

Morphological and Developmental Characteristics of Groundnut

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Abstract Groundnut (*Apios americana*) is a winder legume that produces edible torous tubers along its rhizomes and a vine 2~6 m in length. Side runner originates at lower nodes of main vine and flowers at upper ones. Flowering is abundant, but no fruit. In a field, a whole internodes or several successive short internodes are tuberized occasionally.

Key words groundnut, tuber, protein, seed

Introduction

The great leader Comrade **Kim Il Sung** said as follows.

“Currently, one of the most important aspects of developing the poultry and livestock industries is to solve the protein feed problem.”(“KIM IL SUNG WORKS” Vol. 33 P. 54)

Groundnut (*Apios americana*) is a new nitrogen-fixing crop growing in American and Eastern North America, which was collected as seed from the wild in the lower Mississippi valley in 1985 [2].

Researchers studied the growth characteristics of groundnut under field condition [3], proceeded a preliminary test of the groundnut growth in a tropical region and assessed its possibility as a crop.

In our country where crop area is limited and forest occupies most of land, we must actively cultivate and use high protein natural feed crop in order to solve livestock feed problem harmoniously [1].

We found the morphological and developmental characters of groundnut in our country.

1. Materials and Methods

1.1. Materials

“Tangbam 1” (groundnut, *Apios americana*) was used as seed.

1.2. Methods

After digging a pit with 30cm of width and 35cm of depth, and spreading compost 10t and nitrogen fertilizer 200kg per ha, covered soil on it. Then we laid out seeds on it and covered soil again.

At common growing test the number of plant was 6 000 per ha.

After growing above 10cm, we reared stick 3m high for vein and made net-shape with a line.

Nutritive element and feeding value of groundnut were assessed at the Central Experimental Analysis Company, the Academy of National Science.

2. Results

2.1. Morphological characters of groundnut

2.1.1. Morphological characters of groundnut root

Groundnut produced vein and new torous tubers along the rhizomes.

The investigation result of morphological characters was as follows (table 1).

Table 1. The morphological characters of groundnut root

Color	Root number per plant	Root thickness/mm	Root length/cm
Yellowish brown	3.3	1.5	34.4

As shown in table 1, root of groundnut was thin and very weak unlike general legume crop. The root numbers per plant were average 3.3 per tuber and their thickness was barely 1.5mm.(Fig. 1) Also, groundnut as legume crop produced some or dozens of nitrogen-fixing root knobs of which diameter was 1 to 4mm.

Bud of groundnut germinated at the above end of tubers. All of tubers were able to sprout. (Fig. 2)

Then the number of bud was usually 1 to 7 and the thickness was 2 to 4 mm. The color was mostly white or verdant green (Fig. 3).



Fig. 1. The shape of groundnut's root and root knobs

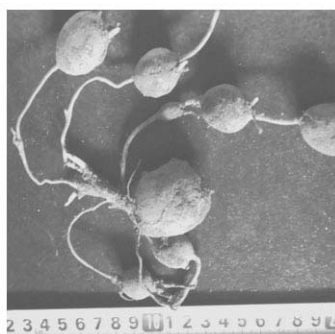


Fig. 2. Sprouting shape of groundnut



Fig. 3. Sprouting shape of a tuber of groundnut

2.1.2. The morphological characters of groundnut stem

The ground stem was twining vein round to the left and side runner were developed from each node of main vein and twisted each other with complexity.

The morphological characters of ground stem were as follows (table 2).

Table 2. The morphological characters of groundnut ground stem

Shape	Color	Length of main vein/m	Diameter/mm	Number of node	Number of side runner
Vein	Fox red	2~4.5	1~4	25~65	9~24

As shown in table 2, the ground vein spread above more than 2m, the color was fox red at lower part and became green along the margin.

The number of main vein node was usually 25 to 65 and a leaf attached to every node.

A side runner originated at every leaf axil and it was clearly about 9 to 10 per plant.

2 to 4 among the side runners clearly developed blooming and reminders developed as flower after growing 5 to 7cm.

2.1.3. The morphological characters of groundnut tuber

The shape of underground tuber was spindle one. The color was brownish and flesh color was white.

Seed tuber of groundnut had several buds at its distal end, but only one of the buds developed to stem and others became rhizomes (Fig. 4).

Table 3. The morphological characters of groundnut rhizome

Reaching depth of rhizome/cm	Extending width of rhizome/cm	Tuber number per plant
23.5	63.6	24~72

As shown in table 3, one tuber reached average 23.5cm depth and extended 63.6cm width or 1.5m at maxim. The number of torous tubers was approximately 24 to 72.

2.1.4. The morphological characters of groundnut leaf

Leaf of groundnut was developed on every node of stem at odd angles from each other. Leaf was a green feather compound one with 1 or 3 pairs of leaflets. The shape of leaflet was ovoidfigure and the end was sharp and its margin was smooth (Fig. 5).

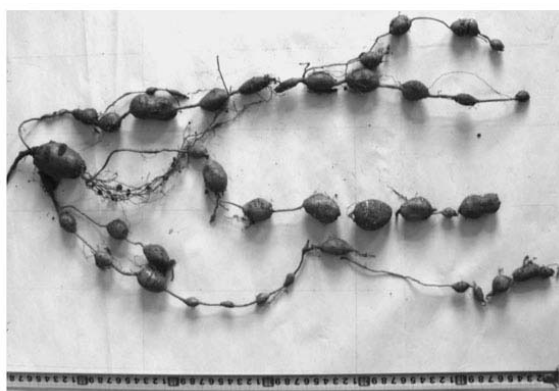


Fig. 4. The shape of groundnut rhizome



Fig. 5. The shape of groundnut leaf

The morphological characters of leaf were as follows (table 4).

Table 4. The morphological characters of groundnut leaf

Leafstalk length /cm	Leaf Length /cm	Leaf width /cm	Number of leaf per plant	Leaflet			Weight of a leaf per plant (g/leaf)
				Shape	Length /cm	Width /cm	
5.0	18~20	10~13	130~150	Oval	7.0~8.5	3.5~4.5	1.4~1.7

As shown in table 4, the number per plant was usually 26 to 45 in main stem and about 150 per plant. The corolla of groundnut was butterfly-shape and its color was deep pink-purple.

Groundnut had a blossom at node produced side runner, one or two blossom at node without side runner.

2.1.5. The morphological characters of groundnut flower

The morphological characters of flower were as follows (table 5).

Table 5. The morphological characters of groundnut flower

Blossom		Inflorescence	Number per node	Flower number per blossom
Length/cm	Width/cm			
5.5~10	2~3	2/5	1~2	25~35

The morphological characters of groundnut's one flower of were as follows (table 6).

Table 6. The morphological characters of one flower of groundnut

Number of petal	Flag-shape petal/cm		Wing-shape petal/cm		Pigeon petal/cm	
	Length	Width	Length	Width	Length	Shape
5	1.2	1.5	1.2	0.5	1.0	Curve



Fig. 6. The shape of inflorescence shaft after flower-withering.

As shown in table 6, in one flower, the size of flag-shape petal was 1.2 to 1.5cm, wing-flag one 0.5~1.2cm and pigeon one 1.0cm, respectively.

The groundnut had abortive flowers, so only inflorescence shaft remained after withering (Fig. 6).

2.2. Developmental characters of groundnut

After some period (3~4 months) of dormancy, groundnut began to sprout under the condition that air temperature is 5°C.

Developmental characters of groundnut were investigated, the results were as follows (table 7).

Table 7. Developmental characters of groundnut (month, date)

Planting time	Emergence time	1 st side runner	1 st flower bud	1 st flower time	Harvesting time	Growing period/d
4.4	5.4	5.30	6.24	7.1	10.17	195

As shown in table 7, the emergence of buds on the ground occurred 30 days after planting (DAP). 1st side runner was produced on May 30th (56 DAP). The biomass of stem reached maximum 165 days after planting, and then progressively declined. Like stem, leaf also increased slowly until 98 DAP and increased vigorously between 98 DAP and 168 DAP and progressively declined at end time.

Flowering characters of groundnut were as follows (table 8).

Table 8. Blooming characters of groundnut

Division	Time of 1 st flower bud	Time of 1 st flowering	Height of flowering	Withering of last flower
Date/month, date	6.24	7.1	7.20	9.15
Days after planting(DAP)	80	87	107	162

As shown in table 8, the best time of Blooming was on July 20th, 107 DAP. During the stem growing flower buds from leaf axil formed continuously and bloomed in turn. Finally, the flowering period was about 75 days.

Conclusion

Groundnut (*Apios americana*) is a winder legume that produces a lot of edible torous tubers along its rhizomes and flowers, but no fruits.

The numbers of tuber formed per plant are 24 to 72.

References

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