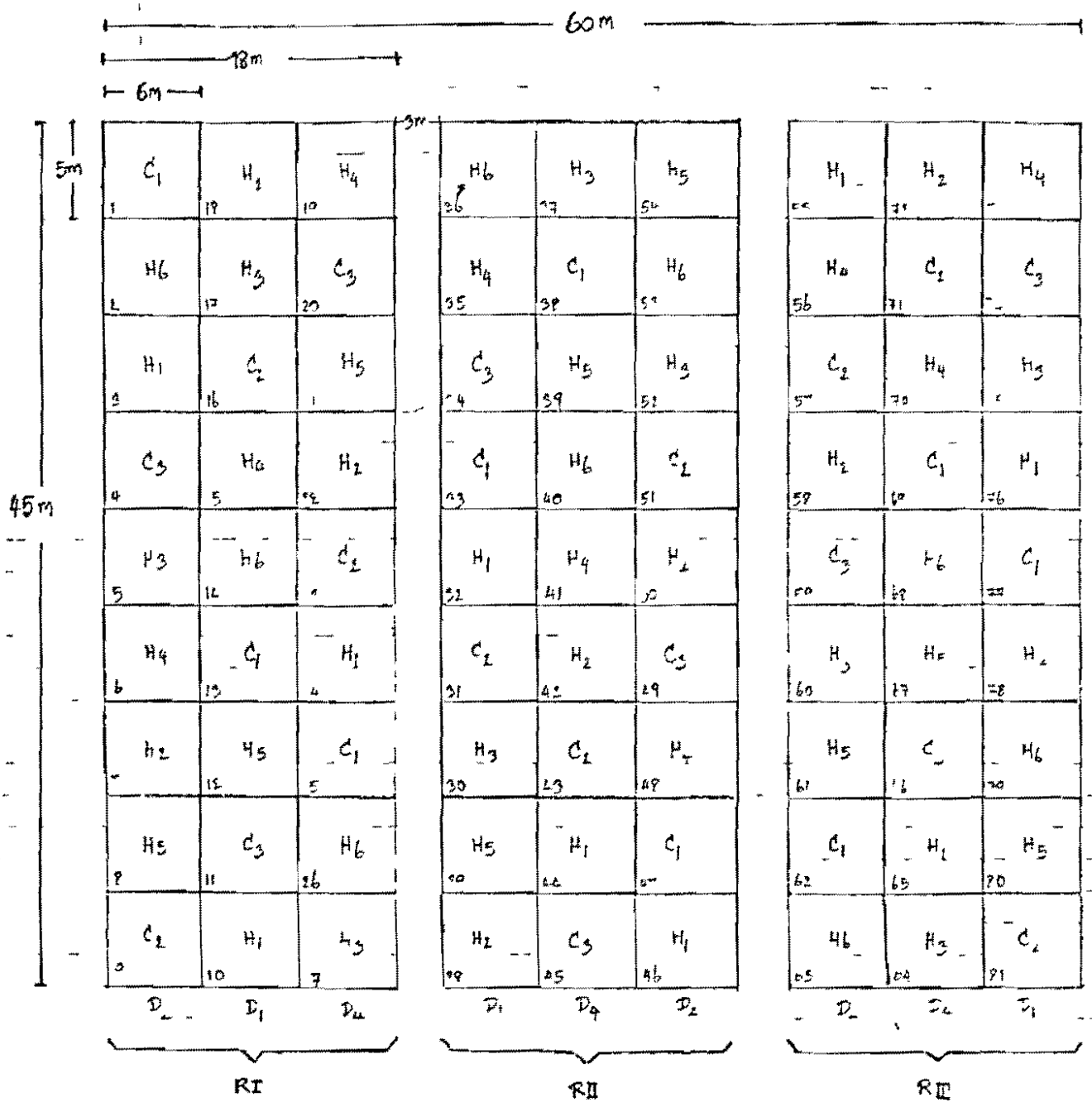
Remark Karmex + Lazo, based on recommended doses as a Standard Check

TABLE 2. Quantities in g or cc per plot of 30 m^2

	PRODUCTS	FORMULATION	Quantities in g or cc per plot of 30 m^2 1x	2x	4x	TOTAL
1	Goal	240 g/l	6 24 cc	12 48 cc	24 96 cc	
	Total (3 plots)		18 72 cc	37 44 cc	74 88 cc	131 04 cc
2	MBR 23709 2-S	240 g/l	12 48 cc	24 96 cc	49 92 cc	
	Total (3 plots)		37 44 cc	74.88 cc	149 76 cc	262 08 cc
3	MBR 20457 2-S	240 g/l	12 48 cc	24 96 cc	49 92 cc	
	Total (3 plots)		37 44 cc	74 88 cc	149 76 cc	262 08 cc
4	NC 20484 (Schering Ag)	400 g/l	15 00 cc	30 00 cc	60 00 cc	
	Total (3 plots)		45 00 cc	90 00 cc	180 00 cc	315 00 cc
5	NC 20484 (Fbc Ltd)	400 g/l	15 00 cc	30 00 cc	60 00 cc	
	Total (3 plots)		45 00 cc	90 00 cc	180 00 cc	315 00 cc
6	Mefluidide 2-S	240 g/l	6 24 cc	12 48 cc	24 96 cc	
	Total (3 plots)		18 72 cc	37 44 cc	74 88 cc	131 04 cc
7	Karmex	800 g/kg	4 50 g	4 50 g	4 50 g	
	Total (3 plots)		13 50 g	13 50 g	13 50 g	40 50 g
	+	+	+			+
	Lazo	480 g/l	7 50 cc	7 50 cc	7 50 cc	
	Total (3 plots)		22 50 cc	22 50 cc	22 50 cc	67 50 cc

Remark Karmex + Lazo, based on recommended doses as a standard check

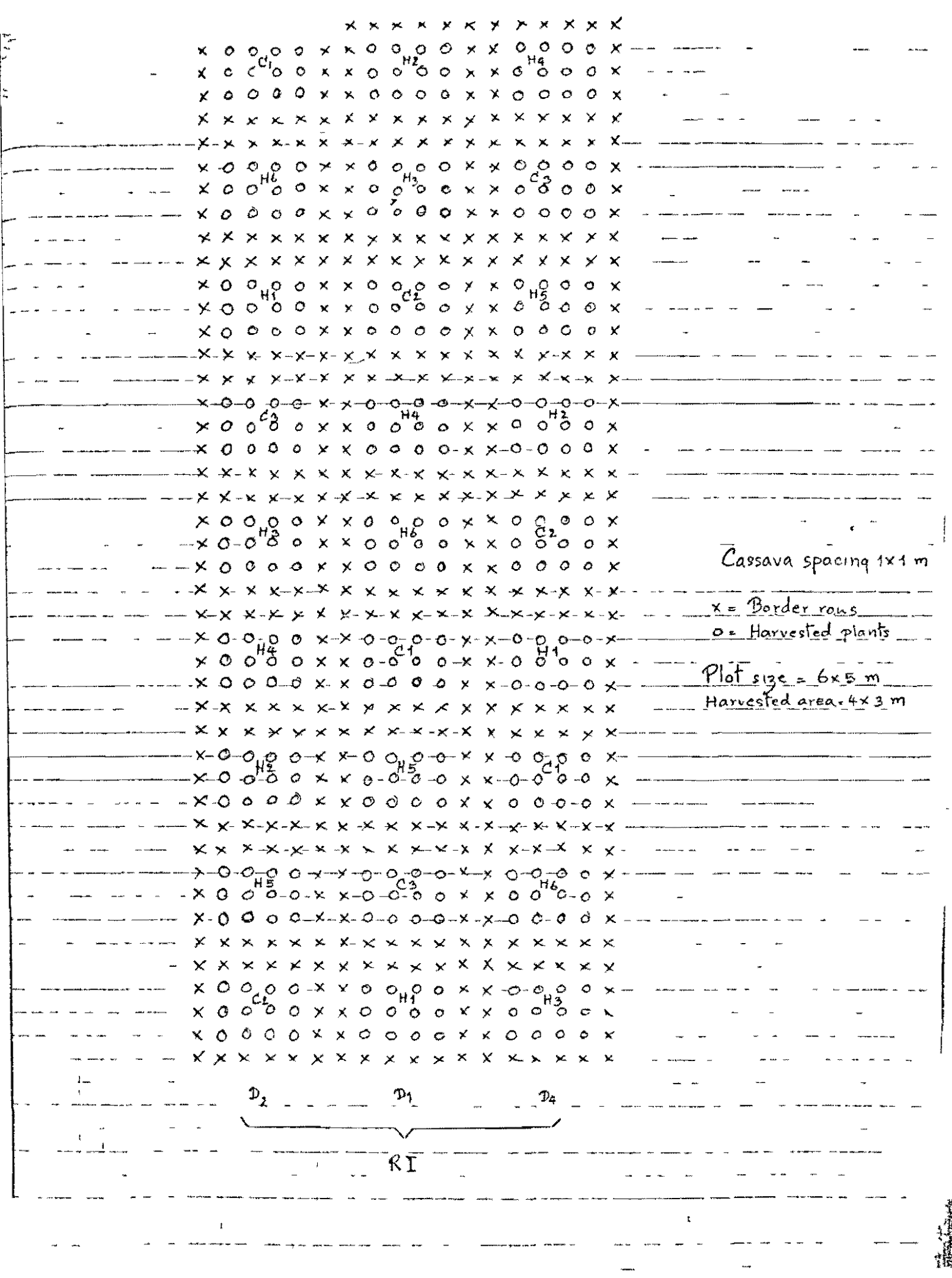
Screening of pre-emergent herbicides



H = Herbicides (H1–H6)

C = Check (C1 = Karmex + Lazo, C2 = Manual Weed Control, C3 = Weedy Check)

D = Dose of application (D1 = recommended doses, D2 = Twice recommended doses, D4 = four times recommended doses)


Cassava spacing 1×1 m
x = Border rows
o = Harvested plants
Plot size = 6×5 m
Harvested area = 4×3 m
D2
D1
D4
R I

The experiment has been done in Centro Internacional de Agricultura Tropical, CIAT Cassava stakes were planted vertically on Ridges with 1 1 x 1 m spacing on May 16, 1983 and 50-50-100-10 kg/ha of N, P_2O_5, K_2O and Zn were applied at planting time Pre-emergent herbicides were applied according to treatments after 2 days with the following soil conditions soil moisture was at field capacity, soil temperature ranged from 29 to 32C at the time of application on May 19, 1983 The evaluation was done as follows

- Weed control percentage was taken at 14-21-28-35-42 and 49 days after application by using a scale 0-100 (0 = no control, 100 = complete control) based on visual comparison to the weedy check
- Damage Index was rated at 21-28-35-42 and 49 days after application by using a scale 0-10 (0 = no damage, 10 = death of plant)
- Count of weeds and non-controlled species was done separately (narrow-broad leaf) in a 0 25 m^2 frame placed at random on the plots
- Plant height (CM) after planting was taken at 21, 28, 35, 42 and 49 days Also, plant development was observed (to detect possible delay days to first fully expanded leaf) and plant perishability was assessed after one month by counting plant death in each plot

TABLE I. Weed control percentage of pre-emergent herbicide, in each applicated doses and time after application
(Rated %, by visual observation)

Name of Pre-emergent herbicide	Commercial recommended doses						Two times recommended doses						Four times recommended doses					
	Days after application						Days after application						Days after appplication					
	14	21	28	35	42	49	14	21	28	35	42	49	14	21	28	35	42	49
Goal	50 0	50 0	48 3	48 3	43 3	43 3	85 0	81 6	75 0	71 6	71 6	68 3	95 0	95 0	95 0	93 3	93 3	93 3
MBR 23709 2-S	56 6	53 3	50 0	45 0	40 0	36 6	56 6	55 0	48 3	45 0	36 6	31 6	78 3	76 6	71 6	68 3	60 0	56 6
MBR 20457 2-S	58 3	56 6	55 0	48 3	45 0	41 6	51 6	50 0	48 3	46 6	45 0	43 3	88 3	85 0	80 0	75 0	70 0	68 3
NC 20484 (Schering Ag)	63 3	63 3	60 0	56 6	53 3	53 3	71 6	66 6	65 0	61 6	60 0	58 3	90 0	88 3	85 0	85 0	85 0	80 0
NC 20484 (Fbc Ltd)	68.3	65 0	61 6	61 6	60 0	56 6	88 3	86 6	81 6	76 6	73 3	70 0	91 6	90 0	88 3	88 3	88 3	88 3
Mefluidide 2-S	46 6	41 6	36 6	33 3	25 0	21 6	65 0	61 6	53 3	45 0	41 6	33 3	83 3	81 6	76 6	75 0	73 3	73 3
Karmex + Lazo	90 0	90 0	88 3	85 0	83 3	81 6	93 3	91.6	88 3	85 0	85 0	83 3	88 3	88 3	86 6	86 6	86 6	86 6

Remark The control application of Karmex + Lazo was made using the recommended doses only

TABLE II Damage Index of cassava, affected by pre-emergent herbicides each doses and time after application.
(Rated scale of Damage Index by Visual Observation)

Name of Pre-emergent herbicide	Commercial recommended doses						Two time recommended doses						Four time recommended doses					
	Days after appplication						Days after application						Days after application					
	14	21	28	35	42	49	14	21	28	35	42	49	14	21	18	35	42	49
Goal	-	0 3	0.3	0	0	0	-	1 3	1 3	0 3	0	0	-	1 6	1 6	0 6	0	0
MBR 23709 2-S	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0
MBR 20457 2-S	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0
NC 20484 (Schering Ag)	-	1 6	1 6	0 6	0	0	-	2 6	2 6	1 3	0 3	0	-	4 0	4.0	2 6	0 3	0 3
NC 20484 (Fbc Ltd)	-	0 6	0 6	0	0	0	-	3 0	3 0	1 3	0 3	0	-	3 6	3 6	2 3	1 3	0 3
Mefluidide 2-S	-	0	0	0	0	0	-	0	0	0	0	0	-	0 3	0 3	0 3	0	0
Karmex + Lazo	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0

Remark The control application of Karmex + Lazo was made using the recommended doses only

TABLE III Amount of broad leaf weeds in 0 25 m^2 frame, which cannot be controled by each applicated doses of pre-emergen herbicide and weedy check (by counting weeds plants/0 25 m^2)

Name of Pre-emergent herbicide	Commercial recommended doses						Two time recommended doses						Four time recommended doses					
	Days after application						Days after application						Days after application					
	14	21	28	35	42	49	14	21	28	35	42	49	14	21	28	35	42	49
Goal	1 0	1 3	2 3	3 3	2 6	2 0	0	0	0	0	0	0	0	0	0 3	0	0	0
MBR 23709 2-S	17 0	20 3	19 6	21 6	13 0	14 0	4 3	4 3	7 0	4 6	4 3	5 6	9 0	7 3	12 0	13 0	9 3	9 3
MBR 20457 2-S	22 3	29 6	24 6	22 6	16 0	18 0	16 3	14 6	15 0	9 6	10 0	8 3	4 0	6 3	8 0	6 3	4 3	5.3
NC 20484 (Schering Ag)	8 6	8 3	9 3	8 0	7 0	8 6	4 0	2 6	2 6	2 6	2 0	2 0	1 3	3 6	1 6	2 3	2 3	1.6
NC 20484 (Fbc Ltd)	7 0	8 6	4 0	7 0	5 0	6 3	2 6	1.3	1 3	2 6	2 3	2 3	0 3	0 3	0 3	1 6	0	0
Mefluidide 2-S	15 6	9 6	16 3	7 3	9 3	6 3	2 3	5 0	7 6	2.6	4 6	4 3	6 3	2 6	3 6	8 0	1 0	0 3
Karmex + Lazo	0 3	0 3	0	0	0	0	0	0	0 3	0 6	0 3	0 3	0	0	0	1 3	0	0
Weedy check	13 6	17 0	18 6	15 0	11 6	11 6	11 0	8 3	9 0	4 0	5 0	5 6	27 6	21 3	31 3	18 6	18.0	15 0

Remark The control application of Karmex + Lazo was made using the recommended doses only

TABLE IV. Amount of narrow leaf weeds in 0.25 m^2 frame, which cannot be controlled by each applicated doses of pre-emergent herbicide and weedy check (by counting weeds plants/0 25 m^2)

Name of Pre-emergent herbicide	Commercial recommended doses						Two time recommended doses						Four time recommended doses					
	Days after application						Days after application						Days after application					
	14	21	28	35	42	49	14	21	28	35	42	49	14	21	28	35	42	49
Goal	5 3	3 6	4 0	4 6	4 6	4 6	6 6	3 0	2 6	5 0	3 3	4 0	0	0	0	0	0	0
MBR 23709 2-S	2 3	1 3	2 3	2 0	1.3	1 3	12 3	14 3	16 3	21 6	21 3	21.3	0	0	0	0	0	1 0
MBR 20457 2-S	2 0	0 3	2 0	3 6	3 3	1 3	3 3	1.3	1 3	3 3	4.0	2 3	0	0	0	0 3	0	0
NC 20484 (Schering Ag)	1 6	0 6	0 6	0 3	0.3	1 3	7 3	5 3	7 0	8 0	11 0	10 3	1.0	0	0 6	0 3	0	0
NC 20484 (Fcc Ltd)	8 6	7 6	19 0	10 3	13 6	13 0	1 6	0 6	1 0	0	0 3	0 3	0	0	0 6	0 3	0	0
Mefluidide 2-S	5 6	27 3	15 3	42 3	35 6	14 3	20 0	20 6	25 0	28 3	35 3	35 6	1.0	0	1 6	1 6	1 0	0 6
Karmex + Lazo	2 3	4 6	3 6	4 6	10 6	14 0	0 6	0	0 1	0	0 3	0 3	0 6	0 6	1 6	1 6	3 0	3 0
Weedy check	11 0	10 0	8 0	10 6	16 3	9 3	20.6	44 6	40 0	42 0	45 6	42 6	7 0	8 6	8 6	9 6	8 3	5 6

Remark Karmex + Lazo, recommended doses as a standard check

TABLE V Amount of broad and narrow leaf weeds in 0 25 m^2 frame, which cannot be controlled by each applicated doses of pre-emergent herbicides and weedy check During period of 49 days after application (plant/0 25 m^2)

Pre-emergent herbicide	Commercial recommended doses		Two time recommended doses		Four time recommended doses	
	Broad leaf	Narrow leaf	Broad leaf	Narrow leaf	Broad leaf	Narrow leaf
Goal	1 0 - 2 6	3 6 - 5 3	0	2 6 - 6 6	0 - 0 3	0
MBR 23709 2-S	13 0 - 21 6	1 3 - 2 3	4 3 - 7 0	12 3 - 21 6	7 3 - 13 0	0 - 1 0
MBR 20457 2-S	16 0 - 29 6	0 3 - 3 6	8 3 - 16 3	1 3 - 4 0	4 0 - 8 0	0 - 0 3
NC 20484 (Schering Ag)	7 0 - 9 3	0 3 - 1 6	2 0 - 4 0	5 3 - 11 0	1 3 - 3 6	0 - 1 0
NC 20484 (Fbc Ltd)	4 0 - 8 6	7 6 - 19 0	1 3 - 2 6	0 - 1 6	0 - 1 6	0 - 0 6
Mefluidide 2-S	6 3 - 15 6	5 6 - 42 3	2 3 - 7 6	20 0 - 35 6	0 3 - 8 0	0 - 1 6
Karmex + Lazo	0 - 0 3	2 3 - 14 0	0 - 0 6	0 - 0 6	0 - 1 3	0 6 - 1 6
Weedy check	11 6 - 18 6	8 0 - 16.3	4 0 - 11 0	20 6 - 45 6	15 0 - 31 3	5 6 - 9 6

Remark the control application of Karmex + Lazo was made using the recommended doses only

TABLE VI Height of cassava in each applicated doses of pre-emergent herbicide, standard check, manual weed control check and weedy check. During 21-49 days (cms)

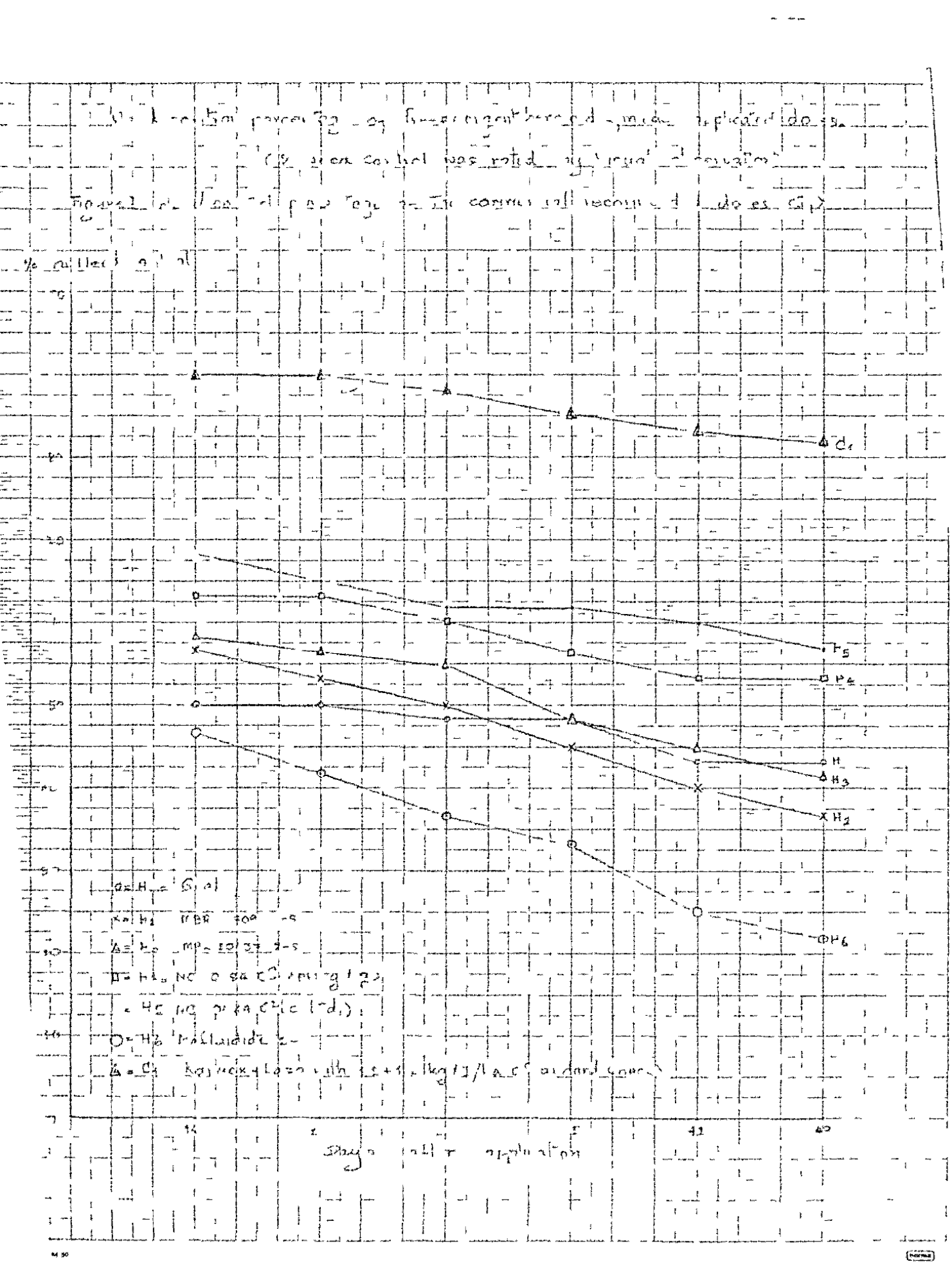
Name of Pre-emergent herbicide	Commercial recommended doses Days after planting						Two time recommended doses Days after planting						Four time recommended doses Days after planting					
	14	21	28	35	42	49	14	21	28	35	42	49	14	21	28	35	42	49
Goal	-	18 6	27 8	32 6	42 3	57 2	-	18 1	26 7	36 2	48 9	56 4	-	21 9	26 4	31 5	45 6	54 4
MBR 23709 2-S	-	22 5	28 5	36 6	44 9	55 1	-	21 3	25 4	35 4	45 6	54 9	-	20 8	27 9	35 0	45 6	58 4
MBR 20457 2-S	-	20 8	28 5	35 5	47 8	55 8	-	20 0	25 7	34 4	45.1	54 7	-	19 3	26 3	33 4	43 4	59 2
NC 20484 (Shering Ag)	-	18 4	24 8	33 0	43 9	55 6	-	17 4	23 6	30 2	39 7	49 0	-	21 0	26 6	34 4	44 0	56 3
NC 20484 (Fbc Ltd)	-	18 6	25 8	35 5	43 2	53 2	-	19 5	25 7	30 0	45 5	53 3	-	20 7	27 3	32 6	48 5	56 2
Mefluidide 2-S	-	20 7	25 6	35 8	43 6	54 8	-	19 2	23 9	33 1	41 1	50 8	-	18 0	24 6	34 1	44 7	56 3
Karmex + Lazo	-	19 8	25 5	32 5	45 3	57 6	-	20 5	24 9	31 9	47 3	55 5	-	18 5	25.7	33 2	48 4	60 3
Manual weed control	-	20 4	26 0	31 2	48 5	58 2	-	18 6	28 4	34 2	46 3	54 0	-	20 0	26 0	33 9	48 5	57 6
Weedy check	-	19 3	26 7	35 7	44 3	49 6	-	21 6	26 3	35 4	44 2	52 9	-	22 3	26 6	33 5	44 1	53 9

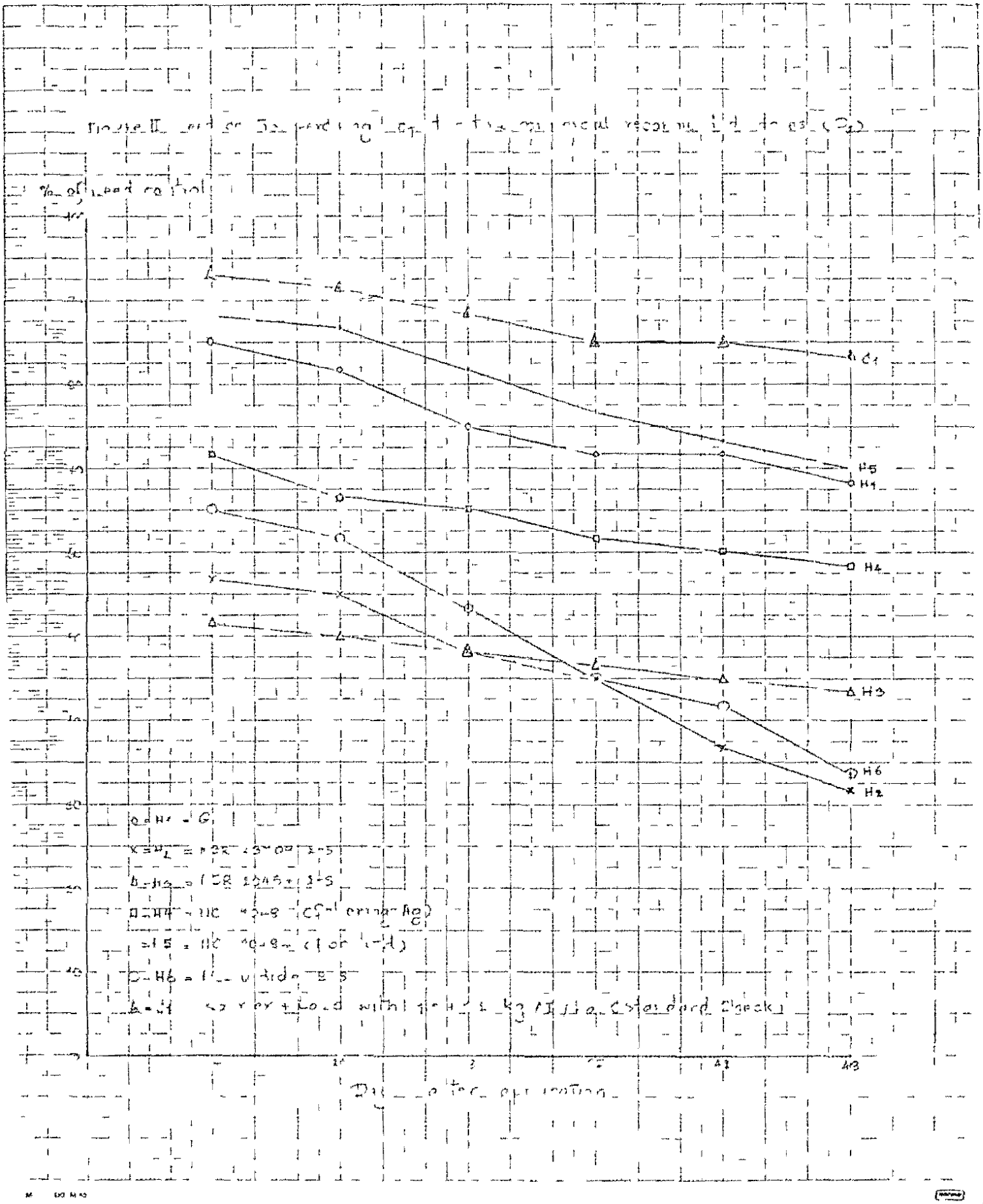
Remark 1 Karmex + Lazo, recommended doses as a standard check
2 At 14 dyas after planting, cassava's height was unable to measure, all stakes just started germination and expanding leaves

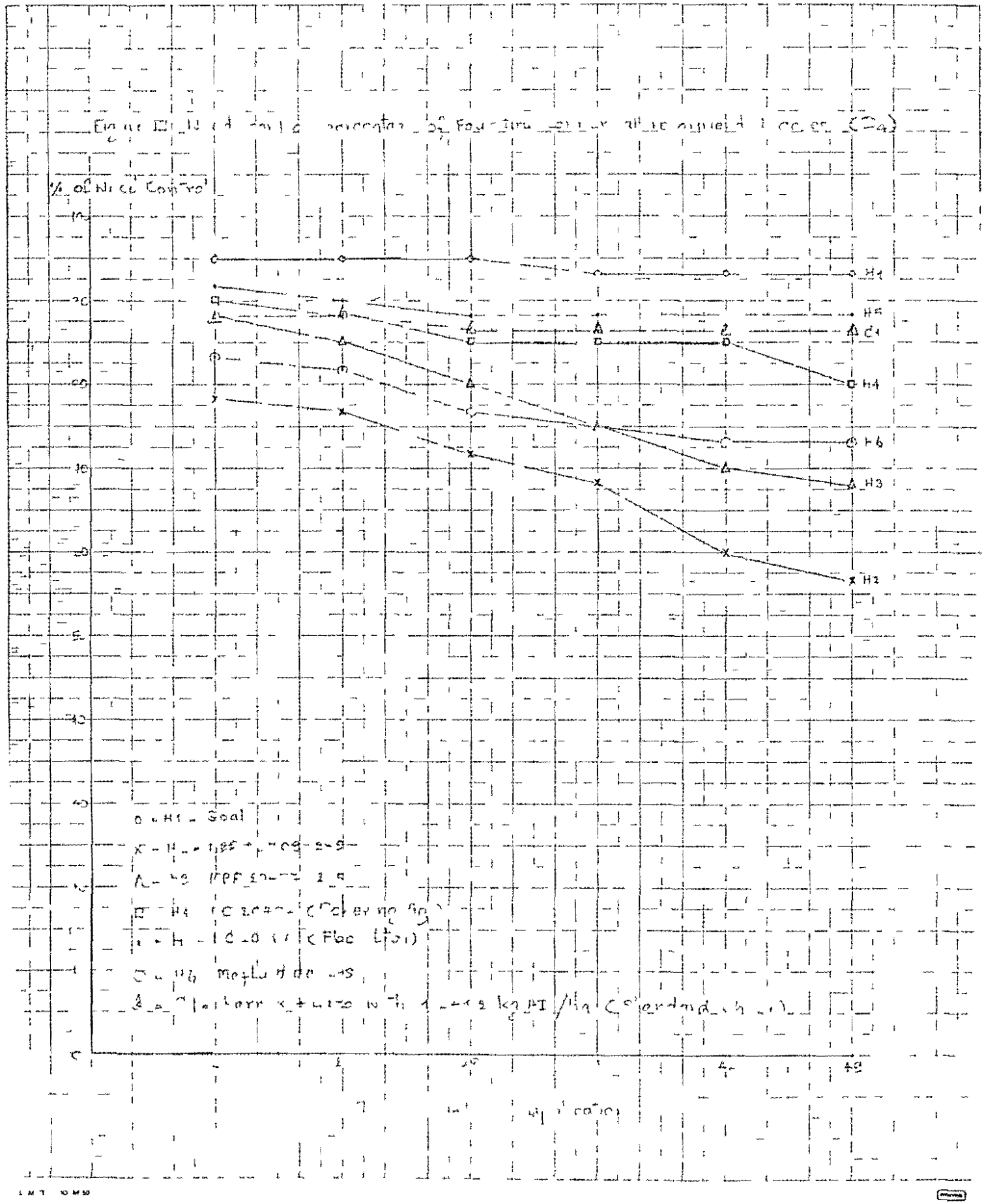
TABLE VII Weed control for Cyperus spp by observation and rating scale in some area of experiment with more pressure of Cyperus spp (between Replication II and III, in case of D which twice recommended doses were applicated)

Name of Pre-emergent	Days after application					
	14	21	28	35	42	49
Goal	25 0	15 0	15 0	10 0	0	0
MBR 23709 2-S	20 0	10 0	10 0	5 0	0	0
MBR 20457 2-S	30 0	22 5	22 5	15 0	10 0	10 0
NC 20484 (Schering Ag)	0	0	0	0	0	0
NC 20484 (Fbc Ltd)	0	0	0	0	0	0
Mefluidide 2-S	0	0	0	0	0	0
Karmex + Lazo	0	0	0	0	0	0

The observation was made under special condition which high pressure of Cyperus spp between Replication II and III where twice commercial recommended doses were applied Weed control for Cyperus spp showed that 3 of the new pre-emergent herbicides provided some effects against Cyperus spp which were Goal with 1 0 kg AI/ha MBR 23709 2-S and MBR 20457 2-S, both with 2 0 kg AI/ha Especially MBR 20457 2-S with 2 0 kg AI/ha showed more reduction of Cyperus spp , when it was compared to a near-by weedy check


d1
H5
H4
H
H3
H2
H6


H1
H2
H3
H4
H5
H6


% of Nickel Content
H1
H5
H4
H6
H3
H2

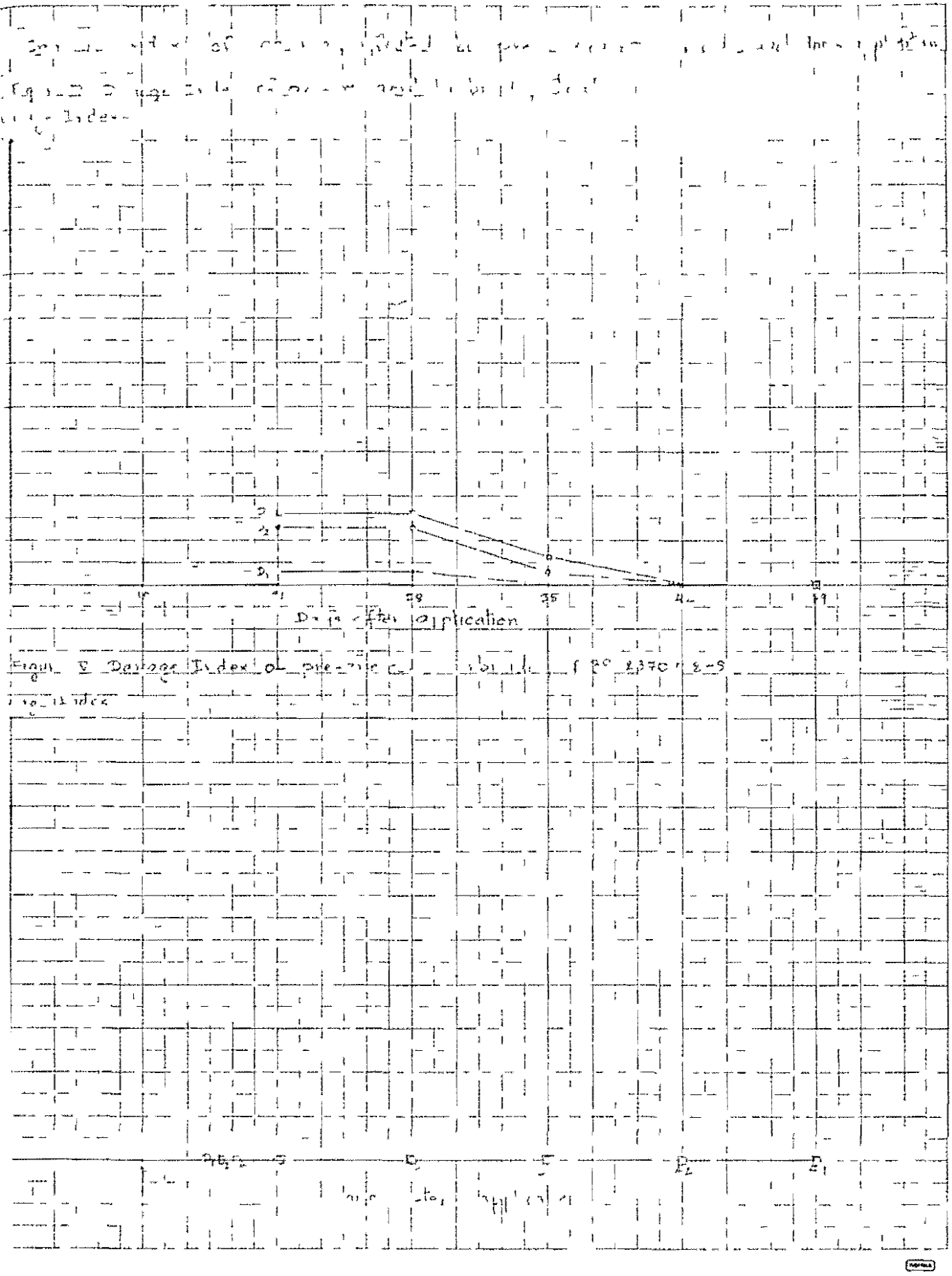


Figure VI Damage Index of pre-emergent herbicide MBR 20-> 1 2 5

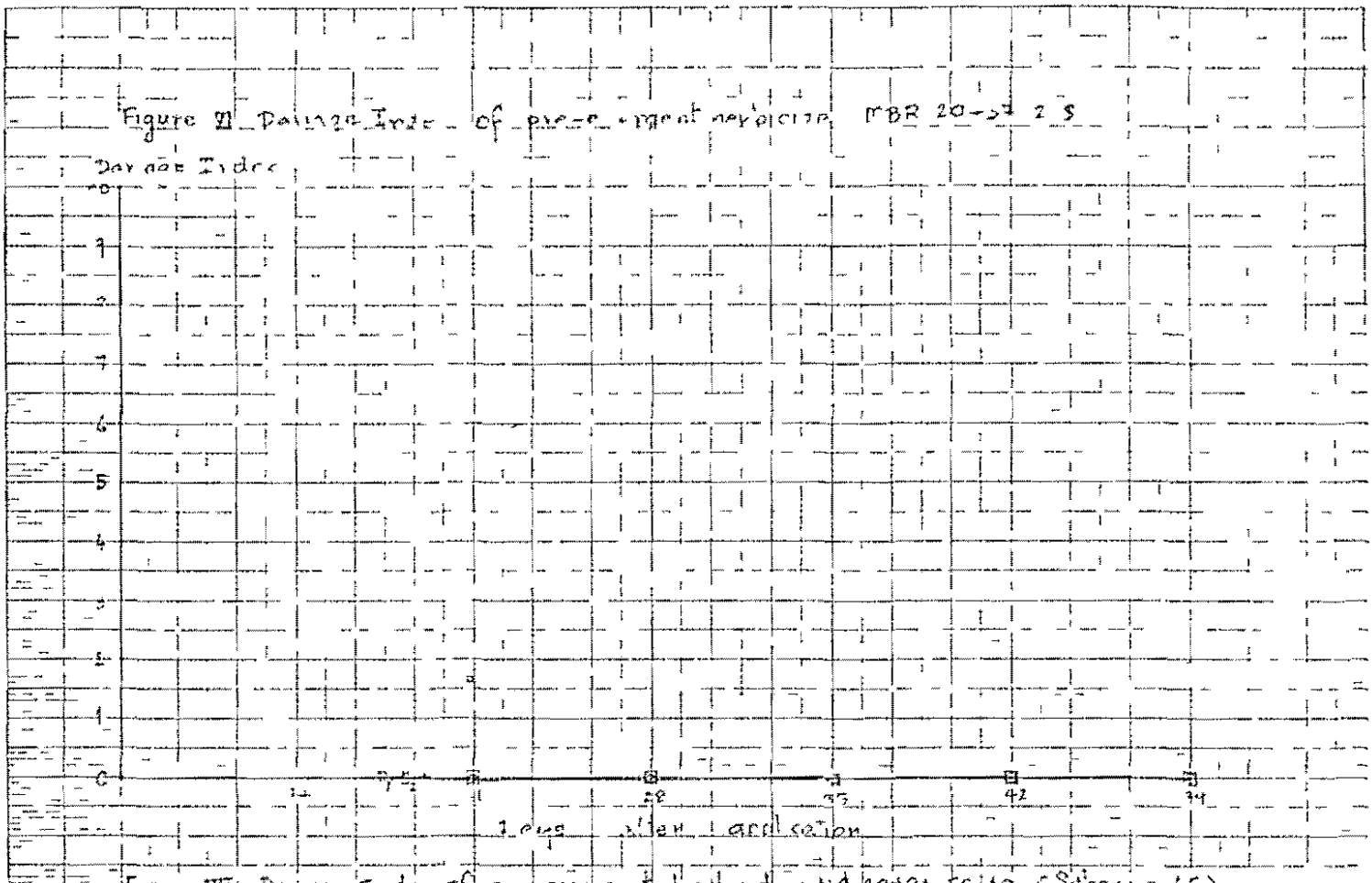


Figure VII Damage Index of pre-emergent herbicide NC 20422 EC 40 (Sencor) @ 4 lb

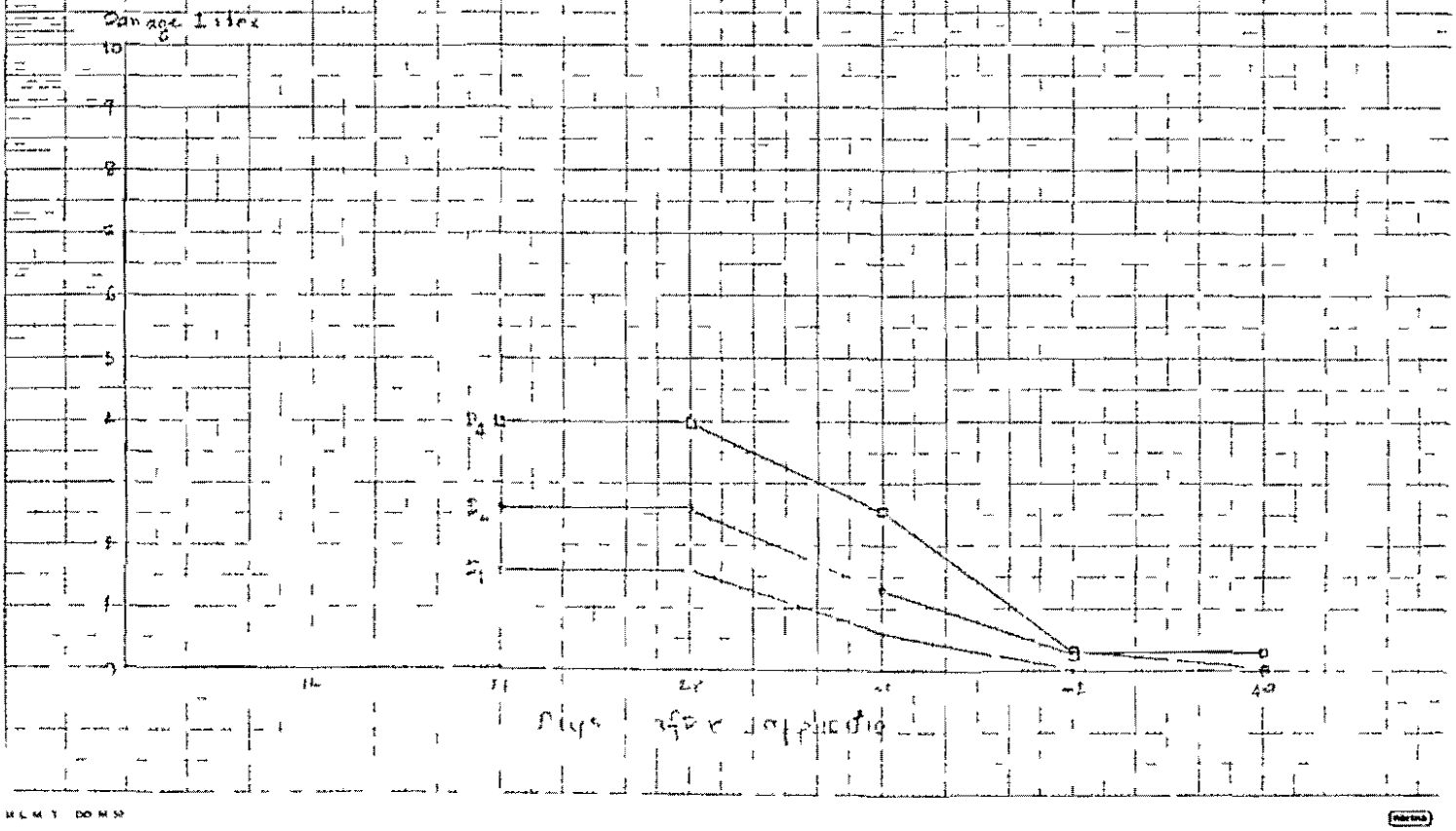


Figure III Damage Index of pre-emergent herbicide, MCPA, EC 40 (EPPO Leaflet)

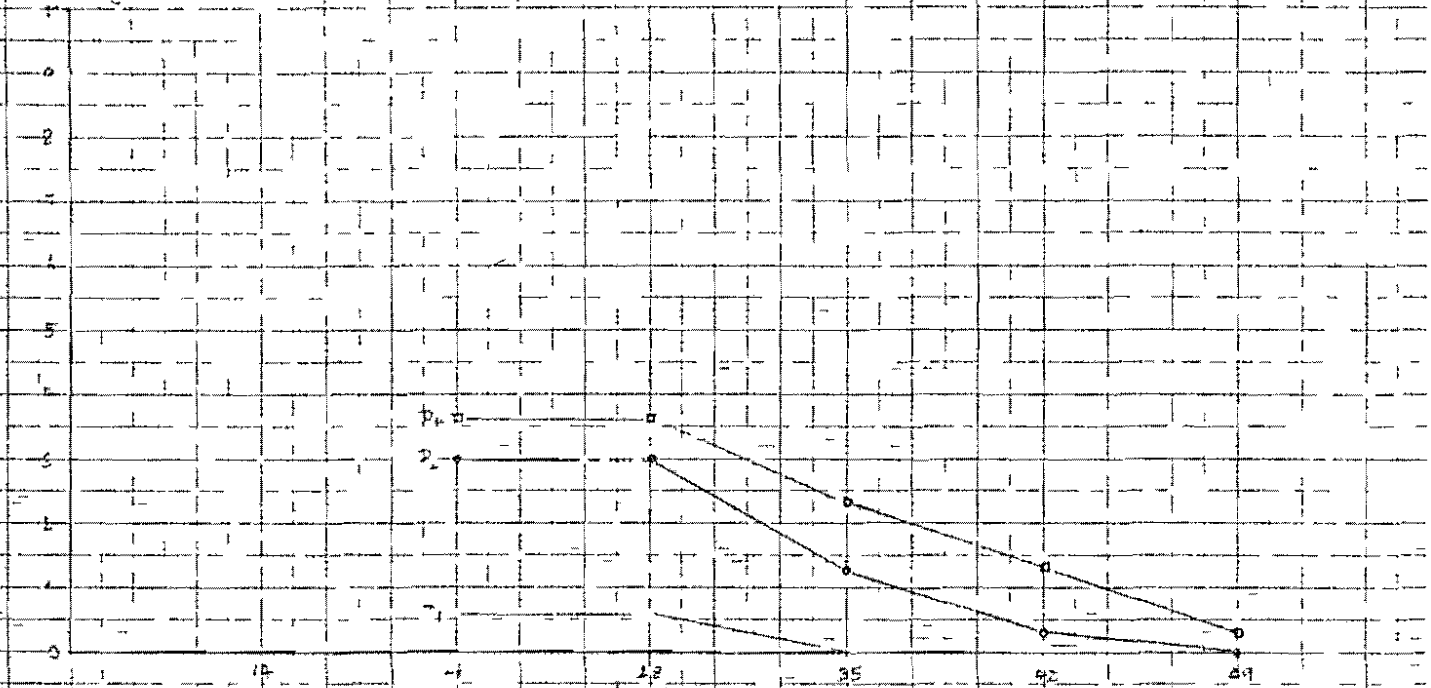


Figure IV Damage Index of pre-emergent herbicide, Mefluidide

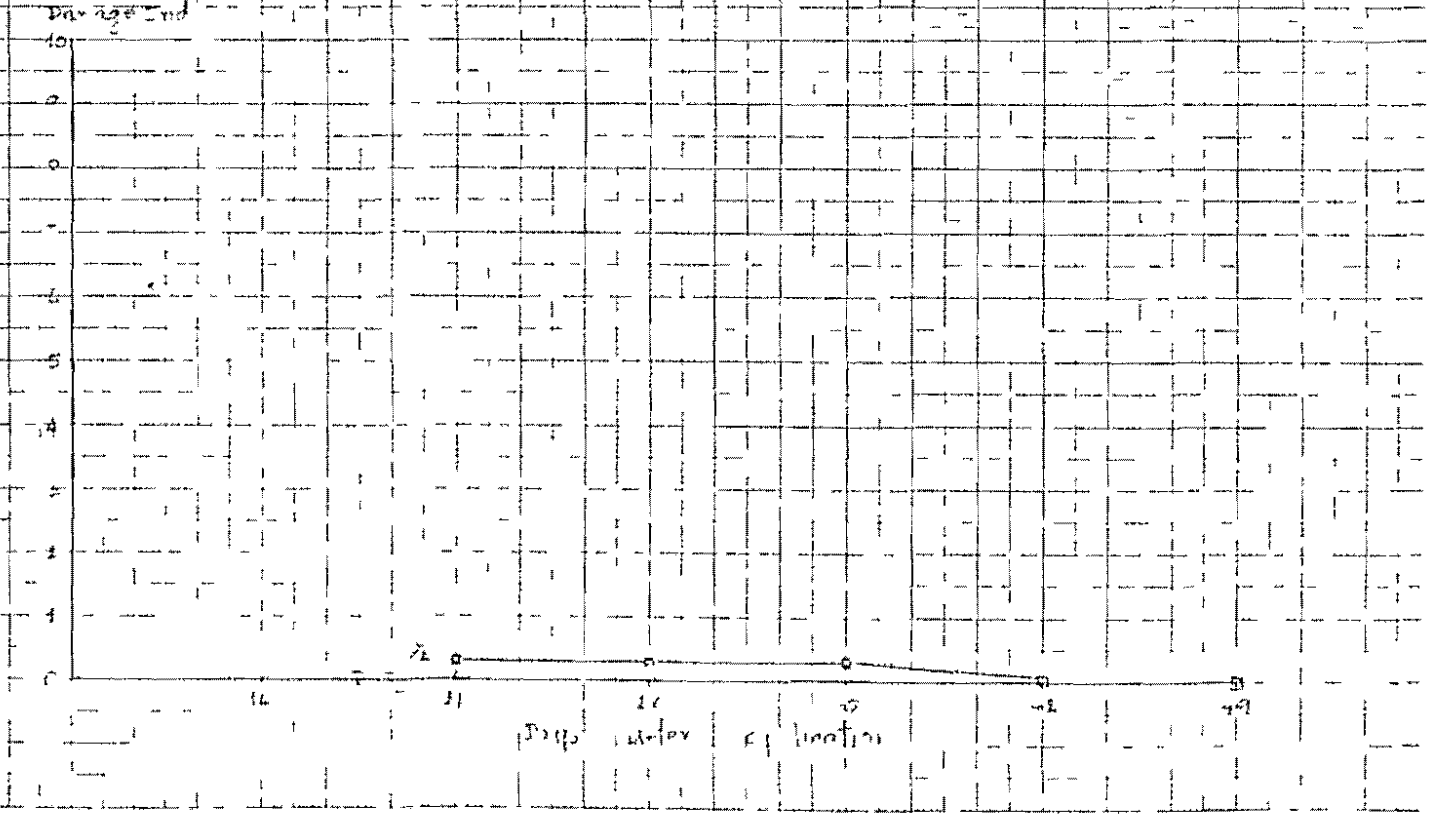
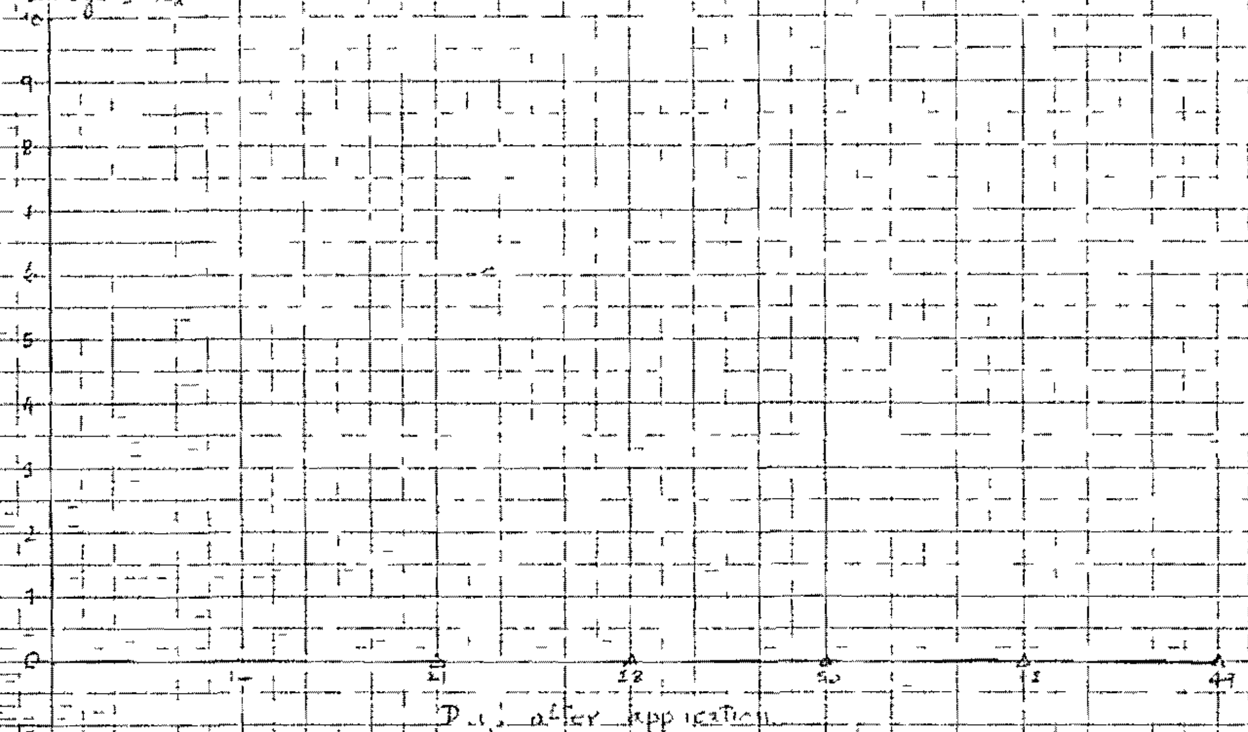


Figure X Weed Index of [illegible] emergent herbicides, [illegible] Standard [illegible]



Remarks:

T_1 = Commercial recommended doses

T_2 = Twice commercial recommended doses

T_3 = Four time commercial recommended doses

T_4 = [illegible] Standard [illegible] kg AI/ha

RESULTS AND DISCUSSION

1. WEED CONTROL PERCENTAGE

Table I and Figure I show the control of the commercially recommended doses of pre-emergent herbicides as compared to a standard check (Karmex + Lazo) All new pre-emergent herbicides showed lower weed control percentage (21 6 - 56 6%) than the standard check (Karmex + Lazo with 1 2 + 1 2 kg AI/ha) with an average control percentage of 81 6 during the 49 days after application After 21-49 days, weed control percentage of all pre-emergent herbicides was declining and lower than at 14 days after application and products ranged from 46 6 to 68 3% weed control compared to the standard check with 90% of weed control NC 20484 (Schering Ag) with 2 0 kg AI/ha and NC 20484 (Fbc Ltd) with 2 0 kg AI/ha showed higher percentage of weed control (63 3 - 68 3%) than any other new pre-emergent herbicide and kept levels of weed control above 50% during the whole observation period, but not higher than the standard check (Karmex + Lazo) These results show that

1 In case of commercial recommended doses, NC 20484 (Schering Ag) and NC 20484 (Fbc Ltd) both with 2 0 kg AI/ha showed efficiencies for weed control higher than 50% and kept levels of weed control during 49 days after application
2 None of the new pre-emergent nerbicides showed such a considerable weed control percentage, when they were compared to a standard check even shortly after application
3 All the new pre-emergent herbicides at commercial recommended doses were less efficient in weed control, when they were compared to the standard check

In Table I and Figure II, weed control of twice the commercially recommended doses of each new pre-emergent herbicide is shown and compared to the standard check (Karmex + Lazo) Even though twice the commercially recommended doses was used, all new pre-emergent herbicides showed lower weed control than the standard check at the normal rate during 49 days after application This trend was similar to that of commercially recommended doses, but the weed control percentage of each new pre-emergent were higher than with the commercially recommended doses At 14 days after application new pre-emergent herbicides showed at least 51 6% and up to 88 3% weed control while the standard check

(Karmex + Lazo) showed 93 3% weed control Goal with 1 0 kg AI/ha and NC 20484 (Fbc Ltd) with 4 0 kg AI/ha showed 85 0 and 88 3% weed control, higher than any other new pre-emergent herbicide During 49 days after application, both of Goal and NC 20484 (Fbc Ltd) kept levels of weed control 68 3 and 70 0, higher than the other new herbicides while the standard check kept the highest level at 83 3% weed control Concluding from these observations, it can be said that

1 Eventhough twice the commercially recommended doses was used, none of the new pre-emergent herbicides showed higher weed control than the standard check (Karmex + Lazo) during 49 days after application
2 Almost all the new pre-emergent herbicides showed higher weed control percentage than with the commercially recommended doses But MBR 23709 2-S and MBR 20457 2-S, both with 2 0 kg AI/ha still showed the same results as in commercial recommended doses
3 During 49 days after application, NC 20484 (Fbc Ltd) with 4 0 kg AI/ha kept a higher level of weed control above 70% than the others which showed a control between 31 6 - 68 3% and the standard check (Karmex + Lazo) was at 83 3% weed control

Table I and Figure III shows weed control obtained with four times the commercially recommended doses of each new pre-emergent herbicide compared to the Karmex-Lazo check applied at the normal rate All new pre-emergent herbicides showed a higher percentage of weed control than with twice the commercially recommended doses and the commercially recommended doses During 49 days after application, Goal with 2 kg AI/ha kept the highest level of weed control, staying above 90% NC 20484 (Fbc Ltd) with 8 kg AI/ha, NC 20484 (Schering Ag) with 8 kg AI/ha and Mefluidide 2-S with 2 kg AI/ha showed 88 3, 80 0 and 73 3% weed control respectively while the standard check (Karmex + Lazo with 1 2 + 1 2 kg AI/ha) showed 86 6% weed control at 49 days after application MBR 23709 2-S and MBR 20457 2-S, both with 4 kg AI/ha showed only 56 6 and 68 3% of weed control, lower than others at the same time and rate As a result, it can be said that

1 All new pre-emergent herbicides showed higher percentages of weed control when higher rates were applied
2 Goal herbicide with 2 kg AI/ha showed a higher weed control

percentage than any other new pre-emergent herbicide and than the standard check, during 49 days after application

3 During 49 days after application, 3 new pre-emergent herbicides which are NC 20484 (Schering Ag), NC 20484 (Fbc Ltd), both with 8 0 kg AI/ha and Mefluidide 2-S with 2 0 kg AI/ha appeared to be interesting herbicides with weed control percentages between 73 3 - 88 3%

4 MBR 23709 2-S and MBR 20457 2-S, both with 4 kg AI/ha showed only 56 6 and 63 3% weed control at 49 days after application Eventhough they were applied at such high doses, they were not efficient enough for weed control when compared to the others

2 DAMAGE INDEX

In Table II and Figure IV-X, the average chemical damage index of cassava as influenced by different herbicides and doses is shown in order to identify their selectivity and allow a classification of the products into non-selective, moderately selective and highly selective Damage index rating was started 21 days after application Using the commercial dosis as application rate, two herbicides NC 20484 Schering Ag and NC 20484 Fbc Ltd, produced a low degree of chemical injury which was nevertheless sufficient to classify them as non-selective to cassava Goal applied at the commercial rate appeared to produce some very minor damage, too However, this observation was not confirmed in all repetitions and therefore was discounted for as an indicator of non-selectiveness Goal was thus classified as moderately selective together with Mefluidide 2-S which nevertheless within the group of moderately selective herbicides seemed to be of higher selectivity than Goal producing only a slight degree of chemical injury at four times the commercial rate Finally, two products, MBR 23709 2-S and MBR 20457 2-S could be classified as highly selective since none of the applied rates produced any chemical injury at all As a results, it can be said that

1 Two of the new pre-emergent herbicides, NC 20484 (Schering Ag) and NC 20484 (Fbc Ltd) are non-selective herbicides for cassava

2 Mefluidide 2-S and Goal are moderately selective herbicides for cassava

3 MBR 23709 2-S and MBR 20457 2-S are highly selective herbicides for

cassava

4 Higher doses of Goal, NC 20484 (Schering Ag) and NC 20484 (Fbc Ltd) showed higher damage index

3 AMOUNT OF BROAD AND NARROW LEAF WEEDS/0 25 m^2

In Table II and Table IV, the average amount of broad and narrow leaf weeds in 0 25 m^2 are shown No clear results were obtained from counting broad and narrow leaf weeds in the 0 25 m^2 frame because of sampling technique errors -- Neither new weeds germination nor weed control could be clearly established by these data Nevertheless, a general impression of the existing weed population was derived from the counting shown in Table V, and the global effect of each herbicide in controlling either broad or narrow leaf weeds was realized

At the commercially recommended doses, 3 new pre-emergent herbicides were more effective against narrow leaf than broad leaf weeds

MBR 23709 2-S with 1 0 kg AI/ha

MBR 20457 2-S with 1 0 kg AI/ha

NC 20484 (Schering Ag) or Fbc (Ltd) 2 0 kg AI/ha

and 2 new pre-emergent herbicides more effective on broad leaf which are

Goal with 0 5 kg AI/ha

Mefluidide 2-S with 0 5 kg AI/ha

At twice the commercial rate, 2 new pre-emergent herbicides were more effective against narrow leaf weeds

MBR 20457 2-S with 2 0 kg AI/ha

NC 20484 (Fbc Ltd or Schering Ag) with 4 0 kg AI/ha

and 3 new pre-emergent herbicides were more effective against broad leaf weeds

Goal with 1 0 kg AI/ha

MBR 23709 2-S with 2 0 kg AI/ha

Mefluidide 2-S with 1 0 kg AI/ha

At four times the commercially recommended doses 5 new pre-emergent herbicides were more effective against narrow leaf weeds

Goal with 2 0 kg AI/ha

MBR 23709 2-S with 4 0 kg AI/ha

MBR 20457 2-S with 4 0 kg AI/ha

NC 20484 (Schering ag or Fbc Ltd) with 8 0 kg AI/ha

Mefluidide 2-S with 2 0 kg AI/ha

The standard check (Karmex + Lazo with 1 2 + 1 2 kg AI/ha) showed a low amount of broad and narrow leaf weeds which were kept at 0 - 1 3 and 0 - 14 0 plants/0 25 m^2 respectively The weedy check showed high pressure of broad and narrow leaf weeds with numbers of broad leaf weeds ranging from 4 0 - 31 3 plants/0 25 m^2 and narrow leaf weeds from 5 6 - 45 6 plants/0 25 m^2 In conclusion, it can be said that

1 MBR 20457 2-S and NC 20484 (Fbc Ltd or Schering Ag) have a clearly pronounced effect against narrow leave weeds although in some occasions, NC 20484 showed also a remarkably good effectiveness against broad leave weeds

2 Some new preemergent herbicides gave opposite results at the higher application rates compared to the commercially recommended rate However, at the highest rate, both broad and narrow leaf weeds were strongly suppressed and a clear distinction between suppression of narrow and broad leaf weeds could not be made

4 WEEDS NOT CONTROLLED SPECIES BY INDIVIDUAL HERBICIDES IN DIFFERENT DOSES

1 Goal - Commercially recommended doses 0 5 kg AI/ha

Narrow leaf	Broad leaf
Leptochloa filliformis	Ipomoea congesta
Echinochloa colonum	Ipomoea hederifolia
Eleusine indica	Euphorbia hirta
Digitaria sanguinalis	Euphorbia hypericifolia
Cyperus rotundus	Mimosa pudica
Cyperus ferax	Borreria laevis
	Caperonia palustris
	Portulaca oleracea
	Sida acuta
	Phyllanthus amarus

- twice the recommended doses 1 0 kg AI/ha

Leptochloa filliformis	Ipomoea congesta
Digitaria sanguinalis	Phyllanthus amarus
Cyperus rotundus	Sida acuta
Cyperus ferax	Portulaca oleracea
	Euphorbia hirta
	Euphorbia hypericifolia
	Borreria laevis

- four times the recommended doses 2 0 kg AI/ha

Leptochloa filliformis	Phyllanthus amarus
Cyperus rotundus	Borreria laevis
Cyperus ferax	

2 MBR 23709 2-S - Commercially recommended doses 1 0 kg AI/ha

Narrow leaf	Broad leaf
Leptochloa filliformis	Phyllanthus amarus
Eleusine indica	Euphorbia hirta
Cyperus rotundus	Euphorbia hypericifolia
Cyperus ferax	Borreria laevis
Digitaria sanguinalis	Portulaca oleracea
Sorghum halepense	Sida acuta
	Ipomoea congesta

- twice the recommended doses 2 0 kg AI/ha

Leptochloa filliformis	Phyllanthus amarus
Eleusine indica	Ipomoea congesta
Cyperus rotundus	Ipomoea hederifolia
Cyperus ferax	Euphorbia hirta
Cynodon dactylon	Euphorbia hypericifolia
Digitaria sanguinalis	Mimosa pudica
Sorghum halepense	Commelina diffusa
	Borreria laevis
	Compuesta sp
	Portulaca oleracea
	Sida acuta
	Caperonia palustris
	Solanum nigrum

- four times the recommended doses 4 0 kg AI/ha

Leptochloa filliformis	Phyllanthus amarus
Eleusine indica	Ipomoea congesta
Digitaria sanguinalis	Ipomoea hederifolia
Cyperus rotundus	Euphorbia hirta
	Euphorbia hypericifolia
	Mimosa pudica
	Borreria laevis
	Portulaca oleracea
	Sida acuta
	Caperonia palustris

3 MBR 20457 2-S - Commercially recommended doses 1 0 kg AI/ha

Narrow leaf	Broad leaf
Leptochloa filliformis	Phyllanthus amarus
Eleusine indica	Ipomoea hederifolia
Cyperus rotundus	Euphorbia hirta
Cyperus ferax	Euphorbia hypericifolia
Cynodon dactylon	Borreria laevis
Digitaria sanguinalis	Portulaca oleracea
	Sida acuta
	Compuesta sp
	Solanum sp

- twice the recommended doses 2 0 kg AI/ha

Leptochloa filliformis	Phyllanthus amarus
Eleusine indica	Ipomoea congesta
Cynodon dactylon	Euphorbia hirta
Digitaria sanguinalis	Euphorbia hypericifolia
Cyperus rotundus	Borreria laevis
Cyperus ferax	Portulaca oleracea
	Sida acuta
	Melopodium divaricatum

- four times the recommended doses 4 0 kg AI/ha

Leptochloa filliformis	Phyllanthus amarus
Cyperus rotundus	Borreria laevis
Cyperus ferax	Amaranthus dubius
	Sida acuta
	Euphorbia hirta
	Caperonia palustris

4 NC 20484 (Schering Ag) - Commercially recommended doses 2 0 kg AI/ha

Narrow leaf	Broad leaf
Leptochloa filliformis	Phyllanthus amarus
Digitaria sanguinalis	Ipomoea congesta
Cyperus rotundus	Ipomoea hederifolia
Cyperus ferax	Emelia sonchifolia
	Euphorbia hirta
	Borreria laevis
	Sida acuta

- twice the recommended doses 4 0 kg AI/ha

Leptochloa filliformis	Phyllanthus amarus
Eleusine indica	Euphorbia hirta
Cyperus rotundus	Euphorbia hypericifolia
Cyperus ferax	Ipomoea congesta
	Borreria laevis
	Caperonia palustris
	Mimosa pudica

- four times the recommended doses 8 0 kg AI/ha

Leptochloa filliformis	Phyllanthus amarus
Cyperus rotundus	Euphorbia hirta
Cyperus ferax	Borreria laevis
	Sida acuta
	Amaranthus dubius
	Caperonia palustris

6 MEFLUIDIDE 2-S - Commercially recommended doses 0 5 kg AI/ha

Narrow leaf	Broad leaf
Leptochloa filliformis	Phyllanthus amarus
Eleusine indica	Portulaca oleracea
Cynodon dactylon	Solanum nigrum
Digitaria sanguinalis	Compuesta sp
Sorghum halepense	Ipomoea hederifolia
Cyperus ferax	Commelina diffusa
Cyperus rotundus	Euphorbia hirta
	Mimosa pudica
	Borreria laevis
	Amaranthus dubius
	Tiaridium indicum
	Sida acuta

- twice the recommended doses 1 0 kg AI/ha

Leptochloa filliformis	Phyllanthus amarus
Eleusine indica	Ipomoea congesta
Digitaria sanguinalis	Ipomoea hederifolia
Cyperus rotundus	Emelia sonchifolia
Cyperus ferax	Euphorbia hirta
	Mimosa pudica
	Borreria laevis
	Portulaca oleracea
	Amaranthus dubius
	Caperonia palustris
	Compuesta sp

- four times the recommended doses 2 0 kg AI/ha

Leptochloa filliformis	Phyllanthus amarus
Eleusine indica	Ipomoea congesta
Digitaria sanguinalis	Euphorbia hirta
Cyperus rotundus	Euphorbia hypericifolia
Cyperus ferax	Mimosa pudica
	Borreria laevis
	Portulaca oleracea
	Sida acuta
	Caperonia palustris

5 NC 20484 (Fbc Ltd) - Commercially recommended doses 2 0 kg AI/ha

Narrow leaf	Broad leaf
Leptochloa filliformis	Euphorbia hirta
Eleusine indica	Euphorbia hypericifolia
Cyperus rotundus	Phyllanthus amarus
Cyperus ferax	Ipomoea congesta
	Borreria laevis

- twice the recommended doses 4 0 kg AI/ha

Leptochloa filliformis	Phyllanthus amarus
Eleusine indica	Ipomoea congesta
Digitaria sanguinalis	Ipomoea hederifolia
Cyperus rotundus	Euphorbia hirta
Cyperus ferax	Borreria laevis
	Portulaca oleracea

- four times the recommended doses 8 0 kg AI/ha

Leptochloa filliformis	Phyllanthus amarus
Cyperus rotundus	Euphorbia hirta
Cyperus ferax	Borreria laevis
	Melampodium divaricatum
	Ipomoea congesta

7 KARMEX + LAZO (Standard check) with recommended doses
1 2 + 1 2 kg AI/ha

Narrow leaf	Broad leaf
Leptochloa filliformis	Ipomoea congesta
Eleusine indica	Ipomoea hederifolia
Cyperus rotundus	Euphorbia hirta
Cyperus ferax	Euphorbia hypericifolia
	Phyllanthus amarus
	Borreria laevis
	Mimosa pudica
	Sida acuta
	Caperonia palustris

8. WEEDY CHECK* - (no control)

Narrow leaf	Broad leaf
Leptochloa filliformis	Phyllanthus amarus
Eleusine indica	Ipomoea congesta
Digitaria sanguinalis	Ipomoea hederifolia
Cynodon dactylon	Emelia sonchifolia
Cyperus rotundus	Euphorbia hirta
Cyperus ferax	Euphorbia hypericifolia
Sorghum halepense	Borreria laevis
	Portulaca oleracea
	Sida acuta
	Mimosa pudica
	Amaranthus dubius
	Caperonia palustris
	Compuesta sp
	Commelina diffusa
	Melampodium divaricatum

* no application of herbicides, weeds germinated and grew freely Thus, the weed population represents the naturally occuring species

4 PLANT HEIGHT (cm)

In Table VI, plant height of cassava in each doses of pre-emergent herbicide, a standard check, manual weed control and weedy check is shown for comparison No differences in plant height were observed according to the applied doses and herbicides at any of the observation dates Growth appeared normal in all plots and height increased from 17 4 - 22 5 cm at 14 days after application to 49 0 - 60 3 cm at 49 days after application By general observation, the only difference that was found, was in girth of cassava in the weedy check because of competition between cassava and weeds With longer periods of competition, some reduction of growth and yield is to be expected

5 PLANT DEVELOPMENT (To detect possible delay in days to first fully expanded leaf)

By observation it was found that there were no differences in days to first fully expanded leaf in any of the doses or herbicides After 15 days from planting, all treatments showed the first fully expanded leave at the same day (Date of planting May 16, 1983 - Day of first fully expanded leaf of all plots May 31, 1983)

6 PLANT PERISHABILITY (After one month by counting plant death)

All stakes were completely sprouted and survived in all plots until the end of the observation period

CONCLUSIONS

1. Each doses of the new pre-emergent herbicides showed different efficiencies for weed control, four times the commercially recommended doses provided more weed control percentage and kept higher levels of weed control during a longer period than commercially recommended doses and twice the commercially recommended dose

   -At the commercially recommended doses, all new herbicides showed only 21 6 - 56 6% weed control whereas the standard check (Karmex + Lazo with 1 2 + 1 2 kg AI/ha) kept a level of weed control of 81 6% at 49 days after application

   -At twice, the commercially recommended doses, Goal with 1 0 kg AI/ha and NC 20484 (Fbc Ltd) with 4 0 kg AI/ha provided more efficient weed control of 68 3 - 70 0% than others (between 31 6 - 58 3%) whereas the standard check gave 83 3% weed control at 49 days after application

   -At four times the commercially recommended doses, during 49 days after application Goal with 2 kg AI/ha provided the highest weed control with 93 3%, NC 20484 (Fbc Ltd) and NC 20484 (Schering Ag) both with 8 kg AI/ha still provided a relatively high 88 3 and 80 0% weed control whereas the standard check provided 86 6% weed control, MBR 20457 2-S with 4 kg AI/ha, Mefluidide 2-S with 2 kg AI/ha and MBR 23709 2-S with 4 kg AI/ha showed 68 3, 73 3 and 56 6% weed control respectively, lower than the standard check, especially MBR 23709 2-S which showed the lowest efficiency for weed control even at high doses of application

2 NC 20484 (Schering Ag) and NC 20484 (Fbc Ltd) proved to be non selective herbicides for cassava and it was found that higher doses of application of this new herbicide showed higher damage on cassava MBR 23709 2-S, MBR 20457 2-S and Mefluidide proved to be selective herbicides for cassava

3 Effectiveness on broad and narrow leaf weeds
MBR 20457 2-S and NC 20484 showed a good effectiveness against narrow leaf weeds by more reducing the amount of narrow leaf weeds than that

of broad leaf weeds

Goal showed more effectiveness against broad leaf weeds.

-At twice the commercially recommended dose, some of the new herbicides provided opposite results to the commercially recommended doses, but at four times the commercially recommended doses all of them showed a strong control of both broad and narrow leaf weeds

4 MBR 20457 2-S with 4 kg AI/ha and Mefluidide 2-S with 2 kg AI/ha appeared to be interesting as selective herbicides in cassava which provided considerable levels of weed control ranging from 68 3 to 73 3% during 49 days after application, but they were not better than the standard check (Karmex + Lazo with 1 2 + 1 2 kg AI/ha)

5 Some observations on weed control showed efficiencies of 3 new herbicides, Goal with 1 0 kg AI/ha, MBR 23709 2-S and MBR 20457 2-S both with 2 kg AI/ha with regard to control of Cyperus spp Especially MBR 20457 2-S with 2 kg AI/ha showed more % weed control of Cyperus spp than the other chemicals

6 A final assessment of the products' weed control effectiveness and selectivity for cassava will be possible when final root harvest is being carried out.