Effect of Four Different Soils on Yield Characters of *Arachis hypogaea* L.

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Abstract

Arachis hypogaea L. is grown throughout Myanmar for its seeds, mainly to produce cooking oil. In this research work, the studies on the growth rate of *Arachis hypogaea*,L the yield characters and the response of the plant to the 4 different soil conditions were carried out in detail.The plant growth in the silt-loam soil of Zee-Chaung Village in Sagaing Township, showed the best results followed by Mandalay University Campus soil and Kyauk- Mee, while soil of Yae-Ma-Pasture Land, soil showed the poorest outcome. Zee-Chaung Village, the soil of Sagaing Township is rich in K_2O_5 than any other chemical components, and has high percentage of slit than sand and clay, and thus forms the silt-loam soil. The data were carefully recorded, analyzed and the conclusion was drawn base on those data.

Introduction

Peanut is the seeds of *Arachis hypogaea* L. of Fabaceae and it is cultivated in most tropical countries, subtropical and even in temperate regions, particularly in Myanmar, India, China, West Africa, Japan and Southern United States. The plants are grown especially for the oil production. The peanut also known as groundnut, earthnut, goobar or pinder, the seeds or nuts are used as a salad oil, for cooking, for packing sardines, in making margarines and shortenings. In Myanmar, the seeds are used as a food and it constitutes a national favorite as appetizer and delicacy. In some countries, even in Europe, the peanut oil is used as adulterant for olive oil. Inferior grades are used for soap making, lubricants and illuminants. The oil cake (the press cake) is one of the best stock feeds as it has higher protein content than any other similar products. The oil is also used for various industrial purposes and it is in great demand in Europe, and thus Europe is the chief importing and processing region (Duke, 1981).

In Myanmar, groundnut is grown in different States and Regions according to their own local way of cultivations. The studies on the growth rate, yield characters and response of plants to different soil conditions were carried out in detail in this research. The results and other facts of this present work would yield the new information in studying of ground for the benefits of the Myanmar cooking oil production.

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Materials and Methods

Peanut or groundnut (*Arachis hypogeae* L.) a single plant material is solely used in this research work. Four different types of soil were collected for the experiments. They were collected from the Yae-Ma-Pasture land, Sagaing (Zee-Chaung-Ywa), Mandalay University Campus and Kyauk-Mee (in Pathein- Gyi-Township of Mandalay Region).

Experimental pots with a diameter of 32 cm and 26 cm in deep were used for the experiments. Altogether 20 pots, 5 for each soil sample were used. All the pots experiments were also carried out in Zee-Chaung-Ywa.

Experiment with the Pots

In pot culture 80 seeds were used for the experiment of pots. 5 pots each were filled with soils that were collected from Yae-Ma-Pasture-Land, Zee-Chaung soil, Mandalay University Campus soil, and Kyauk-Mee soil, 4 seeds were sown in each pot and watered every day. After 5-days from sowing, it starts growing. One month after germination, each plant from each pot were collected to measure their shoot-length, root-length, plant wet-weight and dry-weight, fruit wet-weight and dry-weight and number of fruits per plant. Similar measuring was also done for the next two times.

Soil Test

Soil samples collected from Yae-Ma-Pasture-Land; Zee-Chaung-Ywa of Sagaing; Mandalay University Campus and Kyauk-Mee from Pathein-Gyi Township were tested at Agriculture Institute of Development. Data on the pH value, content of Nitrogen, Potassium and Phosphorus; Total Nitrogen; percentage of organic matter, soil texture and type of soil were shown in (Table 1).

Data Analysis

Data of *Arachis hypogaea* L. that obtained from the pot experiment were analyzed by Least Significance Difference (L.S.D) test. All the statistical methods that used in the present investigation were followed to Steel and Torrie (1960) procedures respectively.

Table 1. Physical and Chemical Characteristics of Soil Samples Used in the Present Investigations.

Location of soil	P^H	Chemical contents					Soil texture %	Soil Type
		N_2%	P_2O_5 lb/ac	K_2O_5 %	Organic C%	Total N_2 %	Sand !Silt !Clay	
Yae-Ma-Pasture- Land	8.31	0.0043	17.15	0.0384	1.7400	0.0610	40.9933.68 25.92	Clay loam
Zee-Chaung Sagaing	6.92	0.1500	12.82	7.3470	0.2400	0.4710	17.9654.43 23.44	Silt loam
Mandalay University Campus	8.65	0.0043	195.32	0.0447	0.3100	0.0990	12.0822.82 61.36	Clay
Kyauk-Mee (Pathein-Gyi Township)	7.86	0.0050	38.40	0.0421	0.9653	0.1094	34.2128.48 33.20	Clay loam

lb/ac = Pound per acre.

Results

Morphological Characters of *Arachis hypogaea* L.

Scientific name - *Arachis hypogaea* L.

Family - Fabaceae

English name - Groundnut, Peanut

Myanmar name - Myay-pe

Erect or trailing herbs. Leaves pinnately compound, with four foliate, leaflets obovate, rarely elliptic. Inflorescence axillary with few yellow flowers. Pods oblong, swollen, pale yellow, woody at maturity. Seeds 1-2 per pod, cylindrical to ovoid swollen, red or pink; hilum white, (Figure1).

Shoot Length: After 5 days of germination, all the germinated *Arachis hyspogaea* L. seeds have the appearance of shoot. Till 7 days of after shoot appearance, their lengths were not different from one to another of the soil. After 8 days, their shoot growth rate became different from one to another soil (Figure2). Comparison on their shoot length from 10 days after the appearance of shoot showed that the plants that planted on the Sagaing soil have significantly longer than the plants that planted on the soil of Kyauk-Mee; Mandalay University Campus soil, and Yae-Ma-Pasture-Land soil.

Measurement taken every replicate showed that the plant on the Kyauk-Mee soil exhibited rapid growth rate and on the fourth time of measurement it resulted the best shoot growth rate among the 4 soil tested (Figure 1; Table 2).

Root Length: After the germination, before the shoot appeared, firstly the root started to elongate. All the germinated seeds of *Arachis hypogaea* L. of 4 different soils gave almost nearly all the same length in every measurement and they were not significantly different from one to another soil (Table 3). Although the root length of *Arachis hypogaea* L. did not highly differ in the first time collection, starting from the second time collection, the plants that were planted on the soil of Yae-Ma-Pasture-Land soil and Zee-Chaung soil showed only slightly increase in root length in the second, third and fourth time collection, while plants from the Mandalay University Campus and Kyauk-Mee soil sharply increased in root length in the second, third and fourth collection.

Plant Wet-Weight (gm): Second time recording the wet weight of plant showed that the plant cultivated on the soil of Zee-Chaung have significantly higher in wet weight than the plants from Mandalay University Campus soil and Kyauk-Mee soil, while the rest were not significantly different (Table 5). On the fourth day of recording, plants from Mandalay University Campus soil had the height weight followed by Zee-Chaung soil, Kyauk-Mee soil and Yae-Ma soil in serials.

Plant Dry-Weight (gm): First, second and Third measurement on plant dry weight of *Arachis hypogaea* L. showed that Zee-Chaung soil of result the highest among 4 types of soil. On the fourth day measurement, the highest weight was observed from the plant that grown on Mandalay University Campus soil. Most of the soils had an increase on dry weight sharply in all measurement (Table 6).

Number of Fruits per Plants: First and second replicate collections showed that *Arachishypogaea* L. plant cultivated on the Zee-Chaung (Township) soil had significantly the highest number of fruits than others, while plants planted on the Mandalay University Campus soil had signigicantly superior number of fruits than othercultivated on the other 3 types of soil on third replicate. Among 4 types of soils used for the experiments, Mandalay University Campus soil and Kyauk-Mee soil gave rise rapidly increase in number of fruits per plant from one to another measurement, while plants from Zee-Chaung soil resulted decreased in number of fruits at the third replicate (Figure 2, Table 7).

Wet Weight of Fruits: Similar to the results on number of fruits, wet weight of fruits were also observed superior on the plants planted on the Zee-Chaung (Sagaing Township) soil for the first and second replicates, while for the third, was observed on the Mandalay University Campus soil. After sharply increased in wet weight of fruits, the fruits from the Zee-Chaung and Yae-Ma-Pasture-Land soils decreased in the third replicates or fourth measuring days, while the fruits from the Kyauk-Mee and Mandalay University Campus soil exhibited increased in wet weight of fruits (Table 8).

Fruits Dry Weight: No significant difference in fruit dry weight was observed in the first replicate, while significantly different from Zee-Chaung soil fruits to Kyauk-Mee soil fruits was observed in the second replicated the heaviest dry weight than Yae-Ma-Pasture-Land fruits in the third replicates were also studied. Rapidly increased in dry weight from one to another replicates were observed from the fruits of Mandalay University Campus soil and Kyauk-Mee soil fruits (Table 9).

The same alphabet in each column showed there were not significantly different from one to another row. S.E = Standard Error.

Different alphabets in each column showed significantly different in plant wet-weight from one to another row in same column at 5 % level; while the same alphabet in each column showed that there were no significantly different from one to another row. S.E= Standard Error.

Different alphabets in each column showed significant difference in plant Dry-weight from one to another row in same column at 5 % level; while the same alphabet in each column showed that there were not significantly different from one to another row. S.E= Standard Error.

Different alphabet in each column showed that the number of *Arachis hypogaea* L fruits were significantly different from one to another that collected for 3 replicates on 4 different types of soils. The significant level is 5 % respectively.

Different alphabet in each column showed that the Wet-Weight of *Arachis hypogaea* L. fruits were significantly different from one to another that collected for 3 replicates on 4 different types of soils. The significant level is 5 % respectively.

Different alphabet in each column showed that the Dry-Weight of *Arachis hypogaea* L. fruits were significantly different from one to another that collected for 3 replicates on 4 different types of soils. The significant level is 5 % respectively.

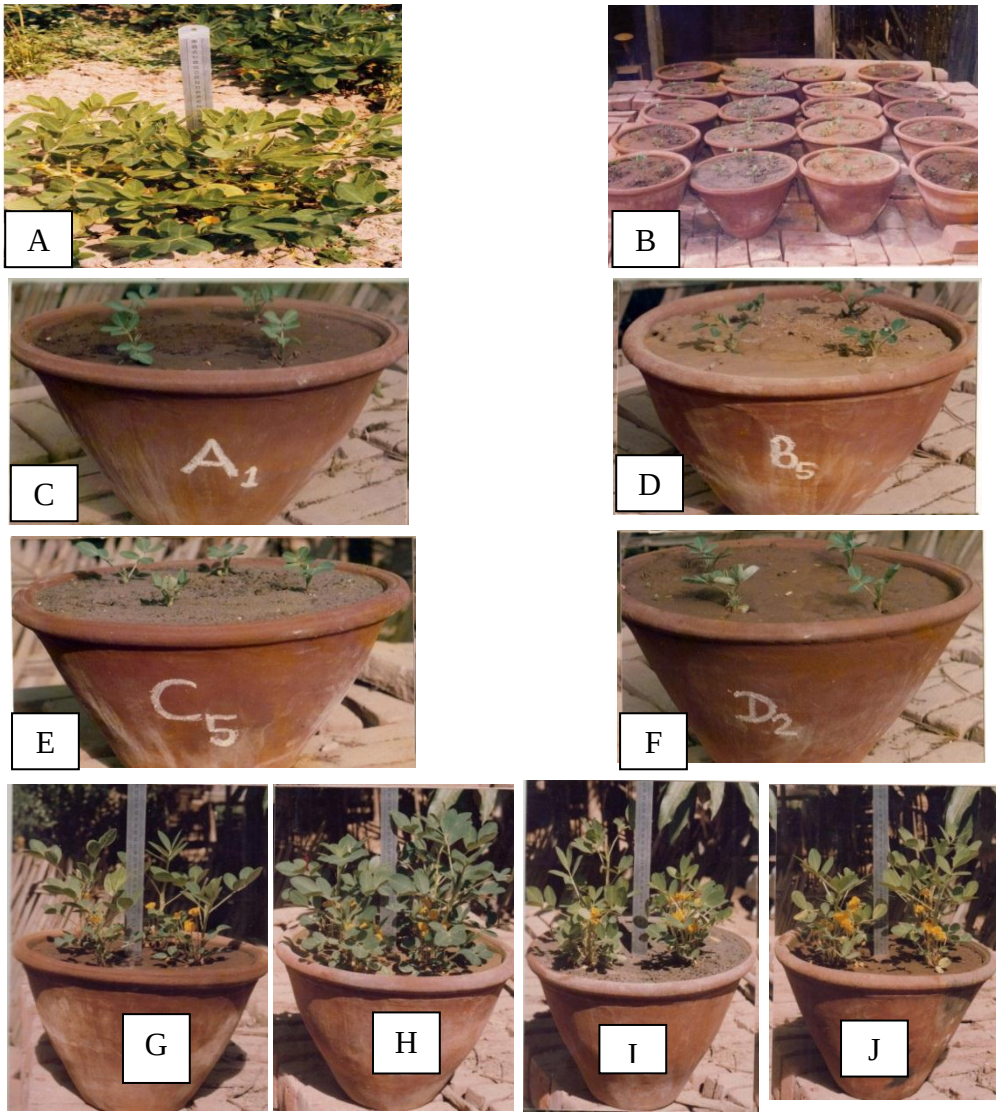

Figure 1. A. Morphological characters and Growth rate of *Arachis hypogaea* L.
B. Pot experiment on *Arachis hypogaea* L. in 4 different types of soil.
C. Seven days old *Arachis hypogaea* L. shoot planted on Yae-Ma-Pasture-Land soil.
D. Seven days old *Arachis hypogaea* L. shoot planted on Zee-Chaung soil.
E. Seven days old *Arachis hypogaea* L. shoot planted on Mandalay University Campus soil.
F. Seven days old *Arachis hypogaea* L. shoot planted on Kyauk-Mee soil.
G. Yae-Ma-Pasture-Land soil,
H. Zee-Chaung soil from Sagaing Township,
I. Soil from Mandalay University Campus,
J. Soil from Kyauk-Mee (Pathein-Gyi Township).

Figure 2. Fruit number of *Arachis hypogaea* L. collected for the (A) first time, (B) second and (C) third time from the experimental pots filled with 4 different types of soil.

I. Yae-Ma-Pasture-Land soil,
II. Zee-Chaung soil from Sagaing Township,
III. Soil from Mandalay University Campus,
IV. Soil from Kyauk-Mee (Pathein-Gyi Township).

Discussion and Conclusion

In the present study, *Arachis hypogaea* L. were tested on 4 different types of soil. They were collected from Yae-Ma-Pasture-Land; Zee-Chaung-Ywa of Sagaing; Mandalay University Campus and Kyauk-Mee from Pathein-Gyi Township. Among those soil experimented, soil from Zee-Chaung, (Sagaing Township) yielded the best which has 6.92 in pH value, while the soil is forming by 54.43 % of silt form, the silt loam soil type, followed by Mandalay University Campus soil which has 8.65 in pH value, while the soil is forming by 61.36 % of clay form, the clay soil type and Kyauk-Mee soil which has 7.86 in pH value, while the soil is forming by 34.21 % of clay form, the clay loam soil type. The plant grown on Yae-Ma-Pasture-Land soil showed the poorest outcome which has 8.31 in pH value, while the soil is forming by 40.99 % of sand form, the clay loam soil type (Table 1).

Flowering of *Arachis hypogaea* L. does not depend on day length. It occurs earliest at high temperature (Bunting and Elston, 1980), although there were cultivar differences in flowering response to temperature (Bolhuis and deGroot,1959). Final pod size was greatest at or below 24˚C (Cox, 1979; Williams *et al*., 1975). The crop appeared to be adapted to high relative humidity (Fortainer, 1975; Lee *at al.*, 1972). Duke (1981) reported that *Arachis hypogaea* L. can be grow and bear fruits on the soil having 4.3 to 8.7 soil pH value, but 6.5 pH value is the best for *Arachis hypogaea* L. growing. The good soil organic matter content is often cited as being necessary for high groundnut yield (Purseglove, 1987).

Some discrepancies between the present data and the information obtained from other research paper may be different in the content of organic matter ratio, the interaction between the soil type and the environmental conditions and the last largely depends on the cultivars used and the fertilizers, the methods of cultivation and other differences used. These data suggest that to suit with their land, soil, environment conditions, with the plants they were going to cultivate on their soil, it needs to carry out the research work concerning with their places, adaptability of the cultivars, response of plants to their local soil and water uses in their cultivation. However, it is believed that this present data and information will be a good tool for those groundnut cultivators, and those who want to study the interaction of soil texture, soil components and the plant characters.

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