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# Time of Weed Removal Influence on Vegetative and Reproductive Yield of Two Cowpea (*Vigna unguiculata* (L) Walp) Varieties, Ife Brown and TVX3236

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## Abstract

Influence of time of weed removal on both vegetative and reproductive yield of two cowpea (Vigna unguiculata (L) Walp) varieties, Ife brown and TVX3236, was investigated on a farm land at the University of Ilorin, Ilorin, Nigeria during 2004 and 2005 growing seasons. Five hand weeding periods at 2,4,6,8 Weeks After Planting (WAP) and weedy control, were carried out. Hand weeding at 2WAP produced best cowpea dry matter ranging from 6.33±2.08 to 13.37±2.47g in both varieties. Highest leaf number was obtained in the cowpea plots weeded at both 2 and 4 WAP ranging from 43.00±13.05 to 106.67±25.16 in both varieties. Total chlorophyll content was highest in the cowpeas weeded at 2, 6 and 8 ranging from 12.15±to 32.79mg/g. Leaf area was generally higher in 2004 planting season than in 2005 with the least in weedy control in 2005 planting season. Pod number, pod weight, seed number and seed weight per plant were very high in the weeding periods of 2, 4, and 6 WAP.

**Key words**: vegetative reproductive, yield, cowpea, chlorophyll, Vigna unguiculata (L) Walp.

## Introduction.

Cowpea is an important food legume crop in the tropics and subtropics providing a less expensive source of protein in many diets (Kay, 1979, Okafor and Adegbite, 1991). In Africa, cowpeas are the most economically important indigenous food legume (Geonaga *et al*., 2008). They are consumed in different forms, with many local variations in their preparation. Cowpea is of great nutritional values which readily add to the dietary protein need. Cowpea is rich in proteins and mineral elements (Kay 1979, Ayodele and Yalwa, 2004; Ayodele and Yalwa, 2005). Most frequently they are cooked together with vegetables (Valenzuela and Smith, 2002) and spices with palm oil to produce a thick bean soup, which accompanies the basic staple food, such as cassava, yams and plantain.

Poor yield of tropical legumes are often due to late or inadequate weeding. In many parts of the world labour for hand weeding is becoming

scarce and expensive. Some crops are highly susceptible to weed infestation due to the competitive superiority of the weed, some have very strong adverse effects on weeds through their ability to develop heavy canopy which can readily smother weeds (Valenzuela and Smith, 2002). Competition sets in as weed and crop increase their demand on limited environmental resources.

Weeding of Cowpea (Vigna unguiculata) plot four weeks after sowing has been reported to give increase in yield by 156.4 and 98.5% over unwedded control in a two consecutive cropping seasons respectively (Bhan *et al* 1982) while crops with weed competition beyond four weeks has very poor recovery. At the International Institute of Tropical Agriculture (IITA), hoeing cowpea plots twice at 1 and 4 weeks after emergence gave yields at par with that obtained after hand weeding throughout the cropping season (Anon,1973). A single timely weeding of cowpea gave a maximum yield in Surinam (Vander and Vermaat, 1978). Yield losses are negligible in cowpea if the crop is hand-weeded twice within 5 to 6 weeks of crop emergence (Moody, 1973).

The objective of this study is to determine the influence of the time of weed removal on both vegetative and reproductive yield of two cowpea varieties Ife brown and TVX3236.

**Materials and Methods**

This study was carried out on a farmland in the main campus of the University of Ilorin, Ilorin, (80 29'N; 40 35'E) in the southern guinea savanna ecological zone of Nigeria during 2004 and 2005 cropping seasons .The average annual rainfall of Ilorin is 1000-1240mm per annum. The vegetation of the study site is of guinea savanna type containing both broad leafed and grass weeds. The topography is of low and smooth terrain.

In each of the planting seasons, cowpeas seeds were planted on freshly hand cultivated ridges of 1metre inter-row spacing and 25cm intra-row spacing. The experimental design was a randomized block design in which the treatments were replicated thrice. Hand weeding was carried out once, using traditional hoe to determine the effect of time of weed removal on the performance of cowpea. This was done at various weeding periods of 2, 4, 6, 8 Weeks after planting (WAP) and weedy control, thereafter left without any further weeding operation.

Data were collected at 8 WAP. Cowpea leaf number was taken by direct counting and recording at 8WAP. Each of the leaflets of the trifoliate leaf was counted as a single leaf.

Total leaf area was determined as

Leaf Area = $L \times B \times 0.75$

where L= leaf length,

B= leaf breadth and,

0.75 = correction factor.

Cowpea dry matter was taken by harvesting the above ground vegetative parts and dried in oven dryer at 80°C to a constant weight and recorded in (g). Chlorophyll content was also determined.

Cowpeas were harvested at 12WAP when the pods were well dried on the parent plants. The following reproductive parameters were taken:

Pod number per plant,

Pod weight per plant,

Seed weight per plant,

Seed number per plant,

Pod length and,

Filling potential that is the seed number per pod length

All data collected were subjected to analysis of variance using SPSS package. Means were separated using Duncan Multiple Range Test at 5% probability level.

**Results and Discussion**

***Effects of time of weed removal on plant dry matter at 8WAP in 2004 and 2005.***

There were significant differences at $p \leq 0.05$ in 2004 in the plant dry matter of Ife brown but not in TVX3236 in all the weeding periods (Fig1). Cowpea dry matter was highest in Ife brown (13.37±2.47g) at the weeding period of 2WAP and least (3.67±1.61g) at the weeding period. of 6WAP. On the other hand, TVX3236 produced the highest dry matter (6.33±2.08g) at the weeding period of 4WAP and least (3.67±1.59g) at 2, 6 and 8WAP weeding periods (Fig 1). In 2005, Cowpea dry matters were similar regarding weeding periods with what was obtainable in 2004 in both varieties. Ife brown had the highest dry matter (17.50±0.50g) in the weeding period of 2WAP and least (3.67±1.53g) in the weeding period of 8WAP whileTVX3236 plant dry matter was highest (6.50±3.50g) at 2WAP weeding period and least (3.00±0.00g) in 8WAP weeding period and the weedy control (Fig 1). This agrees with the reports of Bhan *et al.*, (1982) and Remison, (1978) who observed non effectiveness of delayed

weed removal in cowpea and also confirms the earlier works of Adesina *et. al*., 1998), Fadayomi and Olofintoye (2005) who variously observed better crop performance in a timely hand weeding of cowpea plot.

***Effects of time of weed removal on number of leaves of cowpea at 8WAP in 2004 and 2005.***

Figure 2 shows the effect of time of weed removal on number of leaves of cowpea varieties. The results showed that the effects of time of weed removal were significant on number of leaves per plant in both cowpea varieties in 2004. The situation was similar in 2005 as numbers of leaves per plant at 2 and 4 WAP were significantly higher than other weeding periods and weedy control in both varieties. Number of leaves in Ife brown was highest (43.00±25.16) at the weeding period of 4WAP and least (22.00±9.64) at the weeding period of 2WAP in 2004 while, in 2005 the highest number of leaves (112.00±54.08) in Ife brown was obtained at the weeding period of 4WAP and least (34.33±13.50) at the weeding period of 6WAP (Fig 2). The highest number of leaves in TVX3236 in 2004 was 61.00±24.25 at the weeding period of 6WAP and least (48.00±21.00) at the weeding period of 4WAP while in 2005 it was highest (106.67±13.05) at the weeding period of 2WAP and least (31.33±12.58) at the weeding period of 8WAP (Fig 2). The apparent reduction in leaf number as well as leaf area in cowpeas in plots weeded at 2 and 4 WAP might be due to early fruit production with the subsequent shift from vegetative growth. Coupled with this may as well due to senescence of older leaves without the production of new ones to replace them. These observations agree with the report of Bhan et.al. (1982) who noticed a better grain yield in cowpea weeded within 4WAP.

***Effects of time of weed removal on total chlorophyll content of cowpea in 2004 and 2005 at 8WAP.***

Chlorophyll contents were significantly different in all the weeding periods in Ife brown and TVX3236 in both 2004 and 2005. Highest total chlorophyll content was obtained in Ife brown (32.79±1.40mg/g) at 6WAP weeding period while, TVX3236, was highest (28.07±0.71mg/g) in the weeding period of 2WAP in 2004 planting season (Fig3).

In 2005 planting season however, the highest total chlorophyll content (13.92±0.11mg/g) was obtained in Ife brown at the weeding period of 2WAP and least (7.86±0.19mg/g in weedy control plots. In TVX3236, highest total chlorophyll content was obtained as 12.15±0.08mg/g in the weeding period of 8WAP with the least (7.20±0.24mg/g) in the weeding period of 2WAP (Fig.3). This may be due to shift from vegetative to reproductive growth.

***Effects of time of weed removal on total leaf area of cowpea in 2004 and 2005 at 8WAP.***

In 2004, cowpea total leaf area was significantly high in all the weeding periods in both varieties. Weeding at 4WAP produced the largest total leaf area (5516.93±2200.00cm2) in Ife brown and (3429.98±1481.93cm2) in the weedy control of TVX3236 (Fig 4). The situation was however different in 2005 as total leaf areas were significantly lower than those of 2004 in all the weeding periods in both varieties (Fig 4). Weeding at 2

and 6WAP produced largest (1966.03±366.91 and 2371.03±1317.33cm2) total leaf areas in Ife brown and TVX3236 respectively in 2005 (Fig 4).

***Effects of time of weed removal on reproductive performance of Ife brown and TVX3236 in 2004 and 2005.***

In 2004, pod number per plant was significantly higher in Ife brown in the hand weeding of 6WAP, pod weight per plant at 4WAP, seed number at 6WAP and seed weight per plant at 4WAP (17.33±5.77, 25.17±13.00g, 121.67±56.89 and 17.33±6.66g) respectively. TVX3236 produced the highest pod number, pod weight seed number and seed weight per plant (17.00±5.20, 18.17±11.09g, 145.33±31.08 and 12.33±0.76g) were obtained at 6WAP respectively (Table 1).

In 2005, highest pod number, pod weight, seed number and seed weight per plant for Ife brown were obtained at 4WAP hand weeding periods (21.33±8.08, 23.33±11.02g, 107.33±33.23 and 14.00±2.85g). Thus hand weeding at 4WAP was better than all other hand weeding periods in Ife brown reproductive parameters.TVX3236 highest pod number, pod weight, seed number and seed weight per plant (17.33±8.21, 18.00±4.58g, 143.00±74.29 and 17.00±8.54g) were obtained at 4, 2, 6 and 6 WAP respectively (Table 2). These results agree with the earlier reports of Adenubi and Adejonwo (2006) who reported longer pods, heavier seeds and higher grain yield in cowpea at lower planting density, also a reduction in pod length due to increase in weed density.

***Effects of time of weed removal on reproductive performance of Ife brown and TVX 3236 (pod filling potential) in 2004 and 2005.***

Highest pod length, seed number/pod and pod filling potential for Ife brown in 2004 (16.10±0.40cm, 13.50±0.50 and 0.90±0.09) were obtained at 4WAP and weedy control respectively while TVX3236 were highest (15.75±0.25cm, 14.50±0.50 and 0.92±0.02) at 6WAP (Table3). In 2005, time of weed removal significantly affected pod length, seed number per pod and pod filling potential in both Ife brown and TVX3236 (Table 4). Highest pod length, seed number and filling potential per pod in Ife brown (16.00±0.00cm,15.00±1.00 and 0.94±0.06) were obtained in the weeding periods of 2, 4 , 8WAP as well as the weedy control (Table4). In TVX3236 however, highest pod length, seed number and pod filling potential per pod (15.33±1.15cm.13.33±2.08 and 0.87±0.08) were obtained at 2WAP weeding period (Table 4).

In conclusion, early weeding at 2WAP produced the highest cowpea dry matter, leaf number, total chlorophyll content as well as pod number, pod weight, seed number and seed weight per plant. The results obtained in this study revealed that early weeding will promote high vegetative and reproductive yield which will in turn make the crop more available both as fodder for animal feed and food for human consumption.

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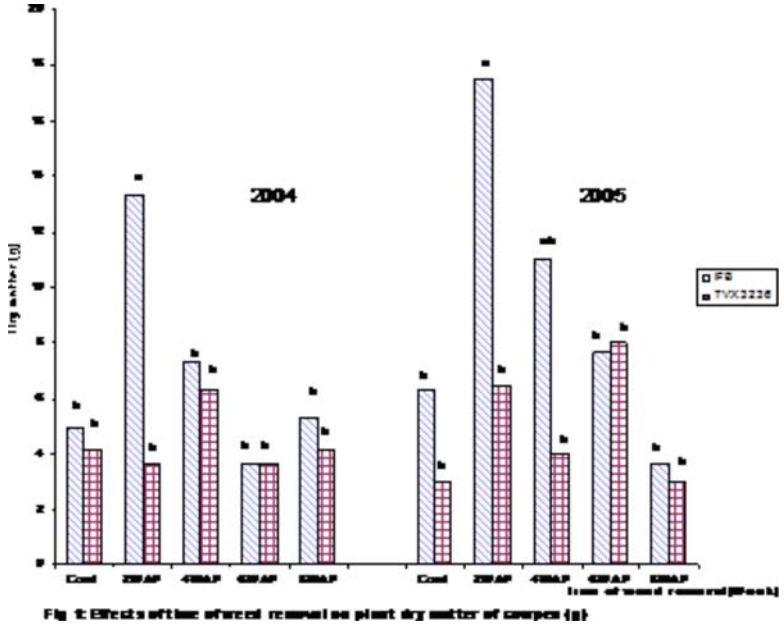


Cont = weedy Control

WAP=week after planting

2 = weeding two weeks after planting, 4 = weeding four weeks after planting

6 = weeding six weeks after planting, 8 = weeding eight weeks after planting

Fig. 1. Effects of time of weed removal on plant dry matter of cowpea.

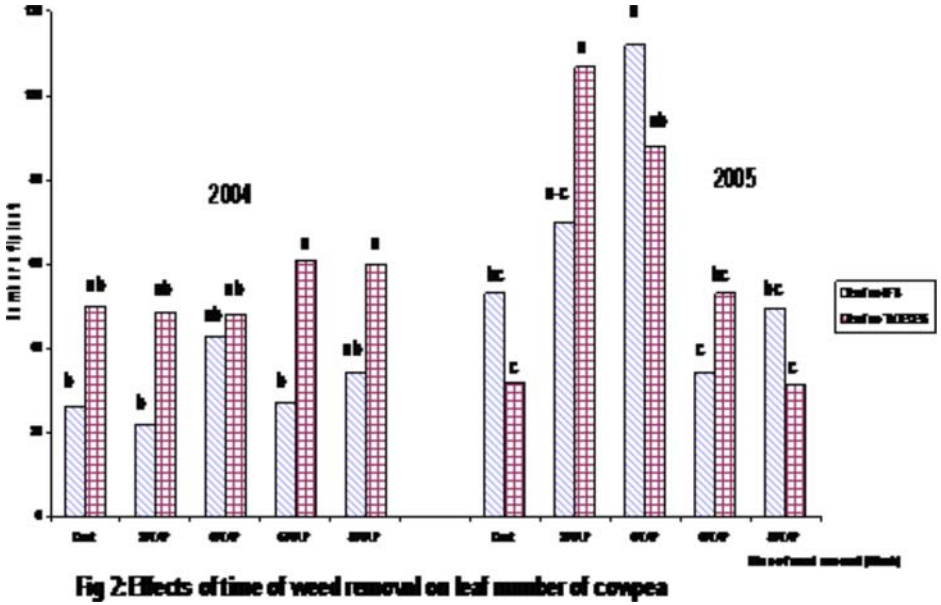


Fig 2: Effects of time of weed removal on leaf number of cowpea

Cont = weedy Control
WAP=week after planting
2 = weeding two weeks after planting, 4 = weeding four weeks after planting
6 = weeding six weeks after planting, 8=weeding eight weeks after planting

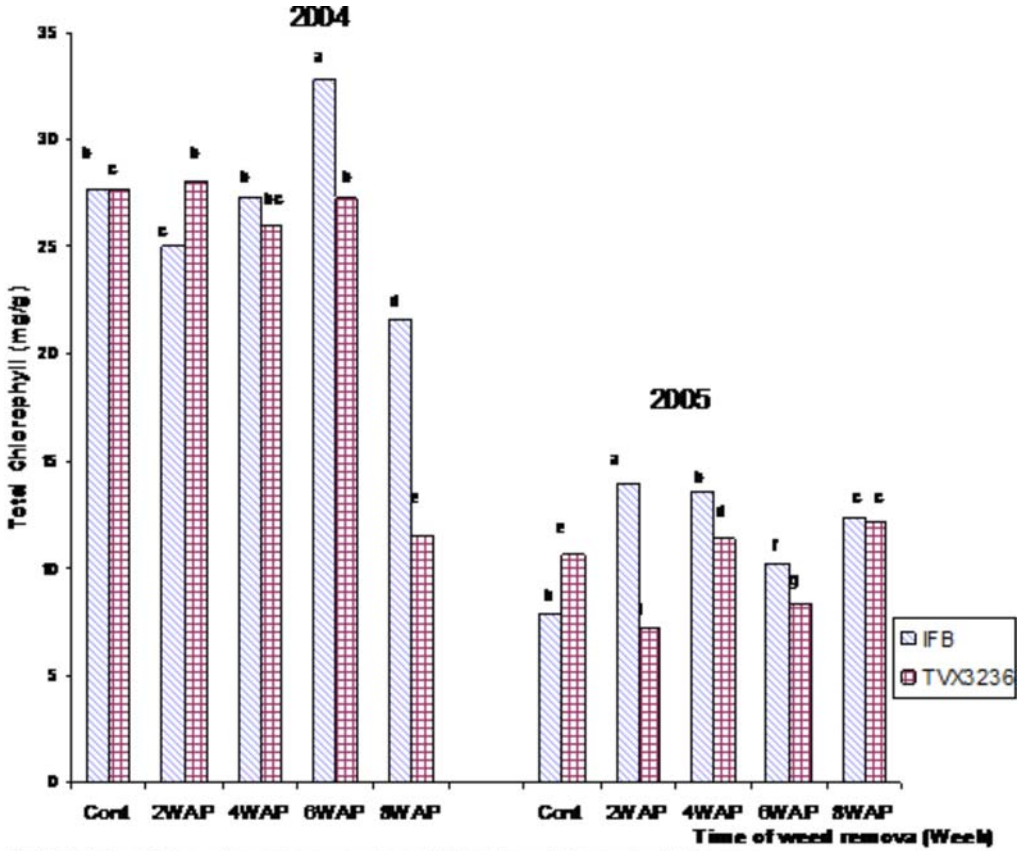


Fig3: Effects of time of weed removal on total chlorophyll content of cowpea

Cont = weedy Control
2 = weeding two weeks after planting, 4 = weeding four weeks after planting
6 = weeding six weeks after planting, 8 = weeding eight weeks after planting

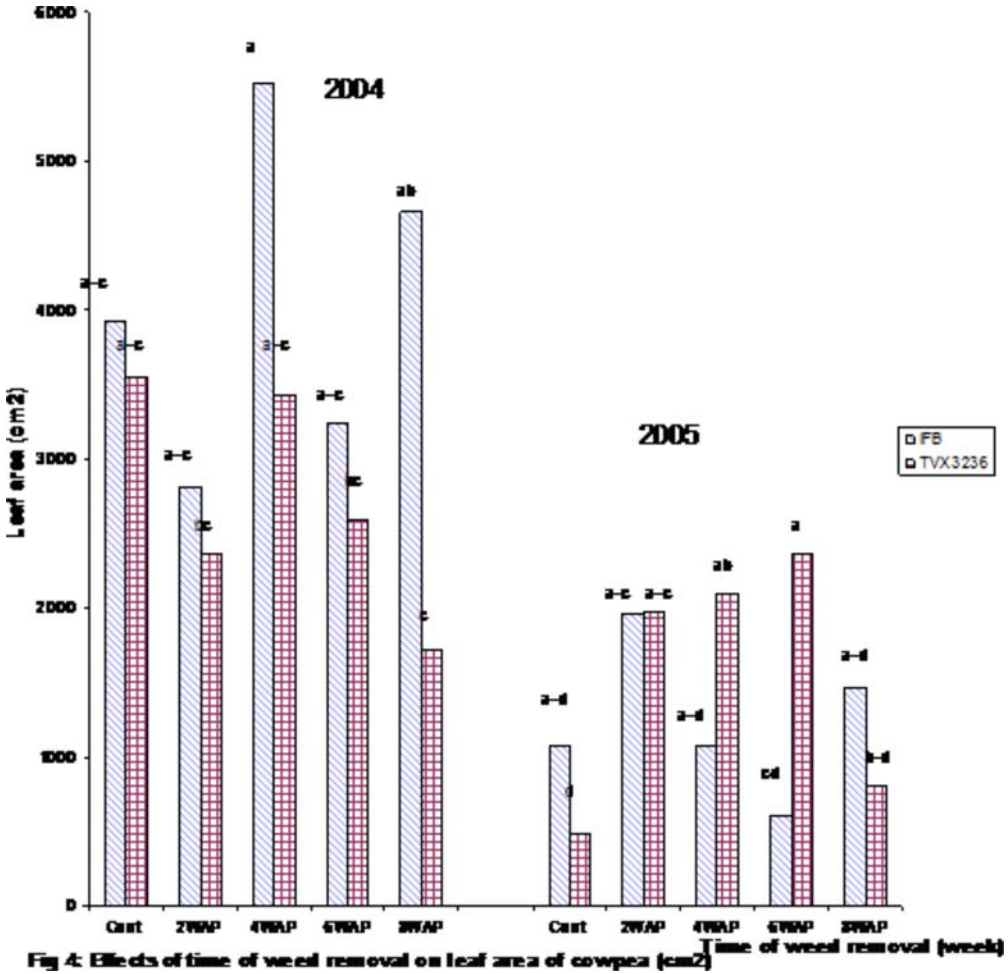


Fig 4: Effects of time of weed removal on leaf area of cowpea (cm2)

cont = weedy control
WAP=week after planting
2 = weeding two weeks after planting, 4 = weeding four weeks after planting
6 = weeding six weeks after planting, 8 = weeding eight weeks after planting

**Table1: Effects of Time of weed removal on reproductive parameters of Ife brown and TVX3236 in 2004.**

| Time of weed removal | Pod No/plt | | Pod Wt/plt | | Seed No/plt | | Seed wt/plt | |
|---|---|---|---|---|---|---|---|---|
| | IFB | TVX3236 | IFB | TVX3236 | IFB | TVX3236 | IFB | TVX3236 |
| Cont | 7.67ab | 15.00ab | 10.17ab | 15.67ab | 53.67cd | 104.33a-c | 6.33cd | 10.00ab |
| 2 | 8.00ab | 5.33b | 10.67ab | 4.00b | 54.33cd | 27.67d | 6.67cd | 2.67d |
| 4 | 15.00ab | 12.67ab | 25.17a | 10.67ab | 112.00a-c | 84.67a-d | 17.33a | 8.17b-d |
| 6 | 17.33a | 17.00a | 23.33a | 18.17ab | 121.67ab | 145.33a | 15.83ab | 12.33a-c |
| 8 | 9.00ab | 15.67a | 13.67ab | 13.50ab | 67.67b-d | 82.67 | 9.33a-d | 7.17cd |

Values in the same group carrying the same letter/s are not significantly different at ($p<0.05$).

Cont = weedy control
2 = weeding two weeks after planting, 4 = weeding four weeks after planting
6 = weeding six weeks after planting, 8 = weeding eight weeks after planting

**Table 2: Effects of Time of weed removal on reproductive parameters of Ife brown and TVX3236 in 2005.**

| Time of weed removal | Pod No/plt | | Pod Wt/plt | | Seed No/plt | | Seed wt/plt | |
|---|---|---|---|---|---|---|---|---|
| | IFB | TVX3236 | IFB | TVX3236 | IFB | TVX3236 | IFB | TVX3236 |
| Cont | 10.67bc | 7.33c | 12.67bc | 6.67c | 80.33ab | 56.00b | 10.00a-c | 5.67c |
| 2 | 12.33bc | 14.00bc | 17.67ab | 18.00ab | 102.33ab | 109.33ab | 12.67ab | 13.33ab |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 4 | 21.33a | 17.33ab | 23.33a | 16.67ab | 107.33ab | 117.33ab | 14.00a | 13.33ab |
| 6 | 10.00bc | 10.33bc | 14.50a-c | 17.67ab | 80.33ab | 143.00a | 11.33-c | 17.00a |
| 8 | 12.33bc | 10.33bc | 14.00a-c | 9.33bc | 79.00ab | 58.33b | 10.00-c | 6.67bc |

Values in the same group carrying the same letter/s are not significantly different at ($p<0.05$)

Cont = weedy control

2 = weeding two weeks after planting, 4 = weeding four weeks after planting

6 = weeding six weeks after planting, 8 = weeding eight weeks after planting

**Table3: Effects of Time of weed removal on reproductive parameters of Ife brown and TVX3236 (Flling potential) in 2004.**

| **Time of weed removal** | **Pod Length (Cm)** | | **Seed No/Pod** | | **Filling Potential** | |
|---|---|---|---|---|---|---|
| | IFB | TVX3236 | IFB | TVX3236 | IFB | TVX3236 |
| Cont | 15.00a | 14.90ab | 13.50ab | 13.50ab | 0.90ab | 0.91ab |
| 2 | 16.00a | 13.80bc | 12.00a-c | 9.00c | 0.74bc | 0.66c |
| 4 | 16.10a | 15.15ab | 12.50ab | 12.00a-c | 0.78a-c | 0.79a-c |
| 6 | 13.75bc | 15.75a | 11.00bc | 14.50a | 0.80a-c | 0.92a |
| 8 | 14.50a-c | 13.00c | 10.50bc | 10.50bc | 0.72c | 0.80a-c |

Values in the same group carrying the same letter/s are not significantly different at ($p<0.05$).

Cont = weedy control

2 = weeding two weeks after planting, 4 = weeding four weeks after planting

6 = weeding six weeks after planting, 8 = weeding eight weeks after planting

**Table4: Effects of Time of weed removal on reproductive parameters of Ife brown and TVX3236 (Flling potential) in 2005.**

| Time of weed removal | Pod Length (Cm) | | Seed No/Pod | | Filling Potential | |
|---|---|---|---|---|---|---|
| | IFB | TVX3236 | IFB | TVX3236 | IFB | TVX3236 |
| Cont | 16.00a | 14.67a-c | 14.00a | 10.67b | 0.88ab | 0.73c |
| 2 | 16.00a | 15.33ab | 14.33a | 13.33a | 0.90a | 0.87ab |
| 4 | 16.00a | 13.33c | 14.00a | 10.00b | 0.88ab | 0.75bc |
| 6 | 14.00cd | 15.00ab | 9.33b | 10.67b | 0.67c-d | 0.71cd |
| 8 | 16.00a | 11.00d | 15.00a | 6.33c | 0.94a | 0.58cd |

Values in the same group carrying the same letter/s are not significantly different at ($p<0.05$).

Cont = weedy control
2 = weeding two weeks after planting, 4 = weeding four weeks after planting
6 = weeding six weeks after planting, 8 = weeding eight weeks after planting