

Effect of Soil Preparation of Tobacco Seedbeds on the Use of Methyl Bromide as Soil Fumigant

L. López Matos¹

INTRODUCTION

Methyl bromide is very effective as a soil fumigant in the control of damping-off of tobacco seedlings.² It is also effective in the control of insects, nematodes, and weeds. However, because of the high cost of the chemical and polyethylene covers required for application, this chemical is still not widely used. In the past, the use of soil fumigants for tobacco beds had been accomplished in well-prepared soil so as to get optimum diffusion of the gas throughout the soil. But soil preparation is an expensive operation.

Studies were initiated in 1962-63 and continued through 1963-64 with the purpose of determining the effectiveness of methyl bromide as a soil fumigant in unprepared soil. This paper presents the data obtained in these two experiments.

MATERIALS AND METHODS

In 1962 an experiment was established in beds which had been used as tobacco seedbeds the year before and in which the soil had remained undisturbed. The experiment included two treatments arranged in a paired-plot design with eight replications. Plots for both treatments consisted of beds 30 feet long by 3 feet wide, inside measurements, made with 16 x 8 x 4-inch concrete blocks placed lengthwise on the ground. The blocks were held together by cement. Each bed was filled up with 3 to 4 inches of gravel in the bottom, followed by 8 to 10 inches of sandy soil.

In 1963-64 the experiment was repeated in the same plots used in 1962 to determine whether continued use of the same soil would affect the effectiveness of methyl bromide or the quality of seedlings. Plots in which the soil was not prepared in the experiment of 1962-63 were also left unprepared in 1963-64. The plots in which the soil was prepared in 1962-63 were again prepared 1963-64. The same experimental design was followed, but treatments were randomized differently from the previous year. The same procedure was followed. Dry-weather conditions prevailed through-

¹ Associate Plant Pathologist, Agriculture Experiment Station, University of Puerto Rico, Río Piedras, P.R.

² Segal, R. H., and López Matos, L., Control of damping-off tobacco in seedbeds by the use of gaseous soil fumigants, *J. Agr. Univ. P.R.* 40 (1): 62-6, 1956.

out the period during which the experiment was conducted. Copper oxychloride was applied only twice.

RESULTS AND CONCLUSIONS

In both experiments the number of seedlings in plots in which the soil was not disturbed was higher than in plots where the soil was prepared in

TABLE 1.—Number of tobacco seedlings per plot in prepared and unprepared soil treated with methyl bromide as soil fumigant in 2 experiments

Replicates	Number of seedlings produced in—			
	Experiment 1 1962-63 in—		Experiment 2 1963-64 in—	
	Prepared soil	Unprepared soil	Prepared soil	Unprepared soil
1	11,775	11,500	20,400	22,500
2	10,600	10,800	17,800	28,300
3	9,600	10,400	21,400	23,100
4	9,375	12,000	13,300	10,600
5	7,350	11,400	22,600	15,200
6	11,850	13,200	25,000	24,700
7	6,000	8,150	20,800	27,000
8	4,870	12,900	22,900	26,800
Total	71,420	89,750	164,200	178,200
Average per plot ¹	8,928	11,219	20,525	22,275
<i>t</i> =	2.954 ²			0.906
Average per cuerda ²	3,135,000	3,938,000	7,223,000	7,835,000

¹ Plot size was 30 feet × 3 feet.

² A cuerda = 0.97 acre.

the conventional way. The difference was statistically significant at the 5-percent level only in the year 1962-63 (see table 1).

The number of seedlings per plot in 1962-63 was approximately half that of 1963-64. In terms of the number of seedlings per cuerda³ in 1962-63, the plots in which the soil was not prepared produced 3,938,000 seedlings while in 1963-64 unprepared plots produced 7,835,000. Heavy showers and consequently higher incidence of damping-off during the period of the 1962-63 experiment are probably responsible for the lower yield in seedlings during that year. It should be pointed out that weather conditions

³ 1 cuerda = 0.9712 acre.

prevailing during 1962-63 were normal and the number of seedlings obtained was excellent for this period. The dry weather that prevailed in 1963-64 was abnormal for that period and consequently there was no damping-off. Weeding was not necessary in plots of either experiment.

Treatment 1 consisted of plots in which weeds were cut at soil level and removed. The soil was then prepared as it is commonly done for tobacco seedbeds for commercial production of tobacco seedlings at the Agricultural Experiment Station Farm, that is, the soil was removed twice and all debris removed from the plot. The soil surface was smoothed out and a 10-10-8 fertilizer applied at the rate of 1,500 pounds per *cuerda*. Arches made of No. 9 wire were placed across the bed. The arches remained 8 to 10 inches high at their centers and were placed 2 feet apart. A polyethylene plastic was then laid over the arches and sealed with dirt around each bed. The beds were fumigated during 4 days with methyl bromide at the rate of 2 pounds per 100 square feet under the polyethylene covers.

In plots under treatment 2, weeds were cut at soil level and all debris was removed from the bed. The soil was left undisturbed for 3 weeks to give time for weed seeds to germinate. The beds were then fertilized and fumigated with methyl bromide, following the same procedure as in the plots submitted to treatment 1.

Tobacco seed was sown at the rate of 3.5 pounds per *cuerda* immediately after removing the covers from all plots of both treatments. Saran⁴ plastic providing 36-percent actual shade was placed over the wire arches. The plastics were held in place by eight grommets 7 inches long, made of No. 9 wire stuck in the ground outside the bed.

Germination of seed was followed by humid weather as a result of a rainy season, and a few small patches of damped-off seedlings were observed in some of the plots of both treatments. To prevent spread of the fungus responsible for damping-off, copper A compound (copper oxychloride) 2 pounds in 100 gallons of water at the rate of 5 gallons per 100 square feet, was applied once a week to all plots.

Some seedlings were ready for transplanting 40 days after sowing the seed. At this time pulling of seedlings was initiated and continued every week. Fertilizer 10-10-8, 5 pounds in 50 gallons of water, was applied at the rate of 5 gallons per 100 square feet to seedlings immediately after each pulling. To prevent fertilizer injury on the leaves the seedlings were "washed" with water immediately after fertilizing. Record was kept of the number of seedlings per plot.

⁴ Trade names are used in this publication solely for the purpose of providing specific information. Mention of a trade name does not constitute a guarantee, warranty, or endorsement by the Agricultural Experiment Station indicating superiority to other similar products not mentioned.

The data obtained show that the effectiveness of methyl bromide as a soil fumigant was not affected by leaving the soil undisturbed during fumigation. Good-quality seedlings were produced in both prepared and unprepared soil. Thus, if the soil is not prepared as is customarily done by tobacco growers, the cost of production of tobacco seedlings is considerably lowered by treating the soil with methyl bromide.

In accordance with these observations, it is suggested that methyl bromide be used as a soil fumigant without disturbing the soil. This seems advisable for at least 3 years.

SUMMARY

Two experiments, one in 1962-63 and the other in 1963-64, were conducted at the same site to determine the effect that fumigating undisturbed soil has on the effectiveness of methyl bromide as soil fumigant in tobacco seedbeds. Beds were made of concrete blocks. A layer 8 to 10 inches high of sandy soil was placed over a layer 3 to 4 inches deep of gravel. Methyl bromide was applied at the rate of 2 pounds per 100 square feet under plastic covers during 4 days. In both experiments plots in which undisturbed soil was fumigated with methyl bromide produced more seedlings than beds where the soil was prepared, the difference been significant at the 5-percent level the first year.

The data show that, under the conditions of the experiments, the effectiveness of methyl bromide as a soil fumigant was not affected by fumigating unprepared soil. Thus it is not necessary to prepare the soil for making tobacco seedbeds. Consequently, the cost of production is lower in seedbeds where the soil is not disturbed than in those where the soil is prepared.

Further studies are necessary to determine the maximum length of time that undisturbed soil could be used for tobacco seedbeds without affecting the effectiveness of methyl bromide and/or the quality of seedlings. Until additional information is obtained it may be recommended that the seedbed be prepared by fumigating unprepared soil with methyl bromide for at least 3 consecutive years.

RESUMEN

Durante los años 1962-63 y 1963-64 se llevaron a cabo dos experimentos en semilleros de tabaco para determinar el efecto que pudiera tener sobre la efectividad del bromuro de metilo su aplicación a un suelo sin preparar. Ambos experimentos se hicieron en cajas sementeras, en el mismo lugar. Las cajas se hicieron con bloques de concreto. En el fondo de cada caja se depositó una camada de 3 a 4 pulgadas de grava, encima de la cual se añadió otra camada de 8 a 10 pulgadas de un suelo arenoso. Luego se les

aplicó bromuro de metilo, a razón de 2 libras por cada 100 pies cuadrados de terreno, bajo cubiertas plásticas, durante 4 días.

En ambos experimentos, las parcelas sin preparar produjeron mayor número de plantitas que aquellas en las cuales se preparó el terreno. La diferencia fue estadísticamente significativa solo en el experimento realizado en el año 1962-63.

Los resultados obtenidos demuestran que bajo las condiciones prevalentes en estos experimentos no se afecta la efectividad del bromuro de metilo cuando se aplica a un suelo sin preparar. Por no ser necesario preparar el terreno para hacer semilleros de tabaco, se pueden reducir considerablemente los costos de producción de las plantitas. No obstante, hasta tanto se obtengan más datos experimentales sobre el número de años en que se pueda fumigar el terreno sin preparación, se recomienda que éste se prepare para su fumigación con bromuro de metilo por lo menos durante 3 años consecutivos.