Ministry of Agriculture, Livestock and Irrigation
Department of Agriculture
Seed Division

Effect of Seed Sorting by Different Salt Water Concentrations on Seedling Vigor Index and Yield of Rice

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Introduction

- Rice is the most important staple food of Myanmar
- Food security for rising number of people
- The use of high quality seeds is one of the most important elements in increasing agricultural production (Eilas , 2018)
- Seeds : uniform size, age and free of contaminants and good germination capacity (TNAU Agritech Portal, 2014)
- Better seedling vigor from heavier or larger seed was attributed to better availability and mobilization of reserve food (Pollock and Roos, 1972).
- Improper processing and storage of paddy seed
    - less vigorous seed , adversely affect the planting value of the seed.

Problem Statement

- Different methods were used to select better quality seeds by seed soaking (water or salt solution) Ella et al. (2011); Farooq et al. (2009)
- Specific gravity of 1.08 is mostly used for separation of quality rice seed in Myanmar
- If the density of salt solution is more than necessary, loss of quality seed may occur. Likewise, if the density of salt solution is less than optimum for selected varieties, separation will not perfect
- Using optimum salt solution density for selected varieties is important

Objectives

- To study the effect of using quality seed sorted by varying salt water concentrations on germination and seedling vigor index, yield and yield components of different rice varieties
- To study the dormancy period of different rice varieties

Materials and Methods

Place	-	Seed Testing Laboratory (Nay Pyi Taw)
Time	-	2023 Rainy Season
Design	-	Split- Plot Design
Treatment	-	3 - Varieties (Htun Pu, Super Hnan Kyauk, GW-11)
	-	4 – Specific Gravity of Salt Solution (Control, 1.03,1.08,1.13)

Laboratory Experiment

Good quality seed selection by using salt water

- 100 seed weight, germination and seedling vigor index of sunk and floated seed

Field Experiment

Cultivation with pot using good quality seed and seedling

- Yield and yield components

Laboratory Experiment (Dormancy Observation)

Just after harvest

- Moistures
- Germination and vigor index

Laboratory Experiment

Preparation of Salt Water Solution

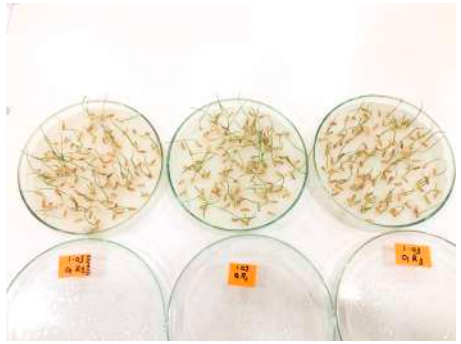
T1 (Control) = Water (500)ml

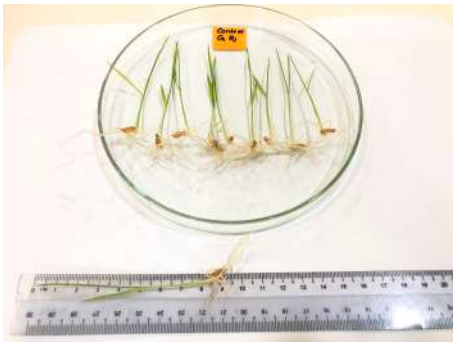
T2 (1.03) = Water (500)ml + Salt (30)g

T3 (1.08) = Water (500)ml + Salt (65)g

T4 (1.13) = Water (500)ml + Salt (115)g

100 Seed Weight, Germination and Vigor Index





Materials and Methods

Seed Germination (%)

$$\text{Seed Germination}(\%) = \frac{\text{No.of seeds germinated}}{\text{Total no.of seeds}} \times 100$$

Seedling Vigor Index (SVI)

Seedling Vigor Index(SVI) = Germination (%) x Seedling Length(cm) **(Ali.etal.,2018)**

Harvest Index (HI)

$$\text{Harvest Index (HI) (\%)} = \frac{\text{Grain Weight}}{\text{Biological Yield}} \times 100$$

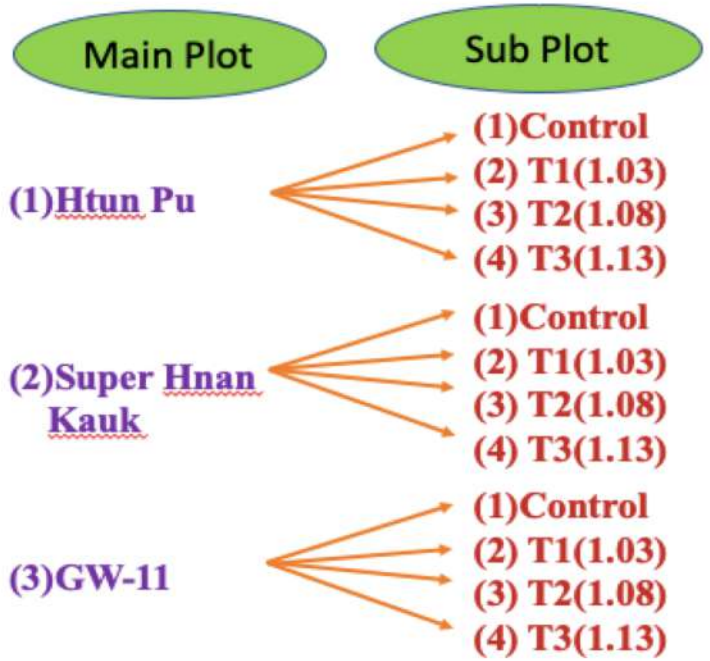
(Amanullah and Inamullah, 2016)

Field Experiment

Data Collection

- Plant Height (cm),
- Panicle Length (cm),
- Tiller Number,
- 1000 grain weight (g),
- Filled Grain (%),
- Yield (g/pot)

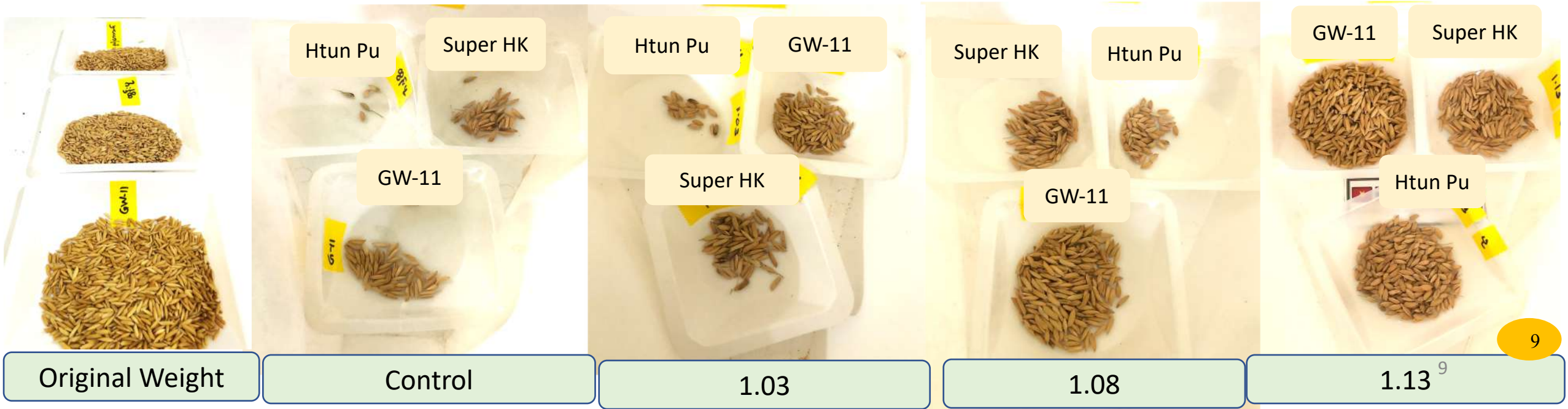
Statistical Analysis: SPSS



Results and Discussion

No	Variety	Floated Seed (%)			
		Control	1.03	1.08	1.13
1	Htun Pu	0.2	1	3	18
2	Super Hnan Kyauk	2	4	6	13
3	GW-11	2	7	15	59

Table 1: Seed Selection by Various Specific Gravity of Salt Solution



Results and Discussion

Treatment	100 Seed Weight (g)		Germination (%)		Vigor Index I	
	Sunk Seed	Floated Seed	Sunk Seed	Floated Seed	Sunk Seed	Floated Seed
Variety (V)						
Htun Pu	2.36 b	1.85 a	99.19 a	79.81 a	1326.06 a	1163.88 a
Super Hnan Kyauk	2.97 a	1.93 a	97.63 b	36.88 b	1230.56 b	520.63 b
GW-11	2.27 c	1.57 b	96.25 c	39.38 b	1220.56 b	390.48 c
Salt Treatment (S)						
Control	2.53	1.39 d	97.17	25.00 c	1226.33	344.67 c
1.03	2.53	1.69 c	97.42	45.83 b	1258.00	616.38 b
1.08	2.54	1.92 b	97.75	56.67 b	1262.58	741.55 b
1.13	2.54	2.13 a	98.42	80.58 a	1289.33	1064.05 a
V	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
S	**ns**	**0.000**	**ns**	**0.000**	**ns**	**0.000**
V x S	**ns**	**0.000**	**ns**	**0.000**	**ns**	**0.000**

Table 2: Seed Weight, Germination and Vigor Index of Different Varieties

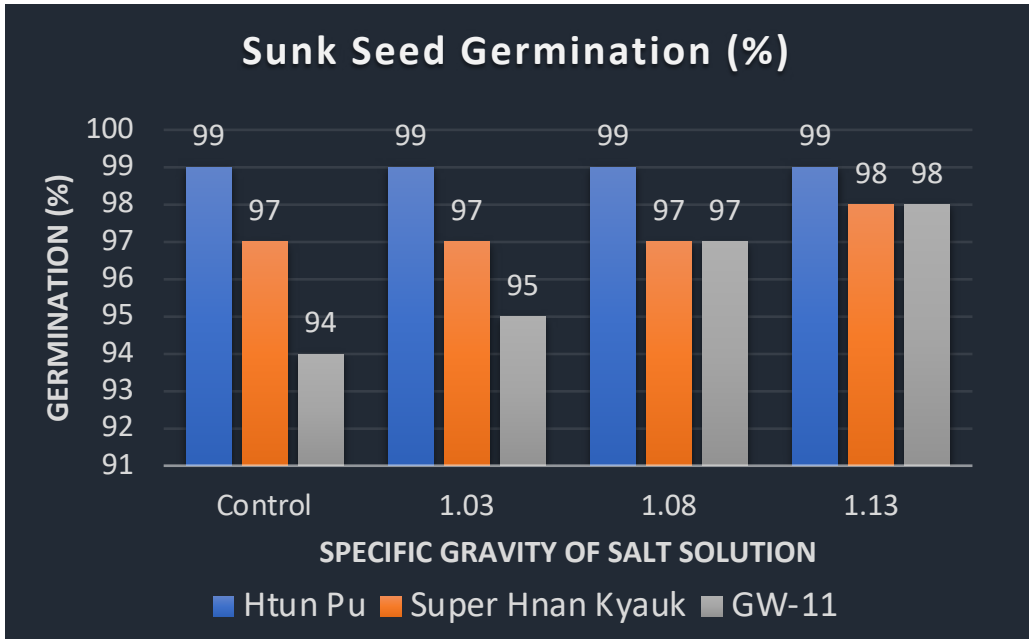


Figure 1(a): Germination Percentage of Sunk Seed

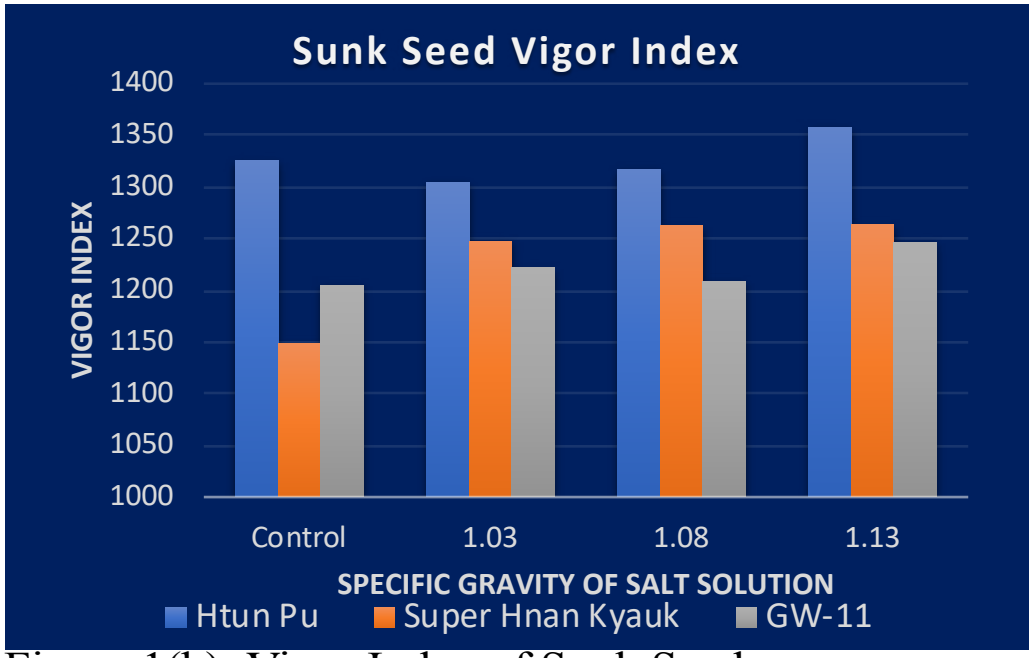


Figure 1(b): Vigor Index of Sunk Seed

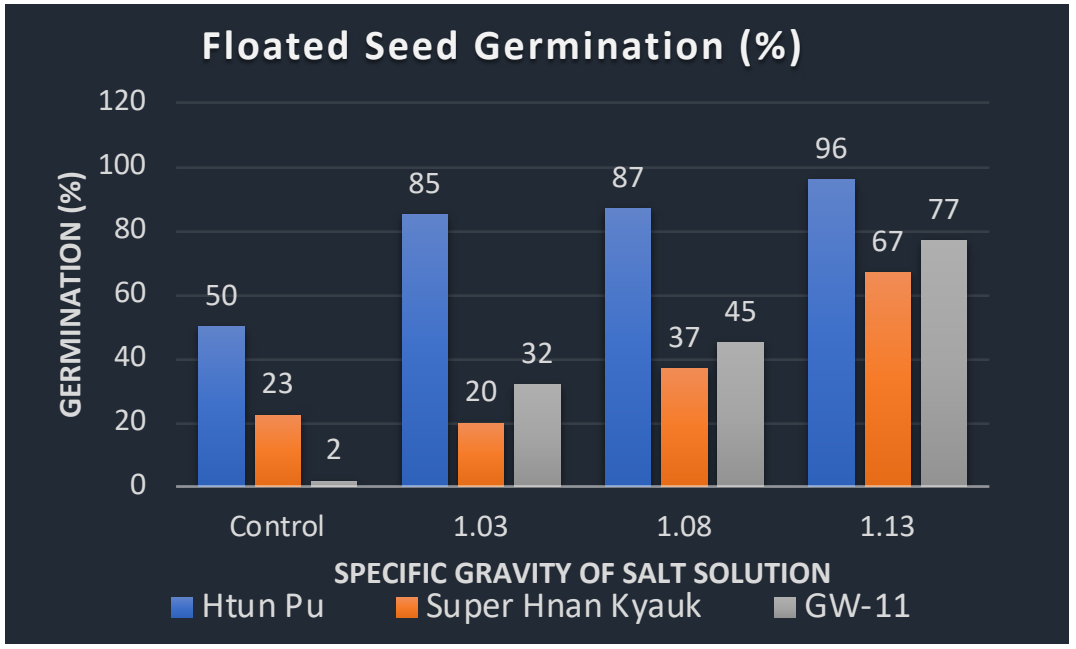


Figure 1(c): Germination Percentage of Floated Seed

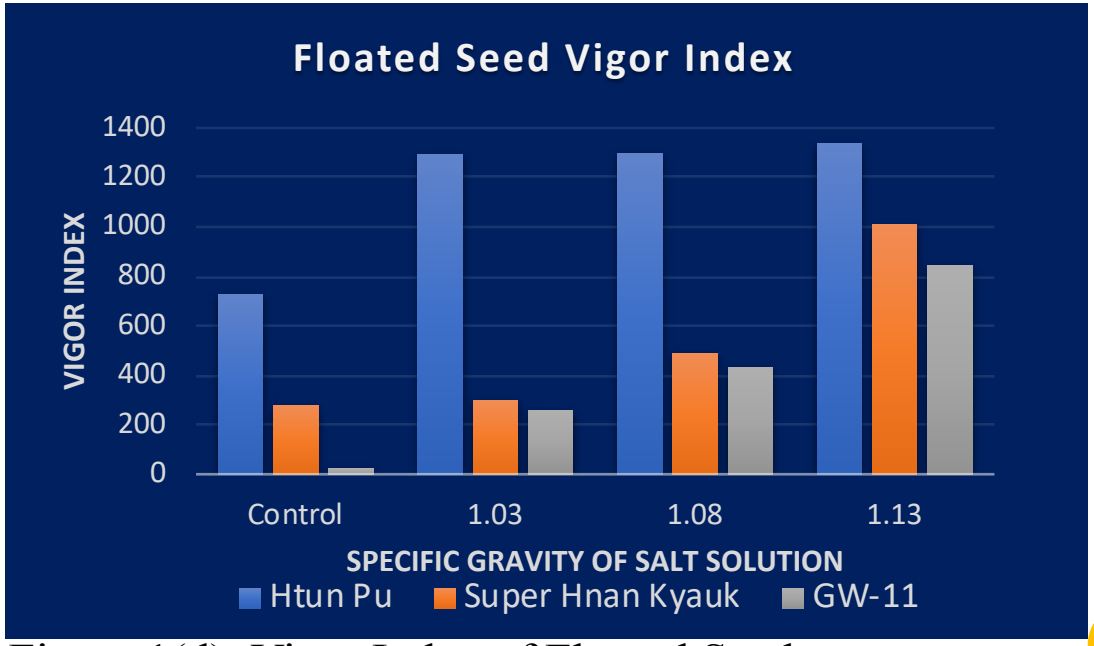


Figure 1(d): Vigor Index of Floated Seed

Results and Discussion

Treatment	Yield (g pot^{-1})	Yield Components				
		Filled grain (%)	1000 Grain Weight (g)	Spikelets Panicle^{-1}	Panicles hill^{-1}	Panicle Length (cm)
Variety (V)						
Htun Pu	42.76	92.35 a	25.16 a	139.36 c	20.31 a	23.45 b
Super Hnan Kyauk	47.23	90.04 a	25.69 a	163.79 b	15.69 b	26.77 a
GW-11	48.87	86.23 b	19.85 b	198.54 a	15.58 b	21.35 c
Salt treatment (S)						
control	44.97	88.47	23.24	170.87	16.75	23.40
1.03	48.24	90.96	23.49	171.08	17.92	24.11
1.08	43.61	88.48	24.01	162.76	16.17	23.79
1.13	48.33	90.24	23.53	164.23	18.33	24.14
V	**ns**	**0.000**	**0.000**	**0.000**	**0.002**	**0.000**
S	**ns**	**ns**	**ns**	**ns**	**ns**	**0.50**
VxS	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**

Table 3: Yield and Yield Components of Different Varieties under Different Treatments

Results and Discussion

- The longer growth duration will result in enhanced dry matter production, thereby contributing to improved grain filling and higher grain yield. (Yoshida, 1981)
- Panicle number per m^2 and number of spikelets per panicle are negatively correlated (Yoshida, 1981)

Results and Discussion

Treatment	HI(%)
Variety (V)	
Htun Pu	61.56 a
Super Hnan Kyauk	46.60 b
GW-11	45.76 b
Salt treatment (S)	
control	51.45
1.03	51.41
1.08	50.43
1.13	51.94
V	0.000
S	ns
VxS	ns

Table 5: Harvest Index of Different Varieties

Variety	Growth Duration (d)
Htun Pu	95
Super Hnan Kyauk	116
GW-11	124

Table 6: Growth Duration of Different Varieties

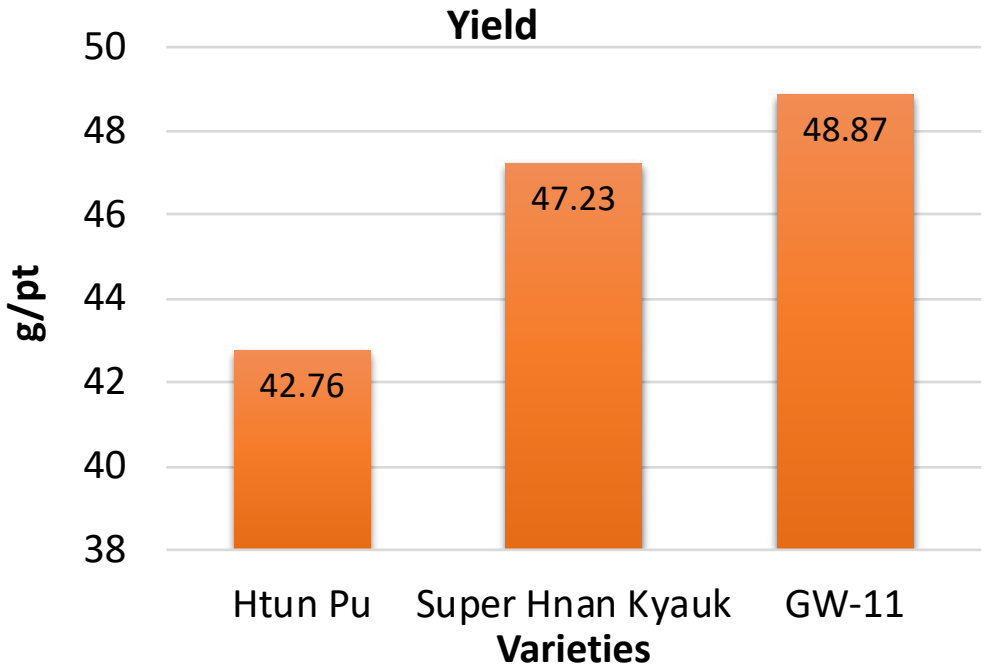


Figure 3: Yield of Different Varieties

Results and Discussion (Dormancy Observation)

No	Variety	Moisture (%)	Germination (%)	Vigor Index I
1	Htun Pu	22	81.25 b	1057.50 a
2	Super Hnan Kyauk	16	25.75 c	388.21 b
3	GW-11	27	97.75 a	1178.69 a
	Sig		0.000	0.000

Table 4: Dormancy Condition of Different Varieties Just After Harvest

- The seed germination for CS is 80%
- Super Hnan Kyauk variety germinate only about 25%
- Showing dormancy
- Germination percentage of Htun Pu and GW-11 varieties showed greater than 80%
- After 2 weeks, germination percentage of Super Hnan Kyauk rose to 94%
- Dormancy period may be about 2 weeks in Super Hnan Kyauk

Conclusion

Laboratory Experiment

- Compared germination percentage and vigor indexs of sunk and floated seed, not too much difference under specific gravity 1.03, 1.08 and 1.13 for Htun Pu
- Germination percentage of Htun Pu (Floated Seed) showed 50% under control condition
- Vigor Indexes of sunk and floated seed are clearly different for Super Hnan Kyauk and GW-11 varieties, except Htun Pu variety
- GW-11 rice variety floated 59% under specific gravity 1.13

Conclusion

Field Experiment

- The highest yield 48.87 (g/pot) was obtained from GW-11 variety and the lowest grain yield was received from Htun Pu variety.
- Did not affect significantly on grain yield of rice.
- Harvest Index (HI) of Htun Pu was the highest , which was significantly different from GW-11 and Super Hnan Kyauk

Dormancy Observation

- Just after harvest condition, germination percentage of GW-11 and Htun Pu showed greater than 80 %
- Super Hnan Kyauk rice varieties showed dormancy period for about 2 weeks

Suggestions

- Different salt concentrations for different rice varieties should be used, i.e separation by only water may be good for Htun Pu rice variety
- Care should be taken to avoid rain during harvesting for GW-11 and Htun Pu varieties

References

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The Way Forward

No	Variety	Floated Seed (%)			
		Control	1.03	1.08	1.13
1	Yadanartoe	3	3	4	10
2	Paw San Yin	2	4	8	25
3	Paw San Baykyar	2	10	11	23
4	Hmawbi-3	5	7	8	11
5	Ayeyarmin	3	6	6	18
6	Manawthukha	6	11	17	32
7	Sinthukha	4	7	16	33

Thank You