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Age of seedling at transplanting influenced growth and fruit yield of sweet pepper (*Capsicum annum* L. cv. Rodo)

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ABSTRACT

Field experiment was conducted at the teaching and research farm of the University of Agriculture, Abeokuta to evaluate the effect of variations in the age of nursery seedlings on growth and fruit yield of sweet pepper. The seedlings were transplanted at different ages viz. 8, 10, 12 or 14 weeks after nursery sowing (WAS). The seedlings were arranged according to their respective ages in a randomized complete block design (RCBD) with three replicates. Result of the experiment showed that the variation in the ages of the sweet pepper seedlings had significant ($p < 0.05$) effect on the subsequent plant height, leaf area, number of leaves and number of branches per plant. Pepper seedlings transplanted at 8 and 10 WAS produced larger leaves, greater number of leaves, more branches per plant, and also grew taller than the seedlings transplanted at 12 or 14 WAS. Variation in the seedling-transplanting age had no statistical significant difference on the fresh fruit yield (kg/ha). However, pepper seedlings transplanted at 8 and 10 weeks produced more fruits and higher fresh fruit yield per hectare than those seedlings transplanted at 12 and 14 WAS. Similarly, pepper seedlings transplanted at 12 and 14 WAS reached 50% flowering earlier than those transplanted at 8 and 10 WAS, thus gave better growth vigor and fresh fruit yield. It is recommended that pepper seedlings should not be left beyond 10 weeks in nursery before transplanting for optimum performance.

Keywords: Sweet pepper, nursery seedlings, transplanting age, fruit yield.

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INTRODUCTION

Pepper (*Capsicum* spp.) belongs to the family Solanaceae (Eshbaugh, 1980). There are about 23 species of peppers, but nearly all of the cultivated varieties belong to one of just four or five species. This family includes tomato, tobacco, eggplant and Irish potato. There has been much debate over years as to how many species of *Capsicum* truly exist. The numbers has fluctuated over the centuries from 1 to 90. Currently five species are recognized. Among these are *Capsicum annum*, *C. chinensis*, *C. pubescens*, *C. battacum, C. frutescens* (Kelley and Boyhan, 2006). Peppers are important vegetable crop all over the world especially in Nigeria. From 1950 to 1980, they were one of the major revenue sources of Nigeria and today serve as the world, most crucial and most used condiment (Showemimo and Olanrewaju, 2000). Pepper is one of the most varied and widely used foods in the world. From various aromas to tastes, they are important spice commodity and an integral part of many cuisines. Some are used in many sauce recipes. Dry pepper are eaten in powder form or macerated in oil. They are also made into a soft or oily paste (Columbus, 2001). Pepper has been credited with many numbers of useful cures and treatment, some of which are valid and some are probably more folklore. One medium green bell pepper can provide up to 8% of the recommended daily allowance of Vitamin A, 2% of Calcium and Iron. Additionally, pepper contains significant amount of A and B vitamins. Despite the wide

Table 1. Meteorological rainfall and relative humidity data in University of Agriculture, Abeokuta for the Year 2008.

Month	Total rainfall relative	Average maximum temperature (°C)	Average minimum temperature (°C)	Average humidity (%)
January	0.5	34.4	19.0	68.4
February	0.0	34.0	24.0	77.0
March	34.8	34.0	25.0	51.0
April	17.3	35.0	24.0	56.0
May	120.2	33.0	23.0	42.0
June	213.9	31.0	23.0	71.0
July	299.2	22.23	30.00	82.85
August	106.7	22.3	30.03	81.4
September	136.8	21.9	30.3	81.5
October	84.5	23.1	33.2	75.3
November	11.4	28.0	34.0	62.0
December	-	-	-	-

Source: Meteorological Station, Department of Agro-meteorological and water management, University of Agriculture, Abeokuta, Ogun State, Nigeria.

uses of pepper, it is still faced with some production constraint such as attack by diseases and pests. Seedlings of pepper are first raised in nursery before transplanting. It is done either with exposed root or by transferring the plant with the root ball intact. In order to increase pepper productions effects are being made to transplant pepper at different time to the field in order to observe the growth pattern and fruit yield from these pepper as transplanted. Responses of pepper to cultural practice have often varied with varieties. There is need for more information on this in order to determine the degree of importance of such variations. Adequate cultural practice such as clearing the bush, loosening of the soil (tilling) in order to increase the surface area for plant establishment must be provided for the crop to express its full growth and yield.

Therefore, the aim of this study is to determine the effect of different transplanting age on the yield and yield components of sweet pepper cv. Rodo.

MATERIALS AND METHODS

Experimental site/location

This experiment was carried out on the site opposite Cashew Plantation along COLANIM Farm at the University of Agriculture, Abeokuta, Ogun State, Nigeria. The experiment started during the raining season and run through the beginning of dry season (May to December, 2008). The annual rainfall during this period was about 1000 mm and average humidity was about 70% during the wet season (Table 1).

Experimental design

The experimental design was randomized complete block design (RCBD) in a split plot with four treatments (planting dates) and three replications. The main plot was 24 m × 17 m and each sub-plots was 5 m × 4 m. The land was manually cleared with hoe and cutlass, disc harrowed and ridged.

Transplanting

Four different transplanting periods were made during the course of this work, pepper seedling were transplanted two weeks interval ranges from the first transplanting date to the fourth transplanting date from the nursery to the field. Pepper seedlings were transplanted at 8, 10, 12 and 14 weeks, respectively.

Management practices

Pepper seedlings were raised in the nursery beds and transplanted into the field at the rate of one seedling per stand at intra-row spacing of 0.3 m and inter-row spacing of 1 m, transplanting of sweet pepper commenced at 8 WAS and ended at 14 WAS as highlighted above. Missing stands of the first three planting date were supplied at 14 WAS which was the transplanting time of the last sets of seedlings. The missing stands of the fourth planting date were supplied 2 weeks later. Weeding was done thrice; fertilizer application was in two rounds which were at the vegetative growth period and during the flowering period (reproductive stage) 8 weeks after transplanting at the rate of 100 kg/ha. Harvesting of ripe pepper fruits begins at 118 days after the first transplanting followed by continuous weekly harvesting of the fruits. At every week of harvesting the fresh weight of the fruits was weighed using electrical weighing balance in the laboratory.

Data collection

Data were collected on the vegetative and reproductive traits of pepper. The vegetative data collected includes numbers of leaves, numbers of branches, plant height and leaf area while the reproductive data includes days to 50% flowering, numbers of fruit per plot and weights of fruits per plot.

Data analysis

All data were subjected to analysis of variance (ANOVA) and significant means were separated using LSD at 5% level of

Table 2. Effect of age of seedling transplant on plant height and leaf area of sweet pepper cv. Rodo in 2008 at Abeokuta.

Sowing date/week after transplanting	Plant height per plant (cm)						Leaf area per plant (cm^2)					
	8 WAS	10 WAS	12 WAS	14 WAS	16 WAS	18 WAS	8 WAS	10 WAS	12 WAS	14 WAS	16 WAS	18 WAS
8 WAS	22.8	23.7	23.9	24.1	24.7	24.7	3.2	3.4	3.7	3.7	3.8	3.8
10 WAS	23.2	24.3	24.6	25.5	25.0	25.9	4.5	4.5	4.7	4.7	4.8	4.7
12 WAS	18.8	19.2	19.4	19.8	22.2	20.7	6.7	6.8	7.2	7.3	7.3	7.3
14 WAS	18.8	19.4	19.6	20.2	21.5	21.1	8.0	8.1	8.2	8.2	8.3	8.2
$LSD_{0.05}$	1.9	1.6	1.6	1.4	NS	NS	3.1	0.9	0.7	0.5	0.7	0.7

NS, Non Significant (P > 0.05); WAS, week after sowing.

Table 3. Effect of age of seedling transplant on number of leaves and branches of sweet pepper cv. Rodo in 2008 at Abeokuta.

Sowing date/week after transplanting	Number of leaves per plant						Leaf area per plant (cm^2)					
	8 WAS	10 WAS	12 WAS	14 WAS	16 WAS	18 WAS	8 WAS	10 WAS	12 WAS	14 WAS	16 WAS	18 WAS
8 WAS	21.7	21.8	22.5	27.3	25.2	26.1	1.9	2.3	3.2	3.9	4.2	4.7
10 WAS	35.1	37.0	42.2	46.2	50.4	52.7	2.3	3.0	3.9	4.7	4.5	5.1
12 WAS	22.6	22.4	22.9	26.0	23.1	23.7	1.3	1.6	2.6	3.6	3.2	3.9
14 WAS	30.5	30.0	32.5	32.9	32.0	32.6	0.9	1.3	2.1	3.0	2.7	3.1
$LSD_{0.05}$	NS	NS	NS	6.4	54.7	53.5	0.2	0.1	0.2	0.2	0.2	0.2

NS, Non significant (P ≤ 0.05); WAT, week after transplanting.

significance (SAS, 2003).

RESULTS

Statistical analysis of the results (Table 2) showed that variations in the relative sowing dates of sweet pepper had significant effect (P ≤ 0.05) on plant height (cm) at 8, 10, 12 and 14 weeks after transplanting (WAS) but had no significant effect at 16 and 18 WAS. The pepper plants whose seedlings were transplanted at 8 and 10 WAT grew taller than those whose seedlings were transplanted at 12 and 14 WAS. The pepper plants whose seedlings were transplanted at 10 WAS were the tallest (25 cm), while the pepper plants whose seedlings were transplanted at 14 WAS were the shortest (19.2 cm). Also, the results showed that pepper plants whose seedling were transplanted at 8 and 10 WAS had significant effect (P ≤ 0.05) on leaf area. Bigger leaf area was recorded on plants whose seedlings were transplanted at 12 WAS while the least was on plant whose seedlings were transplanted at 8 WAS. The LSD value showed that leaf area of pepper whose seedlings were transplanted at 14 WAS, were statistically significant (p ≤ 0.05) than the leaf area of pepper whose seedlings were transplanted at 8 WAS. The result (Table 3) showed that variations in the relative sowing dates of sweet pepper had significant effect (P≤ 0.05) on number of leaves at 14, 16 and 18 weeks after transplanting but had no significant effect at 8, 10 and 12 WAS. The pepper plants whose seedlings were transplanted at 10 WAS produced more leaves per plant than those whose seedlings were transplanted at 8, 12 and 14 WAS. Generally, pepper plant transplanted at 12 WAS produced the least number of leaves per plant. Statistical analysis of results in Table 4 also showed that variations in the relative sowing dates of sweet pepper had significant effect (P ≤ 0.05) on number of branches per plant. The pepper plants whose seedlings were transplanted at 10 WAS had the highest number of branch (5 branches) while those whose seedlings were transplanted at 14 WAS recorded the least number of branch (3 branches). Statistical analysis of the results showed that variation in the relative sowing dates of sweet pepper had significant effect (p ≤ 0.05) on number of fruits per plant, day to 50% flowering and days to first fruit harvest, but had no significant effect on weight of fruits per plant (g), fresh fruit yield (kg/ha), the pepper plants transplanted at 8 and 10WAS recorded the highest fresh fruit yield (kg/ha) as well as weight of fruits per plant (g) compared to those transplanted at 12 and 14 WAS.

DISCUSSION

The variations in relative sowing dates of sweet pepper showed that the pepper plants transplanted at 8 and 10 WAS established and grew well on the field due to early transplanting compared to the pepper plants transplanted at 12 and 14 WAS. This supports Waterer (1992) who

Table 4. Effect of age of seedling transplant on reproductive parameters (days to 50% flowering, days to first harvest, number of fruits per plant, weight of fruits per plant (g), weight per fruit (g), fresh fruit yield (kg/ha) of sweet pepper cv. Rodo in 2008 at Abeokuta.

Planting dates	Days to 50% flowering	Days to first harvest	Number of fruits per plant	Weight of fruits per plant (g)	Weight per fruit (g)	Fresh fruit yield (kg/ha)
8 WAS	90	115.7	3.9	7.8	2.0	274.8
10 WAS	83	102.7	3.2	6.5	2.1	226.5
12 WAS	70	91.3	2.7	5.8	2.0	196.5
14 WAS	64	82.0	2.4	5.0	2.1	170.5
$LSD_{0.05}$	2.05	42.0	0.23	NS	NS	NS

NS - Not Significant.

opined that poor performance of pepper may be attributed in part to poor early growth. Transplanting of pepper at younger age was better in performance especially in height and leaf area than those transplanted later. In the same vein, pepper transplanted earlier also gave higher number of branches and to some extent, higher number of fruits per plant except for weight of fruits. Higher fresh fruit yield also recorded in pepper transplanted earlier than those transplanted later. The result of this research work emphasized the significance of early transplanting of pepper because the transplanted plants must have recovered from transplanting shock before maturity and fruiting time, hence increment in yield (fruits) and yield components (branches, leaves and plant height). But on the other hand, pepper plants that were transplanted later reached 50% flowering by 16 days earlier than those transplanted earlier. This was in agreement with the findings of Larger and Hill (1991) who reported that flowering of pepper commences one or two months after planting and fruit should be ready for harvest one month later.

Conclusions

Based on the findings of this study, the following conclusions were made:

1. Sowing dates at age 8 and 10 WAS respectively for sweet pepper aid good vegetative growth and support good fruit yield.
2. Sweet pepper planted at either age 8 or 10 WAS is not likely to suffer drought while those planted at dates later than 10 WAS may likely suffer drought.

RECOMMENDATION

Ideal planting age for sweet pepper should be 8 WAS to ensure growth and yield in good quality. Commercial pepper production should not be carried out later than 10 WAS.

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