

# Effect of plant spacing on the growth and yield of forage plant, maize, intercropped with cowpea (*Vigna unguiculata* sub spp. *sesquipedalis*)

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## Introduction

Feed constraint is the most important impediment to improved livestock production in the Sub-Saharan African (SSA) countries (Agyemang 2003), as a result of seasonal shortages in the quantity and quality of forage from natural pastures that supply most of the feed for animals due to the prolonged annual dry season. Appropriate technologies to improve the performance of the local animal breeds and feed resources under the traditional system are generally lacking. Maize forms a major part of the cereal crops consumed by man and the residues serve as a source of fodder for livestock (Asawalam and Adesiyani 2001). Demand for maize has led farmers to reduce planting spacing. When crops are grown sole, spacing and planting pattern differ from when intercropped. Maize is known to be a very heavy soil nutrient utiliser and usually produces low yield in situations of low soil fertility and poor agronomic practices. Intercropping maize with legumes has shown prospects for improving maize crop yield and this would result in a reduction in the use of high cost synthetic fertilizers. The cowpea is an example of such legume and little work has been done on plant spacing for this crop in an intercropping system with maize. Plant spacing is an important agronomic attribute as it has effects on light interception which is the energy manufacturing medium of green parts of the plant (Ibeawuchi, *et al.* 2008).

## Materials and methods

The experiment was conducted at the Teaching and Research Farm of Abia State University Umuahia Campus

from the month of May to October, 2012. The routine soil analysis of 0-30cm depth (Mylavapus and Kennelley 2002) showed that it had pH (water) 4.50, total nitrogen (%) 0.06, organic carbon (%) 0.32, available phosphorus (mg / kg) 16.00, exchangeable K (cmol / kg) 0.035, exchangeable Mg (cmol / kg) 1.11, Clay (%) 11.40, Silt (%) 10.80 and Sand (%) 77.80. The treatments included two plant spacings (50x50 cm and 100x100 cm) either in sole or intercropped system viz: maize-cowpea 50x50 (MC50), maize-cowpea 100x100 cm (MC100), Sole maize 50x50 (SM50), Sole maize 100x100 (SM100). Three seeds of maize variety Oba Super 2 sourced from the National Seed Store Umudike were sowed per hole. The legumes were sowed in-between the maize stands along the rows at two seeds per hole. NPK 15:15:15 fertilizer was applied 4 weeks after planting (WAP) at 200 kg/ha. Six plants were randomly selected per plot for determination of growth and yield parameters. The parameters assessed included plant height (cm), stem girth (cm), leaf area per plant, leaf/stem ratio and total dry matter (t/ha). Data were subjected to analysis of variance using SPSS version 17 and means were separated and compared using Duncan's Multiple Range Test (Duncan, 1955).

## Results and Discussion

At week 5, there were significant differences ( $P<0.05$ ) in all the parameters measured except plant height (Table 1). At the 7th week, the intercrops had similar and significantly ( $P<0.05$ ) higher plant heights than the sole plots. Ibeawuchi *et al.* (2008) observed that there were no significant differences in plant height of maize hybrid except at the 6<sup>th</sup> week. Plant height as a growth and yield is vital for maize. This is

**Table 1. Effect of plant spacing and intercropping on the growth indices of maize at 5 (5WAP), 7 (7WAP) and 9 (9WAP) weeks after planting. Means on the same column with different superscripts are significantly different ( $P<0.05$ )**

Treatment	Plant height (cm)			Leaf area (cm <sup>2</sup> )			Stem girth (cm)			Leaf/Stem ratio	Yield (t/ha)
	5WAP	7WAP	9WAP	5WAP	7WAP	9WAP	5WAP	7WAP	9WAP		
SM100	17.1	42.8 b	58.6	190.7 b	552.4 b	603.2	3.7 b	8.11 b	7.4	0.28 c	1.15 c
SM50	20.6	52.4 ab	84.1	225.2 ab	928.5 a	701.3	4.1 b	8.39 ab	7.7	0.47 b	2.76 a
MC100	17.5	58.2 a	97.4	382.1 a	712.9 ab	765.4	5.7 a	9.11 a	8.2	0.48 b	1.89 b
MC50	19.5	58.3 a	97.6	342.1 ab	592.45ab	677.7	4.3 ab	8.33 ab	7.5	0.68 a	2.51 a
sem	1.9	5.41	9.74	33.64	74.17	71.0	0.5	0.80	0.78	0.08	0.22

because the taller a plant, the higher the amount of light energy absorbed by such plant and invariably, the higher the rate of photosynthate produced by the plant. The intercrops had higher stem girth values than in the sole plots. The trend for stem girth was such that the values were lower with greater plant (both maize and legume) population. This phenomenon might be due to closer spacing that leads to a degree of competition and etiolating. The findings from this study corroborate that of Rowland (1993) who found that narrow spacing in maize encourages plant growth with weak stems prone to lodging. Lower stem girth may pose an advantage in livestock feeding as it depicts less stem production which is lower in quality than leaves. At week 5, SM100 had lowest value for leaf area (190.66 cm<sup>2</sup>) while MC100 had the highest (382.06 cm<sup>2</sup>) while SM50 and MC50 had similar values that were in-between. This trend at week 5 could be as a result of soil moisture being retained in the intercrop at wider spacing. It would be expected that the intercrop at closer spacing (MC50) would have the highest value for leaf area but competition for light, water and nutrients may have prevented it. Afuakwa and Crookston (1984) pointed out that soil moisture is an important factor that affects leaf area of plants. Furthermore, at this vegetative stage, the maize plants did not have enough spread to combat the loss of soil moisture and hence the importances of an intercrop such as cowpea with good ground cover. Values for leaf/stem ratio ranged from 0.28 for SM100 to 0.68 for MC50. The trend for this parameter showed that greater plant population resulted in higher leaf/stem ratio. Any agronomic practice that positively influences leaf /stem ratio should be greatly encouraged as it is a very vital forage quality index since leaves have much higher feeding value than stems. SM50 and MC50 had similar values for herbage yield and their values were higher ( $P < 0.05$ ) than those recorded for the other treatments. This is obviously as a result of the greater plant population. The trend in the herbage yield indicates better use of land since inter-

cropping with cowpea was not detrimental to the maize herbage yield.

## Conclusion

This study has shown that plant spacing and intercropping with cowpea (*Vigna unguiculata* sub spp. *sesquipedalis*) had a significant influence on the performance of maize. The results obtained in this study showed that intercropping with cowpea (akidi) at wider plant spacing resulted in better growth indices of maize while herbage yield was higher in the plots with the narrow spacing.

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