FODDER YIELD OF COWPEA INTERCROPPED WITH WATERMELON UNDER BORDER IRRIGATION SYSTEM

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ABSTRACT
Cowpea/watermelon intercropping system can diversify farm income by providing multiple products for sale. The pattern reduces animal feed shortage during dry season and boost economic returns of farmers, making it a sustainable and profitable practice. Thus, an experiment was conducted to evaluate the forage yield of cowpea intercropped with watermelon under border irrigation system. The experimental plots were laid out in a randomized completely block design. The sowing arrangement/treatments consist of sole cowpea, cowpea intercropped with watermelon in intra rows (IR) and cowpea intercropped with watermelon in alternate rows (AR). Plant height, number of leaves and branches per plant, fresh forage yield and dry forage yield were recorded. Results indicated that, there was significant (P<0.05) difference in number of leaves (NL) and number of branches (NB) across all the treatments at 7 weeks after sowing. However, intercropping cowpea together with watermelon under alternate row spacing method recorded higher (P<0.05) NL (64.30) and NB (31.80) compared to sole cropping and intra row spacing method. Sowing cowpea with watermelon at alternate row spacing recorded higher (P<0.05) dry forage yield (0.35t/ha), followed by sole cropping (0.26t/ha) and then intra row spacing recording the least yield (0.21t/ha). It was concluded that cowpea can be intercropped successfully with watermelon under the alternate row spacing method for better forage yield in Sudan Savannah of Nigeria.
Keywords: Cowpea, Forage, Intercrop, Irrigation, Yield.

INTRODUCTION
Intercropping involves the growing of two or more crops simultaneously on the same land. This practice ensures efficient nutrient acquisition; reduced pests, diseases and weed damage; improved microbial diversity; and improved utilization of land resources (Mousavi and Eskandari, 2011). Intercropping system with legumes makes it possible to develop a sustainable system, as the legumes have an N-fixing capability and more protein-yielding potential in the form of either grain or forage (Maitra, *et al.,* 2019). Cowpea is one of such legumes crops that improve nitrogen uptake how availability by nodilation (Li, *et al.,* 2007, thus recommended for intercropping not only with cereal crops but also other crops such as watermelon (Nelson *et al.,* 2007) for better yield. However, it is observed that in intercropping system, the economic return is more imperative than yield to a farmer. For the benefit of African farmers, scientists identified pod borer resistant cowpea (SAMPEA 20-T) with in-built protection against Maruca damage, .An insect pest that causes the largest pre harvest damages (90% loss) to both grain and forage yield (Jackai *et al.,* 1986). The watermelon/cowpea intercropping system can be a specific and efficient cropping pattern as it contributes to the optimization of land use, efficient water use and reducing animal feed shortage during dry season. A lot of studies on intercropping of cereals with legumes on economic production with little or no information on the intercropping of legumes with vegetables (i.e watermelon) on forage yield of the legumes. Therefore, the study aimed to evaluate the best intercropping pattern in improving growth and forage yield of cowpea.

MATERIALS AND METHODS
Experimental Site
The field experiment was conducted at the Irrigation Site of the College of Agriculture and Animal Science, Division of Agricultural Colleges, Ahmadu Bello University, Mando-Road, Kaduna. The field is located at latitude of 10°35'N and longitude of 7°25'E (GPS, 2021).

Experimental design and treatments
A total land area of 187m^2 (11m x 17m) was used for the trial. The experimental plots were laid out in a Randomized Completely Block Design . The experimental plot was divided into 3 sub plots with 3 replicates, totaling 9 sub-sub plots with each measuring 5 m x 3 m (15 m^2) with 1m inter-row path and watering channels. The sowing arrangement/treatments were Sole Cowpea, Cowpea intercropped with Watermelon in intra rows (IR) and Cowpea intercropped with Watermelon in alternate rows (AR). Soil moisture meter was used to measure volumetric water content. Two seeds of the cowpea variety (SAMPEA 20-T) were sown per hole in rows at 20cm apart within the rows. Water melon seeds were sown per hole in rows at 120cm apart within the rows.

DETERMINATION OF GROWTH AND FORAGE YIELD COMPONENTS
Data collection began at five weeks after sowing when plant leaves were fully developed. The forage was sampled at 5 and 7 weeks post-emergence where five plants were randomly selected and tagged per plot for determination of various growth components and forage yield parameters using the standard procedure (Tarawali *et al*., 1995).

Statistical analysis
Data collected were analyzed using Repeated Measures ANOVA by General Linear Model (GLM) and treatment means were separated using Dunnetts test (SAS, 2003).

Results

Growth components of cowpea as affected by intercropping systems
Table 1 shows the growth components of cowpea as affected by intercropping systems. There was no significant (P>0.05) differences in plant height (PH) across the intercropping systems at 5 and 7 weeks after sowing (WAS). Moreover, there is significant (P<0.05) difference in number of leaves (NL) and number of branches (NB) across all the treatment at 7WAS. However, intercropping cowpea with watermelon using alternate row spacing method recorded higher (P<0.05) NL (64.30) and NB (31.80) compared to sole cropping and intra row spacing methods.

Table 1: Effect of intercropping systems on growth components of cowpea at 5 and 7 weeks after sowing

	Growth Component					
Intercropping system	Plant height (cm)		Number of leaves		Number of branches	
	5 WAS	7WAS	5WAS	7WAS	5WAS	7WAS
Sole cropping	18.40	25.40	19.10^a	51.90^b	6.70	25.20^b
Cowpea + Watermelon(A.R)	18.00	24.65	21.10^a	64.30^a	6.90	31.80^a
Cowpea + Watermelon (I.R)	14.20	21.95	21.95^b	10.40^c	33.30	13.70^c
SEM	3.27	2.51	2.52	3.99	2.78	2.60

^{abc}= Means with different superscript along the column differ significantly (P<0.05) = Week after sowing, A.R = Alternate row, I.R= Intra row, SEM= Standard error mean, PH= Plant height, NL=Number of leaves, NB, Number of branches

Fresh forage and dry forage yields of cowpea as affected by intercropping systems
The result of the analysis fresh forage yield (FFY) and dry forage yield (DFY) of cowpea as affected by intercropping systems in presented in Table 2. There was a higher (P<0.05) FFY of cowpea recorded when intercropped with watermelon using alternate row spacing compared to sole cropping and intra row spacing method. However, sole cropping and intra row spacing method recorded similar FFY. Hence, sowing cowpea with watermelon at alternate row spacing recorded recording higher (P<0.05) DFY (0.35t/ha), followed by sole cropping (0.26t/ha) and then intra row spacing recording the lowest yield (0.21t/ha)

DISCUSSION

Influence of intercropping systems on growth components and forage yield of cowpea
Intercropping of cowpea together with water melon under alternate row spacing method or system recorded higher number of leaves and number of branches compared with sole cropping and intra row spacing method. The results may be due to less competition for height, space and nutrients between the crop species. Intercropping system may lead to increase yield of either the main or both crops

(Prasad and Mhoan, 1995). Intercropping with legumes improves soil fertility and leads to better yield and economic returns (Lithourgidis *et al.,* 2011).

Table 2: Effect of intercropping systems on fresh and dry forage yields of cowpea

	Forage Yield	
Intercropping system	FFY (T/ha)	DFY (T/ha)
Sole cropping	0.35^{b}	0.26^{b}
Cowpea + watermelon (A.R)	0.48^{a}	0.35^{a}
Cowpea + watermelon (I.R	0.31^{b}	0.21^{c}
SEM	0.03	0.02

^{abc}= Means with different superscript along the column differ significantly (P<0.05), (WAS) = Week after sowing, A.R = Alternate row, I.R= Intra row, SEM= Standard error mean

CONCLUSION

It can be concluded that cowpea can be intercropped successfully with watermelon using the alternate row spacing method for better cowpea fodder yield.

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