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Nigerian Journal of Basic and Applied Science (June, 2012), 20(2): 125-129 ISSN 0794-5698

Full Length Research Article

# Effects of Inter and Intra Row Spacing on Growth Characteristics and Fodder Yield of Cowpea (*Vigna unguiculata* (L.) Walp. Var. Kanannado) in the Semi-Arid North-Western Nigeria

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**ABSTRACT:** A field trial was conducted during the 2009/2010 cropping season at the Usmanu Danfodiyo University Teaching and Research Farm at Dabagi to investigate the effects of inter and intra row spacing on the growth and fodder yield of Cowpea (*Vigna unguiculata* L. Walp Variety Kanannado). The treatments consisted of factorial combinations of three each of inter and intra spacing of 50, 75 and 100cm and 25, 50 and 75cm respectively. The treatments were laid in a Randomized Complete Block Design replicated three times. The result of the study showed that inter-row spacing influenced ($P<0.05$) stand establishment count and plant height while intra row spacing affected ($P<0.05$) stand establishment count, plant height, leaf width, number of leaves and canopy spread. Dry matter yield did not differ ($P> 0.05$) across the different spacing and the highest yield of 1020 and 970 kg $ha^{-1}$ were recorded for the widest inter-row and intra-row spacing of 100 and 75 cm respectively. It was therefore concluded that wider inter-row spacing of 100 cm and intra-row spacing of 75cm produced the highest dry matter yield with *Vigna unguiculata* L. Walp Variety Kanannado in the semi-arid region of north-western Nigeria.

**Keywords:** Plant Spacing, Growth Characteristics, Cowpea, Semi-Arid

## INTRODUCTION

In Nigeria the main sources of roughage feed for the ruminant animal remains the natural pasture, crop residues, weeds and browse plants. At least 30% of sub-Saharan Africa's significant populations of ruminant livestock are found in West Africa, where over 50% of cattle, sheep, goats and camels are raised in the semi-arid and arid zones. (Bourn *et al*., 1994). In the Sudano-Sahelian region availability of nutritious fodder is limited due to low and erratic rainfall and the long dry season extending from October to May (Sivakumar, 1990). Trends and projections for the region indicate that livestock numbers have risen and are likely to continue to do so. Human populations are likewise expanding rapidly, leading to increased demand for food and livestock products. Because of the limited potential for increasing the area under cultivation, this extra demand must be met through intensification. Increasing both the grain yield and the quantity and quality of crop residues of cowpea is an important option (Singh and Tarawali, 1997). Thus, cultivation of cowpea (*Vigna unguiculata* (L.) Walp.), which is the most widely cultivated food legume in semi-arid West Africa, where rainfall is scanty and soils are sandy and relatively infertile remains the best option (Ashly, 1993; Singh, 1994; Singh *et al*., 1997; Singh and Tarawali, 1997). Box screening for drought tolerance rated Cowpea (*Vigna unguiculata* (L.) Walp. Var. Kanannado) as highly drought tolerant (Singh and Matsui, 2011). This study therefore investigates the effects of inter and intra-row spacing on the growth and fodder yield of Cowpea c.v Kanannado in the semi-arid region of northwestern Nigeria.

## MATERIALS AND METHODS

The experiment was conducted during the 2009/2010 cropping season at the Usmanu Danfodiyo University Teaching and Research Farm ($13^0$ 1'N and $5^0$ 15'E). The experiment was a factorial combination of three inter-row spacing of 50, 75 and 100cm and three intra-row spacing of 25, 50 and 75cm. The treatments were laid in a Randomized Complete Block Design (RCBD), with three replications. The soil of the experimental site was prepared manually using hoe. The plots have a gross area of 3m x 4m ($12m^2$) size. Variety of cowpea (*Vigna unguiculata* var. Kanannado was sourced from the National Animal Production Research Institute (NAPRI) forage seed store at Shika, Zaria, Nigeria. Seeds were sown at the rate of 4-5 seeds per hole and later thinned to 2-3 plants per hole. Spacing adopted was for the various treatments. Stand establishment count was obtained by counting the number of established stands from the net plot area at 4 Weeks After Sowing (WAS). The heights of three randomly selected plants were measured in each plot. This was done by measuring the plant from the base up to the tip of the tallest leaf with a measuring ruler. The leaf length was obtained by measuring the leaf from the base of the leaf stalk to the tip, using a ruler. The leaf width was measured from the widest portion of the leaf using a ruler. The number of leaves per plant and canopy spread were taken from the three randomly selected plants. All the

parameters measured, except the stand establishment count were monitored at 4, 8 and 12 WAS. Fresh herbage yield was obtained by cutting all the plants in the net plots at about 8 cm above the ground and weighed with a pan scale. Samples were then oven dried at 80$^0$C to determine the dry matter weight (Harper, 1983). Data collected were subjected to analysis of variance and where means were significantly different, the Least Significant Difference was used for separation (ANOVA) using SAS (1988).

## RESULTS AND DISCUSSION

### Stand establishment count

Figure 1 presents the stand establishment count as affected by inter and intra-row spacing of cowpea (*Vigna unguiculata* Var. Kanannado). Both inter and intra row spacing tested in this experiment differed (P< 0.05). Inter and intra-row spacing of 50 and 25cm recorded the highest counts of 12.3 and 12.7% respectively. Widest inter and intra-row spacing (100 and 75cm) recorded the least counts of 3.6 and 3.0% respectively. Nakwada (2011) reported establishment counts of 37 and 34% for drilling method of sowing and at the rate of 40 kg ha$^{-1}$ of $P_2O_5$ application respectively in the same area.

### Plant height

Plant height differed (P< 0.05) for both inter and intra-row spacing at 4WAS. However, at the subsequent weeks plant height for the two spacing were similar (P>0.05). At the end of the trial, 12WAS, inter and intra row spacing of 50 and 25cm produced the tallest plants (20.9 vs 22.1cm) respectively (Figure 2). The mean plant height values recorded in this trial fall within the range of 15-80cm reported by Anon. (2011). Futuless *et al*. (2010) reported a mean value of 25.1cm for cowpea (*Vigna unguiculata* (L.) Walp in Mubi, Guinea savanna region of Nigeria. Umar *et al*. (2010) reported a mean plant height of 153.6 cm for Cowpea (*Vigna unguiculata* (L.) Walp. Var. Kanannado in the semi-arid of Kano that was grown to maturity. The values recorded in this study were comparable to the values reported for *Lablab purpureus,* a legume grown in the same area for seeds and fodder (Malami and Abdullahi, 2007; Malami and Sulaiman, 2007; Malami *et al*., 2010).

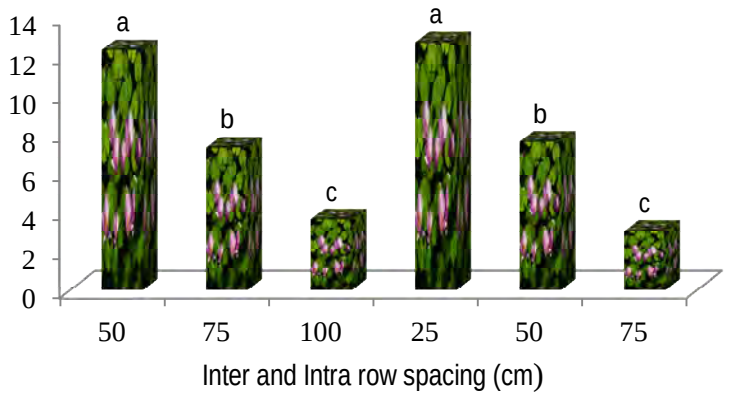


**Figure1:** Percent stand establishment count as affected by inter and intra-row spacing of Cowpea (*Vigna unguiculata* (L.) Walp. Var. Kanannado)

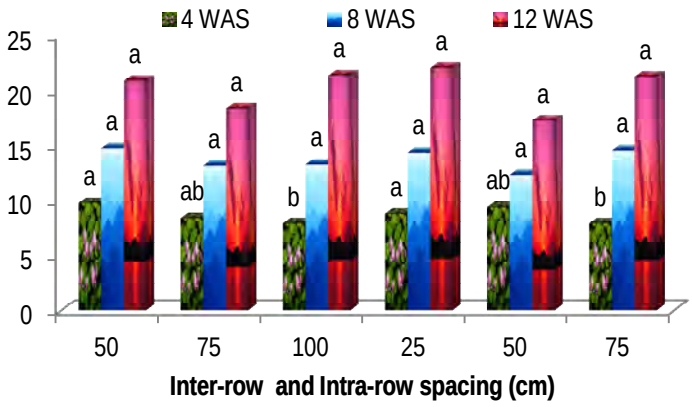


**Figure 2:** Plant height (cm) of Cowpea as affected by inter and intra-rows at 4, 8 and 12 WAS

**Leaf length**

Leaf length was not influenced (P>0.05) by the two spacing at all the weeks of investigations. The longest leaves (11.2 and 11cm) were produced at 75cm spacing of both inter and intra-row spacing respectively (Figure 3). These values fall within the range of 5-25cm reported by Anon. (2011). The values recorded in this study were higher than the values reported by Malami *et al*., (2010), comparable to the values reported by Malami and Abdullahi, (2007); Malami and Sulaiman, (2007), for *Lablab purpureus*, a legume grown in the same area for seeds and fodder.

**Leaf width**

Leaf width was significantly (P<0.05) affected at 4 and 12WAS for intra-row spacing. Inter-row spacing was however not affected in all the weeks of the study. At 12WAS the widest leaves of 5.9 and 6.3cm were recorded for inter and intra-row spacing of 75cm (Figure 4). The values reported in this study were higher than the mean of 3cm reported by Nakwada (2011) in the same area. The values recorded in this study were comparable to the values reported for *Lablab purpureus,* a legume grown in the same area for seeds and fodder (Malami and Abdullahi, 2007; Malami and Sulaiman, 2007; Malami *et al*., 2010).

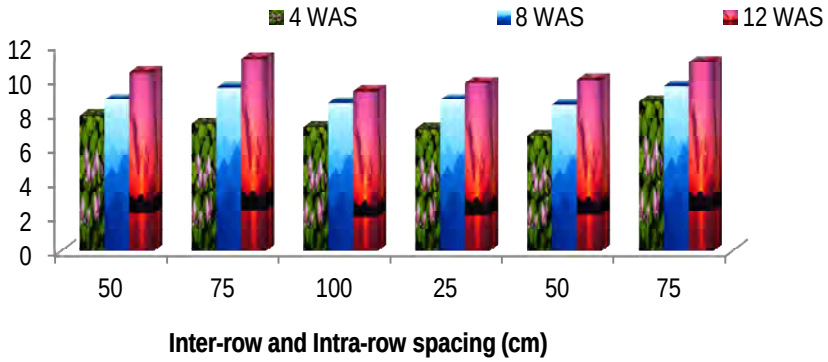


**Figure 3:** Leaf length (cm) of Cowpea as affected by inter and intra-rows at 4, 8 and 12 WAS

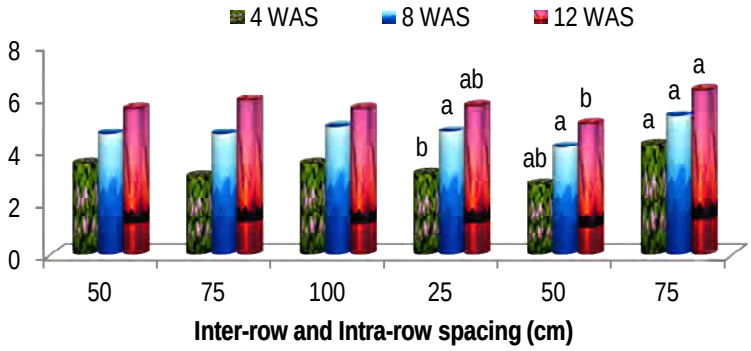


**Figure 4:** Leaf width (cm) of Cowpea as affected by inter and intra-rows at 4, 8 and 12 WAS

**Number of leaves**

Number of leaves per plant was influenced (P<0.05) by intra-row spacing at 8 and 12WAS. However, inter-row spacing did not affect (P>0.05) the number of leaves per plant at 4, 8 and 12WAS. The highest mean number of leaves recorded for inter and intra-row spacing at 12WAS were 112 and 127 at 50 and 75cm respectively (Figure 5). Umar *et al*. (2010) reported a mean value of 141 for Kanannado cowpea variety at Kano in the same semi-arid environment. The values recorded in this study were comparable to the values reported for *Lablab purpureus,* a legume grown in the same area for seeds and fodder (Malami and Abdullahi, 2007; Malami and Sulaiman, 2007; Malami *et al*., 2010).

**Canopy spread**

Canopy spread was only influenced (P<0.05) by intra-row spacing at 4, 8 and 12WAS. At 12WAS 50 and 75cm inter and intra-row spacing produced the widest spread of 38.6 and 42.7cm (Figure 6) respectively. Nakwada reported a mean of 25.1cm at 10WAS.

**Dry matter yield (kg ha$^{-1}$)**

Dry matter yield was not influenced (P>0.05) by spacing 100 and 75cm inter and intra-row spacing produced 1.02 and 0.97 tonnes ha$^{-1}$ respectively. This value was comparable to the value of 1.1.1 tonnes ha$^{-1}$ reported by Singh and Matsui (2011) for the same variety in Minjibir, semi-arid Kano in Nigeria. However, our values were lower than the range of 3-10 tonnes ha$^{-1}$ reported by Anon. (2011). Dry matter yield recorded in this study were comparable to the dry matter yield of *Lablab purpureus* grown in the same environment as reported by Malami and Abdullahi, (2007); Malami and Sulaiman, (2007) and Malami *et al*. (2010).

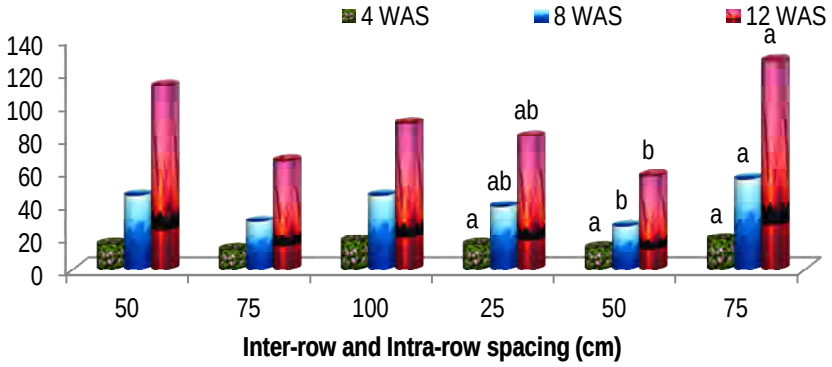


**Figure 5:** Number of leaves of Cowpea as affected by inter and intra-rows at 4, 8 and 12 WAS

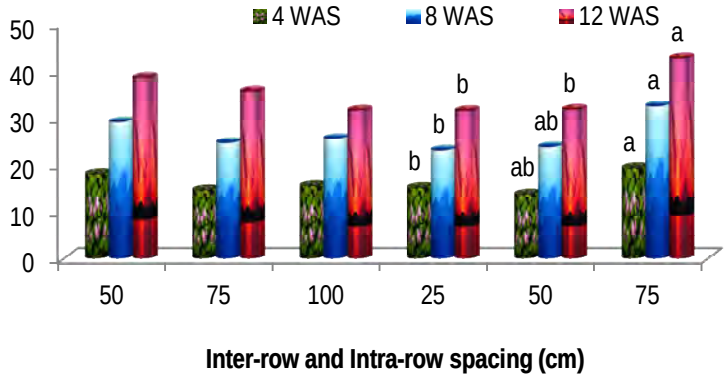


**Figure 6:** Canopy spread (cm) of inter and intra-rows at different weeks after sowing.

## CONCLUSION

It was concluded that growth components of cowpea *Vigna unguiculata* Var. Kanannado are affected by shorter spacing while wider spacing increased number of leaves and dry matter yield in semi-arid of Sokoto

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