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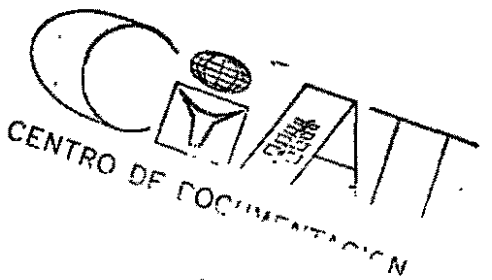

Optimum dosage of a new pre-emergence herbicide, Oxifluorfen (Commercial name GOAL), on the cassava planted in different soil types.

OPTIMUM DOSAGE OF A NEW PRE-EMERGENCE HERBICIDE OXIFLUORFEN (Commercial name GOAL) ON THE CASSAVA PLANTED IN DIFFERENT SOIL TYPES

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OBJECTIVES: Main objectives of this experiments were:

1) To study the optimum dosage of a new pre-emergence herbicide (Oxifluorfen) on different soil types by evaluating chemical injury on cassava leaves.
2) To investigate the relationship between the diameter of the seed cutting and the initial growth.
3) To analyze mineral nutrition aspects of N deficient plants.
4) To obtain general information about the effect of urea foliar application to cassava plants showing nitrogen deficiency.

MATERIAL AND METHOD.-

Four different soil types were prepared by mixing a Palmira soil containing about 90% clay with sand.

The following mixtures were prepared: 25% Palmira soil and 75% sand, 50% Palmira soil and 50% sand, 75% Palmira soil and 25% sand and 100% Palmira soil. All soils were put into pots of 26 cm diameter, 8 kg soil each plot.

The pots were fertilized with urea, potassium chloride and triple superphosphate at a rate equivalent to 100 kg, 200 kg and 100 kg per hectar of N, P_2O_5 and K_2O.

One day before planting, 20 cm cassava cutting from one-year old planting material of the variety CMC 40 were prepared. These cuttings were treated for protection from pathogens in a chemical solution which was a mixture of 222 g of Dithane,

125 g of Manzate, 200 g of Vitigram, 500 g of Malathion and 2 kg of zinc sulfate in 100 liters of water for 15 minutes. Each pot was irrigated before planting to facilitate germination. Cuttings were measured and planted vertically. At the same date of planting, the new pre-emergence herbicide (Oxifluorfen) was applied at the following dosage.

(1) 4.2 liters per hectar (recommended dosage by the company), (2) 8.4 liters per hectar (two times the recommended dosage), and (3) 2.1 liters per hectar (one half of the recommended dosage).

After application of the herbicide, the soil surface was covered with the aluminum foil to prevent damage by heavy rainfall. Thus, this experiment had 4 different soil types and 4 herbicide application rates (including control). The experiment was replicated 3 times.

The following data was collected weekly: germination, degree of chemical injury to leaves, plant height and number of leaves developed.

The degree of chemical injury on the leaf was visually assessed according to the following rating.

Rating	Verbal description
0	No injury
1	Very slight discoloration
2	Slight discoloration
3	More severe, but not lasting
4	Moderate and not lasting
5	Moderate and more lasting
6	Medium and lasting
7	Heavy

Rating	Verbal description
8	Very heavy
9	Nearly destroyed
10	Completely destroyed

8 weeks after planting, plants on 25% Palmira soil and 75% sand showed typical symptom of nitrogen deficiency. At this time plant analysis was made of an upper leaf of the deficient plant and a normal plant planted in the 100% Palmira soil. An urea foliar application was superimposed as a one percent and two percent solution of urea and urea side-dressing were applied as shown below. Thus, all pots were applied N 100 kg per hectar, at element base.

A secondary side-dressing with the same N rate was applied 11 days later. The number of leaves developed and plant height were recorded every week after applying the additional fertilizer.

100% Palmira soil

75% Palmira soil
+ 25% sand

50% Palmira soil
+ 50% sand

25% Palmira soil
+ 75% sand

control | Urea sidedressing to the soil | 2% urea foliar application | 1% urea foliar application

RESULT AND DISCUSSION.-

1) Chemical injury caused by the different dosages of herbicide in the various soil types.

Typical symptoms of the chemical injury caused by Oxifluorfen

were observed as shown at Picture 1. The degree of the chemical injury that occurred for the different herbicide dosage is shown in Fig. 1.

Herbicide injury increased with increasing application of Oxifluorfen. Soil type influenced the magnitude of herbicide damage. As soil content increased and clay content decreased, herbicide damage increased (Fig. 2). Thus, there was an interaction between herbicide rate and soil type. High clay content soils required higher herbicide rate for injury to occur, while sandy soil required lower herbicide rates for injury to occur. Significant difference of the degree of the chemical injury was obtained at 1% level among the soil type, the dosages and its interaction. This suggests that the dosage of the herbicide should be determined considering the soil type.

The plant growth measured as plant height and the number of leaves developed are shown in Fig. 3 and Fig. 4 respectively. There was no significant difference between plant growth and the dosage of the herbicide in the soil type.

This suggests that the initial plant growth such as the plant height and the number of leaves developed was not affected by the different dosages or soil types used in this experiment.

Germination was also not affected by herbicide rates or soil types. The number of leaves developed was slightly lower on 25% Palmira soil and 75% sand than that on 100% Palmira soil at all dosages of the herbicide. The reduction in

numbers of leaves developed was probably caused by lower soil fertility.

2) The relationship between the diameter of the seed cutting and the initial plant growth.

Relationship of the diameter of the seed cutting to the germination rate and the plant height was observed as shown at Fig. 5, Fig. 6 respectively. There was no correlation of the diameter of the seed cutting to the germination rate or the plant height. Initial growth has a relation to the weight of seed cutting and the age of seed cutting, therefore cutting diameter should not affect initial growth greatly. In general, small diameter cuttings comes from the upper part of the stem and large diameter from the basal part. The cutting from the basal parts is older than the upper one and more lignified. There was no difference in the germination date between the thin cutting and the thick cutting. This would suggest that the germination rate or initial growth is not related to the position of the seed cutting prepared from the mother plant or the age of the cutting material.

3) Nitrogen deficiency caused by the various soil types. 50 days after planting, the upper leaves of some plants indicated slightly yellow color as shown in Picture 2.

It was diagnosed as nitrogen deficiency. The symptom of the nitrogen deficiency was not observed on 100% Palmira soil. Soil sample from the pots of 25% Palmira and 75% sand and 100% Palmira soil was taken and analyzed (See

Table 1). Similarly the upper 2-3 leaves from the same pots were sampled and analyzed (See Table 2). Organic matter, calcium, magnesium, potassium and manganese decreased with the lower content of Palmira soil in the soil mix but two elements copper and iron increased. Nitrogen and potassium also decreased with the lower content of Palmira soil on the soil mix in the leaf analysis. Number of leaves developed was affected by the soil type (i.e. the soil fertility) as shown in Fig. 7. However, the plant height was not changed.

4) Urea foliar application.

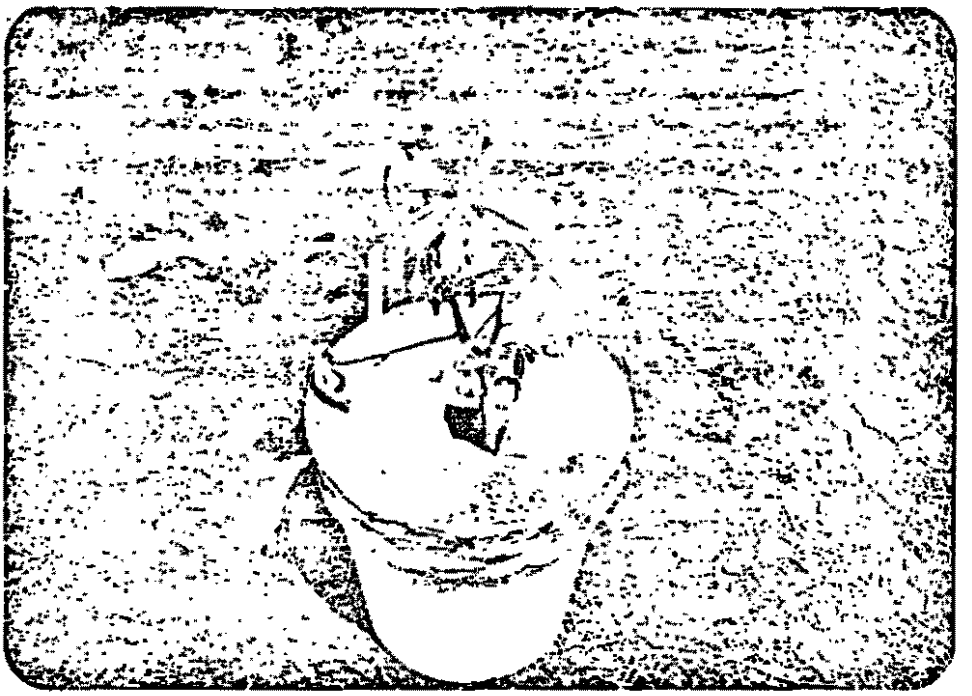
Both plants treated by 1% and 2% urea foliar application were injured at the same degree of the severity. Its symptom on the leaf was a brown spot as shown in Picture 3. This suggests that cassava is very susceptible to urea foliar application and injured even by 1% urea solution. Compared with the treatment of 1% and 2% foliar application, a significant plant height difference was not observed at the pots of sidedressed and no urea application as a control. The plants which no urea application showed a slightly yellowish leaf coloration as shown in Picture 4. Number of leaves developed increased by the sidedressing. It suggests that urea sidedressing to the soil is no more effective to increase leaf development than the foliar application.

TABLE 1.- Results of soil analysis of 100% Palmira soil and 25% Palmira soil + 75% sand mix, 50 days after planting.

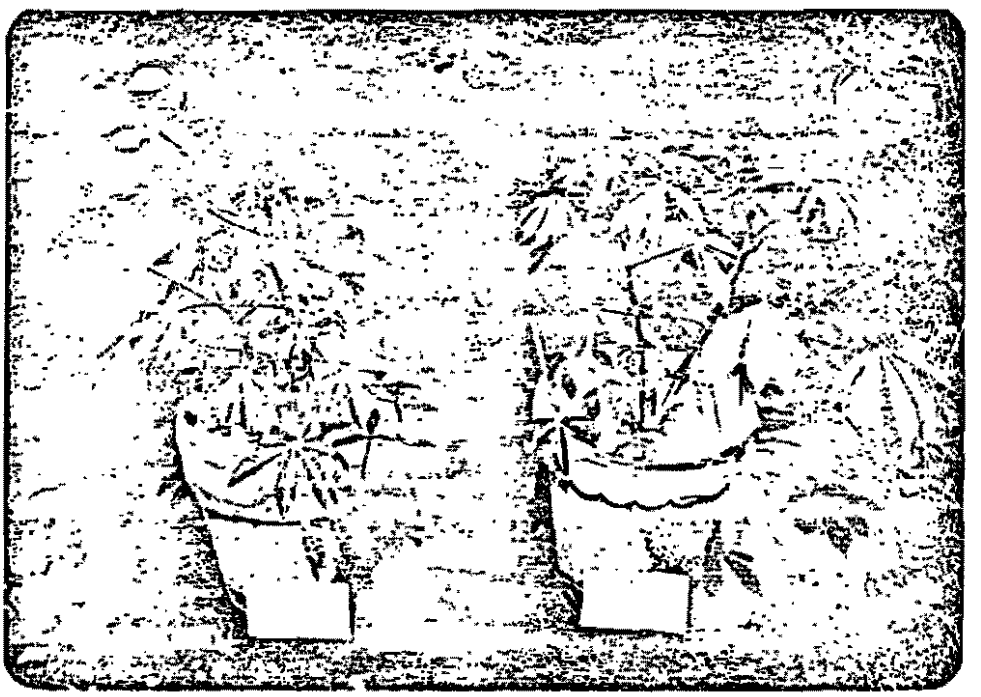
SOIL SAMPLE	ORGANIC MATTER %	PHOSPHATE (Bray II) ppm	pH	Ca	Mg	K	Na	C.E.C	B	Zn	Mn	Ca	Fe
				meq/100 gr soil					ppm				
100% Palmira soil	4.6	63.0	6.6	11.3	7.2	0.97	0.08	23.6	0.39	5.0	39.1	0.62	2.5
25% Palmira soil + 75% sand	1.0	56.0	6.7	7.5	2.7	0.28	0.11	10.6	0.12	3.7	53.0	2.54	22.5

TABLE 2.- Result of upper leaf analysis of 100% Palmira soil and 25% Palmira soil + 75% sand mix 50 days after planting.

	N	P	K	Ca	Mg	Zn
			%			ppm
100% Palmira soil	3.12	0.18	1.23	0.80	0.33	39
25% Palmira soil + 75% sand	2.50	0.18	1.17	0.74	0.30	44
Reference	Nutrient levels of uppermost fully expanded leaf blades of cassava of 2-5 months of age shown by R. H. Howeler, 1977.					
Deficiency	4.5	0.2	1	0.5	0.2	35
Critical level	5.7	0.4				35 - 50
normal	5.0 - 6.0	0.3 - 0.5	1.2 - 2.0	0.6 - 1.5	0.25 - 0.5	40 - 100

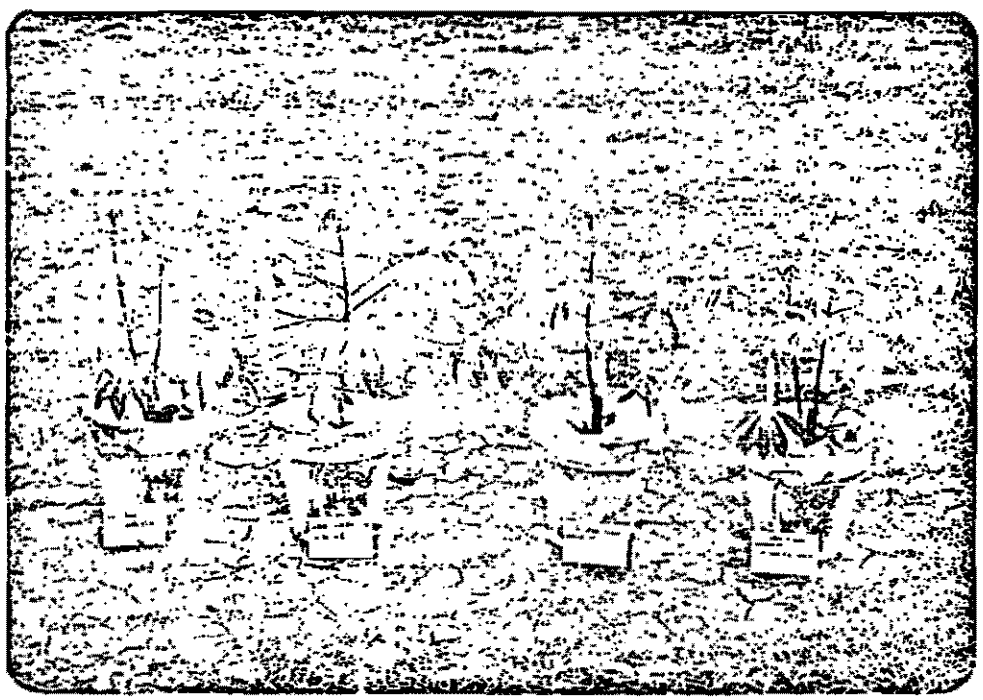


PICTURE 1.- Herbicide injury on cassava leaf



PICTURE 2.- Symptom of nitrogen deficiency

PICTURE 3.- Chemical injury caused by 2% urea foliar application



PICTURE 4.- Plant growth differences caused by the urea foliar application and sidedressing to the soil 23 days after application.

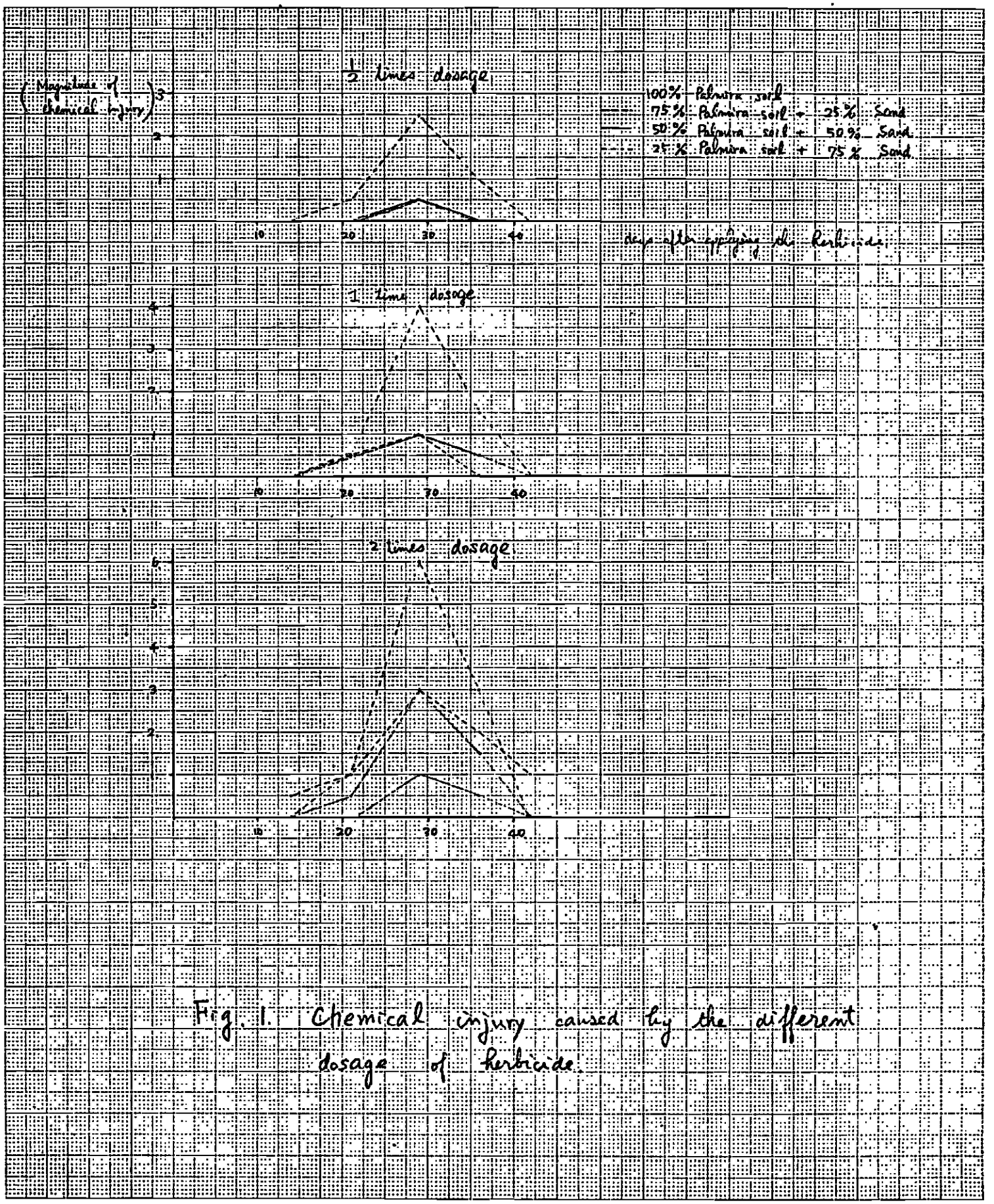


Fig. 1. Chemical injury caused by the different dosage of herbicide.

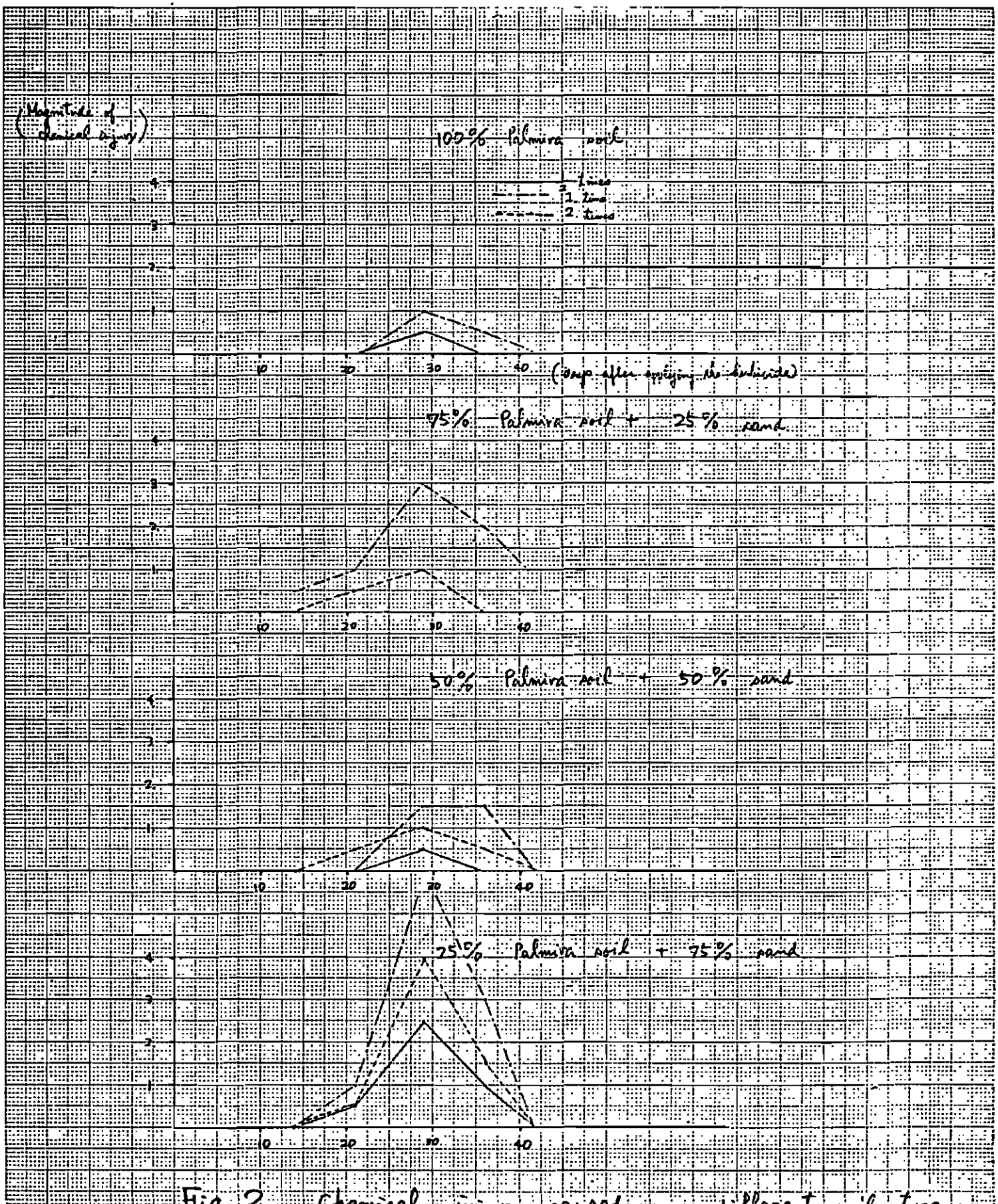


Fig. 2. Chemical injury caused on different soil type.

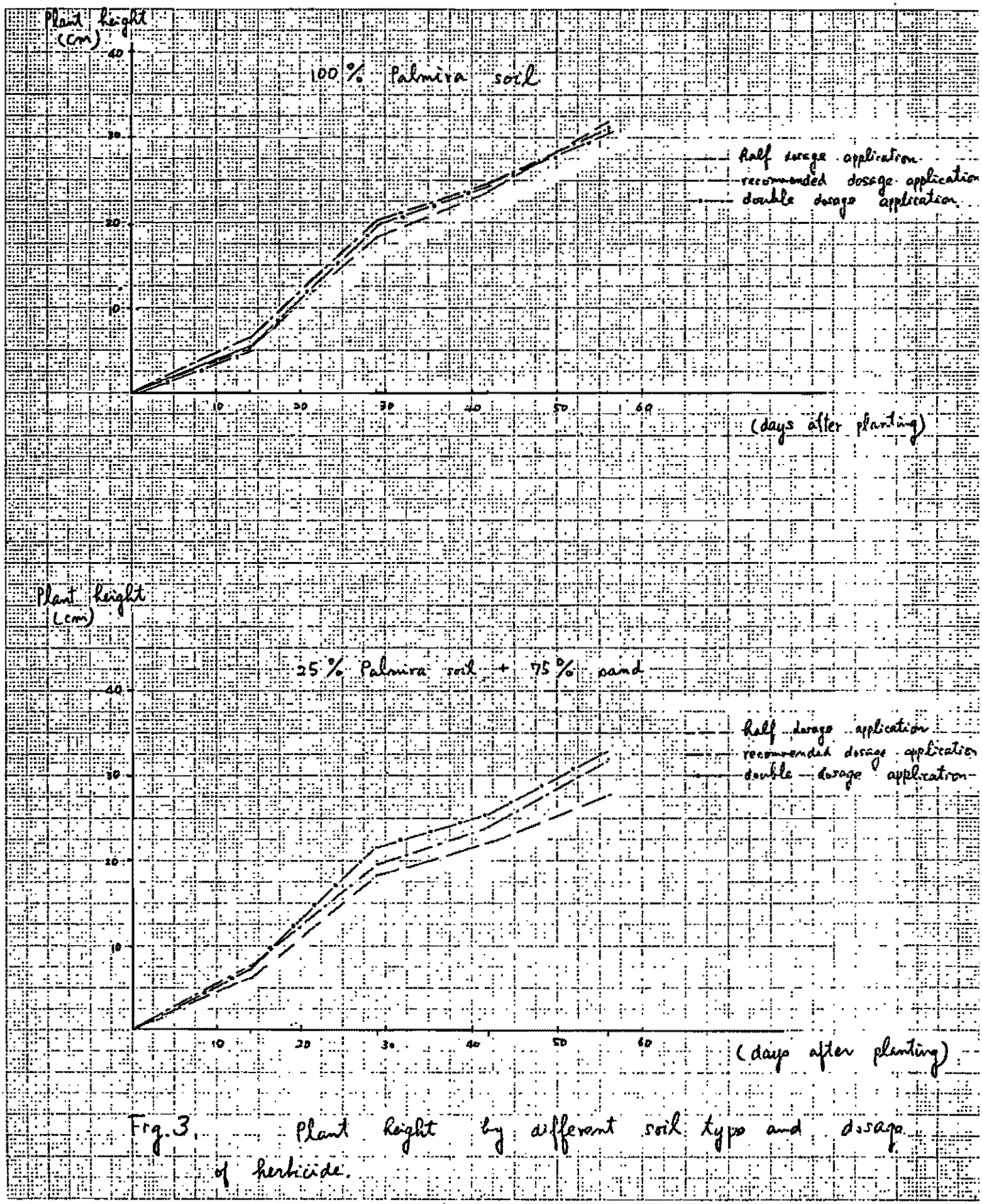


Fig. 3. Plant height by different soil type and dosage of herbicide.

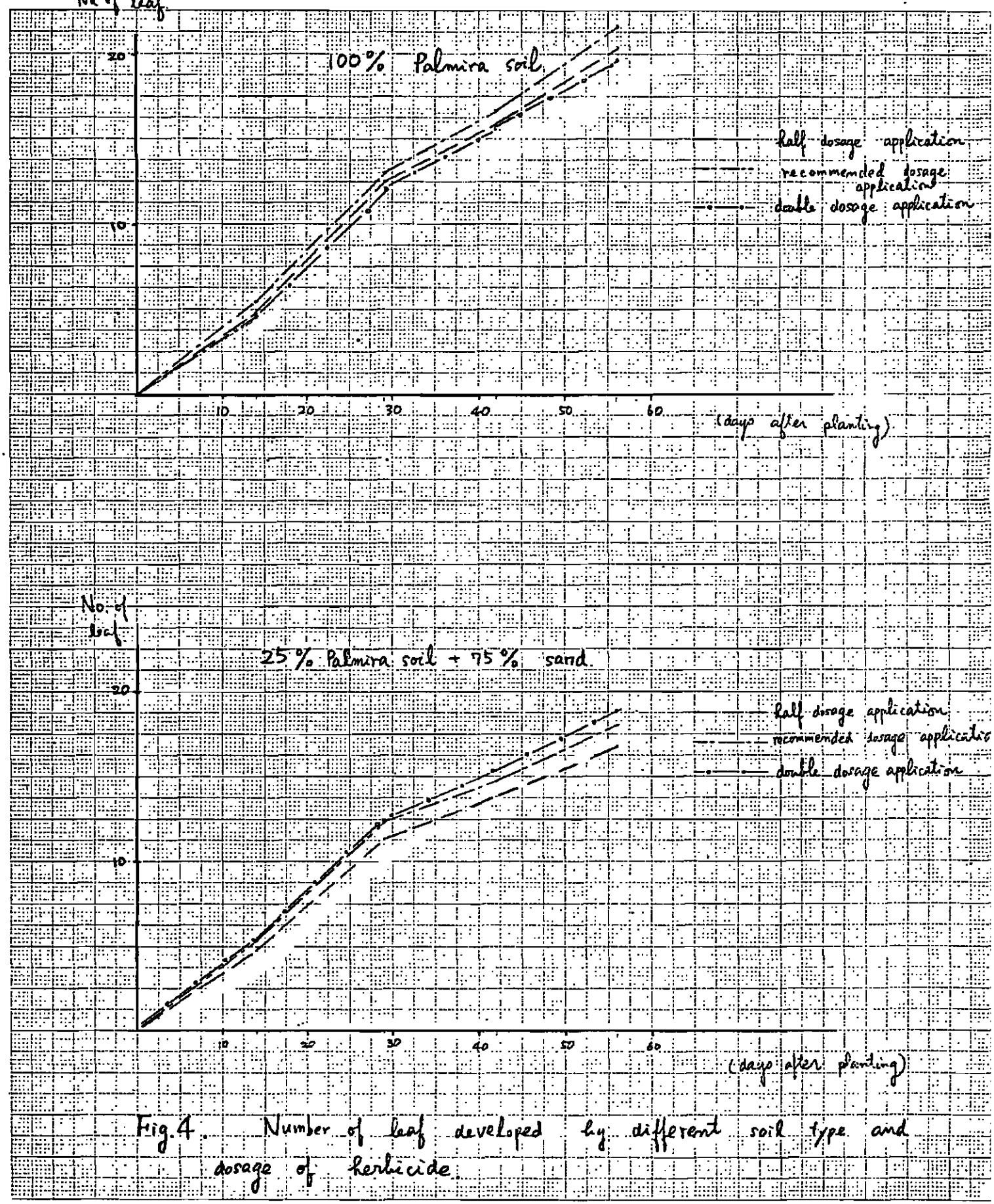


Fig. 4. Number of leaf developed by different soil type and dosage of herbicide.

Fig. 5. Relationship between diameter of cutting and plant height 29 days after planting.

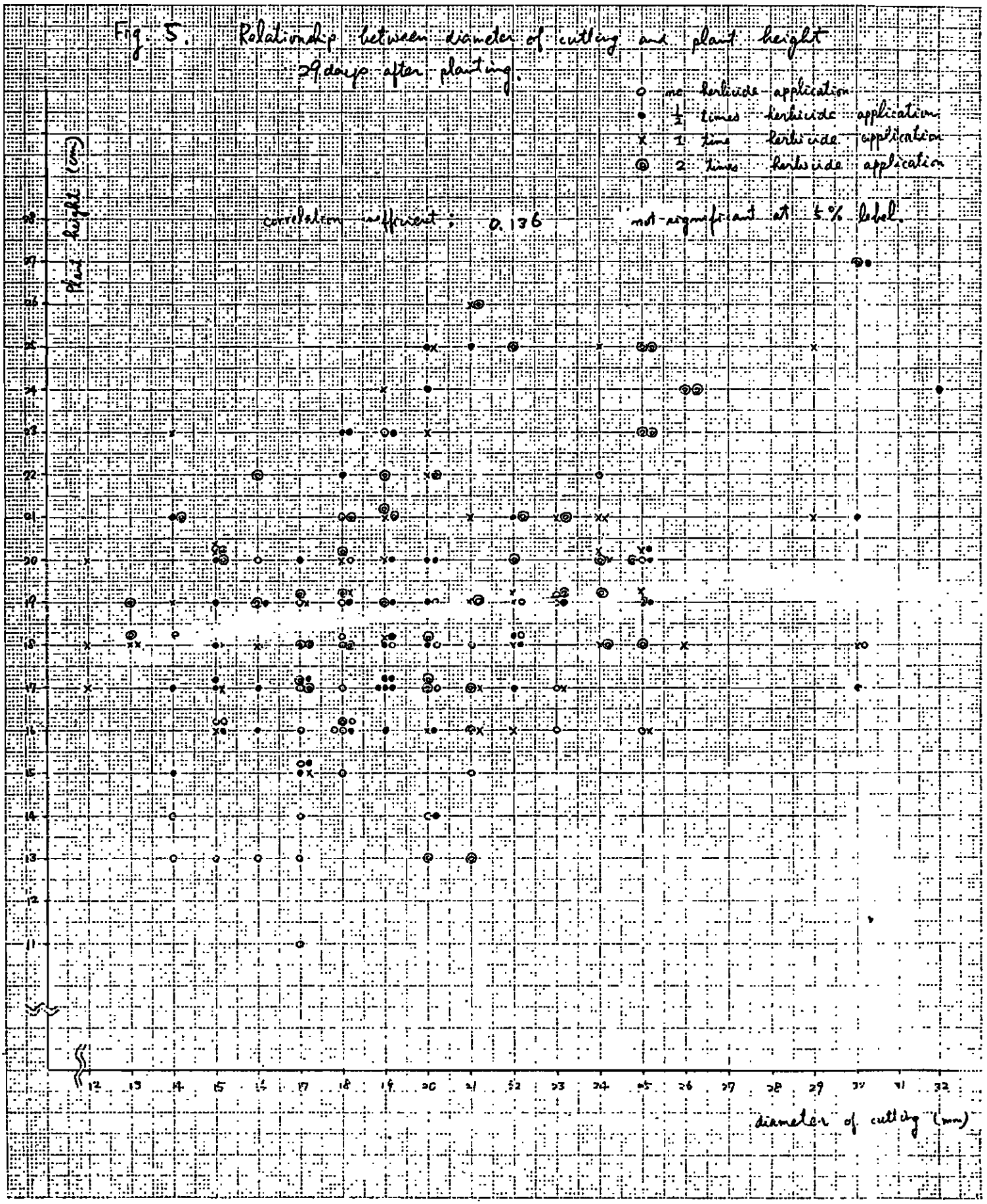
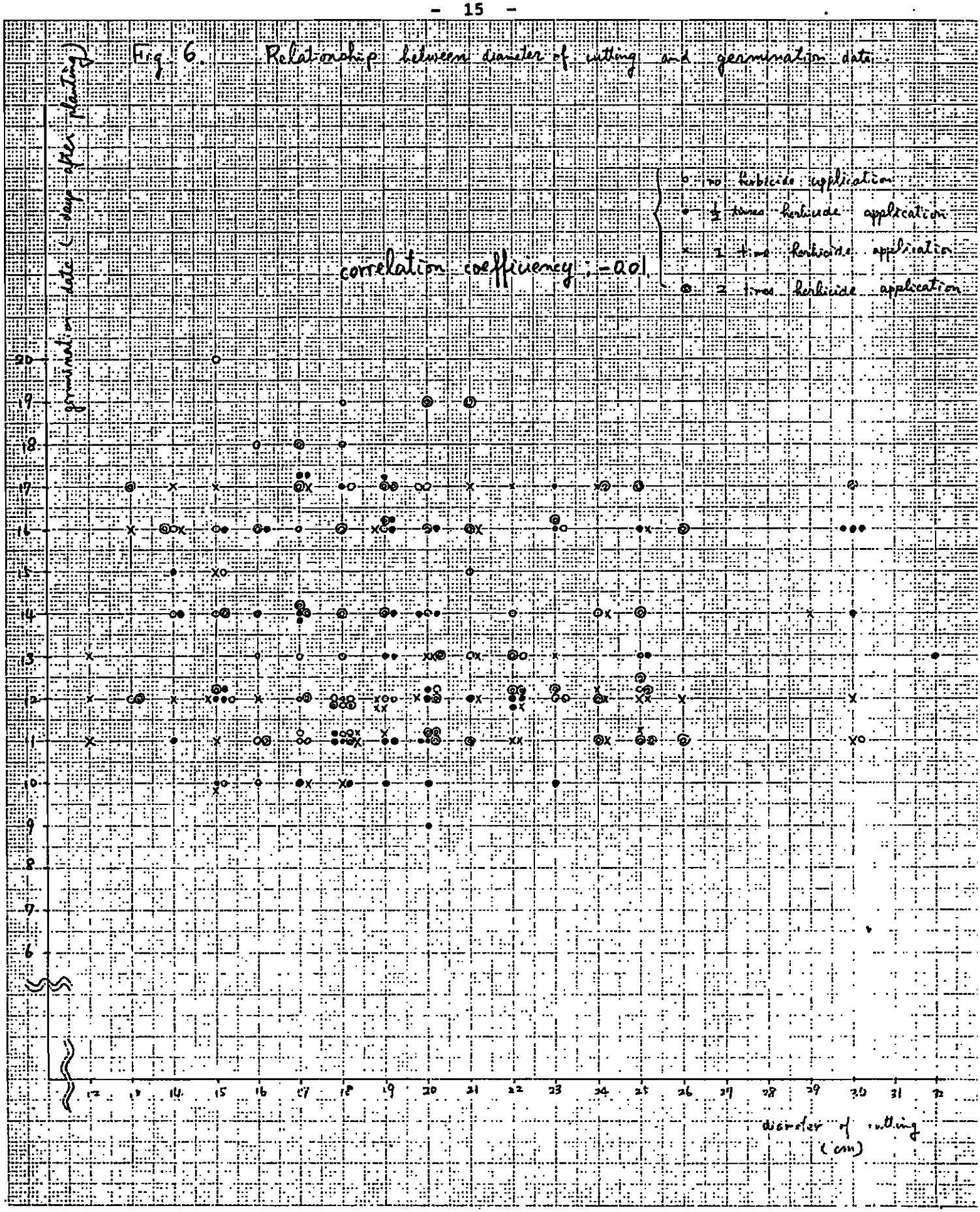


Fig. 6. Relationship between diameter of cutting and germination date.



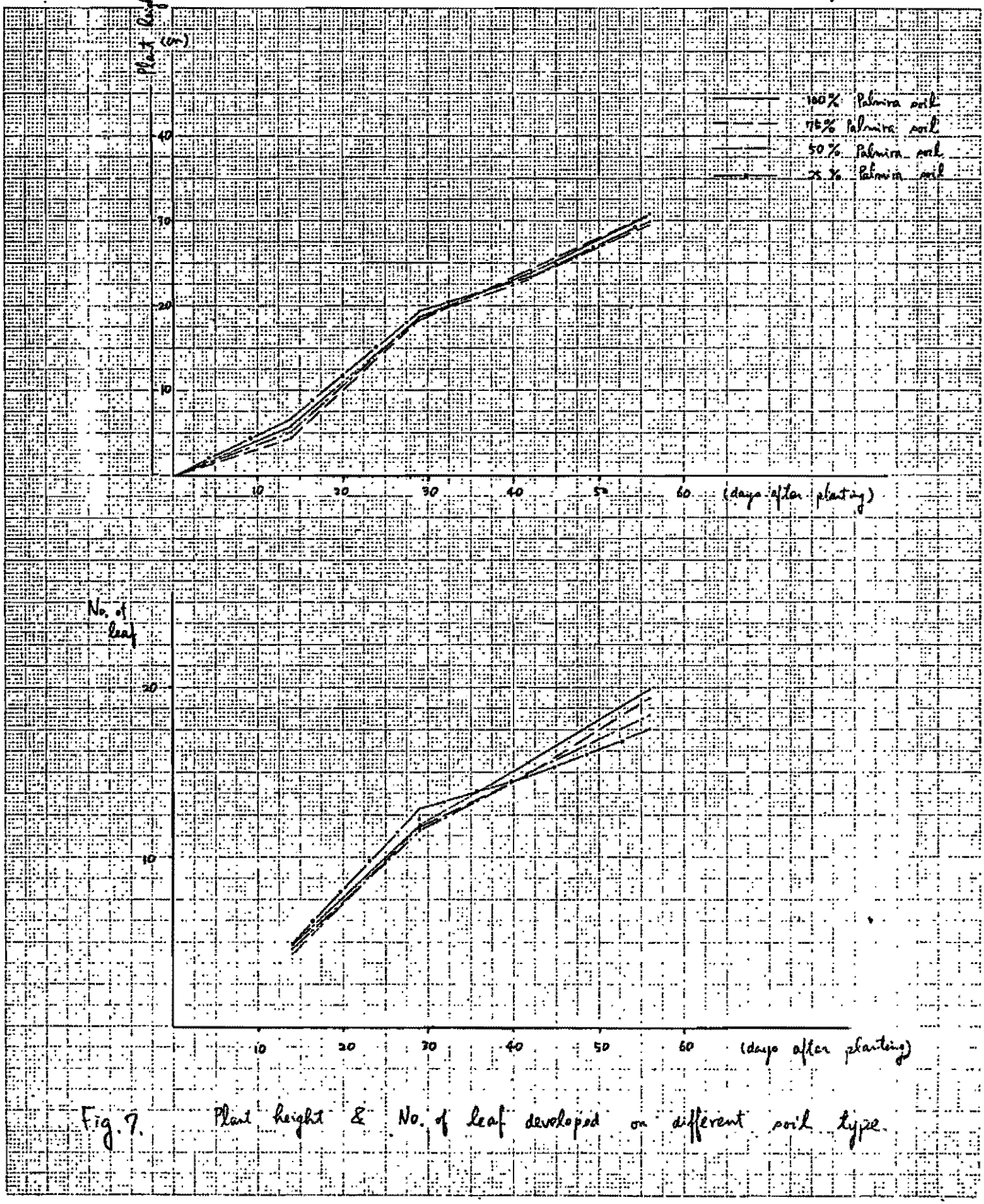


Fig. 7. Plant height & No. of leaf developed on different soil type.

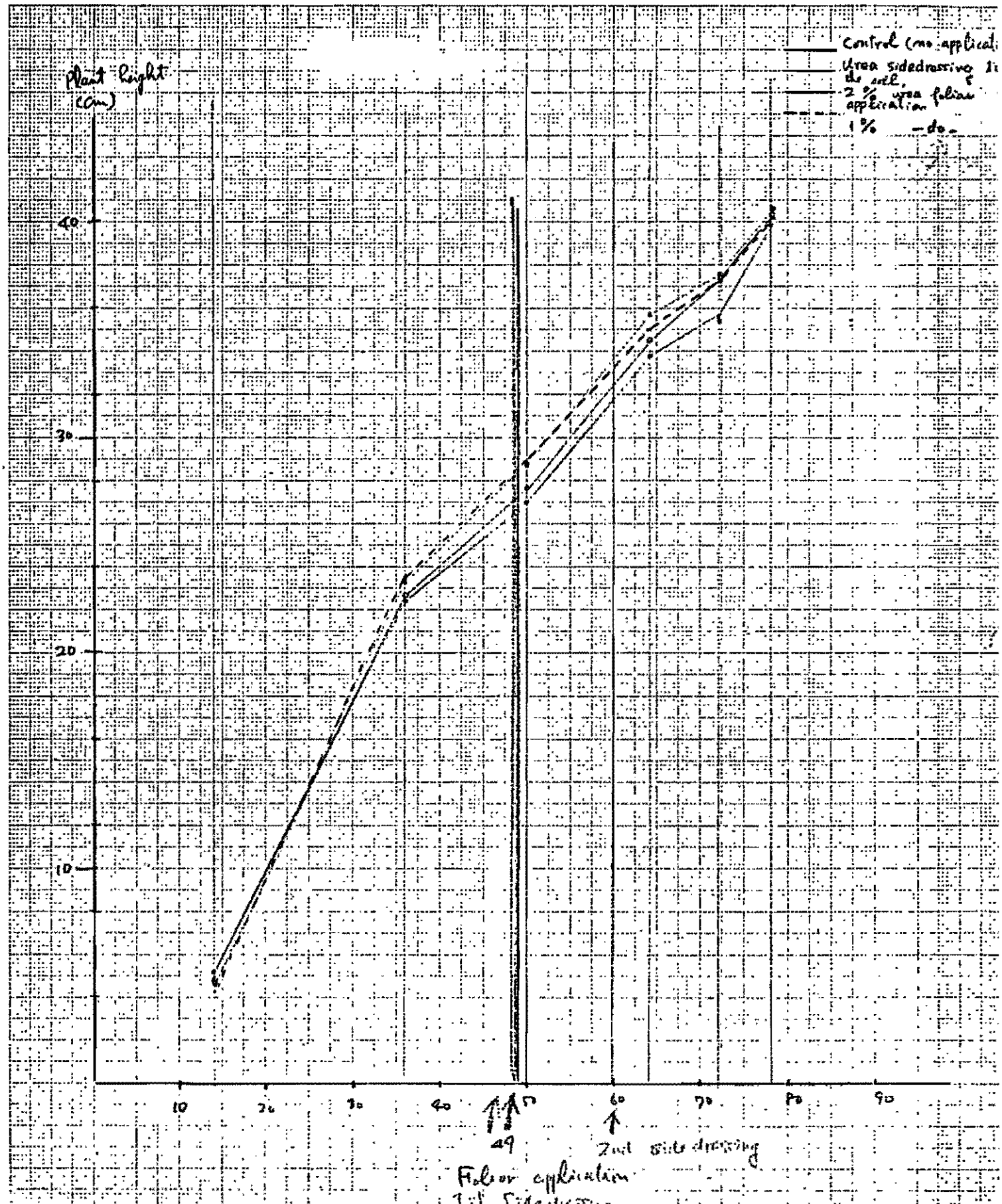


Fig. 8. Plant height difference by the urea foliar application and sidedressing to the soil.

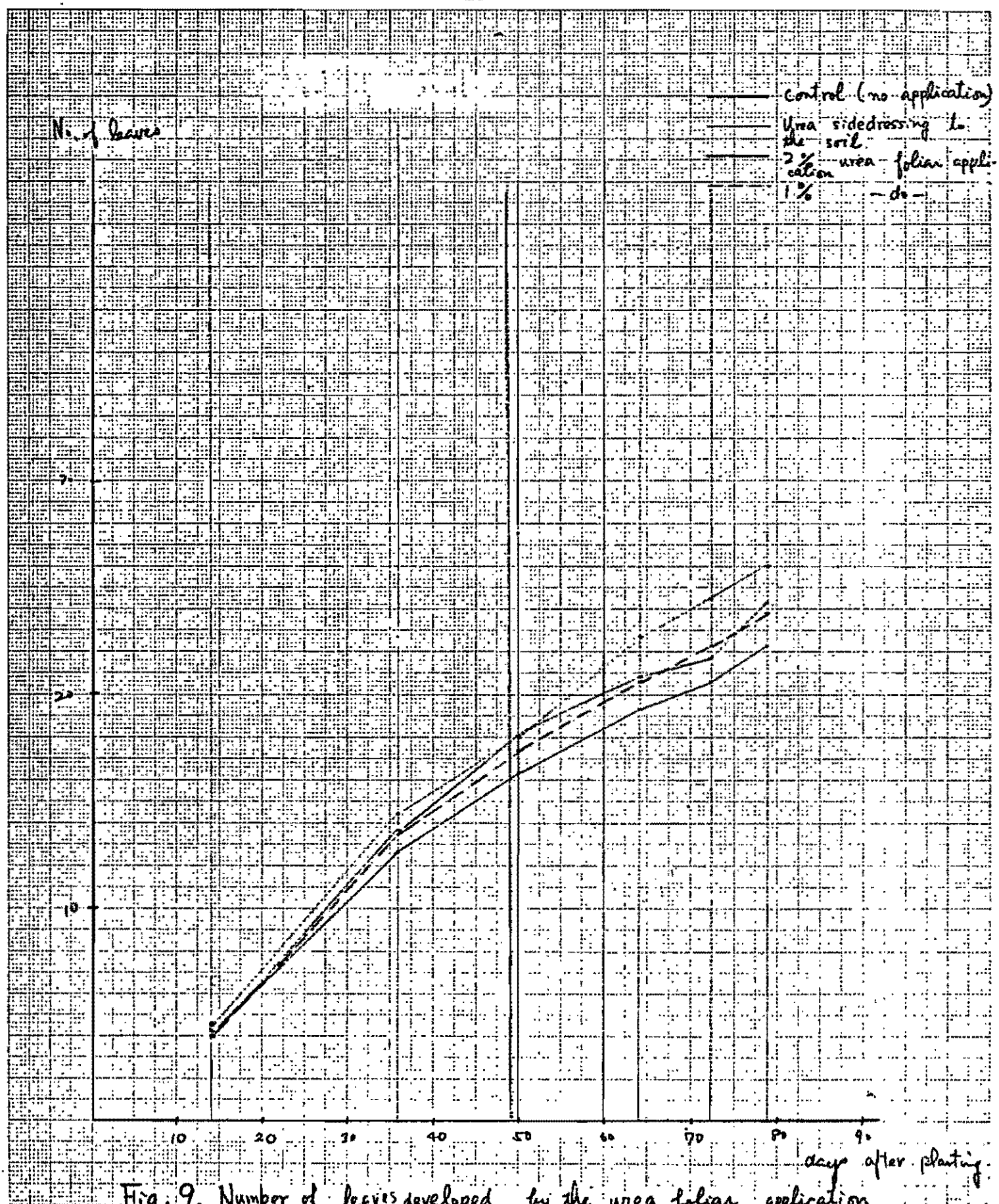


Fig. 9. Number of leaves developed by the urea foliar application and sidedressing to the soil.