Responses of okra (*Abelmoschus esculentus* (l.) moench) to different organic mulch materials in humid rainforest south western agro ecological zone Nigeria

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Abstract: Field experiment was conducted during the dry season of 2011 at the Lagos State Polytechnic, Teaching and Research Farm, Ikorodu, to evaluate the effects of different mulch materials on the growth and yield of okra. Three different organic mulch materials (dry grasses, banana leaves and wood shavings) were compared with control (with no mulch material) laid out in a Randomized Complete Block Design (RCBD) replicated three times. Results showed significant effects of mulch materials on the number of leaves, plant height at 4 and 6 weeks after planting (WAP), and number of flowers at 50% flowering, number of pods per plant at harvesting; while there was non-significant difference among the treatments on weight of harvested pods per plant. Therefore, it was concluded that Lagos okra farmers could applied organic mulch to obtain maximum okra growth and yield.

[Sanni, K. O. and Eleduma, A. F. **Responses of okra (*Abelmoschus esculentus* (l.) moench) to different organic mulch materials in humid rainforest south western agro ecological zone Nigeria.** *Nat Sci* 2014;12(1):93-95]. (ISSN: 1545-0740). http://www.sciencepub.net/nature. 14

Keywords: evaluate, growth and yield, mulch materials, significant effects, weeks after planting,

Introduction

In Nigeria, okra is an important fruit vegetable crop grown by small scale farmers under rain-fed conditions, while its economic important lies in the internal trade. Okra is grown in both wet and dry seasons but attracts a large profit during the dry season when the demand is often higher than of the limited supplies. As a result of low input system mostly adopted for okra production, green pod yield in most cases has been relatively modest.

Mulching is an effective method of manipulating crop growing environment to increase yield and improve product quality by controlling weed growth, ameliorating soil temperature, conserving soil moisture, reducing soil erosion, improving soil structure and enhancing organic matter content (Opara-Nadi, 1993; Hochmuth *et al*., 2001; Awodoyin and Ogunyemi, 2005). It has been reported that much of tomatoes, peppers, egg plants, strawberries and melons are produced under mulches in southern Florida (Hochmuth *et al*., 2001). However research information is scare on response of okra to mulch materials in Nigeria. Therefore, the objective of this study is to evaluate the effect of different organic mulch materials on the growth and yield of okra during dry season in Ikorodu agro-ecological (humid rainforest south western) zone of Nigeria.

Materials and methods

The experiment was carried out at Horticultural section of the Teaching and Research Farms, Lagos State Polytechnic, Ikorodu, Lagos State, Nigeria (Latitude 6°S 25°N and longitude 30°E) in 2010 cropping season. The land had been previously cropped with *Amaranthus* and tomatoes. The land was ploughed and harrowed twice to get a fine tilth and was marked into plots and total land area is 208m^2. Core soil sample were collected randomly on different 10 points of the site using soil auger and was properly mixed together. The soil was air dried, and analysed, the soil physio-chemical properties of the experimental site revealed that the soil was sandy loam and found to be slightly acidic (pH of 6.6) containing 1.26 % organic carbon, 0.10% total nitrogen, available P 59.94 (ppm), P 0.16 (Me/100g), Ca 1.00 (Me/100g), Mg 1.46 (Me/100g), Na 0.29 (Me/100g), Mn 16.8, (ppm), Fe 130.40 (pmm), Cu 3.40 (ppm), Zn 51.76 (ppm).

The okra seeds of NHAE 47 – 4 variety was used for the experiment and prior to planting viability test was conducted by soaking the seed in water, The okra seeds were planted 2 seeds per hole sown on 27th August, 2011 at a spacing of 60cm × 50cm to give 2 rows per plot. This was later thinned to one stand at 2 week after planting (Adesina and Idoko, 2013). After germination, supplying of missing stands was done 5 days after germination of the seeds. Mulching of the seed bed was done at 2 WAP and the crop was sprayed twice at a week interval with Lambda-cyhalothrin 25EC at 1.5gk/ha against insect pest. Harvesting started at about 54 days after planting (DAP) and the fruits were harvested at fresh succulent stage by twisting the stalks of the pods carefully so as not to damage both the pod and stem at a four days interval, the pods were counted and weighed immediately in the laboratory.

Data was collected on number of leaves, plant height at 4 and 6 WAP; number of flowers at 50% flowering, number of pods per plant at harvest and weight of pods per plant from ten randomly selected plants from each plot. Data collected was subjected to the analysis of variance procedure (ANOVA) using MSTAT-C statistical package and Least Significant Differences (LSD) test was used to separate means at 5% probability level (Steel and Torrie, 1980).

Result and Discussion

Effect of mulch materials on okra plant height, number of leaves at 4 and 6 WAP and 50% flowering is presented in Table 1. The result shows that plot treated with wood shaving mulch material had the tallest plant height at 4 WAP (23.4cm) and 6 WAP (33.76cm), followed by Banana leaves mulch and the shortest plant height obtained in control. Plant height was significantly ($P < 0.05$) influenced with mulch materials on okra at 4 and 6 WAP compared to control treatment. Number of leaves/plant was highest with Banana leaves mulch (4.85 leaves/plant) at 4 WAP, closely followed by wood shaving mulch material (4.57 leaves/plant) and the lowest in control plot, while at 6 WAP wood shaving produced the highest number of leaves (8.67 leaves/plant) closely followed by dry grasses (8.53 leaves/plant) and the least being control treatment (6.0 leaves/plant). Mulch materials significantly increased number of leaves at 4 WAP and were not significantly different at 6 WAP. Uniformity of flowering, as measured by 50 per cent flowering was significantly different ($P<0.05$). Result shows that okra plant mulched with dry grasses had maximum flowers (50.2), followed by okra plant mulched with wood shaving (36.75) and minimum flower recorded in control plot (29.75). Yield data revealed a significant ($P<0.05$) effect of different type of mulches (Table 2). Maximum yield was obtained from those plants which were grown under dry grasses and wood shaving mulch (13.75) followed by banana leaves mulch (12.5) while minimum yield (6.5) was obtained from control plots. Okra fresh fruit weight was significantly ($P<0.05$) affected by different type of mulches (Table 2). Maximum fruit weight (0.3kg) was observed in dry grasses mulch followed by wood shaving (0.25kg) and Banana leaves (0.21kg) mulch while minimum fruit weight (0.20kg) was measured in control plots.

Discussion

From the study it was observed that mulch type affected the growth and yield of okra. The increased in plant height observed in this study is consistent with the findings of Mamkagh, (2009) that covering the soil surface with mulch significantly increased plant height compared with bare soil, which might be due to the increased soil temperature (Tuli and Yesilsoy, 1997). Observations on plant growth showed that the okra plants mulched plots were generally tall, more vigorous and reached 50% flowering earlier than in the un-mulched plots. These results were agreed with those results obtained by Olabode *et al.* (2007). Kouwenhoven *et al*. (2002) reported that water use efficiency was enhanced with mulching. According to Sharma *et al*., (1990) higher moisture status increased root proliferation and thus enhanced availability of nutrients to crop roots. These also imply that greater moisture availability to mulched crop during the growing season helped to cope better with drought in mid and late season drought. The surface mulch favourably influences the soil moisture regime by controlling evaporation from the soil surface (Adekalu, 2008), improves infiltration (Jones and Sing, 2000) soil water retention (Anikwe *et al*., 2007 and facilitates condensation of soil water at night due to temperature reversals (Tisdall, *et al*., 1991). Mulches also promote crop development, early harvest and increase yields as found by Adekalu *et al.* 2008. The stunted performance observed under mulch is due to immobilization of soil N by the soil microbes caused by high C: N ratio in the shaving (Owaiye, 1983). The higher yield of okra recorded in the mulches, is a direct effect of improved soil nutrients, structure and moisture content, and reduced weed pressure (Opara-Nadi, 1993). The decomposition of the grass mulch makes for higher nutrient availability. The grass mulch with lower C: N ratio decomposed faster than the banana leaves and wood shaving and increased the soil organic matter for the plants' use. The C: N measures the rate of biodegradability of organic materials.

Table 1: Effect of mulch materials on plant height, number of leaves and 50% flowering

Treatment 4 WAP	plant height 6 WAP	plant height 4 WAP	no of leaves 6 WAP	no of leaves (cm)	50% flowering (cm)
Dry grasses	18.08	26.83	3.97	8.53	50.2
Banana leaves	20.27	30.42	4.85	7.85	28.25
Wood shaving	23.4	33.76	4.57	8.67	36.75
Control	14.94	21.58	3.57	6.0	29.75
SE±	0.59	1.87	0.19	1.87	2.08
LSD (P<0.05)	6.94	7.94	0.71	7.94	7.73

Table 2. Effect of mulch materials on okra yield

Treatment	number of pod/plant	weight of pod at harvest (kg)/plant
Dry grasses	13.75	0.30
Banana leaves	12.5	0.21
Wood shaving	13.75	0.25
Control	6.5	0.20
SE±	0.77	0.14
LSD (P<0.05)	2.86	0.10

Conclusion

The study had shown that mulch materials vary in their effectiveness on the performance of okra, to produce short-duration crops like okra; the use of dry grasses mulch material is adequate, considering the ease of application, availability and long-term effects on soil.

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12/30/2013