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Effect of under Sowing Date of Melon under Sown to Maize and its Influence on Soil Properties

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ABSTRACT

The study examined the under sowing date of melon under sown to maize and its influence on soil properties. The field trial was carried out at the Faculty of Agriculture Teaching and Research Farm, Chukwuemeka Odumegwu Ojukwu University, Igbariam Campus. The experiment was laid out in a randomized complete block design (RCBD) with four replications. Data collected was subjected to T-test analysis and mean separation was done using LSD at 5% alpha level. The findings of the study showed that the tested parameters; plant height, leaf area, maize grain yield and soil properties assessed increased in mixed crop than the sole crop. The results suggest that under sowing melon under sown to maize at 2 weeks after maize establishment is an efficient and effective production system. Both the maize and studied soil benefited from the melon. The study clearly indicated that melon can be under sown to maize to maximize land use and higher productivity per unit land area.

INTRODUCTION

Soil is the best medium for all crop production systems in Nigeria, but most of the Nigerian soils especially the south eastern soils show nutrient deficiency problems after a short period of cultivation because of the fragile nature and prevailing environmental condition. The increases in population have led to intensive pressure on the available land and this has caused various degrees of soil degradation in the area. Therefore the need to take adequate measures to improve the decline in soil fertility while maintaining the productivity of the soil is very urgent as the rate of soil deterioration is on the increase and if not checked will have terrible impact on the future food demands of the teaming population. Under this situation farmers can enhance the low fertility status of their soils by using various kinds of leguminous crops within their land use practices. As poor soil quality is not desirable and economically cost effective for the growth of several crops like maize that is very exhaustive in nutrient utilization, especially now that the cost, non-availability, soil acidity and nutrient imbalance experienced in the use of chemical fertilizer have posed serious challenges to the maize production in the region. The leguminous crop when included in the crop mixture has the capacity of improving the nutrient strength of the soil, erosion, weed control and better performance of farm animals that may be fed on the maize forage supplement with the legume crops. Though the performance will depends on the digestibility of the fodder materials.

Sowing of a secondary crop underneath the primary crop is referred to as under sowing. The growing of two or more crops species simultaneously in the same piece of land is defined as intercropping (Ofori and stem 1987). This system, under sowing or intercropping allows both crops to develop at the same time, as the leguminous crop aims to cover the ground with a rapid growing dense layer of vegetation underneath the crop, both crops maybe taken to yield and one maybe there as a living mulch to check weed and erosion. The system tend to provide an efficient utilization of environmental resources, reduce risk to the cost of production, provides greater financial stability for farmers, reduce the incidence of pathogens and pest damages, improve soil fertility status through nitrogen increase to the system and improve forage yield and quality, increase soil organic matter, improve microbiological activities of soil leading to the liberation of plant nutrients, improve soil structure and water infiltration, nutrient recycling, reduces soil temperature, leaching, evapotranspiration and provide habitat for beneficial insects (Onwueme and Sinha 1991; Ayisi and Mposi 2001; Jiao et al., 2008; Akobundu,2010; Vallis et al., 2012; Esekhade et al., 2013; Nweke and Ijearu 2017). With views expressed, it then shows that a long term practice of leguminous crop in crop mixture will increase soil productivity.

Melon is one of the farmers' popular crops in southeast, Nigeria because of its adaptability to wide range of soils and can stand poor soil conditions better than most other crops due to its ability to fix soil nitrogen from the atmospheric nitrogen in association with rhizobium bacteria. The crop can be under sown in association with other crops in order to maximize land use and higher crop yield per unit land area. However, its compatibility with major food crops like maize needs to be properly assessed as to fully appreciate the impact. Thus, this study was designed to assess the effect of under sowing date of melon under sown to maize and its impact on the characteristics of the soil.

MATERIALS AND METHODS

Location

The study was carried out at the experimental farm of the department of Crop Science and Horticulture, Faculty of Agriculture Chukwuemeka Odumegwu Ojukwu University, Igbariam campus. Igbariam is in Anambra East Local Government Area of Anambra State and fall within the derived savannah zone of Nigeria and is located at latitude of 06 14'N and longitude of 06 45'E, the soils of the experimental area falls under the class of sandy clay loam, acidic and low in plant nutrient content (Nweke *et al*., 2014).

Land Preparation/Experimental design/Treatment application

The land area for the study was cleared with machete and debris removed. The field was then lined and pegged and marked into plots. The experiment was laid out in randomized complete block design (RCBD) with 16 plots, each plot measured 3m x 3m ($9m^2$), with a distance of 0.5m between plots and 1m apart between blocks. The total land area used for the study measured 11m x 21m (0.231 ha). The maize seed was planted two per hole at a spacing of 75cm x 25cm and at about 4cm depth and thinned down to one stand per hole 2 weeks after germination. The under sown crop - melon was planted 2 weeks after maize germination, two-seeds per hole NPK (15:15:15) mixed with urea (0.6kg NPK + 0.3kg Urea) was thoroughly applied as blanket treatment three weeks after planting using ring method to boast vegetative growth. At the end of the study, soil samples were collected from both sole crop plots and mixed crop plots. The soil samples were air dried and sieved through 2mm mesh and use for the determination of selected soil chemical parameters which was analysed based on the principles outlined by Black (1965). While core samples were used for the analysis of selected physical parameters of the soil.

Agronomic parameters measured were maize height leave area per plant and number of leaves per plant. Ten plants were randomly selected from each plot and used. At the maturity, the grain from the tagged plant per plot were harvested and dried to 12% moisture content. The grain harvested from the tagged plant was weighed to get the grain yield per plot. Data collected from the study was subjected to T-test

analysis, while treatment means were compared using least significant difference (LSD).

RESULTS

Table 1 showed the result of plant height, number of leaves, leaf area and maize grain yield. The result showed that intercrop plots had the highest values in these parameters when compared to the values obtained for sole maize. This indicated that melon under sown to maize influenced the tested parameters. The effect of melon under sown to maize on soil chemical properties indicated non-significant difference in pH, TN and available P (Table 2). Though higher values for pH and TN was observed in maize/melon (MCV), while sole maize (SM) show higher value in available P. Melon under sown to maize show percentage increase of 21.65% (OC), 20.80 (ECEC), 29.34 (Ca) and 32.35 (Mg) respectively over the sole maize.

The physical properties of the soil was equally improved with the under sowing of melon to maize. The values of BD, TP and HC (Table 3) obtained from MCV indicated that root proliferation and water transmission and all that dissolve therein, will be more effective in MCV of which invariable played out in the yield and yield component results of MCV compared to the SM result. Thus the under sowing melon to maize not only increased yield efficiency of maize, but both physical and chemical properties of the studied soil was enhanced.

Table 1: Effect of under sowing date of melon under sowing to maize growth parameters and grain yield of maize

Treatment	Plant Height (cm)	Number of Leaves/plant	Leaf area (cm^2)	Maize grain yield kg/plot
MCV	187.06	12.89	630.35	3.45
SM	157.99	11.92	544.27	1.53
LSD0.05	4.76	NS	16.56	1.02

Table 2: Effect of under sowing date of melon under sown to maize on selected soil chemical properties

Treatment	pH (H_20)	OC %	TN %	P $Mgkg^{-1}$	ECEC $Cmolkg^{-1}$	Ca $Cmolkg^{-1}$	Mg $Cmolkg^{-1}$
MCV	6.05	o.97	0.13	18.70	9.81	3.92	2.04
SM	5.86	0.76	0.12	19.60	7.77	2.77	1.48
LSD0.05	NS	0.26	NS	NS	1.25	0.52	0.17

MCV = Maize + *Colocynthis vulgaris* (intercrop)
SM = Sole Maize

Table 3: Effect of under sowing date of melon under sown to maize on selected soil physical properties

Treatment	BD gcm^{-3}	TP %	MC %	HC $Cmhr^{-1}$	AS %
MCV	1.22	50.42	40.12	7.90	25.17
SM	1.36	38.95	47.15	6.88	24.52
LSD0.05	NS	NS	3.39	0.65	NS

MCV = Maize + *Colocynthis vulgaris* (intercrop)
SM=SoleMaize

DISCUSSION

Maize performances in the under sowing system of cropping examined in this study gives evidence from the findings that the system statistically improved the maize performances and fertility status of the studied soil. The leaf area, height of the plant and grain yield of maize increased significantly on mixed crop compared to sole crop. The significant increase in plant height and leaf area was good for the mixed crop, for these parameters described the profitability of light interception in relation to mixed crop, because according to Reddy and Welley (1981) where the component of an intercrop are in direct competition for light increased total biomass production by the crop result to improved yield of which was observed in this study. The improvement in the nutrient status of soil observed from the study is an indication that melon is a critical component of productivity in intercrop systems. Cover crops maintain and improve soil productivity, increase organic matter content and microbiological activity that improve nutrient recycling, all these has resultant positive effect on the physical and chemical characteristics of the studied soil of which resulted in the increased maize yield recorded in the study.

CONCLUSION

The mixed crop performed better than the sole crop, this indicates that maize benefits from melon and also a cover crop which suppresses weed and therefore reduces weed competition and increased yield. Mixed crop production system is important where land is scare and cost of production is relatively high, it provides financial stability for farmers, more efficient utilization of environmental resources, suppresses weeds growth. Improve soil fertility, grain yield and quality of produce.

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