Effect of Terralyt Plus, a soil conditioner, on growth and economic yield of tomato

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ABSTRACT

A study was used at the University of Ghana farm, Legon, to determine the performance of tomato (*Lycopersicon esculentum*) on a field to which Terralyt Plus, a soil conditioner, had been applied. The soil conditioner at the recommended rate significantly increased plant height, number of fruits per truss, mean fruit size, fruit yield, and total soluble solids. Furthermore, Terralyt Plus and the inorganic fertilizer applied at half the recommended rates also increased all the parameters mentioned above when compared with only fertilizer application at the recommended rate.

RÉSUMÉ

OFOSU-ANIM, J. & ADASE, R.: *Effet de Terralyt Plus, un conditionneur du sol, sur la croissance et le rendement économique de tomate*. Une étude était entreprise au champ de l'Université du Ghana à Legon pour déterminer le rendement de tomate (*Lycopersicon esculentum*) sur un terrain auquel Terralyt Plus, un conditionneur du sol a été appliqué. Le conditionneur du sol à la proportion recommandée augmentait considérablement la taille de plante, le nombre de fruits par grappe, la grosseur moyenne de fruit, le rendement de fruit et le total de solides solubles. De plus, Terralyt Plus et l'engrais inorganique appliquées à une demie de la proportion recommandée augmentaient aussi tous les paramètres mentionnés ci-dessus lorsque comparés avec l'appplication d'engrais seulement à la proportion recommandée.

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Introduction

Tomato (*Lycopersicon esculentum*) is the most important vegetable crop in Ghana in acreage under cultivation as well as usage (NARP, 1993). Methods for cultivating tomato vary all over the country. In the northern part of Ghana, tomato is mostly cultivated in the dry season when lack of rains prevents the cultivation of field crops like sorghum, maize and millet. Soil physical condition is one factor that can limit crop production.

The poor physical condition of the soil can restrict penetration and movement of water in the soil, plant root development, and aeration of the soil. Farmers are constantly seeking the most efficient and economical production systems. The use of soil additives such as soil conditioners, soil activators, wetting agents, soil inoculants, and microbial enhancers have been promoted for sometime (USDA, 1957, 1978). The increasing production cost, especially of fertilizers, have renewed producers' interest in these materials. Soil conditioners are usually defined as materials that improve the physical properties of soil by increasing their water-holding capacity and availability of water to plant, releasing "locked" nutrients, reducing irrigation frequency and compaction tendency, soil's aeration, and root development (Bauder, 1976). Certainly, maintaining or improving soil structure or both is highly desirable in crop production. Soil conditioners can, therefore, reduce the amount of fertilizers to be applied, increase the benefits derived from

applying, or make mineral nutrients in applied fertilizer available to the crop.

Most traditional soil amendments and commercial fertilizers have been tested extensively through research trials to document their benefits and limitations. However, research on the new products being marketed, including non-traditional additives, has been inadequate. Nonetheless, farmers should be wary of the types of products available, and aquire a good knowledge of their potential to benefit crop production from extension officers and researchers. Terralyt Plus, a soil conditioner, is usually associated with high yield when applied to the soil. London (1994) observed that Terralyt Plus restored the natural regeneration power of soil, and plants had deep-green leaf colouration, higher growth rate and yield. Though vegetable producers could benefit from this soil conditioner, no research has determined the efficacy of the product in Ghana.

This study was, therefore, designed to determine the response of tomato to soil-applied Terralyt Plus.

Materials and methods

The University of Ghana farm, Legon, was used for the study, during the major vegetable growing season of 2003, to evaluate the beneficial effect of Terralyt Plus as a new soil conditioner under field conditions. In 2002, preliminary trials were used to test the efficacy of the soil conditioner at the Sinna garden of the Department of Crop Science, University of Ghana. The soil in the farm belongs to the Adenta series, and to the FAO/UNESCO classification. The tomato cultivar used was Campbell 33, a determinate cultivar. Seeds of the cultivar were collected from the seed stock of the Crop Science Department of the University of Ghana. Seeds were sown in a seed box containing topsoil. To control fungal diseases in the nursery, the soil was treated with Dithane M45 at the rate of 5g l^{-1}. Seedlings were pricked out 2 weeks after germination. A week before transplanting, Terralyt Plus was applied to the experimental plots, using a knapsack sprayer, at the recommended rate of 0.2 ml/200 ml of water.

Tomato seedlings were transplanted 2 weeks after pricking out. A starter solution of NPK (20-20-0) at the rate of 6.9 g l^{-1} was applied after transplanting at the rate of 100 ml per plant using a 100-ml beaker. The following treatments were used: control, NPK plus sulphate of ammonia fertilizers at the recommended rate (IF), Terralyt Plus at the recommended rate of 0.2 ml/200 ml (T), Terralyt plus combined with inorganic fertilizers at half the recommended rate (0.2 ml/400 ml + NPK-110 kg ha^{-1} and sulphate of ammonia - 4 g $plant^{-1}$) (0.5 IF + 0.5 T), and Terralyt Plus-combined inorganic fertilizers at the recommended rates (IF + T). The NPK (20-20-0) was applied at the rate of 220 kg ha^{-1} 2 weeks after transplanting, and sulphate of ammonia at the rate of 8 g $plant^{-1}$ at flowering. A randomized complete block design was used with five treatments and four replicates. Each plot measured 2.4 m by 2 m with four rows of five plants per treatment, and data were collected on the middle five bordered plants.

To control insect pests, Karate 25EC was applied at a rate of 2 ml l^{-1} once a week. Watering and weeding were applied when necessary. All plants were staked. Harvesting of fruits started at about 8 weeks after transplanting when fruits were at red-ripe stage.

Routine plant measurements for each experimental plot were taken at weekly intervals throughout the experiment.

Data were collected on the following: mean plant height (weekly), number of days to flowering, plant height at flowering, number of trusses, percent fruit set per plant, plant height at maturity per harvest, mean fruit size, mean yield per plant, mean yield per hectare, and total soluble solids.

Results and discussion

Table 2 shows the effect of Terralyt Plus on plant height of plants at flowering. Plant height ranged from 28.50 to 33.50 cm. Generally, plant height and other vegetative growth were suppressed, probably due to the harsh environmental

conditions during the growth period (Tables 1a, b). The rate of increase in height of plants on 0.5I F + 0.5 T and IF + T plots were significant, with IF + T plants being taller. The average height of control plants was generally lower than that of plants on Terralyt Plus-treated plots. The Terralyt Plus present in the root zone of the plants might have enhanced the plants' ability to absorb more water and, hence, nutrients; thus, increasing growth. Whitney, Gordon & Lamoneh (1996), in support of this finding, reported that most soil conditioners increase nutrient uptake by increasing root branching and root hair development. At first harvest, however, no significant difference was observed between control and Terralyt Plus, though plants on IF + T-treated plots were the tallest.

No significant differences were recorded between the treatments in the mean number of days from planting to flowering. However, significant differences were observed between control and other treatments. Generally, flowering was observed within the expected 50 to 65 days after transplanting documented for southern Ghana (Sinnadurai, 1992).

Though the total number of fruits per plant was reduced by the harsh environmental conditions (e.g. the erratic rainfall and high temperatures) that prevailed during the experiment, the differences between the control and all treatment levels were significant ($P<0.05$) in the number of fruits per truss. The IF + T plants had the highest significant ($P<0.05$) mean number of fruits per truss. Similarly, significant differences ($P<0.05$) were recorded in percent fruit set and number of fruits. The difference in percent fruit set between plants on Terralyt Plus-treated plots and control plot represent the extent of plant response to Terralyt Plus soil treatment. Binning, Michaelis & Hughes

TABLE 1a

Long-term (40 years) Mean Total Rainfall (mm) and Mean Temperature (°C) of Legon from April to September

Month	*Mean total rainfall (mm)*	*Mean temperature (°C)*	
		Minimum	*Maximum*
April	103	24.0	31.5
May	205	23.6	30.5
June	303	23.0	28.6
July	76	22.2	27.2
August	38	21.2	26.2
September	56	22.0	27.5

TABLE 1b

Mean Total Rainfall (mm) and Mean Temperature (ºC) of Legon for April to September for 2003 and 2004

Month	*Mean total rainfall (mm)*	*Mean temperature (ºC)*	
		Minimum	*Maximum*
2003			
April	21.5	24.7	32.1
May	71.2	24.9	32.1
June	30.2	31.1	29.3
July	36.8	23.1	29.3
August	25.9	23.0	28.2
September	39.8	23.7	29.7

Source: Meteorological Services of Ghana, Mempeasem, Accra, Ghana

TABLE 2

Effect of Terralyt Plus on Plant Height at Flowering and Maturity and Days to Flowering

Treatment	*Height at flowering (cm)*	*Days to flowering*	*Height at maturity (cm)*
Control	28.50	57.0	61.50
Fertilizer	32.25	55.5	73.00
Terralyt Plus	30.25	55.8	62.25
0.5 IF + 0.5 T	31.75	54.5	73.75
F1 T1	33.50	55.0	76.75
LSD (5%)	1.62	1.5	3.74

(2000) reported that once soil conditioner-treated plants started to grow rapidly, their growth rate surpassed that of untreated plants; and this is reflected in increased number of fruits and subsequent higher yield. Significant differences (P<0.05) were observed between the treatments for total soluble solids. The highest value of 5 per cent was recorded for IF + T plants, and the lowest of 4.24 per cent for control plants (Table 3).

Terralyt Plus significantly affected the mean fruit size (weight) per plant. Mean fruit size of plants on Terralyt Plus-treated plots were significantly higher than those of control plants. The IF + T plants had the highest fruit weight of 70.75 g, and the lowest mean fruit weight of 47.5 g was recorded in control plants.

Significantly (P<0.05) high yield was also recorded on plots treated with Terralyt Plus (Table 4). The effect of Terralyt Plus on mean yield per plant as well as yield per hectare all followed the same trend (Table 4). The significantly higher yields of treated plants recorded in this study show that soil conditioners could stimulate growth and flowering, leading to higher crop yield (Yangyuoru *et al.*, undated; Khan, Giles & Cattanach, 2001).

TABLE 3

Effect of Terralyt Plus on Number of Trusses, Percent Fruit Set, Number of Fruits Per Plant, and Total Soluble Solid Content

Treatment	*No. of trusses*	*Percent fruit set*	*No. of fruits per plant*	*Total soluble solids (% Brix)*
Control	10.50	55.7	5.50	4.24
Fertilizer	13.25	56.5	6.50	4.56
Terralyt Plus	10.75	61.2	6.00	4.92
0.5 IF + 0.5 T	12.50	56.0	6.75	5.05
F1 T1	13.25	65.2	7.75	5.05
LSD (5%)	1.55	7.54	1.10	0.74

TABLE 4

Effect of Terralyt Plus on Fruit Size and Yield of Tomato

Treatment	*Fruit size (g)*	*Yield (g)/plant*	*Yield (tonnes)/ha*
Control	47.50	260.8	2.61
Fertilizer	60.00	389.5	3.90
Terralyt Plus	55.50	334.5	3.35
0.5 IF + 0.5 T	64.75	444.5	4.45
F1 T1	70.75	548.2	5.48
LSD (5%)	3.81	67.16	0.672

Conclusion

Wide variations were observed among treatments and control in all the parameters studied. Generally, plants grown on plots treated with Terralyt Plus responded positively to the soil conditioner. The study showed that Terralyt Plus has a high potential in improving the yield of tomato.

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