



**Research Papers Submitted to the  
25<sup>th</sup> Anniversary of  
Sagaing University of Education**

**Sagaing University of Education**

## **FORWARD**

Sagaing University of Education was first founded as Mandalay Institute of Education in Mandalay on 16<sup>th</sup> November, 1992. It was moved to Sagaing in 2000 and is now standing as Sagaing University of Education.

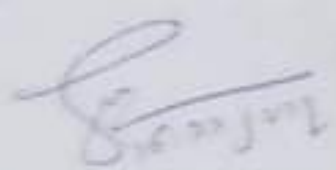
It has been producing thousands of teachers for Basic Education for 25 years. Teacher educators in Sagaing University of Education not only teach students to become well-qualified teachers but also upgrade themselves and do researches to find better means and ways for future education.

This is the compilation of research papers read at the ceremony of paper reading session in honour of Sagaing University of Education's 25<sup>th</sup> Anniversary.

**Dr. Saw Pyone Naing**  
**Rector**  
**Sagaing University of Education**  
**November, 2017.**

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Research Papers Submitted to the 25<sup>th</sup> Anniversary of  
Sagging University of Education

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## Studies on Germinability and Vegetative Growth Rate of Five *Allium* Species

Phyu Phyu Min<sup>1</sup>

### Abstract

Among the five species, *Allium cepa* varieties show Shwe Phar Lar Hteik Pyar exhibited the highest and Leek the lowest germination rate. They were ranged between 50% to 70% and 6.5% to 28% respectively. Shoot growth rate from bulb of Baung Zauk, Zaw Mwar of Myintha and Shwe Pha Lar Hteik Pyar showed highly variation in growth rate from plant to plant. Shoot growth rate from seeds of Shwe Phar Lar Hteik Myint have the highest growth rate than other three *Allium* while the poorest growth rate was observed in Baung Zauk.

**Key words:** *Allium cepa*, Myintha and Baung Zauk

### Introduction

*Allium cepa* L. is a diploid species ( $2n = 16$ ) which has been in cultivation for food since date back to 300 BC. In most countries the common onion (*Allium cepa*) is used as food or spice for it, have odour of alkyl sulphides. As onion becomes one of the most important vegetable crop many aspects of its usage as well as for its improvement were being made in many parts of the world. In 1988, world total production of onion reached to 25496 thousand metric tons (MT) from areas of 1787 thousands hectare nearly half of the world total production was produced from Asia exceeding 1212 thousands metric tons (MT) from 1003 thousands hectare. The chief onion production countries are China, India, USSR, USA, Turkey, Japan, Spain, Brazil, Iran and Poland. According to FAO 1987, the most onion exporting country is Netherland which followed by Spain, India, Mexico and Turkey, Germany, United Kingdom, United States, France, Malaysia and Canada are the countries that imported onion most.

Local varieties Shwe Phar Lar and Baunkzauk have their sub varieties differing in shape, example, Shwe Phar Lar Hteik Myint and Shwe Phar Lar Hteik Pyar. Besides Shwe Phar Lar there are many local varieties grown for both commercial and for home feeding. They are like

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Baung Zauk, Zaw Mwar has grown for both leaf and bulb while variety Leek grown only for the leaves.

Thus the present study investigates the germinability and growth rate of shoot of five local varieties. Shwe Phar Lar Hteik Myint, Shwe Phar Lar Hteik Pyar, Zaw Mwar of Myittha and Baung Zauk were carried out to broading the information on onion *Allium cepa*.

### Materials and Methods

#### Materials

Five common onion (four *Allium cepa* L. and one *Allium ampeloprasum* L. (*syn.A. Porrum*) cultivars widely grown in Myittha Township, Meiktila Township, Thazi Township, Pyinmanar Township of Mandalay Division in Myanmar are used in this investigation. Detailed information of five *Allium* cultivars used in the present investigation are described in Table 1.

Sample to be sown or grown from seeds were obtained from the seed shops and farmers separately. Bulbs were obtained from the plants grown from the seeds in the field (Men Chummery II of Mandalay University, (Plate 1, 2).

**Table 1. Detailed information of five *Allium* cultivars used in the present investigation**

No	Scientific Name	Myanmar Name	Chromosome No	Ploidy level	Source
1.	<i>Allium cepa</i> L.	Shwe Pha Lar Hteik Myint	16	2n	Market & farmers
2.	<i>Allium cepa</i> L.	Shwe Pha Lar Hteik Pyar	16	2n	Market & farmers
3.	<i>Allium cepa</i> L.	Baung Zauk	16	2n	Market & farmers
4.	<i>Allium cepa</i> L.	Zaw Mwar (Myittha)	16	2n	Market & farmers
5.	<i>Allium ampeloprasum</i> L.	Leek	16	2n	Market & farmers

## Methods

### Experiment for Germinability

In order to justify the germinability of five varieties of *Allium*, germination of seeds was done for five replicates. For each replicates 100 seeds for each variety were used. First seeds were sterilized in 70% alcohol for 5 minutes, then rinsed under running tap water for 5 minutes. Then the seeds were placed in the petridishes with filter paper presoaked with distilled water. The germinating seeds were counted continuously for fifteen days. This was done for all replicates. For experiment onion seedlings that are given plenty of vertical root space are grown in shallower quarters.

### Experiment for Vegetative Growth Rate

Experiments for vegetative growth rate of five *Allium* species were done for only one replicate. The experiments were carried out by using both the seeds and bulbs planting. For experiment with seeds first one hundred from each varieties were sown in the petridishes similarly as in experiment for germination. Seven days after the root and shoot appear from the seeds, they were transplanted into the field plots that already prepared in the height of men Chummery II of Mandalay University campus. Eventually the onion seedlings stay outdoors 24/7, provided temperatures are well about 46°F (8°C) at night. Consistent exposure to temperatures below 50°F (10°C) for more than 10 days can cause onion to bolt rather than producing big bulbs. The height of shoot were measured from 45 days after transplan-tation. The measuring process was carried out for 15 days continuously. The best time for planting onion seeds outdoor is in spring, usually around March to April. They are placed about an inch deep in the soil and approximately half an inch or more apart, if planting rows, spaced them at least one and half to two feet apart. (Plate 3, 4)

To carry out the experiment with bulbs, bulbs were randomly selected from the market place. They were directly planted into the plots in men Chummery II campus. Measuring the vegetation shoot was done as soon as the shoot appeared from the bulb (i.e. about 2 days after planting). This measuring process was also done for 15 days continuously.

### Statistical Analysis

Least Significance Difference tests were used to analyses the difference of vegetative growth rate of all the five cultivars. Comparison



was done for each and every days of the 15 days collection data. This was done for both vegetative shoots of seeds as well as of bulbs. The test method was adopted from the Gomez 1984.

## Results

### Germinability

Germinability of five *Allium* species was tested for five replicates. For the first replicate variety, Shwe Phar Lar Hteik Pyar exceeded 50% of germination, while variety Leek have only 6.5% (Fig.1). For the second replicate, varieties of Baung Zauk and Zaw Mwar of Myittha have no germination seeds at all, while variety Leek only 18 % of germination percentage.

In the third replicate, except variety Shwe Phar Lar Hteik Myint, germination of the rest four varieties ranged between 28 % and 48 % (Fig.1). In the fourth generation, similar as in first replicate, variety Shwe Phar Lar Hteik Pyar and variety Leek resulted the highest and lowest germination percentage (Fig.1). In the fifth replicate variety Baung Zauk and variety Leek showed the highest and lowest germination percentage (Fig.1). According to the Fig.1, it showed that variety Shwe Phar Lar Hteik Pyar, Baung Zauk and Zaw Mwar of Muitha have best germination ability compare to variety Leek and variety Shwe Phar Lar Hteik Myint showed poor in germinability.

### Growth rate of five *Allium* species

#### (A) Shoot growth rate from bulb

Comparison among five varieties of *Allium* species grown from bulb showed that variety Baung Zauk has the best growth rate which is followed by variety Zaw Mwar of Myittha then variety Shwe Phar Lar Hteik Pyar. The poorest growth rate of shoot was observed on variety Shwe Phar Lar Hteik Myint respectively (Fig.2). Measurement of shoot growth rate was done for 15 days continuously and found out that variety Shwe Phar Lar Hteik Myint has not significantly grown in all 15 days, they were gradually grown up. Varieties Zaw Mwar of Myittha, Baung Zauk, Shwe Phar Lar Hteik Pyar and Leek showed significantly rapid growth rate from eleventh day of data collection (Table.2). Varieties Baung Zauk, Zaw Mwar of Myittha and Shwe Phar Lar Hteik Pyar

showed much variation in growth rate from plant to plant, i.e. they have wide standard deviation (Fig.2).

#### **(B) Shoot growth rate from seeds**

Measuring of growth rate from the shoot can be done on only four varieties, for variety Leek are too poor in seeds germination. Opposite results were obtained in this experiment compare with the pervious growth rate grown from bulb. In this experiment variety Shwe Phar Lar Hteik Myint has the highest growth rate than the other three varieties, while the poorest rate was observed in variety Baung Zauk which exhibited the best growth rate of shoot when grown from bulb (Fig.3.)

When the data collected for 15 days were tested with Least Significant Difference (L.S.D) test, it showed that variety Shwe Phar Lar Hteik Pyar has significantly rapid growth rate than the other days collection while the rest varieties were not significantly different from one to another days collection data (Table.3.). Compare to the growth rate of shoot in growth rate than the former one (Fig.3.). Among the four varieties tested, variety Boung Zauk exhibited the slowest growth rate than other varieties. (Table 3, Fig.3)



Fig. 1. Growth rate of five different varieties of rice grown from seeds

- Variety - (filled circle) - (filled circle) - (filled circle) - (filled circle) - (filled circle)
- ▲ Lok
- Variety - (open circle) - (open circle) - (open circle) - (open circle) - (open circle)
- Variety - (open square) - (open square) - (open square) - (open square) - (open square)
- \* Variety - (asterisk) - (asterisk) - (asterisk) - (asterisk) - (asterisk)



Fig. 2. Comparison of the strength of the specimens.

- Tensile Test (Original Specimen)
- Tensile Test (Cut)
- Tensile Test (After Heat Treat)
- ◇ Cut
- ▲ After Heat Treat (Cut)



Fig. 1. Influence of various factors on the adsorption of lead ions by the adsorbent.

Legend:

- - 100% relative humidity
- - 50% relative humidity
- - 25% relative humidity
- △ - 10% relative humidity
- ◇ - 5% relative humidity

Table 2. Comparison on shoot growth rate of five *Allium* spp. grown from bulbs. Measurement was done for 15 days.

DC	Varieties				
	SPLHM	LEEK	SPLHP	BZ	ZM(MT)
	Mean ± S.E.	Mean ± S.E.	Mean ± S.E.	Mean ± S.E.	Mean ± S.E.
1.	1.00±0.95 a	0.73±0.75 a	0.32±0.53 a	5.30±4.54 b	0.57±0.63 a
2.	2.57±1.52 a	1.93±1.72 a	1.00±1.06 a	7.43±5.99 bc	1.70±1.35 ab
3.	3.63±1.59 a	2.97±2.28 a	2.63±3.03 a	10.97±7.27 b	4.60±3.40 a
4.	6.03±2.55 a	4.27±2.50 a	4.79±4.47 a	14.45±7.80 b	7.43±3.70 a
5.	7.20±3.32 a	5.93±2.94 a	7.15±5.51 a	18.33±7.46 b	9.85±4.38 a
6.	9.13±3.92 a	8.00±3.61 b	9.97±6.02 a	22.53±6.95 c	13.75±5.27 a
7.	11.90±4.44 a	10.13±4.05 a	11.82±6.03 a	26.23±5.86 b	17.00±5.64 c
8.	13.42±4.40 a	12.13±4.12 a	15.03±6.36 a	28.47±5.69 b	20.10±6.02 ab
9.	15.22±4.56 a	13.92±4.16 a	17.88±6.64 a	29.57±5.53 b	23.30±6.33 ab
10.	17.28±4.83 a	16.15±4.16 ab	20.72±6.70 ac	31.70±7.74 bc	25.80±5.91 bd
11.	18.70±4.93 a	17.32±4.32 a	23.37±6.60 b	34.33±4.20 c	28.17±5.87 d
12.	20.60±5.19 a	18.60±4.44 a	25.95±6.90 b	36.83±4.11 c	30.97±5.82 d
13.	21.80±5.15 a	20.07±4.36 a	28.93±6.49 b	38.90±3.84 c	32.10±5.84 b
14.	23.52±4.99 a	21.73±4.33 a	30.60±6.67 b	40.50±3.46 c	33.90±5.92 b
15.	25.10±5.43 a	23.10±4.32 a	31.90±6.42 b	41.27±3.33 c	35.45±6.15 b

Different alphabet in each line show significantly different at 1% level.

S.E. = Standard Error. ZM (MT) = Myitha Zaw Mwar,  
 SPLHM = Shwe Phalar Hteik Myint; SPLHP = Shwe Phalar Hteik Pyar,  
 BZ = Baung Zauk and Leek.

Table 3. Comparison on shoot growth rate of four *Allium* sp. grown from seeds. Measuring was done for 15 days.

Days of Collection	Varieties			
	ZM(MT)	SPLHM	SPLHP	BZ
	Mean ± S.E.	Mean ± S.E.	Mean ± S.E.	Mean ± S.E.
1	10.53±3.08 a	13.40±3.23 ab	12.34±3.23 a	9.70±5.11 ac
2	10.93±3.08 a	13.90±3.27 ab	12.63±3.15 a	9.87±5.28 ac
3	11.30±3.04 a	14.30±3.27 b	13.08±3.15 ab	10.64±5.50 a
4	11.76±3.05 a	13.27±3.21 b	13.57±3.16 ab	10.88±5.67 a
5	11.03±3.02 a	15.66±3.22 b	14.12±3.30 ab	11.17±5.58 a
6	12.49±3.11 a	16.10±3.28 b	14.70±3.51 ab	11.38±5.70 a
7	12.93±3.15 a	16.78±3.27 b	15.14±3.66 ab	11.78±5.57 a
8	13.18±3.32 a	17.28±3.67 b	15.38±3.72 ab	12.19±5.58 a
9	13.28±3.51 a	17.56±3.75 b	15.58±3.75 ab	12.25±5.55 a
10	13.53±3.65 a	17.87±4.00 b	15.87±3.78 ab	12.29±5.57 a
11	13.75±3.84 a	18.35±4.64 b	16.32±3.74 ab	12.60±5.65 a
12	14.18±3.81 a	18.63±4.46 b	16.86±3.78 ab	13.16±5.54 a
13	14.36±4.14 a	18.68±4.64 b	17.23±3.80 ab	12.70±7.05 ac
14	14.34±5.07 ab	18.91±5.00 b	17.54±3.85 b	12.94±7.21 a
15	14.43±5.14 a	19.02±5.35 b	17.79±3.88 b	13.11±7.52 a

Different alphabet in each line show significantly different at 1% level.

S.E = Standard Error. ZM (MT) = Myitha Zaw Mwar,

SPLHM = Shwe Phular Hteik Myint, SPLHP = Shwe Phalar Hteik Pyar,  
and BZ = Baung Zaik.

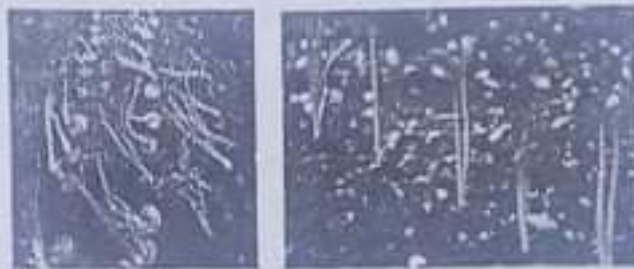


Plate 1. Steady state of low yielding reaction.  
 a.  $2 \times 10^{-4}$  mole/l. of  $Ca^{2+}$  ions,  $2 \times 10^{-4}$  mole/l. of  $CO_2$   
 b.  $1 \times 10^{-4}$  mole/l. of  $Ca^{2+}$  ions,  $1 \times 10^{-4}$  mole/l. of  $CO_2$   
 c.  $5 \times 10^{-5}$  mole/l. of  $Ca^{2+}$  ions,  $5 \times 10^{-5}$  mole/l. of  $CO_2$



Plate 2. Steady state of low yielding reaction.  
 a.  $1 \times 10^{-4}$  mole/l. of  $Ca^{2+}$  ions,  $1 \times 10^{-4}$  mole/l. of  $CO_2$   
 b.  $5 \times 10^{-5}$  mole/l. of  $Ca^{2+}$  ions,  $5 \times 10^{-5}$  mole/l. of  $CO_2$   
 c.  $2 \times 10^{-4}$  mole/l. of  $Ca^{2+}$  ions,  $2 \times 10^{-4}$  mole/l. of  $CO_2$   
 d.  $1 \times 10^{-4}$  mole/l. of  $Ca^{2+}$  ions,  $1 \times 10^{-4}$  mole/l. of  $CO_2$   
 e.  $5 \times 10^{-5}$  mole/l. of  $Ca^{2+}$  ions,  $5 \times 10^{-5}$  mole/l. of  $CO_2$





A. Allium cepa (15 days)

B. Allium cepa (17 days)



C. Allium cepa (15 days)

Photo 3. Allium cepa grown from bulbs (A, B, C) (10, 17, 15)



A. seeds (Allium cepa)



B. Germination 3 days



C. Allium cepa (10 days)



D. Allium cepa (15 days)

Photo 4. Allium cepa grown from seeds (A, B, C, D)

### Discussion

Onion (*Allium cepa* L.) belongs to family Liliaceae and is one of the most important monocotyledonous, cool season vegetable crops in India. In the present study, the germination of the variety Shwe Phat Lar Hteik Pyar exhibited the highest germination rate. But the germination rate is not exceeded than 50% for all the varieties were also observed. The poorest germination was resulted by the variety leek which highest germination rate in the third replicate did not exceed 10% respectively (Fig. 1). The process of germination is very distinct and will illustrated by Troll (1935) and Foster and Gifford (1974). It has been studied in detail by Suchs (1863) and by Hoffman (1933).

In Myanmar however, very little information is available concerning with the basic and germplasm of *Allium cepa* cultivars have been previously reported. In many parts of the country, onion seed fields often produced uneconomically low yields or fail entirely. The discrepancies result with the other authors in germinability which is distinctly low suggested that more attention should be given to study more detail and precisely on seeding ability and growth rate of the onions that grown locally around the county. On the other hand, it also showed that for the successive growing of onion as the satisfactory economically crops, it cultivars should be produced with high germinability as well as to improve the variety to be a high yielding variety. When it comes to onion seeds germinating temperature plays an active role. While typical germination occurs within 7-10 days, soil temperature affects this process. For instance, the cooler the soil temperature, the longer it will take for onion seeds to germinate up to two weeks. Warm soil temperature, on the other hand, can trigger onion seed germination in as little as four days. Onion plants have shallow roots and require frequent irrigation throughout the growing season.

Although the seed characters of the five varieties showed good looking characters and also were not different from one to the other varieties, (Fig. 1), (Plate 2), showed that the ability of germination was significantly different from one to the other varieties. This showed that this also remains as one of the characters that must improve for onion to be one of the successful economical crops in Myanmar.

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