

## Study on The Plant Growth Development And Yield Of Cowpea By Using Chemical Fertilizer

Win Win Nu<sup>1</sup>, San Khine<sup>2</sup>

### Abstract

The cultivation on the plant of *Vigna catjang* Walp. is belonging to the family, Fabaceae are cultivated and studied. The plant specimens of these species are collected in the field area of East Yangon University Campus, Than-lyin Township and are identified and classified in the Laboratory of Botany Department, East Yangon University. The uses of these plants, Plant height, yield of pods, seeds and their nutrient contents are also studied. It was found that the plantation of cowpea without using NPK (control) was more effective than using NPK. Especially, the yield of pods and seeds and number of leaves were good for without using NPK (control). The plant height and nutrient contents of seeds were higher with using NPK than without using NPK (control).

**Key words:** Uses of these plants, Plant height, yield of pods, seeds contents

### Introduction

*Vigna catjang* Walp is an annual plant, varying in habit from erect and bushy to prostrate and scrambling. It produces stems from 15-80 cm long. The plant is often cultivated for its edible seed in warm temperate and tropical zones. An abundant cropper, it can produce a crop all year round in the Tropics, especially if new sowings are made every few months. Succeed in full sun and in light shade. Plants can grow in a wide range of moist but well drained soil. pH in the range 5.5 – 7.5, tolerating 4 - 8.8. Established plant is moderately drought tolerant. Seed pre-soak for 12 hours in warm water and sow 1-3 cm deep in situ. The seed germinates best when the soil temperature is above 21°C (Ken Fern, 2014)

Seeds were soaked in water for 12 hours. The seeds were placed in 30 – 60 cm deep from the top soil. The distance between the rows was 60 cm and plant to plant distance was 30cm, 120 cm – 180 cm in each plot area respectively. Insecticide (Aldrin) was sprayed into the soil before the seeds. After 3 days, seed were germinated in the field.

The cowpea is quick growing crop and must be well applied with nutrients and moisture to keep it growing vigorously. Responses have been

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<sup>1</sup> Dr., Win Win Nu, Lecturer, Department of Botany, East Yangon University

<sup>2</sup> Dr. San Khine, Professor and Head, Department of Botany, East Yangon University

recorded to P, K and S as well as molybdenum on poor fertility soils (<http://www.fao.org/ag/agp/AGPC/doc/gbase/data>).

When young seedpods are cooked, it is tender and delicious taste. They are picked whilst the seeds are very immature and then cooked like French beans. The pods are harvested when 30 - 60 cm long, they are usually borne in pairs and are stringless. Seed – cooked, use in soups, rich in protein. Leaves and young stems can also cooked. A mild flavour, though they give off a strong aroma when cooking. The seed is used as diuretic. It is used to strengthen the stomach. When boiled and eaten as a food it is considered to destroy worms in the stomach. The crushed leaves are used in a poultice to heal and bond broken bones.

## **Materials and Methods**

### **Experimental Site**

A field experiment was conducted on an open field of Campus of East Yangon University (Than-lyin Township), Yangon Division.

### **Preparation of Materials and Methods**

In this study, mature seeds of cowpea cultivars crop was cultivated in the field. The morphological characters of those commercially cowpea crops was studied during their flowering period. During their flowering period, the morphological character of 10 sample plants in each cultivar were collected and examined by preparing the free hand section cutting. The floral parts from fresh flower specimens were studied under the dissecting microscope. All fresh specimens were immediately recorded and taking photographs during the study.

### **Field preparation**

Firstly, weeding was done in the field and soil was plowed pulverizely by using hoe. Mixed NPK fertilizer was obtained from agricultural shop Thanlyin Township. Soil was then thoroughly mixed with NPK and without NPK (control) (Figure 1)

### **Cultivation of cowpea seeds germinating in field.**

Mature seeds of cowpea were soaked in water for 12 hours. The seeds were placed in 30-60 cm deep from top soil. The distance between the rows was 60 cm and plant to plant



**Figure 1 Field preparation for cowpea cultivated**



**Fig 2 Cultivation of cowpea seeds in field**

distance was 30 cm, 120 cm – 180 cm in each plot area respectively. Insecticide (Aldrin) was sprayed into the soil. Before germinating the seeds, the cultivated plot area was watered to obtain enough amounts of soil moisture contents. After placing the seeds, the seeds were started to grow onto the ground at 3 DAS (days after sowing). After one week, NPK (1200 g) was applied into the soil and then the soil was mounted to get about 3 cm height of respective plots in field. After 10 days, insecticide (Fury 10 cc) was sprayed

## Results

### Morphological Characters

Scientific Name	-	<i>Vigna catjang</i> Walp.
Family Name	-	Fabaceae
Common Name	-	Pe - thee - daung, Pe - daung-she, Pe- lun
English Name	-	Cowpea, Chowli or Asparagus Be

Annual herb, erect, spreading to 80 cm tall, glabrous: taproot stout with laterals near soil surface; roots with large nodules; stem usually procumbent, often tinged with purple: leaves: first leaves above cotyledons are simple and opposite: subsequent trifoliate leaves are alternate the terminal leaflets, 3.9 – 14.3 cm long and 2.4 – 8.6 cm wide; often bigger and longer than the two asymmetrical laterals: lateral leaflets ovoid-rhombic, entire or slightly lobed, apex acute, base acute to rounded, lateral leaflets oblique: stipule present: 4.0 – 13.2 cm long and 2.7 – 8.3 cm wide; 3.7 – 14 cm long and 2.4 – 9.5 cm wide petiole: petiolate 0.6 – 3.7 cm long, 0.2 – 0.3 cm wide, (in apex) petiole 2.7 – 12.5 cm long and 0.35 – 0.6 cm wide; inflorescence axillary, 2 - 4 flowered, crowded, near tips on short curved peduncles 8.5 – 25 cm long and 0.35 – 0.4 cm wide, flower, bracteate, ebracteolate, pedicellate, bisexual, zygomorphic, hypogynous. Calyx, campanulate 0.6 – 1.0 cm long and 0.3 cm wide, teeth lanceolate with triangular teeth, the upper 2 teeth connate and longer than rest: Corolla dull white, yellow white to yellow, or violet, with standard 2 - 3

cm in diameter, keel usually white, keel 1.8 - 2 cm long, 0.7 cm wide, truncate: wing blue to purple, wing 1.6 cm long, 1.2 cm wide, stamens 10, (1+9) diadelphous, rarely 9 and monadelphous, all fertile, anthers basifixed, ditheous, longitudinally dehiscent, pollen granular: filaments 1.0 cm long fused to form staminal column but free near the apex. Gynoecium is monocarpellary, superior, unilocular, ovary with marginal placentation and one row of ovules. Style thick 2.5 cm long and curved or reflexed at base, stigma capitate. Fruit a dehiscent. Pods curved, pods 15.2- 23.4 cm long with (14-17) seeds/pod, straight or coiled: Seeds 0.2 – 1.2 cm long, globular to reniform, smooth or wrinkled, red, black, brown, green buff or white, as dominant color; full colored, spotted, marbled, speckled eyed, or blotched .



**Figure 3. Habit of cowpea plant**



**Figure 4. Flowering of cowpea plant**



**Figure 5. Leaf**



**Axillary of inflorescence**



**Flower and Pod**



**Figure 7 Pods**



**Mature pods**



**Mature seeds**

### Plant height

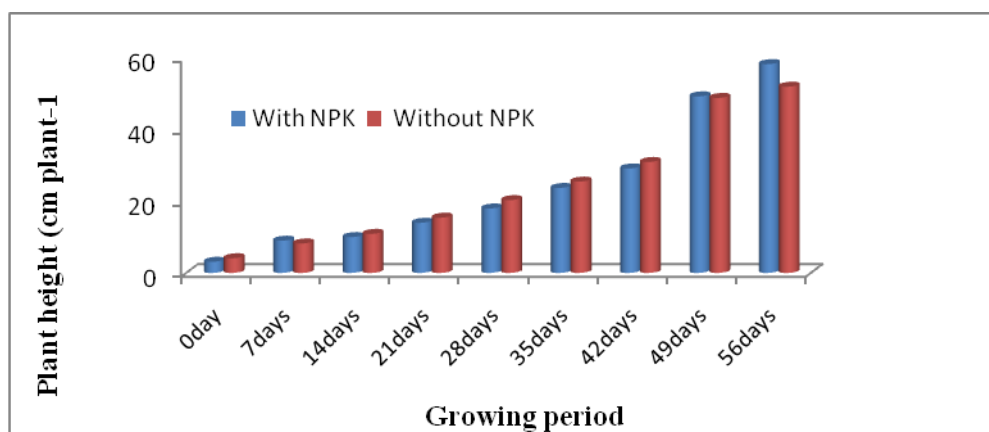
In the present study, plant growth development of cowpea plants (with NPK and control (without NPK) were cultivated and collected grown for 56 days in the field. The results of the study showed that changes in plant growth development had significantly differences overtime among the treatments of cowpea during growth period for 56 days in the field (Table 1 and Figure 8).

The cowpea showed the statistically significant differences were observed in 5% significant level ( $P \leq 0.05$ ) of LSD (least significant differences) at 35-, 42 – and 56 days in the field (Table 1 and Figure 8). Height of cowpea plant was gradually increased overtime in two treatments during their growing period (Figure 8). Among the treatment of control, the cowpea was treated with 49 days followed by 56 days were obtained the maximum height after growing for 56 days (Table 1 and Figure 8).

**Table 1 Study on the Plant Height of Cowpea (with NPK and without NPK) in field( $\text{cm}^{-1} \text{pt}$ ).**

Treatment	0 Day	7 days	14 days	21 days	28 days	35 days	42 days	49 days	56 days
with (NPK)	3.1	9.0	10.0	14.0	18.0	23.73	29.17	49.30	58.30
Without (NPK) control	4.1	8.23	10.9	15.43	20.33	25.50	30.97	48.87	52.0
F-test	ns	ns	ns	ns	ns	*	*	ns	*
L S D (5%)	0.20	0.48	0.37	0.37	0.50	0.28	0.25	0.40	0.68
C V (%)	9.8	9.6	6.1	4.3	4.6	2.0	1.4	1.4	2.1

Each value represents the mean from 3 replications. Mean differences within each column determined by LSD at 5% level of significant. \* $p \leq 0.05$ ; ns = non significant.



**Figure 8 Studies on the Plant Height of Cowpea (with NPK and without NPK) in field**

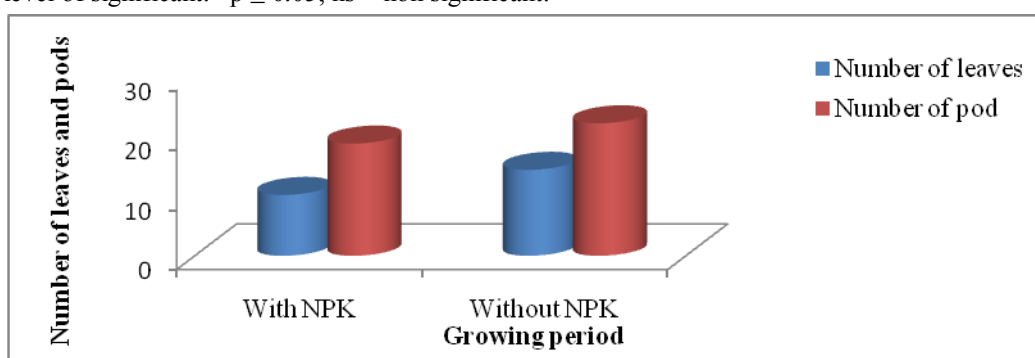
### Number of Leaves and Number of pods

After harvest, tallest plant growth were found in control (with NPK) compared to the height of control without NPK) cowpea bean plants (Table 2). However, number of leaves and number of pods were (obviously higher in control (without NPK) cowpea plants significantly lower in (with NPK) (Figure 9). Cowpea plants had statistically significant number of pods among treatments chemical fertilizer during the growing period (Table 2). Among the treatments of without NPK number of pods and number of leaves highest in cowpea plants at harvesting time (Figure 9).

**Table 2 Study on the number of leaves and number of pods in cowpea (with NPK and without NPK) in field.**

Treatment	Number of leaves ( plant <sup>-1</sup> )	Number of Pods ( plant <sup>-1</sup> )
with (NPK)	18.80	10.20
Without (NPK) control	22.20	14.40
F-test	ns	*
L S D (5%)	2.20	0.41
C V (%)	24.00	7.5

Each value represents the mean from 3 replications. Mean differences within each column determined by LSD at 5% level of significant. \* $p \leq 0.05$ ; ns = non significant.



**Figure 9 Study on the number of leaves and number of pods in cowpea (with NPK and without NPK) in field**

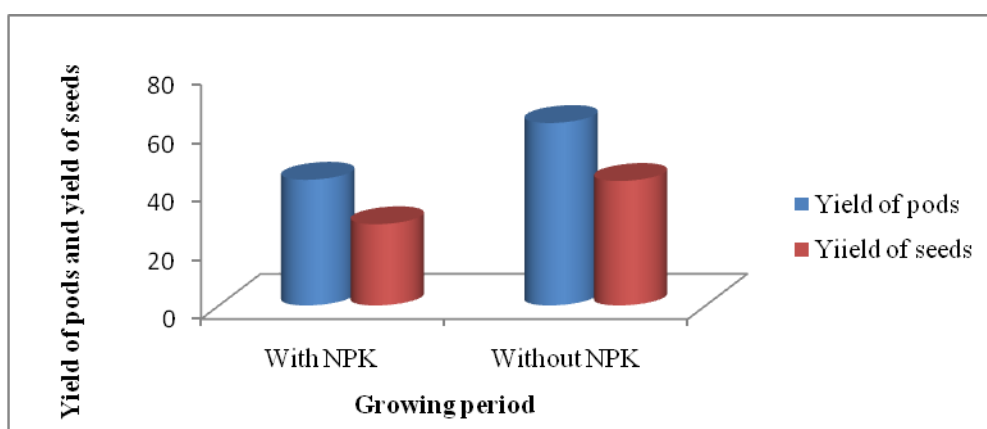
### Pods of yield and seeds of yield

In the present study, one of with NPK and without NPK cowpea seeds had not statistically significant differences in yield of pods and yield of seeds among treatment. Comparison on with NPK and without NPK cowpea plants, the pod yield and seed yield were higher in the without NPK (Table 3 and Figure 10).

**Table 3 Study on the pod yield and seeds of yield in cowpea (with NPK and without NPK) in field.**

Treatment	Pod yield (g plant <sup>-1</sup> )	Pod of seeds (g plant <sup>-1</sup> )
with (NPK)	43.00	27.78
Without (NPK)control	62.42	42.58
F-test	ns	ns
L S D (5%)	6.12	3.76
C V (%)	26.0	23.9

Each value represents the mean from 3 replications. Mean differences within each column determined by LSD at 5% level of significant. ns = non significant.

**Figure 10 Study on the pod yield and seeds of yield in cowpea (with NPK and without NPK) in field.**

### Discussion and Conclusion

The present study was carried out to the effect of plant growth and yield of cowpea seeds using and without using chemical fertilizer in the field of East Yangon University Campus during 2017 to 2018. The morphological characters, plant height, pods yield and nutrient components of cowpea seeds were cultivated. In the present study, cowpea seeds were grown in the field and observed their plant growth development, yield components and yield after harvesting.

Those morphological characters of the present study were agreed with the following authors. According to Johri and Bhattacharyya (1998), flowers are raceme, bracteates, bracteolate, pedicellate, bisexual, hypogynous, zygomorphic. Sepals 5, connate, campanulate, corolla papilionaceous, petals

5, the posterior odd petal outermost and is called standard, two lateral ones the wings and the two anterior ones fused to form a keel. Stamens 10, (1+9) diadelphous, rarely 9 and monadelphous, all fertile, anthers are basifixed, ditheous, filaments fused to form staminal column but free near the apex. Gynoecium monocarpellary, superior, unilocular, ovary with marginal placentation and one row of ovules, style thick and curved at base, stigma brushy, capitate. Fruit a dehiscent. Seeds are reniform funicle. Embryo is exalbuminous.

In this study, plant height of cowpea for two types was measured once a week. Total measuring week was nine weeks. It was found that the plant height of cowpea by using Chemical fertilizer (NPK) was longer than that of control. The plant height of cowpea by using NPK was 58.30 cm and 52.00 cm of plant height was observed for growing control.

The number of pod, weight of pod, seeds in of pods and number of leave per plants were also discussed. In the plant by using NPK, number of pods was (10.20)gm and (14.40)gm per plant was observed for growing control. The weight of pods per plant (43.00) gm growing with NPK was less than that of pods per plant (62.42) gm control. It was found that number seeds per plant (27.78)gm by using NPK. It was lesser than number of seeds per plant (42.58) gm control. Then, number of leaves per plant (18.80) gm was counted for growing with NPK and 22.20 gm leaves per plant was present for growing control.

Finally, it was found that only plant height of cowpea by using NPK was nearly same as than that of cowpea by control. But, number of pods, seeds in pods, weight, weight of pods and number of leaves per plant by using NPK was less than that per plant by control. It should be studied how to change plant growth and yield components in future.

Therefore, the application of chemical fertilizer on cowpea seeds would be influenced the plant growth development and production of high yield and seed yield in lower than chemical fertilizer. Because seed bearing plants such as peas, beans and tomatoes require a good amount of phosphorus and potassium but little nitrogen. This anomalous behavior of cowpea may be due to incorrect ratio of NPK. According to the result parameter of growth, the



amount from without using NPK is more significant than by using NPK during present situation.

It was concluded that the method cultivation process of these useful species of cowpea are more applicable crop for the organic farming.

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### Website

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