

Differential Response of Cowpea Genotypes to Sowing Depth in Relation to Growth Parameters (*Vigna unguiculata* L. Walp)

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Abstract—Depth of sowing has an important effect on seedling emergence, growth and yield of crops and a uniform seeding depth is essential towards achieving higher crop yield. A field experiment was conducted at two locations, at Bayero University, Kano (BUK) and Beli, Kano State, to study the effects of depth of sowing, and variety on growth of cowpea (*Vigna unguiculata* L. Walp). The treatments consisted of three cowpea varieties (SAMPEA -7, SAMPEA -8 and SAMPEA -9), two sowing depths (3cm and 4cm) which were laid out using split – plot design and replicated three times. Depth of sowing and variety were assigned to the main plot and phosphorus levels to the subplots. Sowing depth was discovered to have a significant effect on the growth and yield of cowpea at both locations. Cowpea sown at 3cm depth produced the highest percent of seedling emergence compared with other sown at 4cm. However, the mean results of the two sites showed that for high grain yield, cowpea should be sown at 4cm depth. The result also indicated that SAMPEA -7 recorded superior mean growth attributes compared with SAMPEA - 8 and 9. However, SAMPEA -9 produced significantly higher mean number of seeds/pod, pod lengths and grain yield than the other varieties.

Keywords— Cowpea, genotypes, yield and sowing depth.

I. INTRODUCTION

COWPEA (*Vigna unguiculata* L. Walp) is an important food legume and a versatile crop cultivated between 35°N and 30°S of the equator, covering Asia and Oceania, the Middle East, Southern Europe, Africa, Southern U.S.A and Central South America [13]. However, being drought tolerant crop with better growth in warm climates, cowpea is most popular in the semi-arid regions of the tropics where other food legumes do not perform well.

Cowpea has the unique ability to fix nitrogen even in very poor soils (PH range 4.5 – 9.0, organic matter less than 0.2% and sand content greater than 85%). Also it is shade tolerant and therefore, compatible as an intercrop with a number of cereals, root crops, cotton, sugar cane and several plantation crops. Coupled with these attributes, its quick growth and rapid ground cover have made cowpea an essential component of sustainable subsistence agriculture in marginal lands and drier regions of the tropics where rainfall is scanty and soils are sandy with little organic matter. In

Nigeria cowpea is produced in northern part of the country, mainly in Kano, Kaduna, Kastina, Bauchi, Borno, Adamawa and Taraba states[3].

Cowpea is of major importance to the livelihood of millions of relatively poor people in less developed countries of the Tropics. From production of this crop rural families variously derive food, animal feeds and cash, together with spill over benefits to their farm lands for example in situ decay of root residues. Cowpea is also planted to serve as cover crop in order to protect soil erosion. The usage patterns, seed preference, cropping systems vary from region to region. It is particularly important in West Africa with an annual production of over 2.41 million tones in 2002 [6]. The grains are good source of human protein, while the haulms are valuable source of livestock protein [9].

The sowing depth has an important impact on the seeding emergence, growth and yield of crop. Uniform seeding depth is essential toward achieving higher crop yields. Cowpea is widely grown under rain fed conditions in the tropics [14], although it occupies a smaller proportion of the crop area than cereals,[16]. According to Whitbread (2006) cowpea should be sown at a depth of 30 – 50mm.

In Nigeria cowpea is grown largely by resource poor smallholder farmers under rain-fed conditions with the aid of cutlass, hoe or dibbler. One of the problems of using these hand tools is that they produce depths of sowing significantly different from 50mm [1 and 2]. Sowing depth is an important factor in crop management practices [5]; [10] cited by [12]. The depth of sowing is important in achieving crop stand establishment and yield, the main objective of seeding is to put seeds at a desired depth and spacing within the row. Uniform distribution of seeds within the soil results in better germination and emergence and higher yields, by minimizing competition between plants for available light, water and nutrients. The objective of this study is to determine the effect of depth of sowing on nodulation, growth and yield of cowpea.

II. MATERIALS AND METHODS

The experiment was conducted at the Research Farm of the Faculty of Agriculture, Bayero University Kano, Nigeria. The study area lies between latitude 8° 42'N and 9° 30'N and between longitude 9° 30'E and 12° 30'E 460m above sea level) and a farm in Beli Rogo local Government Area

(Latitude 11°30'N, and longitude 7° 49'N), of Kano State of Nigeria.

Soil samples were collected at the depths of 0 – 15cm and 15 – 30cm by random sampling from different locations of each field. The soil samples were bulked for each depth and were analyzed to determine the physical and chemical properties. Weather parameters such as rainfall, relative humidity and sunshine hours were recorded for the two locations. The treatments consisted of two sowing depths (3cm and 4cm), and three varieties of cowpea (SAMPEA 7, SAMPEA 8 and SAMPEA 9), these were laid out in a completely randomized block design and replicate three times. Ten plants were tagged randomly on each plot, which were used for subsequent data collection. Some growth and yield characters were assessed.

The data collected were subjected to statistical analysis using ANOVA as described by [15] and the means were separated using Duncan multiple range test [8]. Correlation coefficient analysis among the growth and yield characters was carried out to determine the nature of their relationship. [11]

III. RESULTS

Depth of sowing significantly affected number of nodules produced per plant. At 6 WAS, (Table 1a &1b) planting cowpea at 3cm depth produced significantly more nodules/plant than sowing at 4cm. At 9 WAS, however, the depth of sowing produced statistically same number of nodules/plant. Cowpea variety significantly influenced number of nodules/plant. At 6 and 9 WAS SAMPEA 7 produced significantly more nodules/plant than either SAMPEA 9 or 8, which were statistically at par, only at 6 WAS while at 9 WAS SAMPEA 9 was superior to SAMPEA 8. There was no interaction on number of nodules.

TABLE 1A
EFFECT OF SOWING DEPTHS AND VARIETIES ON NUMBER OF NODULES/PLANT OF COWPEA AT BUK, 2008

| Treatment | Number of nodule/plant | |
|-------------------------------|------------------------|--------------------|
| | 6WAS | 9WAS |
| <u>Depth of sowing (D) cm</u> | | |
| 3 | 19.23 ^a | 3.528 |
| 4 | 17.01 ^b | 2.583 |
| SE + | 1.1925 | 0.4728 |
| <u>Variety (v)</u> | | |
| Sampea 9 | 16.33 ^b | 2.250 ^b |
| Sampea 8 | 17.38 ^b | 0.667 ^c |
| Sampea 7 | 20.66 ^a | 6.250 ^a |
| SE + | 1.4605 | 0.5791 |
| <u>Interaction</u> | | |
| DXV | NS | NS |

Means followed by the same latter in a column are not significantly different at 5% level

NS = Not significant XX = highly significant.

TABLE 1B
EFFECT OF SOWING DEPTHS AND VARIETIES ON NUMBER OF NODULES/PLANT OF COWPEA AT, BELI 2008

| Treatment | Number of nodules/plant | |
|-------------------------------|-------------------------|--------------------|
| | 6WAS | 9WAS |
| <u>Depth of sowing (D) cm</u> | | |
| 3 | 20.28 | 2.194 |
| 4 | 19.02 | 1.750 |
| SE + | 1.4554 | 0.3076 |
| <u>Variety (V)</u> | | |
| Sampea 9 | 16.51 ^a | 0.917 ^b |
| Sampea 8 | 19.80 ^b | 0.250 ^b |
| Sampea 7 | 22.65 ^a | 4.750 ^a |
| SE + | 1.7825 | 0.3767 |
| <u>Interaction</u> | | |
| DXV | NS | NS |

Means followed by the same latter in a column are not significantly different at 5% level

NS = Not significant. XX = highly significant

There was no significant difference between the two sowing depths with respect of number of nodule/plant at all sampling periods. (Table 2). Cowpea variety had a significant influence on the number of nodules/plant at all sampling periods. At 6 WAS SAMPEA 9 and 7 produced statistically similar but significantly more nodule than SAMPEA 8. At 9 WAS however, SAMPEA 7 produced more nodule/plant than SAMPEA 9 and 8, which are statistically at par. There was no interaction on number of nodules/plant.

TABLE II
EFFECT OF SOWING DEPTHS AND VARIETIES ON EFFECTIVE NODULES/PLANT OF COWPEA AT BUK, 2008.

| Treatment | Effective nodules/plant | |
|-------------------------------|-------------------------|--------------------|
| | 6WAS | 9WAS |
| <u>Depth of sowing (D) cm</u> | | |
| 3 | 19.09 ^a | 2.556 |
| 4 | 16.87 ^b | 1.833 |
| SE + | 11835 | 0.3109 |
| <u>Variety (v)</u> | | |
| Sampea 9 | 16.17 ^b | 1.458 ^b |
| Sampea 8 | 17.31 ^b | 0.375 ^c |
| Sampea 7 | 20.47 ^a | 4.750 ^a |
| SE + | 1.4494 | 0.3808 |
| <u>Interaction</u> | | |
| DXV | NS | NS |

Means followed by the same latter in a column are not significantly different at 5% level

NS = Not significant xx = highly significant

Sowing depth had a significant effect on the number of effective nodules/plant At 6 WAS planting seeds at 3cm depth produced statistically more number of effective nodules/plant than sowing at 4cm depth, while there was no significant difference in number of effective nodules/plant between the two sowing depths. At 9 WAS. (Table 3)

TABLE III
EFFECT OF SOWING DEPTHS AND VARIETIES ON EFFECTIVE NODULES/PLANT OF
COWPEA AT BELI 2008.

| Treatment | Effective of nodules/plant | |
|-------------------------------|----------------------------|--------------------|
| | 6WAS | 9WAS |
| <u>Depth of sowing (D) cm</u> | | |
| 3 | 21.65 ^a | 1.861 |
| 4 | 18.88 ^b | 1.361 |
| SE + | 1.6986 | 0.2992 |
| <u>Variety (v)</u> | | |
| Sampea 9 | 18.49 ^b | 0.542 ^b |
| Sampea 8 | 19.59 ^b | 0.042 ^b |
| Sampea 7 | 22.72 ^a | 4.250 ^a |
| SE + | 2.0802 | 0.1343 |
| <u>Interaction</u> | | |
| DXV | NS | NS |

Means followed by the same latter in a column are not significantly different at 5% level

NS = Not significant. XX = highly significant.

Cowpea variety had a significant effect on effective nodule/plant at all periods of sampling. At 6 and 9 WAS SAMPEA 7 produced statistically more effective nodule /plant than either SAMPEA 9 or 8, which were observed to be statistically similar, at 6 WAS, but at 9 WAS SAMPEA 9 WAS superior to SAMPEA 8. There was no interaction on effective nodules/plant. Sowing depth had influenced number of effective nodules/plant at Beli. At 9 WAS there was no significantly different among the depths, of sowing on the number of effective nodules/plant but at 6 WAS 3cm sowing depth produced significantly more effective nodules/plant than 4cm sowing depth.

Cowpea variety was observed to significantly affected, the number effective nodules/plant at all stages of sampling. At 6 and 9 WAS sampling periods SAMPEA 7 produced statistically more effective nodules/plant than either SAMPEA 9 or SAMPEA 8, which were observed to be statistically at par. There was no interaction on effective nodules. (Table 3)

At Beli there was no statistical difference between the two sowing depths with respect to number of days to maturity. However at B.U.K, 4cm sowing depth produced significantly more number of days to maturity. (Table 4)

TABLE IV
EFFECTS OF SOWING DEPTHS AND VARIETIES ON DAYS TO MATURITY OF
COW PEA AT B.U.K AND BELI 2008.

| Treatment | Number of days to maturity | |
|-------------------------------|----------------------------|--------------------|
| | B.U.K | BELI |
| <u>Depth of sowing (D) cm</u> | | |
| 3 | 70.42 ^b | 71.67 |
| 4 | 71.67 ^a | 70.87 |
| SE + | 0.1278 | 0.2867 |
| <u>Variety (v)</u> | | |
| Sampea 9 | 73.13 ^b | 75.00 ^b |
| Sampea 8 | 60.00 ^c | 60.00 ^c |
| Sampea 7 | 80.00 ^a | 80.00 ^a |
| SE + | 0.2581 | 0.2735 |
| <u>Interaction</u> | | |
| DXV | NS | NS |

Means followed by the same latter in a column are not significantly different at 5% level NS = Not significant. XX = highly significant.

Cowpea variety had significant influence of the number of days to maturity, SAMPEA 7 produced significantly more number of days to maturity than SAMPEA 9 while SAMPEA 8 produced significantly the least number of days to maturity. There was no interaction at both locations.

Sowing depths had no significant effect on net plot weighed, therefore at BUK and Beli, the two sowing depths statistically produced the same. Table 5

TABLE V
EFFECT OF SOWING DEPTHS AND VARIETIES ON NET PLOT WEIGHED OF
COWPEA (KG) AT BUK AND BELI, 2008

| Treatments | Net plot weighted Kg/ha | |
|-------------------------------|-------------------------|--------------------|
| | BUK | BELI |
| <u>Depth of sowing (D) cm</u> | | |
| 3 | 14.31 | 12.34 |
| 4 | 13.94 | 13.31 |
| SE + | 0.6742 | 0.941 |
| <u>Variety (V)</u> | | |
| Sampea 9 | 11.45 ^c | 12.54 ^b |
| Sampea 8 | 13.22 ^b | 14.73 ^a |
| Sampea 7 | 17.70 ^a | 11.52 ^b |
| SE + | 0.8257 | 1.1562 |
| <u>Interaction</u> | | |
| DXV | NS | NS |

Means followed by the same latter (s) in a column are not significantly different at 5% level

NS=not significant XX=highly significant

Cowpea variety produced significant effect on net plot weight. At B.U.K SAMPEA 7 produced significantly the heavier net plot weight than SAMPEA 8 which in turn was superior to SAMPEA 9 while at Beli the reverse was the case SAMPEA 8 produced significantly the heavier net plot weight followed by SAMPEA 9 and 7 which produced statistically similar net plot weight. There was no interaction on net plot weight.

IV. DISCUSSION

Sowing depth had significant effect on the growth of cowpea *vigna unguiculata* throughout the two locations of study. Germination in all the varieties started three days after sowing, rate of germination increased with increase in number of days after sowing, and at two weeks after sowing, more than 80% germination was recorded for all the varieties in both locations. However, sowing at 3 cm produced the highest percentage seedling emergence compared with sowing at 4cm. This was probable due to the sowing depth being deep. This observation is consistent with that of [1] and [7] that deep sowing (e.g. beyond 60mm) can significantly affect crop emergence and yield. The study shows that for optimum seedling emergence, cowpea should be sown at 3 cm depth.

Number of leaves increased with increase with plant age in all the varieties. And varietal differences were observed with significant at 3, 6, 9 and 12 WAS. The number of leaves and branches varied significantly with maximum at 3 cm sowing depth and minimum with the 4cm sowing depth at BUK while at Beli the two sowing depths effected number of branches only at 3 WAS"

V.CONCLUSION

The research shows that the two depth of sowing (3 and 4cm) significantly affected number of nodules produced per plant. But there was no interaction on number of nodules. The two depth of sowing At 6 WAS did not significantly affected the start of flowering, days to 50% flowering and maturity period, but the number of days to start flowering, 50% flowering and maturity period differed significantly among the varieties in the two study areas. Cowpea variety produced significant effect on net plot weight. At B.U.K SAMPEA 7 produced significantly the heavier net plot weight than SAMPEA 8 while at Beli SAMPEA 8 was higher. This variation could be associated with differences in the genetic composition.

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