

Original Research Article

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Effect of Pinching Height on Growth, Fruit and Seed Yields of Tomato (*Lycopersicon lycopersicum* Mill.)

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ABSTRACT

Keywords

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The field experiment was conducted at the Teaching and Research farm of Niger State College of Agriculture, Mokwa during 2010 and 2011 cropping seasons (9° 18'N and 5° 04'E) with altitude of 378.0 m above the sea level in the Southern Guinea Savanna region of Nigeria to assess the effect of pinching height on growth, fruit and seed yields of tomato (*Lycopersicon lycopersicum* Mill). Treatments consisted of two varieties (Ibadan Local and Ife 1) and four levels of pinching. Farmers' normal practice (1), pinching height at 30 cm (2), pinching height at 50 cm (3) and pinching height at 60 cm (4). The experiment was factorial layout fitted into Randomized Complete Block Design (RCBD), replicated three times. Harvesting was done when 85% of the fruits had turned yellowish. Data were taken on plant height per plant, number of flowers per plant, number of fruits per plant, fruit yield t/ha. Other parameters included number of rotten fruit per plant, seed yield (kg/ha) and 100 – seed weight. Data collected were subjected to analysis of variance (ANOVA) using Minitab 15 software and means were separated using (NDMRT). The result showed that number of fruits, fruit and seed yields were greater in Ibadan Local than the other variety. Plants pinched at 50 cm height had the highest fruit yield and pinching at 30 cm height gave the best seed yield.

Introduction

Tomato (*Lycopersicon lycopersicum*) belongs to solanaceae family. It is one of the most widely use vegetable in the world (Kocchar, 1981). The tomato is a savory, typically red, edible fruit which originated in South America (Abdelmageed, 2003). It grow best under temperature of 20 – 27°C fruit setting is poor when average temperature exceed 30°C or dry

period as it causes cracking of fruit. It prefers well drained soil with a pH of 5.5 to 7.0 (George, 2004).

To obtain high fruit yield farmers will need to harvest when the crop is 85% ripe so as to avoid rotting of the fruits (Schippers, 2000). The most adequate height in which tomato plants can be pinched to have maximum fruit yield is 40-50 cm (Michele, 2009). The

optimal harvesting period is twice a week if the fruits must not be waste (Kayum *et al.*, 2008).

In areas where tomato is produced, the farmers are known to face some problem of a multitude of side stems which weaken the main stem causing the tomato plant to break because appropriate pinching height period is not observed as the crop start producing flowers at various period of time. Most farmers especially those that produce in large scale do record low yield at this period because before they realize most of the plants are already flowering and forming fruits that are not of good quality. This research was therefore carried out to determine the most appropriate pinching height to pinch tomato plants for optimum yield under rain-fed conditions.

Materials and Methods

The experiment was conducted during 2010 and 2011 cropping seasons (July – November) at the Niger State College of Agriculture, Mokwa ($9^{\circ} 18'N$ and $5^{\circ} 04'E$) with altitude of 378.0 m above the sea level in the Southern Guinea Savanna region of Nigeria. The experiment was laid out in a Randomised Complete Block Design (RCBD), replicated three times. The main - plot treatments consisted of two tomato varieties (Ibadan Local and Ife 1) obtained from the Department of Agricultural Technology, Niger State College of Agriculture, Mokwa. The seeds were sown on the prepared beds in the nursery. Watering was done every two days to supplement rainfall. The sub-plot treatments consisted of four different pinching heights (PH₁ served as control, PH₂ – 30 cm, PH₃ – 50 cm, and PH₄ – 60 cm. Each plot measured 2 m x 2 m and contained four ridges. The land was cleared and ridges were constructed at 75 cm apart manually. Seedlings were transplanted when they were four weeks old at an intra-row

spacing of 50 cm. Weeding was done thrice at 3, 6 and 9 weeks after transplanting (WAT). N.P.K.15:15:15 fertilizer was applied at the rate of 200 Kg/ha. Data were collected on average plant height (cm), number of flowers per plant, number of aborted flowers per plant, number of fruits per plant, fruit yield (t/ha). Other parameters included number of rotten fruit per plant, seed yield (kg/ha) and 100 – seed weight (g). All data collected were subjected to analysis of variance (ANOVA) using Minitab 14 statistical package. Means were separated using New Duncan Multiple Range Test (NDMRT) at 5% probability.

Results and Discussion

Plant height per plant

Statistical analysis showed that Ibadan Local and Ife 1 varieties were not significantly ($P \geq 0.05$) different from each other in 2010 cropping season, though Ife 1 had the highest value of 57.8. But in 2011 Ibadan Local was significantly ($P \leq 0.05$) different from Ife 1 variety (Table 1). In both years PH₁ and PH₄ treatments were not significantly ($P \geq 0.05$) different from each other but they were significantly ($P \leq 0.05$) different from PH₂ and PH₃ and the latter two were similar.

Number of flowers per plant

Variety did not significantly ($P \geq 0.05$) influence number of flowers in the two years of study. PH₄ was significantly ($P \leq 0.05$) different from other treatments and PH₁, PH₂ and PH₃ were at par in both years.

Number of flowers abortion per plant

In 2010 and 2011 cropping seasons the analysis of variance proved that both variety and pinching height treatments did not affect number of flowers abortion significantly ($P \geq 0.05$) (Table 2).

Table.1 Effect of pinching height on average plant height and number of flowers of tomato plant in 2010 and 2011 cropping seasons

Treatment	Plant height (cm)		Number of flowers per plant	
	2010	2011	2010	2011
Variety				
Ibadan Local	53.9a	58.6a	3.2a	7.8a
Ife	57.8a	48.7b	3.6a	5.2a
Pinching Height (cm)				
1	65.2a	67.5a	3.6b	5.2a
2	42.1b	44.7b	3.1b	4.9a
3	46.8b	49.9b	3.1b	5.0a
4	58.2a	61.9a	6.9a	7.5a
Interaction	ns	ns	ns	ns

Means followed by same letter (s) within a column are not significantly different at 5% probability (NDMRT)

* Pinching height treatments: PH₁ = Plants were allowed to grow normally (control); PH₂ = 30 cm; PH₃ = 50 cm; PH₄ = 60 cm.

Table.2 Effect of pinching height on number of flowers abortion and number of rotten fruits of tomato plant in 2010 and 2011 cropping seasons

Treatment	Number of flowers abortion		Number of rotten fruits/plant	
	2010	2011	2010	2011
Variety				
Ibadan Local	3.3a	4.2a	1.5a	2.2a
Ife	3.6a	3.9a	1.3a	1.8a
Pinching Height (cm)				
1	4.0a	3.8a	2.4a	2.1a
2	3.5a	3.5a	1.3a	2.0a
3	3.3a	3.6a	1.5a	1.8a
4	3.5a	3.6a	1.3a	1.9a
Interaction	ns	ns	ns	ns

Means followed by same letter (s) within a column are not significantly different at 5% probability (NDMRT)

* Pinching height treatments: PH₁ = Plants were allowed to grow normally (control); PH₂ = 30 cm; PH₃ = 50 cm; PH₄ = 60 cm.

Table.3 Effect of pinching height on number of fruits per plant and fruit yield ($t\ ha^{-1}$) of tomato plant in 2010 and 2011 cropping seasons

Treatment	Number of fruits per plant		Fruit yield	
	2010	2011	2010	2011
Variety				
Ibadan Local	13.3a	18.4a	2.5a	8.2a
Ife	5.4b	9.6b	1.2b	3.6b
Pinching Height (cm)				
1	5.5b	9.3b	0.4c	1.5c
2	7.6a	12.8a	0.8b	3.9b
3	9.2a	16.1a	1.6a	7.7a
4	9.9a	15.8a	0.7b	4.1b
Interaction	ns	ns	ns	ns

Means followed by same letter (s) within a column are not significantly different at 5% probability (NDMRT)

* Pinching height treatments: PH₁ = Plants were allowed to grow normally (control); PH₂ = 30 cm; PH₃ = 50 cm; PH₄ = 60 cm.

Table.4 Effect of pinching height on Seed yield (kg/ha) and 100–seed weight (g) of tomato plant in 2010 and 2011 cropping seasons

Treatment	Seed yield (kg/ha)		100 - seed (g)	
	2010	2011	2010	2011
Variety				
Ibadan Local	60.4a	65.1a	4.0a	3.9a
Ife	34.8b	42.8b	4.2a	4.1a
Pinching Height (cm)				
1	35.0c	25.9b	4.2a	4.5a
2	98.7a	77.6a	4.2a	4.9a
3	49.2b	75.4a	3.9a	4.8a
4	56.7b	78.9a	4.2a	4.3a
Interaction	ns	ns	ns	ns

Means followed by same letter (s) within a column are not significantly different at 5% probability (NDMRT)

Pinching height treatments: PH₁ = Plants were allowed to grow normally (control); PH₂ = 30 cm; PH₃ = 50 cm; PH₄ = 60 cm.

Number of fruits per plant and fruit yield ($t\ ha^{-1}$)

In both years Ibadan Local variety produced more fruits than Ife 1 significantly ($P \leq 0.05$). PH₂, PH₃ and PH₄ were not significantly ($P \geq 0.05$) different from each other but they proved their superiority over PH₁ (Table 3).

Table 3 shows that variety significantly ($P \leq 0.05$) influenced fruit yield weight. Ibadan Local significantly recorded heavier fruits than Ife 1 variety in both years of study.

PH₃ was superior to PH₁, PH₂ and PH₄ while PH₂ and PH₄ were significantly different from PH₁ treatment in both years of study.

Seed yield per plant (kg)

Table 4 shows that variety affected seed yield significantly ($P \leq 0.05$) in both years. Ibadan Local proved superior over Ife 1 with the mean value of 60.4 kg in 2010 and 65.1 kg in 2011 seasons, respectively. PH₂ was significantly ($P \leq 0.05$) different from others while PH₃ and PH₄ were significantly at par with each other, but proved their superiority over PH₁ in 2010 cropping season. Moreso in 2011 cropping season PH₂, PH₃ and PH₄ were not significantly ($P \geq 0.05$) different from each other but proved to be significantly different from PH₁. Variety X pinching height interaction did not affect seed yield significantly.

Variety and pinching height treatments did not significantly ($P \geq 0.05$) influenced 100 – seed weight in the two years of study. Variety X pinching height interaction did not significantly influenced seed yield.

The superiority of Ibadan Local over Ife 1 variety in respect of the number of fruits, fruit yield and seed yield agrees with Olaniyi (2009) who stated that tomato varieties differ in flowering ability due to differences in genetic make - up. The result from this study showed that pinched and un-pinched plants produced similar number of flowers in both years of study. In this present study, pinching height three (50 cm) had fruit yield that was significantly better than other pinching height treatments. Olaniyi *et al.*, (2010) reported that fruit yield per plant and total fruit yield significantly differed among varieties due to genetic differences.

Results of the study showed that pinching height two (30 cm) gave the highest seed yield of about 99 kg/ha in 2010 which falls close to the middle value of a range of 39.78 to 181.83 kg/ha reported by Jeffrey (2004). The average yield of over 65 kg/ha was

obtained in Ibadan Local in 2011 cropping season which falls at the lower value range reported by Jeffrey (2004) who agreed that seed may vary with variety, growing conditions and other factors.

It could be concluded from this study that pinching height three (50 cm) resulted in significantly having the highest fruit yield than other treatments. Pinching height two (30 cm) gave the best seed yield of 99 kg/ha. Both fruit and seed yields were higher in Ibadan Local compared to the other variety. From the result of this study, Ibadan Local is recommended for high fruit, seed yields and quality. For seed production of Ibadan Local, plants should be pinched at the height of 30 cm. The recommendation made can be adopted for the farmers that want to grow Ibadan Local variety within agro- ecological climate of guinea savanna of Nigeria.

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