

# **Effects of Seed Sizes and Varieties on Growth, Yield and Oil** and Protein Contents of Groundnut (Arachis hypogaea L.)

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### Introduction

Groundnut is the second most important oilseed crop in Myanmar. More than 70% of total groundnut production is being utilized for edible oil, 20% for seed purpose and limited quantity of groundnut kernel is used for direct consumption as confectionery. The quality of seed always plays an important role to the groundnut grower. Good seed is essential for establishing the designed plant population, good development and yield.

Seed size is one of the components of seed quality in further crop development. Generally, groundnut growers prefer large and medium seed sizes for seed stock because they usually consider that they might achieve higher income and fulfillment of self-sufficiency of oil from those seed sizes. The effect of seed size on crop performance has been observed to differ in crops. The aim of the present study was to compare how seed sizes affect growth, yield and oil and protein contents of groundnut varieties.

#### Table 1.1. Crop growth rate as affected by different seed sizes in groundnut varieties during rainy season 2010

Tractments	Crop Growth Rate (g m <sup>-2</sup> day <sup>-1</sup> )							
Treatments	14-28 DAE	28-42 DAE	42-56 DAE	56-70 DAE	70-84 DAE			
Variety								
Sinpadaethar 7	<b>1.52 b</b>	<b>2.85</b> c	6.75	0.05 b	<b>3.93</b> b			
Sinpadaethar 8	1.91 ab	<b>5.87</b> a	9.01	<b>3.97</b> a	8.01 a			
Sinpadaethar 9	2.11 ab	3.87 b	7.35	1.28 ab	6.07 ab			
Magway 15	2.41 a	4.52 b	8.82	2.84 ab	7.18 a			
LSD 0.05	0.63	0.69	3.46	3.79	2.95			
Seed size								
Large	2.03	4.20	8.04	1.87	6.33			
Medium	2.17	4.19	9.02	0.94	6.03			
Small	1.76	4.46	6.88	3.29	6.52			
LSD 0.05	0.55	0.60	3.00	3.28	2.55			
Pr>F								

Table 1.2. Crop growth rate as affected by different seed sizes in groundnut varieties during winter season 2010-2011

Treatmonte	Crop Growth Rate (g m <sup>-2</sup> day <sup>-1</sup> )							
Treatments	14-28 DAE	28-42 DAE	42-56 DAE	56-70 DAE	70-84 DAE			
<u>Variety</u>								
Sinpadaethar 7 0.67 b		1.22	0.81	0.81	0.57			
Sinpadaethar 8 1.05 a		1.59	0.81	1.75	0.98			
Sinpadaethar 9 1.07 a		1.45	0.93	1.67	1.01			
Magway 15 0.95 ab		1.27	1.01	1.18	0.34			
LSD <sub>0.05</sub>	0.20	0.42	0.59	1.05	1.72			
Seed size								
Large	<b>1.21 a</b>	<b>1.53</b> a	1.55 a	1.62	0.78			
Medium	0.98 b	1.48 ab	0.78 b	1.58	0.68			
Small <b>0.62 c</b>		1.14 b	0.34 b	0.86	0.72			
LSD 0.05	0.17	0.36	0.51	0.91	1.49			
Dr~F								

## **Results**

# **Materials and Methods**

The experiments were conducted at upland farm of Yezin Agricultural University in Nay Pyi Taw, Myanmar during rainy and winter season 2010–2011. The field experiments were laid out in a splitplot design with three replications.

### Main-plot factor (Varieties)

- Sinpadaethar 7 (90-95 days)
- Sinpadaethar 8 (100-105 days)
- Sinpadaethar 9 (100-105 days)
- Magway 5 (110-115 days)

### Sub-plot factor (Seed sizes)

- (> 8mm diameter) Large
- Medium (7mm 8mm diameter)
- ( < 7mm diameter) Small



#### Figure 1. Experimental site

Variety	< 0.05	<0.001	0.46	< 0.05	< 0.05	
Seed size	0.29	0.55	0.34	0.34	0.92	
Variety x Seed size	0.62	0.68	0.26	0.40	0.98	
CV(a)%	21.25	26.61	20.80	44.08	38.73	
CV(b)%	20.39	8.39	18.74	37.31	27.98	

0.86 0.24 Variety < 0.002 0.26 0.81 < 0.001 < 0.05 0.17 0.99 Seed size < 0.001 0.36 0.13 0.47 0.70 0.98 Variety x Seed size 24.28 43.56 70.70 52.09 CV(a)% 47.61 CV(b)% 15.05 20.11 30.48 53.73 48.45

Means followed by the same letter are not significantly different at 5 % LSD. DAE = Days After Emergence

LSD = Least Significant Difference *CV* = *Coefficient of Variance* 

*CV* = *Coefficient of Variance* 

Table 2.1. Yield and yield components as affected by different seed sizes in groundnut varieties during rainy season 2010

Treatments	Pods per plant (no.)	100 pod weight (g)	100 seed weight (g)	Pod yield (kg ha <sup>-1</sup> )
Variety				
Sinpadaethar 7	16.78 a	108.01	44.23	2735.00 a
Sinpadaethar 8	11.94 bc	114.10	44.54	2234.56 b
Sinpadaethar 9	<b>10.63 c</b>	113.88	45.44	2007.11 b
Magway 15	14.56 ab	115.09	45.15	2296.11 b
LSD 0.05	3.17	9.64	1.46	332.18
Seed size				
Large	13.75	114.81	45.18	2313.67
Medium	14.77	113.44	45.16	2340.75
Small	11.90	110.06	44.18	2300.17
LSD 0.05	2.74	5.65	1.26	287.68
Pr>F				
Variety	< 0.004	0.12	0.31	< 0.002
Seed size	0.11	0.22	0.19	0.96
Variety x Seed	0.24	0.47	0.90	1.00
size				
CV(a)%	16.65	7.41	4.38	25.24
CV(b)%	23.50	5.79	3.25	14.30
	1			

Means followed by the same letter are not significantly different at 5 % LSD LSD = Least Significant Difference

Table 3.1. Shelling percentage and harvest index as affected by different seed sizes in groundnut varieties during rainy season 2010

ents	Shelling (%)	Harvest inc

Means followed by the same letter are not significantly different at 5 % LSD. DAE = Days After Emergence LSD = Least Significant Difference *CV* = *Coefficient of Variance* 

Table 2.2. Yield and yield components as affected by different seed sizes in groundnut varieties during winter season 2010-2011

Treatments	Pods per plant (no.)	100 pod weight (g)	100 seed weight (g)	Pod yield (kg ha <sup>-1</sup> )
Variety				
Sinpadaethar 7	16.14	92.08	44.75	2065.42
Sinpadaethar 8	12.19	95.33	45.44	1926.44
Sinpadaethar 9	11.50	96.92	45.95	1584.94
Magway 15	14.47	100.58	46.25	2011.36
LSD <sub>0.05</sub>	4.41	18.21	2.15	691.25
<u>Seed size</u>				
Large	15.31	96.03	45.66	1901.12
Medium	13.06	95.98	44.86	1925.56
Small	12.35	96.68	46.27	1864.44
LSD 0.05	3.82	15.77	1.86	598.64
Pr>F				
Variety	0.14	0.80	0.49	0.48
Seed size	0.26	1.00	0.30	0.98
Variety x Seed size	0.16	0.71	1.00	0.41
CV(a)%	36.21	18.51	4.76	34.64
CV(b)%	32.43	18.94	4.72	36.46

LSD = Least Significant Difference *CV* = *Coefficient of Variance* 

Table 3.2. Shelling percentage and harvest index as affected by different seed sizes in groundnut varieties during winter season 2010-2011

Treatments	nents Shelling (%) Harvest index (HI)		Treatments	Shelling (%)	Harvest index (HI)	
Variety			<u>Variety</u>			
Sinpadaethar 7	75.27 a	0.51 a	Sinpadaethar 7	70.34	0.62	
Sinpadaethar 8	72.07 b	0.35 b	Sinpadaethar 8	70.29	0.52	
Sinpadaethar 9	72.00 b	0.35 b	Sinpadaethar 9	70.09	0.46	
Magway 15	72.78 b	0.37 b	Magway 15	68.44	0.53	
LSD 0.05	0.85	0.07	LSD 0.05	2.78	0.12	
Seed size			Seed size			
Large	73.06	0.39	Large	70.60	0.56	
Medium	73.27	0.39	Medium	69.98	0.51	
Small	72.77	0.40	Small	68.79	0.53	
LSD 0.05	0.74	0.06	LSD 0.05	2.40	0.11	
Pr>F			Pr>F			
Variety	< 0.001	< 0.001	Variety	0.44	0.09	
Seed size	0.38	0.99	Seed size	0.30	0.62	
Variety x Seed size	0.08	0.94	Variety x Seed size	0.99	0.86	
CV(a)%	0.89	21.79	CV(a)%	7.64	30.81	
CV(b)%	1.17	18.75	CV(b)%	3.98	23.07	



7 mm sieve





#### Data Collection

- Crop Growth Rate
- Pod yield
- Yield components
- Shelling percentage

Large seed size (seeds > 8mm diameter)	Medium seed size ( seeds 7mm to 8mm diameter)	Small seed size (seeds < 7mm diameter)
	Variety - Sinpadaethar 7	

Variety - Sinpadaethar 8



Variety - Sinpadaethar 9



Variety - Magway 15 Figure 3. Different seed sizes of four varieties

- Harvest index
- Oil content
- Protein content

\*Oil and protein contents were determined by Petroleum Ether Extracts Method and Kjeldahl Digestion and Distillation Method.

Means followed by the same letter are not significantly different at 5 % LSD. *LSD* = *Least Significant Difference* 

*CV* = *Coefficient of Variance* 

Table 4.1. Oil and protein contents of different seed sizes and varieties of groundnut during rainy season 2010

		<b>Oil</b> (%)		Protein (%)			
-	Large	Medium	Small	Large	Medium	Small	
	size	size	Size	size	size	size	
Sinpadathar 7	54.00	53.49	54.03	29.55	29.00	29.47	
Sinpadathar 8	52.15	52.78	52.28	29.68	29.74	29.61	
Sinpadathar 9	44.72	44.65	45.84	30.38	30.25	30.36	
Magway 15	50.56	52.24	51.17	30.22	30.12	30.31	

LSD = Least Significant Difference *CV* = *Coefficient of Variance* 

Table 4.2. Oil and protein contents of different seed sizes and varieties of groundnut during winter season 2010-2011

			<b>Oil</b> (%)			Protein (%)		
all			Large	Medium	Small	Large	Medium	Small
ze			size	size	size	size	size	size
47	Sinpadat	har 7	46.72	46.68	47.26	30.96	31.22	31.03
61	Sinpadat	har 8	46.25	46.36	46.77	31.00	32.00	32.14
36	Sinpadat	har 9	45.32	46.25	46.40	32.00	31.87	32.14
31	Magway	15	40.05	41.23	40.02	32.58	32.25	32.69





Figure 4. Research trial

The effects of groundnut varieties on the yield and other related characters were found to be obvious and significant. The pod yield, number of pods per plant, shelling percentage, harvest index, and oil content were observed to be highest in Sinpadaethar 7, and this variety should be recommended to be applied for effective production in terms of pod yield in rainy and winter seasons. The highest protein content was observed in Sinpadaethar 9 and Magway 15 in rainy and winter season, respectively.

The effects of size of planting seeds on yield and growth characters were not as obvious as that of variety. The plants from large seeds indicated faster growth rate, especially in the initial growth stage as expressed in higher mean values of plant height, crop growth rate and harvest index in both season. At later growth stages, no significant differences were observed for the above parameters. Oil and protein contents were slightly affected by seed size.

Based on the findings of this study on the effect of seed size on yield, it can be recommended that the smaller seeds can be used as the seed stock for groundnut growers whereas medium and large seeds should be used for generating income.