Effect of time of mulch application on the growth and yield of cucumber (*Cucumis sativus*) in Owerri, southeastern Nigeria

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Abstract

The broad objective of this study was to determine the effect of time of dry guinea grass mulch application on the growth and yield of cucumber plant. The experiment was conducted at the training and research farm, Federal University of Technology Owerri located between latitude 5º 27′ 50.23″ N and longitude 7º 02′ 49.33″ E and on an elevation above sea level of 55 m. Experimental results indicated no significant differences, in germination and emergence of planted seeds, week to first male and female flower appearance, number of branches/plant, weeks to first harvest, mean fruit weight, fruit length and fruit diameter. However, significant differences were observed in the number of male and female flowers 5 WAP for mulching 2 WAP and 3 WAP, number of leaves/plant, leaf area and number of roots close to soil surface at 5 WAP for mulching at planting, mulching 1 WAP, 2 WAP, and 3 WAP and these were significantly different from no mulch application and mulching at 4 WAP. There were significant differences in mean number of fruits per plant between mulching at planting (8.55) mulching 1 WAP (8.55), mulching 2 WAP (9.75), and mulching 3 WAP (9.55) and mulching 4 WAP (3.50) and no mulch application (2.25). Also, significant differences were observed in yield t/ha between mulching at planting (8.95 t/ha) mulching 1 WAP (9.10 t/ha), mulching 2 WAP (9.95 t/ha) mulching 3 WAP (10.05 t/ha) and the no mulch application, which had 5.25 t/ha and mulching 4 WAP (5.65 t/ha). [Life Science Journal. 2008; 5(1): 68 – 71] (ISSN: 1097 – 8135).

Keywords: time of mulching; cucumber growth and yield

1 Introduction

Cucumber (*Cucumis sativus*) is an important vegetable crop grown in the temperature and tropical zones of the world and it belongs to the guard family cucurbitaceae (Adams, 1992) but rarely grown in southeast Nigeria. It requires a stable warm temperature for good yield (Cobeil and Gosselin, 1990).

According to Struzina and Kromer (1989), the use of black plastic or rice straw mulch on cucumber plots produced higher yields and compensated additional costs of production input in Germany. Also Goyal and Allison (1983) reported that plastic mulch on cucumber increased production by 4.6 t/ha in Pueto Rico.

Mulching is a popular agronomic practice in agriculture and it has many advantages which include: to prevent loss of soil moisture, to control weeds by shading them and diseases by preventing soil contact with the plant foliage, to control soil temperature, either by keeping it cool or keeping it warm, to add to soil fertility and increase soil organic matter content when organic mulch is used and decay takes place. Some mulch materials such as the reflective mulches are efficient in repelling insects (AVRDC, 1990)

In southeastern Nigeria, growing of cucumber is rarely practiced because of its special ecological requirement with extreme temperatures, heavy rainfall and high humidity. All these hinder effective production practices of most crops in the area. However, for a cucumber (*Cucumis sativus*), the use of mulching was considered to help moderate the ecological problems. Thus, the effect of mulching on the growth and yield of cucumber in this area was studied.

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2 Materials and Methods

The experiment was carried out from 5th June to 20th September 2005, at the teaching and research farm Federal University of Technology, Owerri located between latitude 5º 27′ 50.23″ N and longitude 7º 02′ 49.33″ E and on an elevation of 55 m above sea level (Handheld Global Positioning System).

The study site had a mean annual rainfall of 2,190 mm, 91% relative humidity and mean minimum and maximum ambient temperature of 22 ºC and 32 ºC. Mechanical soil analysis of the experimental site showed that it had 88% sand, 10% clay and 2% silt and belongs to sandy loam in the soil textual class. The chemical soil analysis revealed that it had 2.23% organic matter, 0.03 total nitrogen, 8.4 ppm phosphorus and exchangeable bases Ca, Mg and K of 0.74, 0.36, 0.65 cmol/kg respectively. The soil reaction pH (H_2O) was 5.42.

A Randomized Complete Block Design (RCBD) with 4 replications consisting of 6 treatments made up of dry guinea grass (Panicum maximum) as the mulching material were used to conduct the experiment. The treatments were as the follows:

1. Mulching at planting,
2. Mulching one week after planting (WAP),
3. Mulching two WAP,
4. Mulching three WAP,
5. Mulching four WAP,
6. No mulch applied.

Mulching was done at the rate of 20 metric tones per hectare or 8 kg per experimental plot. Each plot measured 4 × 1 m with 1 m gap between each plot in a block and 2 m between blocks plus a 2 m guard area around the experimental site. This gave a total of 24 plots with experimental area of 462 m^2. A plant spacing of 60 × 100 cm was used. Twelve plants were grown in two rows of 6 each row per plot. Two times weeding was done in all plots at 2 WAP and 3 WAP with hoe. Staking was done 2 WAP with forked sticks.

Fertilizer NPK 15 : 15 : 15 at 200 kg/ha mixed with poultry manure (4000 kg/ha) were applied 18 days after planting (DAP) by side dressing. No insecticide or biocide was use rather handpicking of insects pests was carried out on weekly bases. The data collected were % emergence expressed as (Ng × 100)/Np, where Ng is the number of germinated emerged cucumber seeds and Np is the number of cucumber seeds planted, plant height was measured with rule at 2 WAP, 3 WAP, and 4 WAP, number of leaves per plant at 2 WAP, 3 WAP and 4 WAP on plot basis, leaf area (cm^2) using the formula Ogoke *et al* (2003), number of branches at 3 WAP and 4 WAP, number of flowers per plant at 50% flowering, number of fruits per plant, fruit length (cm), fruit diameter (cm), fruit weight (g), root pattern and total yield in /tha. Data analysis was determined using analysis of variance (ANOVA) as described by Wahua (1999).

3 Results and Discussion

3.1 General field observation

Germination and emergence of seeds in all the plots took place 4 – 7 DAP directly in the field and percent emergence was not statistically significant (Table 1).

3.2 Flower development of cucumber

Results (Table 1) show that there were no significant differences among the mulch treatments in terms of weeks to first male and female flowers appearance. Male flowers were produced 4 WAP while female flowers were produced a week later in all the treatments. This shows that the males were ready to fertilizer the female flowers as soon as they appear. From the results, the numbers of female flowers recorded were higher than the number of male flowers at 5 WAP and these were significantly different in mulching at 1 WAP, 2 WAP and 3 WAP respectively. This is important for fertilization and fruit development.

The time of mulching significantly affected plant heights of cucumber. Mulching at planting, 1 WAP, 2 WAP and 3 WAP had significantly longer vine length than mulching 4 WAP and the control no mulch (Table 1). The number of branches/plant and weeks to first harvest were not significantly different at 3 WAP, 4 WAP and 5 WAP (Table 1).

Results indicated that time of mulching influenced the number of leaves/plants and leaf area of cucumber at 3 WAP and 4 WAP (Table 2). Mulching at planting, mulching 1 WAP, 2 WAP and 3 WAP had significantly more number of leaves per plant and larger leaf area than the other treatments investigated in the experiment (Table 2). However, investigations showed that the number of roots per plant at 5 WAP were not significantly different whereas the number of roots close to the soil surface at 5 WAP were statistically significantly different from no mulch application and mulching 4 WAP. Mulching 2 WAP and 3 WAP had 17.50 and 16.25 number of roots close to the soil surface but were not significantly different from mulching 1 WAP (14.25) and mulching at planting (12.25) (Table 2). This may be attributed to search for nutrients by plant roots on the cool soil surface and nutrient abundance due to decayed organic matter and

Table 1. Effect of mulch application on flower development of cucumber in week after planting WAP

Treatments	Weeks to first		Numbers							
	Male flower	Female flower	Plant height (cm)			Male flower		Female flower		% emergence
			2 WAP	3 WAP	4 WAP	4 WAP	5 WAP	4 WAP	5 WAP	4 – 7 DAP
Mulching at planting	4	5	14.80	62.00	110.00	4.02	8.88	6.55	10.30	40.62
Mulching 1 WAP	4.5	5	13.90	57.30	106.50	3.99	7.98	8.05	12.55	37.46
Mulching 2 WAP	4	5	14.30	52.60	102.00	5.63	10.50	8.77	14.25	36.46
Mulching 3 WAP	4	5	13.50	54.00	106.00	5.24	10.30	8.47	16.25	38.54
Mulching 4 WAP	4	5	12.50	33.00	73.00	4.49	7.83	6.95	11.35	38.96
No mulch application	4	5	12.20	25.40	68.00	3.83	6.29	6.62	8.75	39.17
LSD (0.05)	NS	NS	NS	10.87	22.15	NS	1.21	NS	4.62	NS

NS: No significant

Table 2. Effect of mulch application on vegetative growth and root development in cucumber

Treatments	No of Branches/plant			Leaf of area (cm^2)					
	2 WAP	3 WAP	4 WAP	2 WAP	3 WAP	4 WAP	5 WAP	5 WAP	weeks to first harvest
Mulching at planting	3.89	5.46	14.50	11.44	29.68	31.30	24.20	12.5	6
Mulching 1 WAP	2.75	3.83	12.49	5.00	14.30	21.29	26.20	14.75	6
Mulching 2 WAP	3.17	4.10	12.69	9.67	26.61	30.11	24.50	17.50	6
Mulching 3 WAP	2.81	3.81	4.05	6.09	21.77	27.80	25.95	16.25	6
Mulching 4 WAP	2.45	3.49	10.25	5.28	11.75	18.99	24.60	10.25	6
No mulch application	2.25	3.25	7.75	3.50	9.24	15.14	23.48	9.25	6

NS: No significant

subsequent release of plants nutrients on the soil surface.

3.3 Horticultural characteristics and total yield of cucumber

Highly significant differences were observed in time of mulching of cucumber plants. Mulching 2 WAP and 3 WAP had higher mean number of fruits/plant and were significantly different from mulching 4 WAP and no mulch application but had no statistically significant differences between them and mulching at planting and mulching 1 WAP (Table 3). There were no significant differences among the treatments investigated in mean fruit weight, mean fruit length and mean fruit diameter.

Time of mulching had a significant effect on the total yield of the cucumber plant. Mulching 3 WAP (10.05 t/ha), 2 WAP (9.95 t/ha), 1 WAP (9.10 t/ha) and mulching at planting (8.95 t/ha) respectively had significantly higher yields than mulching 4 WAP (5.65 t/ha) and no mulch application (5.25 t/ha) (Table 3).

In summary the results of this experiment showed

Table 3. Effect of time mulch application on the yield and yield components of cucumber

Treatments	Mean No. of fruits/plant	Mean fruit weight (g)	Mean fruit length (cm)	Mean fruit diameter (cm)	Total yield (t/tha)
Mulching at planting	8.55	154.61	16.08	10.55	9.95
Mulching 1 WAP	8.55	130.66	18.09	10.61	9.10
Mulching 2 WAP	9.75	176.00	17.88	10.75	9.95
Mulching 3 WAP	9.55	186.13	17.57	10.91	10.05
Mulching 4 WAP	3.50	104.66	16.95	10.57	5.65
No mulch application	2.50	114.11	16.92	10.48	5.25
LSD (0.05)	3.51	NS	NS	NS	5.25

NS: No significant

that mulching had no significant difference in cucumber emergence, weeks to first male and female flower appearance, mean fruit length, fruit diameter and fruit weight these agreed with the report of Tran (1993). The result on yield also agreed with Tran (1993) that mulching affect the total yield of cucumber, but this experiment however investigated the time of mulching which significantly affected the total yield, number of fruits per plant, number of roots close to the soil surface, and number of branches per plant.

4 Conclussion

Mulching of cucumber in the rain forest zone of Nigeria should be targeted between planting time to 3 WAP to get reasonable yield since yield is the ultimate target of all farmers/producers of horticultural and agronomic crops.

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