EFFECT OF DIFFERENT IN-SITU LIVE MULCHES ON GROWTH AND YIELD OF COCOYAM IN OBIO AKPA SOUTH EASTERN NIGERIA.

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ABSTRACT

Field experiment was conducted at Akwa Ibom State Teaching and Research farm, Obio Akpa Campus in 2018. The objective of the study was to assess the effect of different In-situ live mulches on the growth and yield of cocoyam. The experiment was laid out in a Randomized Complete Block Design (RCBD) and replicated three times. The treatments were four live mulches - Melon, Sweet potato, Fluted pumpkin, Cantaloupe and control (No live mulch). Growth and yield data collected were subjected to analysis of variance. Significant means were compared using least significant difference (P<0.05) at 5% probability. Result showed significant differences in the leaf area, height of plant, yield and yield components in the treatment plot with melon. The plot with melon + cocoyam had total cocoyam yield of 29.84t/ha, followed by 26.10t/ha from the control treatment plot. The plots with fluted pumpkin + cocoyam and cantaloupe + cocoyam had 22.67t/ha and 24.31t/ha total yield respectively while the plot with sweet potato + cocoyam had the least yield value of 18.39t/ha. The study recommended melon + cocoyam as the most suitable live mulch combination for Cocoyam (*colocasia esculenta*) in obio akpa, South-eastern Nigeria.

Keywords: - Live Mulches, cocoyam, melon, sweet potato, cantaloupe

INTRODUCTION

Cocoyams are herbaceous perennial plants belonging to the family Araceae and are grown primarily for their edible roots, although all parts are edible. Cocoyam refers to two members of the Araceae family namely *Colocasia esculenta* (L. schott) and *Xanthosomonas sagitifolium* (L. schott) in the sub family Colocasoidae. They are important staple foods for many people in developing countries of Africa, Asia and Pacific. In other parts of the world, the species of *Colocasia esculenta* may also be referred to as taro or old cocoyam while species of *Xanthosomonas sagitifolium* is reffered to as tannia or new cocoyam (Manner and Taylor, 2010; Lebot, 2009). In the Pacific island countries where taro is widely grown and consumed, two botanical varieties of *Colocasia* have been recognized as C*olocasia esculenta var. esculenta*, often called dasheen and *Colocasia esculenta var – antiquorum* often called eddoe. The dasheen varieties have large central corms with suckers and stolons; whereas eddoes have a relatively small central corm and a large number of smaller cormels (Purseglove, 1972).

Cocoyam ranks third in importance after cassava and yam in extent of production among the root and tuber crops of economic value in Nigeria (FAO, 2005) and provides cheaper yam substitute, especially during periods of food scarcity. Nigeria is the largest producer of cocoyam in the world, accounting for about 37% of total world output (FAO, 2007; NRCRI, 2009) and over 70% of production in West Africa.

From 0.73 million metric tonnes in 1990, cocoyam production in Nigeria rose to 3.89 million metric tonnes in 2000 (Ojiako *et al*., 2007) and further by 30.3% to 5.068 million metric tonnes in 2007 (FAO, 2007b). The world production of cocoyam is estimated at 11.8 million tons per annum (Vishnu *et al*., 2012), produced from about 2 million hectares with mean yield of 6.0 t/ha (Singh *et al*., 2012). Small holder production systems in developing countries account for most of the global cocoyam production that utilizes minimum external resource inputs (Singh *et al*., 2012).

Cocoyams have nutritional advantages over root and tuber crops (Lyonga and Nzietchueng, 1986). They have more crude protein than other roots and tubers and its starch is highly digestible because of the small size of the starch granules. The contents of calcium, phosphorus, Vitamin A and B are reasonable (Ojinnaka *et. al*., 2009.These nutritional attributes make it a good base for food preparation for infants and it has been shown that cocoyam starch can be incorporated in the development of weaning food which is highly digestible and accessible to low income earners (Oti and Akobundu; 2008). Cocoyam is also used mainly as food for humans and animals.

Nwosu (2017) reported that cocoyam is a big delicacy to many households within and outside the country, especially as it is eaten by low income farmers and is highly adapted for varying tillage practices and fertilizer requirements giving best growth and yield (Udounang, 2015). It has high productive capacity in intercropping systems and when intercropped with maize and melon gives best result (Udounang, 2015).

Mulching is the practice of covering the soil to make more favourable conditions for plant growth, development and efficient crop production. Technically, the term mulch means "covering of soil". There are types of mulches, which may be classified into two broad group namely; non-living mulch and living mulches.

Non-living mulches are residues from organic and inorganic sources that are used as ground cover for the main crop. Living mulches however are cover crops planted either with or after a main crop and maintained as a living ground cover throughout the growing season. Live mulches are extension of cover crops used to reduce soil erosion, suppress weeds, improve soil structure, retain soil moisture, add nutrients to soil (Hartwig and Ammon, 2002).

Though Nigeria has been rated highest producer of cocoyam in the world with 37% of total world production, little or nothing has been documented to show what percentage of Nigeria's cocoyam production has been cultivated through the use of live mulch practices considering its relative advantage. In furtherance to this, it is therefore pertinent to evaluate the growth and yield of cocoyam traditionally with various live mulches to ascertain the effectiveness and contribution of this traditional system of farming on cocoyam production.

MATERIALS AND METHODS

The study was conducted at the Akwa Ibom State University Teaching and Research Farm in Obio Akpa. The farm is located on latitude 4^0N 59^0 and longitude 74^0 and 94^0 E. The area has a mean annual rainfall of 2000mm – 2500mm (Slus – AKS, 1989) with a binomial rainfall starting in the month of March and ending in the month of November with a short period of relative moisture stress in August referred to as the ''August break''. The annual temperatures are uniformly high with an average of about 27^0 Cand being highest in the months of February through April.

The experiment was laid out in a randomized complete block design with three replications. The treatments were four live mulches – Melon + Cocoyam, Sweet potato + Cocoyam, Fluted pumpkin + Cocoyam, Cantaloupe + Cocoyam and Control (Cocoyam only).The treatment plots measured 3m x 4m. The cocoyam setts with the average weight of 0.3kg were planted on the crest of the ridges at 1x1m spacing giving a plant population of 10,000 stands per hectare. The melon, fluted pumpkin, cantaloupe seeds and sweet potato vines were planted between the rows of cocoyam as live mulch. Fertilizer was applied to the crops at 8 weeks after planting. Weeding was done manually three (3) times at 3, 8, 12 weeks after planting. Harvesting of the melon, cantaloupe, pumpkin was done at 4months while the cocoyam was harvested at 8 months after planting respectively.

The following parameters for growth and yield of cocoyam were collected – height of plant, leaf area, number of leaves, stem girth for growth parameters; weight of corms, weight of cormels, number of cormels, length of cormels, diameter of cormels for the yield parameters.

The data collected were subjected to Analysis of Variance and the means were separated using the LSD at 5%probability level.

RESULTS

The result showed significant differences ($P<0.05$) in the height of cocoyam with the various mulch used at 4 and 6 months after planting (Table 1). At 2 Months after Planting (MAP), cocoyam + Sweet potato gave the highest height of cocoyam. This was followed by cocoyam + cantaloupe and the least recorded height was obtained with fluted pumpkin when compared to the control treatment. The result however changes subsequently at 4 and 6 MAP with cocoyam + melon giving the highest height of 46.33cm and 68.70cm respectively. The least result was recorded with cocoyam + sweet potato and cocoyam + cantaloupe at 4 and 6 MAP when compared with the control with values of 36.40cm and 54.30cm respectively. The effect of live mulches on the leaf area of cocoyam is shown in table II. The result showed a significant difference ($P<0.05$) at 2, 4 and 6 MAP on the various live mulches used. At 2,4 and 6 MAP, cocoyam + melon gave the highest values of 284.69cm^2, 370.09cm^2 and 509.40cm^2 respectively. This was followed by cocoyam + fluted pumpkin at 2 MAP and cocoyam + cantaloupe at 4 and 6 MAP. The least recorded value was obtained with cocoyam + Sweet Potato with values of 224.16cm^2, 295.89cm^2 and 381.70cm^2 at 2, 4 and 6 MAP. Table III shows the effect of different live mulches on the number of leaves of cocoyam at 2, 4 and 6 MAP. There was no significant difference ($P<0.05$) at 2, 4 and 6 MAP on the number of leaves of cocoyam. However, cocoyam + fluted pumpkin gave the highest recorded values of 5.29, 5.47 and 5.49 at 2, 4, 6 MAP. The least value was obtained with cocoyam + melon at 2 MAP with value of 5.22, whereas, cocoyam + cantaloupe gave the least value of 5.10 and 5.30 respectively at 4 and 6 MAP. The effect of live mulches on the stem girth of cocoyam is shown in Table IV. The result showed no significant difference ($P<0.05$) at 2, 4 and 6 MAP. The highest value of the stem girth was recorded with cocoyam + Fluted pumpkin at 2and 4 MAP with the values of 5.64cm and 5.99cm whereas cocoyam + melon gave a higher value of 9.25cm at 6 MAP. The least value of 5.07cm, 5.89cmand 8.16cm were obtained with cocoyam + sweet Potato at 2, 4 and 6 MAP when compared with the control treatment. The effect of various live mulches on the yield and yield component of cocoyam is shown in Table V. The result shows significant difference in the number of cormels per plant, corm yield (t/ha), cormels yield (t/ha) and the total yield (t/ha). However, number of corms per plant shows no significant difference with the various live mulch used in the study. Cocoyam + melon gave the highest number of corms per plant with the value of 1.30. The least number of corms per plant was obtained with cocoyam + cantaloupe with the value of 1.08 when compared with the control. Cocoyam + melon gave the highest value of 5.50 of number of cormels whereas cocoyam + sweet potato gave the least value of 3.61 in comparison with the control treatment. Corm yield recorded an increase in value with cocoyam + melon with the value of 10.29t/ha. The least value of the corm yield was obtained with cocoyam + sweet Potato (6.33t/ha). Cormels yield recorded an increase with cocoyam + melon (19.55t/ha) as opposed to the least value of 12.06t/ha obtained with cocoyam + sweet potato when compared with the control. The total highest yield obtained (29.84t/ha) was recorded with cocoyam + melon whereas the least total yield of 18.39 was obtained with cocoyam + sweet potato. Generally, yield and yield components are highly favoured by cocoyam + melon combination of live mulch and the least is obtained with cocoyam + sweet potato live mulch combination.

DISCUSSION

The result of the study shows that live mulch enhances as well as improved the growth and yield components of cocoyam. The combination of cocoyam + melon has been found to greatly enhance growth and yield of cocoyam as opposed to the others. Live mulch combinations such as cocoyam + sweet potato and cocoyam + fluted pumpkin however performed below when compared with the control treatment. it could however be deduced that the higher growth and yield recorded by the cocoyam + melon combination came as a result of the ability of the melon to smoother the weeds earlier following its rigorous growth pattern, soil conservation capability and the ability to complete its life cycle earlier and within the three months in comparison to sweet potato and fluted pumpkin. The ability to complete life cycle implies the deposition minerals and nutrients resulting from the dead and decay of the plants. The cocoyam on the contrary will make adequate use of the minerals and nutrients earlier too, even at the peak of its growth and development period. Apart, the sweet potato and fluted pumpkin are heavy feeder and would have the propensity to compete with the available major nutrient depositions in the soil instead of addition to complement the existing nutrient for the development of the cocoyam. This observation agrees with the findings of Ikeh (2010) that melon, cowpea and ground nut serves the best live mulch in root and tuber crops. The observation further agrees with Ikeh *et al* (2017) and Udealor (2002) that some cover crops compete for nutrients and other growth resources with the main crop; that the competition becomes more pronounced as the population of the cover crops and live mulches increases. The different live mulches used in this study varied in terms of contribution to growth and yield of cocoyam in Obio Akpa due to differences in their morphology, earliness to growth and life cycle, hence the emphasis on the adoption of appropriate live mulch system for each crop. It therefore recommended that melon be adopted applied for cocoyam in Obio Akpa farming community.

CONCLUSION AND RECOMMENDATIONS

The evidence in the research indicates that the combination of melon + cocoyam with the melon as a live mulch, enhanced the growth and yield of cocoyam. The combination of sweet potato + cocoyam with the sweet potato serving as a live mulch, reduces the growth and yield of cocoyam.

It is therefore recommended that farmers in Obio Akpa should adopt melon as a live mulch combination with cocoyam for effective growth and yield of cocoyam.

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APENDIX

Table 1 – Cocoyam Height (cm) as influenced by Live Mulches

Live mulches	**2 MAP**	**4MAP**	**6MAP**
Control	32.71	39.74	60.49
Melon + cocoyam	32.75	46.33	68.70
Sweet potato + cocoyam	34.18	36.40	56.30
Fluted pumpkin + cocoyam	32.29	37.40	56.70
Cantaloupe + cocoyam	33.47	36.75	54.30
LSD (P< 0.05)	**NS**	**3.61**	**2.47**

NS => Not Significant

Table 11 – Cocoyam Leaf Area (cm^2) as influenced by Live Mulches

Live mulches	**2 MAP**	**4MAP**	**6MAP**
Control	223.18	267.40	457.30
Melon + cocoyam	284.69	370.09	509.40
Sweet potato + cocoyam	224.16	295.89	381.70
Fluted pumpkin + cocoyam	231.75	321.00	418.51
Cantaloupe + cocoyam	229.49	331.47	478.51
LSD (P< 0.05)	**5.12**	**7.74**	**8.16**

Table 111 – Number of Cocoyam Leaves per plant as influenced by Live Mulches

Live mulches	**2 MAP**	**4MAP**	**6MAP**
Control	5.28	5.36	5.41
Melon + cocoyam	5.22	5.44	5.46
Sweet potato + cocoyam	5.28	5.40	5.48
Fluted pumpkin + cocoyam	5.29	5.47	5.49
Cantaloupe + cocoyam	5.27	5.10	5.30
LSD (P< 0.05)	**NS**	**NS**	**NS**

NS => Not Significant

Table 1V – Stem girth of Cocoyam (cm) as influenced by Live Mulches

Live mulches	**2 MAP**	**4MAP**	**6MAP**
Control	5.21	6.31	8.10
Melon + cocoyam	5.38	6.80	9.25
Sweet potato + cocoyam	5.07	5.89	8.16
Fluted pumpkin + cocoyam	5.64	5.99	8.34
Cantaloupe + cocoyam	5.20	5.95	8.60
LSD (P< 0.05)	**NS**	**NS**	**NS**

NS => Not Significant

Table V – Yield and Yield components of Cocoyam as influenced by Live Mulches

Live Mulches	**Number of Corms/Plants**	**Number of Cormels/ Plants**	**Corms Yield (t/ha)**	**Cormels Yield (t/ha)**	**Total Yield of Cocoyam (t/ha)**
Control	1.20	3.40	8.71	17.39	26.10
Melon + cocoyam	1.30	5.50	10.29	19.55	29.84
Sweet potato + cocoyam	1.10	2.71	6.33	12.06	18.39
Fluted pumpkin + cocoyam	1.11	2.80	7.56	15.11	22.67
Cantaloupe + cocoyam	1.08	3.61	8.01	16.30	24.31
LSD (P< 0.05)	**NS**	**1.75**	**2.09**	**2.38**	**2.55**

NS => Not Significant