

Full Length Research Paper

Influence of number of sucker per plant on the growth, yield and yield components of Plantain (*Musa sp*) in Ado-Ekiti, Nigeria

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Abstract

Field trials were conducted in the seasons of 2008/2009 and 2009/2010 at the experimental site of the Livestock development unit site of the Ekiti State Ministry of Agriculture Ado-Ekiti to investigate the overall effects of number of suckers that were allowed to grow with the main plantain plant on the growth yield and yield components of plantain. Frequent sucker removal was done to maintain the required number of suckers per plant to arrive at the following treatments: Zero sucker, one sucker, two suckers, three suckers and multiple suckers. Plant heights were highest in the multiple sucker plants while stem girths and number of green leaves at bunching were highest in the zero or one sucker plants. Complete sucker removal (Zero sucker) gave comparable yield and yield components records that were higher than either the three or multiple sucker plants. Observations showed that higher number of suckers led to reduced yield and yield components while taller and thinner plants were produced. It is thus recommended that sucker emergence in plantain production be reduced to the minimum to achieve optimum yield.

Key word: Plantain, suckers, growth, yield and yield components.

Introduction

Plantains and bananas represent the world's second largest fruit crop with an annual production of 129,906,098 metric tons (FAOSTAT, 2010). They rank as the fourth most important global food commodity after rice, wheat and maize in terms of gross value of production (INIBAP, 1992). About 70 million people are estimated to depend on *Musa* fruits for a large proportion of their daily carbohydrate intake (Swennen and Wilson, 1983).

Gross yield of banana per hectare depends on yield per plant and the number of plants per hectare (Challopadhay *et al.*, 1985). Productivity had been reported to increase with increasing density, but yield gains from increasing density decreases (Daniells *et al.*, 1985). It had been noted that increase in the planting densities is not a requirement to increase yield (kg ha⁻¹) linearly (Niels, 2009). Theoretically, there is less competition between plants within the optimal plant density. This could be achieved by minimizing mutual shading and overlapping of root zones. Interplant competition is increasing under higher plant densities (above 2000 plants ha⁻¹). Decrease in bunch weight has

been known to be more than average weight influenced by increasing plant density (Niels, 2009). Observations have shown that most banana growers often allow suckers to emerge and grow in multiple forms along the main banana plant leading to reduction in the overall yield per stand.

The study was designed to highlight the important effect of number of suckers per stand on the growth, yield and yield components of plantain (cook-able banana) in Ado Ekiti a South-western Nigerian location.

Materials and methods

The trials were conducted in the seasons of 2008/2009 and 2009/2010 at the experimental site of the Livestock development unit site of the Ekiti State Ministry of Agriculture Ado-Ekiti. Plantain suckers of minimum height and pseudostem girth of 50 cm and 15 cm respectively were planted in the field for the purpose of the experiment [Stover and Simmonds, 1987]. Suckers were planted in March of each year which marks the beginning of raining season in the study area. Water was adequately supplied in times of water stress to guard against any negative effect on the plant (Ademiluyi *et al.*,

2012). Emerged suckers were frequently cut off to maintain the required number of suckers per plant. The treatments were the number of suckers allowed to remain with the main plantain plant to make the following: Zero sucker; one sucker; two suckers; three suckers and multiple suckers. In the zero sucker treatments, no sucker was allowed to survive along with the main plantain plant. Also in the multiple suckers, suckers were allowed to emerge and grow naturally without interference with their growth and number. Side dressing of NPK fertilizer at the rate of 200g plant⁻¹ was applied after 8 weeks of planting. The experiment was laid out in a randomized complete block design. The height and girth of pseudostem as well as number of green leaves were measured at bunch shooting. Bunches were harvested a year after and the following yield and yield parameters were determined: bunch weight, number of fingers, finger weight per bunch, number of arms, number of fingers on the first basal arm, weight of fingers on the first basal arm, finger length, finger girth weight of

fingers on the last arm and number of fingers on the last arm.

All data collected were subjected to statistical analysis of variance (ANOVA) and means compared using the Duncan's multiple range tests.

Results

Table 1 shows the effect of number of suckers per plant on the height and girth of plantain pseudostem. The tallest plants were observed in plants with multiple suckers followed by three suckers and two suckers. The shortest plantains were recorded in the zero and one sucker per plant. Results obtained from pseudostem girth showed that zero or one sucker produced the biggest stem girth while the smallest was obtained from the multiple sucker plants. Numbers of green leaves at bunch shooting were identical and highest in the zero, one and two suckers per plant. The lowest number was recorded in the multiple suckers.

Table 1: Effects of sucker production on plant height, girth of pseudostem and number of green leaves

Treatments	Height of pseudostem(cm)		Girth of pseudostem (cm)		Number of green leaves at bunch shooting	
	2008/2009	2009/2010	2008/2009	2009/2010	2008/2009	2009/2010
Zero sucker	286.5c	290.0c	65.48a	65.60a	11.0a	11.4a
One sucker	299.2c	289.3c	64.63ab	64.85a	11.2a	12.1a
Two suckers	341.3b	349.5b	59.81b	53.98b	10.5a	11.3a
Three suckers	353.1b	351.8b	46.23c	43.45c	8.0b	7.4b
Multiple suckers	358.5a	372.1a	34.80d	31.51d	6.4c	5.6c

Means with the same letter(s) within column are not significantly different ($p=0.05$) according to Duncan multiple range test

The effects of sucker production on bunch weight and finger weight per bunch is presented in Table 2. The highest bunch weights were produced by stands without sucker (15.18kg plant⁻¹) and those with one sucker (14.68kg plant⁻¹) were not significantly different. The lowest bunch weight was produced by banana stands with multiple suckers. While banana stands with one sucker and those with two suckers gave comparable yield figures in both trials, stands with three suckers gave

significantly lower bunch weight. Finger weight produced by banana stand without sucker and those with one sucker were not significantly different but higher than the others. The lowest finger weight was recorded in the stands with multiple suckers. The finger weight produced by stands with one sucker and those with two suckers were not significantly different. Stands with three suckers however produced more number of fingers per bunch than the ones with multiple suckers.

Table 2: Effects of sucker production on bunch weight and weight of fingers per bunch (Kg)

Treatments	Bunch weight (kg)		Weight of fingers per bunch (kg)	
	2008/2009	2009/2010	2008/2009	2009/2010
Zero sucker	15.48a	15.60a	14.52a	14.82a
One sucker	14.63ab	14.85ab	13.39ab	14.01ab
Two suckers	13.81b	13.98b	12.21bc	13.20b
Three suckers	10.23c	10.45c	11.50c	12.02c
Multiple suckers	7.80d	8.51d	7.58d	6.92d

Means with the same letter(s) within column are not significantly different ($p=0.05$) according to Duncan multiple range test

Table 3 presents the effect of sucker production on number of fingers per bunch and number of arms per bunch. Number of fingers per bunch was highest in plants without sucker but not significantly different from those with one sucker. Banana stands with multiple suckers produced the least number of fingers per bunch. Number of fingers produce in stands with one sucker was higher than those with two suckers in 2008/2009 but similar in 2009/2010. Also while number of finger

observed in stands with two or three suckers were comparable in 2008/2009, those with two suckers were higher than those with three suckers in 2009/2010. Number of arms produced by zero, one and two sucker plants were comparable and highest. The lowest number of arms was recorded in the multiple sucker plants which was lower than the three sucker plants.

Table 3: Effects of sucker production on number of fingers and number of arms per bunch

Treatments	Number of fingers per bunch		No of arms per bunch	
	2008/2009	2009/2010	2008/2009	2009/2010
Zero sucker	35.0a	36.0a	9.0a	9.0a
One sucker	34.2a	33.1ab	8.5a	9.0a
Two suckers	28.5b	31.3b	8.3ab	8.2a
Three suckers	25.0b	27.4c	7.5b	7.0b
Multiple suckers	16.4c	19.6d	6.2c	5.6c

Means with the same letter(s) within column are not significantly different ($p=0.05$) according to Duncan multiple range test

Table 4 shows the effect of sucker production on the weight and number of fingers on the first basal arm. The weights of fingers in the first basal arm were highest in the banana plants without sucker but not significantly different from those with one sucker. Plants with two and three suckers produced similar finger weights in the first basal arm. Multiple sucker production produced the

lowest finger weights in the first basal arm. Number of fingers in the first basal arm was identical in the No sucker, one sucker and two suckers except in 2009/2010 when fewer number was produced in two sucker production. The least finger was produced in the multiple sucker production but not significantly different from three suckers.

Table 4: Effects of sucker production on weight and number of fingers on the first basal arm

Treatments	Weight of first basal arm (kg)		No of finger on the first basal arm	
	2008/2009	2009/2010	2008/2009	2009/2010
Zero sucker	3.75a	3.71a	9a	9a
One sucker	3.69a	3.65a	9a	9a
Two suckers	2.39b	2.58b	8ab	7bc
Three suckers	2.20bc	2.52b	7bc	7bc
Multiple suckers	1.96c	1.8c	6c	6c

Means with the same letter(s) within column are not significantly different ($p=0.05$) according to Duncan multiple range test

Finger length and girth as affected by sucker production is presented in Table 5. The longest fingers were produced in both zero and one sucker production while the shortest fingers were recorded in the multiple and three sucker productions. Finger length was higher

stands with two suckers than those with three suckers. While girths of fingers were identical in Zero, one and two sucker per stand, multiple and three suckers produced smaller girths. The least girth was recorded in the plantain plants with multiple suckers.

Table 5: Effects of sucker production on finger length and finger girth (cm)

Treatments	Finger length (cm)		Finger girth (cm)	
	2008/2009	2009/2010	2008/2009	2009/2010
Zero sucker	31.3a	33.1a	19.1a	19.5a
One sucker	32.2a	32.5a	18.5a	17.9a
Two suckers	26.5b	30.3b	18.2a	18.0a
Three suckers	24.2bc	23.4c	15.4bc	15.6b
Multiple suckers	22.5c	21.7c	13.1c	12.5c

Means with the same letter(s) within column are not significantly different ($p=0.05$) according to Duncan multiple range test

Weight and number of fingers in the last arm are presented in Table 6. Zero sucker and one sucker production resulted to the highest weight of last arm of plantain. The weight of last arm was consistently lowest in the multiple sucker production in the two trials. The number of fingers in the last basal arm also showed that

highest number fingers were recorded in the zero and one sucker per plant. While the least number of fingers in the last arm was produced in multiple suckers in 2008/2009, two, three and multiple suckers produced identical number of fingers in the last arm that were lower than both the zero and one sucker productions.

Table 6: Effects of sucker production on weight and number of fingers on the last arm

Treatments	Weight of last arm (kg)		Number of fingers on the last arm	
	2008/2009	2009/2010	2008/2009	2009/2010
Zero sucker	0.95a	0.79a	3.0a	2.8a
One sucker	0.91ab	0.75a	2.8a	2.9a
Two suckers	0.75b	0.54b	2.5bc	1.5b
Three suckers	0.52c	0.34d	2.2c	1.4b
Multiple suckers	0.16d	0.30d	1.2d	1.4b

Means with the same letter(s) within column are not significantly different ($p=0.05$) according to Duncan multiple range test

Discussion

This trial has clearly shown that the number of suckers allowed to grow alongside the main plantain plants significantly affected the growth and overall yield of plantain in the study area. The more the number of suckers per plant, the lower the yield obtained. While taller plants were obtained in the multiple suckers than the zero or one sucker plants, bigger stems and higher number of leaves were obtained from the zero or one sucker plants when compared with the three or multiple sucker plants.

Taller plants obtained under the multiple suckers corroborate the findings of Sarrwy, *et al.* (2012) who reported that closer spacing recorded maximum plant height, while the wider spacing recorded minimum plant height. Also, Ahmed and Mannan (1970), Robinson and Nel (1988), Khodaer (1999) and Abdallah *et al.* (2010) reported that highest pseudostem occurred under higher planting densities. The taller plants observed in the multiple suckers probably reflects the effect of competition between the main plant and the growing suckers. However, girths recorded under the zero sucker or one sucker were higher the multiple of three sucker plants. Athani *et al.* (2009) had reported higher vegetative growth parameters in the wider spacing and lower in the closer spacing. The effect of multiple suckers in the present study is similar to those of closer spacing as multiple suckers is indicative of higher plant density.

Number of green leaves at bunch production indicated that multiple sucker plants which had shown taller plants produced fewer number of leaves when compare with the zero or one sucker plants. There had been conflicting reports on the effects of plant population density on number of leaves at bunching. While Robinson and Nel (1988) reported an increased total leaf numbers at higher plant density, Saleh (1988) and Khodaer (1999) reported that plant population per unit area had no effect on number of leaves at bunch shooting.

The results obtained from bunch weight, finger weight and number of fingers per bunch and other yield factors consistently showed that multiple sucker plants performed lower than either the zero or one sucker plants. These results agree with those earlier reported that average bunch weight increased with decreased planting densities (Robinson and Singh 1974, Kesayan *et al.* 2002, Nalina *et al.* 2003 and Abdallah *et al.* 2010). It had also been pointed out that manipulation of plant spacing gave direct influences on plantain finger size (Odeke *et al.*, 1999). Lower yield and yield factors recorded in the three and multiple sucker plants probably reflects the effect of competition for the available plant nutrients in the soil environment. While fewer sucker plants will make effective use of the available nutrients, multiple suckers will share the nutrients competitively with the main plant. It had been suggested that yield (kg ha⁻¹) increases do not anymore increase linearly with increasing planting densities (Niels, 2009).

The results from the present study clearly show the importance of frequent removal of emerging plantain suckers to reduce competition with the main plant in

order to enhance optimum performance in the study area. Since the zero sucker and one sucker per plant gave similar bunch weight and finger weight, it is suggested that suckers should be reduced to one per plant to ensure higher yield.

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