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EFFECT ON SOME MANAGEMENT PRACTICES ON THE PERFORMANCE OF TOMATO (*Lycopersicon esculentum*, Mill)

L.A. BABATOLA[1] AND J.O OLANIYI[2]

1. *Department of Agronomy, University of Ibadan, Ibadan, Nigeria*

2. *Department of Agronomy, Ladoke Akintola University of Technology, Ogbomoso, Nigeria*

ABSTRACT

Two experiments were conducted at the Teaching and Research Farm, University of Ibadan, Ibadan during the1997 and 1998 cropping seasons, to investigate the combined effects of tillage, staking and mulching on the growth and yield performance of tomatoes. Growth, yield and yield parameters of tomato were significantly ($P<0.05$) affected by all the treatment combinations. Treatment with full complement of management practices (i.e. tillage, staking and mulching) gave the best result for all parameters considered while the control (no tillage, no staking and no mulching) gave the poorest performance in terms of growth and fruit yield. A combination of tillage, staking and mulching was found to be one of the cultural inputs capable of enhancing tomato production in the southern guinea savanna ecological zone.

INTRODUCTION

Tomato, *Lycopersicon esculentum Mill* is a popular fruit vegetable in the world and is very important in human diet. It is a very cheap source of vitamins and also contains large quantity of water, calcium and Niacin all of which are of great importance in the metabolic activities of man.

Although tomato is an important fruit vegetable, its production in tropical (Villareal, 1980) countries is low compared to those of the temperate zones due to differences in crop environmental conditions and cultural practices applied to the crop. In Nigeria, tomato, comes from small farms where vegetables generally are grown in a complex culture of relay and mixed inter-cropping with other crops (Okigbo, 1975). Tomato yields are often low (about 2-5 ton ha^{-1}) due to poor fruit-set (Villareal, 1980 *op. cit.*), low yielding varieties, diseases and pests scourge, poor knowledge of tomato nutrition and inadequate cultural management (Simon and Sobulo, 1975).

No tillage or minimum-tillage cropping systems have gained wide acceptance for growing field corn and soybeans; however, data on these systems for vegetables is limited. Knavel *et al.*(1977) reported that plant survival of transplanted tomato and pepper plants was similar for no-tillage and conventional tillage, but conventionally tilled plants generally out-yielded no-tilled plants. Spring cabbage plants grown by no-tillage culture yielded less than conventionally tilled plants when grown under the same N treatment and spacing (Knavel and Herron, 1981).

Staking tomato crops and mulching the soil surface with either black polyethylene films or grass under wet conditions significantly increased marketable yield. In order to boost tomato yield, it is necessary to investigate the effects of some management practices

such as tillage, staking and mulching on the growth and performance of tomato with a view to recommending an optimum management practice for adoption in this agro-ecology.

MATERIAL AND METHODS

The experiments were conducted at the Rock feller plot of the Teaching and Research farm of the University of Ibadan (7^{th} 20'N; 30^{0} 45'E) with a bimodal rainfall of over 1,000mm during the early cropping season of 1997 and 1998. The soil was sandy loam and well drained which had been cropped previously for a few year with fertilizer application. Initial soil samples were collected from surface 15cm for analysis before the field was cleared. The soil particle size was done by hydrometer method (Bouyoucos, 1951). The pH was determined in 1:2 soil: water suspension using a pH meter. The organic carbon was determined by dichromate oxidation (Walkley and Black, 1934), total N by the Micro-Kjeldahl method (Jackson, 1964) and available P by the Bray P-1 method (Bray and Kurtz, 1945). The exchangeable bases were displaced by neutral N NH_4OAC. The displaced K and Na in the extract was determined with atomic absorption spectrophotometer. The exchangeable acidity (Al and H) was extracted with NKCL and estimated titrimetrically (Mclean, 1965). The experimental design was a randomised complete block with three replications. The variety planted was 'pomodoro'. Seedlings were raised for four weeks in the nursery before transplanting to the field. The spacing used was 50cm x 100cm.

The treatment combinations used were as follows:

1. Tillage, Staking and Mulching
2. Tillage, Staking and no-mulching
3. Tillage, no-staking and mulching
4. Tillage, no-staking and no-mulching
5. No-tillage, staking and mulching
6. No-tillage, staking and no- mulching
7. No-tillage, no-staking and mulching
8. No-tillage, no-staking and no- mulching

Tillage was done manually. The untilled soil was left undisturbed without loosening the soil. Mulching was done immediately after clearing, using weeds cleared from the land, which were predominantly *Panicum maximum* and *Chromdacna odorate*. Staking was done a month after transplanting using *Leucaena* stem. Also, routine agronomic practices of watering and weeding at 2 weeks interval, were done manually. The seedlings were sprayed with Vetox 85 for pests control and against diseases (e.g fungi) using dithane M-45 at the rate of 5ml per 10litres of water from two weeks after transplanting.

Six plants per plot were randomly tagged for data collection. The parameters taken were: plant height, measured with a meter ruler from the base to the tip of the main shoots. The number of leaf and fruit were determined by counting. Days to 50% flowering was observed and recorded.

Data were analyzed using the Analysis of variance. The Duncan's Multiple Range test (DMRT) (Duncan, 1955) was used to separate the means.

RESULTS AND DISCUSSION

The results of the soil analysis before the experiments were planted are presented in Table 1. The soil is sandy loam and moderately P and organic matter, indicating that there is need for supplementary for inorganic fertilizer.

There was no significant variation in the growth and yield performance obtained for tomato in 1997 and 1998 under this investigation. There were significant differences among treatments for plant height. Plants growing under the full complement of tillage, mulching and staking were consistently taller than those of other treatments but significantly taller only than plants that were neither staked nor mulched (Table 2). However, plants in untilled soils did not differ significantly for height regardless of other management practices, except at 4th week after transplanting.

The number of leaf of the plants under the different treatments followed the same pattern as the plant height (Table 3). The number of leaf increased as the plant matures irrespective of the management practices. Plants in tilled soils produced greater number of leaves than those in untilled soils. Soil compaction in untilled soils and lack of staking may have accounted for the poor growth observed. This observation is similar to the report of Agboola (1981) on maize, and Afolayan and Braimon (1991) on okra that plants under no-tillage treatment gave reduced growth and yield performance. It was also observed that staking prevented microbial infection on tomato leaves and fruits as earlier reported by Pusa (1993).

Days to 50% flowering were shorter in treatments where soil was tilled. Number of fruit per plant was also higher in tilled soils compared to no-till. Similarly, an increase of over 100% in fruit yield was observed in plots with full complement of management practices over the control (No management practices). This showed that yield does not depend only on climatic and soil conditions but also on management practices applied. Staking and mulching increase the yield and improve fruit quality of tomato (Quinn, 1975; Adelana, 1976). This is because staking keeps the tomato plant from the ground (AVRDC, 1985), thereby exposing the photosynthetic areas to sunlight. Hence, more assimilates were produced and the fruit size of those staked was significantly larger than those unstaked.

In the unstaked plots, contact with the soil exposed the fruits to infestation by soil borne diseases, hence the importance of staking especially during wet season (Quinn, 1975; Pusa, 1993). Mulching will also aid in conserving water thereby improving the productivity of the crop (Asiegbu, 1991). This will create a conducive environment for the plant growth which can be translated into higher yield as indicated by Villareal (1980).

CONCLUSION

Result obtained from this study indicated that the combination of the three management practices (tillage, staking and mulching) proved effective in enhancing the productivity of tomatoes. Apart from growth and yield advantages, two combinations of these three management practices (i.e. tillage, staking and mulching) appeared to have some yield constraints such as flower abortion, fruit rot, weed, pests and diseases infestation normally encountered during tomato cultivation in the field.

Table 1: Physical and chemical analysis of the soil on experimental plot.

	VALUES	
Characteristics	1997	1998
% Sand	70.5	72.0
% Silt	11.5	10.2
% Clay	18.0	17.8
% O. M	1.7	1.8
Avail P (ppm)	7.2	7.0
K (me/100g)	0.2	0.3
Al +++ (Me/100g)	4.2	4.5
Ca "	0.1	0.1
Na "	6.0	5.6
CEC "	0.2	0.2
%N	11.5	12.0
	0.1	0.2

Table 2. The Effect of some management practices on the mean height of Tomato

Treatment	Plant height (cm) (weeks after transplanting)							
	2		4		6		8	
	1997	1998	1997	1998	1997	1998	1997	1998
Till/St./mulch	30.7a	3.3a	42.4a	44.0a	40a	51.0a	60.5a	62.3a
Till/St./No-mulch	28.6a	28.5ab	40.5a	42.1a	48a	49.2ab	58.3ab	59.5ab
Till/No-st/mulch	24.4bc	26.0b	38.3a	40.5a	46a	48.0ab	55.5b	57.0b
Till/No-st/no mulch	20.8c	21.5c	30.7b	35.5b	38b	38.9c	46.7c	48.2c
No-till/St./mulch	11.5d	13.7d	16.9d	18.0d	30.6c	36.6c	32.6d	34.2d
No-till/St./no-mulch	12.3d	15.0d	21.4c	21.8c	28.4c	32.5cd	32.5d	33.5d
No-till/No-St/mulch	11.9d	12.5d	16.2d	17.6d	24.5c	26.6d	30.4d	32.0d
No-till/No-st/no-mulch	9.8d	10.2d	15.5d	16.0d	20.2c	22.5c	28.7d	29.5de
S.E.	8.4	8.5	11.6	12.1	11.4	10.9	13.6	13.7

N.B. Means in each column for different levels followed by common letter do not differ significantly at Pm = 5% level of Duncan's Multiple Range Test.

Key:
Till = Tillage
St =Staking
Mulch = Mulching

Table 3: The effect of some management practices on the mean number of leaf per plant of tomato.

Treatment	Number of leaf per leaf (weeks after transplanting)							
	2		4		6		8	
	1997	1998	1997	1998	1997	1998	1997	1998
Till/St./mulch	18a	22.0a	24a	26a	46a	57a	62.a	65a
Till/St./No-mulch	16ab	19.ab	22a	23b	44a	47ab	60a	62a
Till/No-st/mulch	15b	16b	18b	20b	40a	43b	58a	60a
Till/No-st/no mulch	11c	13c	16b	17c	36b	40b	48b	51b
No-till/St./mulch	11c	12c	14c	16c	26c	28c	35c	37c
No-till/St./no-mulch	8d	8d	10e	14c	17cd	20cd	28d	30c
No-till/No-St/mulch	5c	7d	7d	10cd	16d	18d	25d	26d
No-till/No-st/no-mulch	4e	4e	6d	8d	13d	15d	18e	21d
S.E.	5.1	6.2	6.7	6.2	13.4	14.2	17.4	17.6

N.B. Means in each column for different levels followed by common letter do not differ significantly at Pm = 5% level of Duncan's Multiple Range Test.

Table 4: Effect of some management practices on the mean yield of tomato

	Days to 50% Flowering		Number of Fruit Per Plant		Total Yield (ton/ha)	
	1997	1998	1997	1998	1997	1998
Till/St./mulch	72c	72c	14a	16a	3.7a	4.0a
Till/St./No-mulch	72c	74bc	13ba	14ab	3.2b	3.5ab
Till/No-st/mulch	74c	74bc	12ba	14ab	2.3c	2.5b
Till/No-st/no mulch	76cd	75b	10cd	11b	2.0dc	2.2c
No-till/St./mulch	78b	78b	8c	12b	1.9d	2.0e
No-till/St./no-mulch	78ba	79b	7c	8c	1.8ed	1.9cd
No-till/No-St/mulch	80ba	81ab	7c	7c	1.7e	1.8cd
No-till/No-st/no-mulch	82a	85a	5c	4d	1.5e	1.5d
S.E.	3.7	4.3	3.3	4.1	0.8	1.0

N.B. Means in each column for different levels followed by common letter do not differ significantly at Pm = 5% level of Duncan's Multiple Range Test.

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