

## The Effect of NPK Fertilizer on Peanut Crop Production (*Arachis hypogaea* L.)

Andrian Imam Rahmadi<sup>1</sup>, Siti Hardianti Wahyuni<sup>2</sup>, dan Meiliana Friska<sup>3</sup>

<sup>1,2,3</sup>Faculty Agriculture, Agroteknology Universitas Graha Nusantara, Indonesia

\*Corresponding author : [sitihardiantiw@yahoo.com](mailto:sitihardiantiw@yahoo.com)

**ABSTRACT.** The need for peanuts from year to year continues to increase in line with the increasing population, community nutrition needs, food diversification, and the increasing capacity of the feed and food industry in Indonesia. N, P, and K are important factors and must be available to plants because they function as metabolic and biochemical processes of plant cells. Nitrogen is used as a builder of nucleic acids, proteins, bioenzymes, and chlorophyll. The purpose of this study was to determine the effect of NPK fertilizer on the growth and production of peanut plants. This research was conducted from January 2023 to April 2023 at the Faculty of Agriculture, Graha Nusantara University Padangsidempuan. The method in this research is Non Factorial Randomized Group Design (RAK) with 4 types of calcium fertilizer treatments: 0 g/polybag (C0), 3 g/polybag (C1), 5 g/polybag (C2) and 7 g/polybag (C3). The results showed that NPK fertilizer affected the number of pods, pod weight and seed weight. The calcium fertilizer treatment that gives the best results on soybean crop production is in the C2 treatment, namely a dose of 5 3 g / polybag.

**Keywords :** *Groundnut, Growth, NPK Fertilizer, Production*

### INTRODUCTION

Peanuts have a high economic value and play a major role in meeting the needs of legumes. Peanuts contain 25-30% protein, 40-50% fat, 12% carbohydrates and vitamin B1 and peanuts are the main source of protein after peanuts. The benefits of peanuts in the industrial field include the manufacture of margarine, jam, soap, cooking oil, (Cibro, 2008).

Groundnut cultivation is suitable in areas with moderate rainfall. Groundnut cultivation is effective in loose soil with sufficient nitrogen (N), potassium (K) and phosphate (P) nutrients. Groundnut is a plant that can produce its own N with the help of bacteria, but the formation needs to be stimulated first by the provision of Nitrogen from outside.

The low productivity of groundnut in Indonesia is caused by several factors, including cultivation techniques, pest control and fertilization. Efforts to increase the productivity of peanut plants can be done in many ways. One of the efforts that can be made to increase peanut crop production is fertilization.

N, P, and K are important factors and must be available to plants because they function as metabolic and biochemical processes of plant cells. Nitrogen is used as a builder of nucleic acids, proteins, bioenzymes, and chlorophyll. Phosphorus is used as a builder of nucleic acids, phospholipids, bioenzymes, proteins, metabolic compounds that are part of ATP important in energy transfer. Potassium is used as a regulator of the balance of cell ions that function in regulating various metabolic mechanisms such as photosynthesis. For this reason, the doses of N, P and K fertilizers will have a good effect on plant growth and yield (Firmansyah et al., 2017). Nutrients N, P, and K are essential nutrients for plants and as a limiting factor for plant growth. Increasing the dose of N fertilization in the soil can directly increase protein (N) levels and crop production, but the fulfillment of N elements alone without P and K will cause plants to be easily lodged, sensitive to pests and diseases and reduce the quality of farm production (Tuherkih & Sipahutar, 2008).

### MATERIALS AND METHODS

This research was conducted in September-December 2023 on farmers' land in Pintu Padang I village, Batang Angkola sub-district, South Tapanuli district. The tools used in this research are hoes for cultivating the soil, paddles for watering plants, polybags (3 kg), scales, meters. The materials used in this study were peanut seeds, NPK fertilizer.

This study used a non-factorial Randomized Group Design (RAK) with NPK fertilizer treatment:

C0 = without NPK fertilizer (control)

C1 = dose of NPK fertilizer 3 g/polybag

C2 = dose of NPK fertilizer 5 g / polybag

C3 = dose of NPK fertilizer 7 g / polybag

### Research Implementation

The implementation of the research was carried out in several stages, namely:

#### a. Preparation and Processing of Planting Media

Planting media in this study is soil, the soil that has been taken is first cleaned from garbage, plastic, litter, root pieces and gravel. After cleaning, the appropriate planting media was put into polybags. Furthermore, polybags were arranged randomly according to the experimental plot.

#### b. Planting

Before the seeds were planted in the polybags, soaking the bean seeds with warm water (temperature 40-45 c) for 10 minutes was carried out with the aim of breaking the dormancy period of the seeds (awakening the seeds while accelerating germination). Planting by immersing the seeds into polybags containing soil as many as two seeds in one hole. Replanting was done one week after planting.

#### c. NPK Fertilizer Application

Fertilization is done at the age of 1 (one) MST. NPK fertilizer is applied according to the treatment into each polybag at the age of 2 MST and 6 MST 10 MST.

#### d. Maintenance

Plant maintenance is carried out in the form of weed control, pests, and diseases adjusted to field conditions. Weed control is carried out every week after planting, pest and disease control is carried out by applying insecticides.

#### e. Harvesting

Harvesting is done by taking peanuts from the ground and cleaning them from the remaining soil after which they are dried in the sun. Drying of peanuts is done naturally by drying the seeds under the sun until they reach a moisture content of 9-10%.

### Research Parameters

The parameters measured and observed in this study are:

#### 1. Number of Pods (pods)

Observation of the number of pods was done at harvest time by counting all pods on each plant. Counting was done in units of pods per plant.

#### 2. Pod weight (gram)

Observation of pod weight is done at harvest time by weighing all pods on each plant.

#### 3. Seed Weight (gram)

Observations were made after harvest by cleaning the seeds from the pods, then weighed on the plant.

### Data Analysis

The collected data were analyzed by Analysis of Variance (ANOVA) and statistical data processing was carried out using the F test at the  $\alpha = 5\%$  level. If the results showed significant differences, it was continued with the Duncan Multiple Range Test (DMRT).

## RESULTS AND DISCUSSION

### Number of Pods (pods)

The variable number of pods is taken by counting all the number of empty and filled pods formed on each plant, from the analysis of NPK fertilizer treatment affects the number of pods between the treatment and control. The average number of peanut pods is presented in Table 1.

Table 1. Average number of pods of peanut plants against the effect of NPK fertilizer application

Treatments	Number of Pods
C0	17.83a
C1	39.17b
C2	41.67b
C3	40.00b

Based on the results of variance analysis above, it is known that the treatment of NPK fertilizer on the number of pods of peanut plants shows a significant effect between the control and treatment, namely in the treatment of C0 (0 g) with C2 showing a significant effect. The highest average number of pods of peanut plants is found in the C2 treatment which is 41.67. The lowest

average number of pods was found in the C0 (0 g) treatment. The number of pods formed is influenced by the dose of fertilizer treatment, this is in line with the opinion of (Meirina et al., 2009) that different doses of NPK fertilizer will affect the absorption into the plant through the roots and different doses of fertilization affect the reproductive growth of peanut plants.

In accordance with the results of the study that the best optimum dose in peanut plants is in the C2 treatment, if less or more than the dose, it greatly affects the results of the number of peanut pods. Furthermore, Irwan (2006) stated that variety plays an important role in determining the yield component of peanut because to achieve high productivity is largely determined by the potential yield power of the superior varieties planted. In addition, the number of pods formed is also influenced by certain nutrients that play a role in flower formation. The application of NPK fertilizer with the right dose gives higher results, this shows that the increase in the number of pods in the application of NPK fertilizer with the right dose has to do with the adequate availability of assimilates during seed filling due to increased assimilate transport from leaves and stems towards pods for seed filling (Pandingan, 2017).

### Pod weight (gram)

The observation data of peanut pod weight is calculated as a whole, namely empty pods and filled pods along with the skin. The results of analysis of variance of peanut with NPK fertilizer treatment can be seen in Table 2 below.

Table 2. The average weight of peanut pods against the effect of NPK fertilizer.

Treatments	Pod weight (gr)
C0	26.67a
C1	73.33b
C2	80.00b
C3	68.33b

Based on the results of variance analysis above, it is known that the treatment of NPK fertilizer on the weight of peanut pods showed a significant effect between the control (C0) and the treatment of C1, C2, and C3. In the observation of the lowest average pod weight was found in the C0 treatment (26.67) and the highest average was found in the C2 treatment (73.33). NPK has an important role in cell wall and membrane stability in active young tissues associated with physiological processes (Matos et al., 1993). NPK composes structural elements in the form of cell membrane building. Pod weight in peanut plants treated with fertilizer looks different without fertilizer.

Nitrogen nutrients contained in npk fertilizer have uses for plants, namely, making leaves contain more green leaf grains (chlorophyl), phosphate elements are useful for strengthening stems and killing fungi on plant skin and potassium elements are useful for accelerating plant growth, can increase plant protein content and npk fertilizer can also be used for all types of plants, both food crops, horticulture, and especially plantation crops (Marsono.2001: 203). The nutrients needed by plants are C, H, O (availability in nature is still abundant), N, P, K, Ca, Mg, S (macro nutrients, levels in plants > 100 ppm), Fe, Mn, Cu, Zn, Cl, Mo, B (micro nutrients, levels in plants < 100 ppm). The 13 nutrients are very limited in number and tend to be inadequate in the soil (Marsono, 2001: 190).

### Seed Weight (gram)

The observation of seed weight of peanut plants on the effect of NPK fertilizer application showed a real effect. The results of the analysis of the average weight of filled pods can be seen in Table 3.

Treatments	Seed weight (gr)
C0	16.67a
C1	40.00bc
C2	46.67c
C3	35.00b

The results of variance analysis showed that seed weight showed a significant effect between the control and treatments C1, C2, and C3. The highest average seed weight was found in the C2 treatment which was 46.67 grams and the lowest treatment was in the C0 treatment which was 16.67 grams. Huang et al. (2005), stated that the provision of NPK can reduce fruit rupture in plants.

According to Sukmawati (2013), seed weight is an important indicator in peanuts, because seeds are a form of harvest in peanut cultivation. Seed yield is a stimulant effect of the interaction of various environmental and genetic factors of peanut plants. The availability of sufficient water during generative growth can increase seed weight because seed weight is strongly influenced by the amount of water given in the growing season (Adisarwanto, 2005).

According to Sinaga (2005), the diversity of peanut seed size in one plant occurs due to the diversity of environmental conditions in various growth areas, the diversity of conditions between plants in a plantation, and the diversity of conditions and age of pods in one plant. The application of NPK fertilizer to plants can increase the availability of the element P, increasing P can increase seed weight, this is because phosphorus is an integral part of plants that play a role in the capture of ADP (adenosine diphosphate) and ATP (adenosine triphosphate) which are used to carry out reactions that require energy, such as the formation of sucrose and flour (Sitepu, 2017). Element P plays a role in cell division and the formation of fat and albumin, the formation of flowers, fruits, and seeds, plant maturity and improving plant quality (Soepardi, 1983).

The element P is a constituent of every living cell, such as phospholipids, nucleoroteins and phytin which will then become widely stored in seeds. Phosphorus plays a very active role in transferring energy in the cell, also functions to convert carbohydrates so that the weight of 1000 seeds increases (Opala et al., 2018).

## CONCLUSION

The conclusions of the research results are: Application of NPK fertilizer has a significant effect on the number of pods, pod weight and seed weight. The best treatment is found in C2 which is the application of 5 g NPK fertilizer.

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