

Short Communication

Effect of Different Seed Hydropriming Techniques on Field Germination, Vigor, Growth and Yield of Groundnut (*Arachis hypogaea* L.)

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Introduction

Groundnut (*Arachis hypogaea* L.) is an important leguminous oilseed crop. Most of the farmers who use their own groundnut seeds for planting are relatively inferior in quality compared to the certified seeds issued by the Department of Agriculture, Sri Lanka. High oil and protein content in seed mainly contribute to poor seed quality under poor storage condition. Seed priming is one of the most effective approaches to enhance seed performances of partially-deteriorated seeds. Various studies have identified seed priming as an effective method to enhance germination, vigor, field establishment and yield of different crops including groundnut. Therefore, the present study was undertaken to evaluate the effects of hydro priming technique on the germination, vigor and yield of aged (partially deteriorated) ground nut.

Materials and Methods

Seeds of groundnut (*A. hypogaea*) variety 'Thissa' were obtained from the Oilseed Division of the Grain Legume Oil Crop Research and Development Centre (GLORDC), Angunukolapelessa. At the time of selection seeds were stored in

a polysac bags at ambient temperature for five months. The present study was conducted during the 2019 and 2020 at GLORDC. A field experiment was conducted considering priming time and drying method as the two factors. Priming time consisted of seven treatments (8 hour soaking, 12 hour soaking, 24 hour soaking, 8 hour aerated soaking, 12 hour aerated soaking, 24 hour aerated soaking and non-priming). Drying method comprised of two treatments as surface drying and drying. Treatments were arranged in a Randomized Completed Block Design with two replicates with 4 m × 2.7 m plot size. In drying treatment seeds were dried under sunlight until reaching the original moisture content of seed lot (Drying) and Surface dried the seeds for two hours before planting (Surface drying). The aeration refers to the continuous supply of oxygen to water using an aquarium pump. A preliminary germination test was carried out to verify the seed lot quality and germination time based on the germination parameters.

$$\text{Germination percentage} = \frac{\text{Total number of seedlings}}{\text{Total number of seeds planted}} \times 100$$

$$\text{Germination Index} = \frac{\text{Number of germinated seeds at first count}}{\text{Number of days to first count}} + \frac{\text{Number of germinated seeds at final count}}{\text{Days to final count}}$$

Mean Germination Time = $\frac{\sum(N_i T_i)}{\sum N_i}$

N_i is the number of seeds germinated at time i , and T_i is the time from sowing.

Data were processed using statistical software SAS version 10.3. Mean comparison was done by using Duncan's multiple range tests (Steel and Torrie, 1980).

Results and Discussion

As the selected seed lot was stored under the ambient conditions in polysac bag for 5 months, germination percentage of the seed lot was reduced up to 51%. The field emergence rate of hydro primed seeds was

significantly increased in both seasons (Table 1). All the primed treatments recorded higher germination percentage compared to non-primed treatments in *Maha* season. In *Yala* season 8 and 12 hour soaking treatments and 24 hour aerated treatments the recorded highest field emergence rate compared to non primed treatment ($P < 0.05$). In both seasons, seedling vigor index was found to be significantly higher in certain treatments. Drying treatments were not significantly affected on germination percentage, mean germination time and seedling vigor index in both seasons.

Table 1. The effect of hydro priming techniques on germination parameters of ground nut in *Maha* 2019/2020 and *Yala* 2021 seasons

Treatments	Germination at 14 Days after planting (%)		Mean Germination Time (MGT) - days		Seedling Vigor Index		Germination Index	
	<i>Maha</i>	<i>Yala</i>	<i>Maha</i>	<i>Yala</i>	<i>Maha</i>	<i>Yala</i>	<i>Maha</i>	<i>Yala</i>
Primed time (PT)								
8 hours soaking	58.1 ^{ab}	63.7 ^{abc}	7.1 ^{ab}	11.4 ^{abcd}	470.9 ^{ab}	352.5 ^{abc}	3.9 ^{ab}	2.4 ^{ab}
12 hours soaking	62.5 ^{ab}	68.7 ^{ab}	7.4 ^{ab}	11.5 ^{abc}	365.4 ^{ab}	393.7 ^{ab}	3.7 ^{ab}	2.5 ^{ab}
24 hours soaking	70.0 ^{ab}	60.0 ^{bc}	7.0 ^b	11.3 ^{bcd}	461.3 ^{ab}	335.0 ^{abc}	3.4 ^{ab}	2.2 ^{ab}
8 hours aerated soaking	78.1 ^a	55.0 ^c	7.2 ^{ab}	11.2 ^{cd}	488.3 ^a	251.2 ^{bc}	3.6 ^{ab}	2.3 ^{ab}
12 hours aerated soaking	57.5 ^{ab}	59.4 ^{bc}	7.4 ^a	11.0 ^d	342.1 ^{ab}	372.5 ^{abc}	3.5 ^{ab}	2.6 ^a
24 hours aerated soaking	75.6 ^a	73.1 ^a	7.2 ^{ab}	11.7 ^a	434.6 ^{ab}	453.1 ^a	4.1 ^a	2.6 ^a
Non-priming	46.2 ^b	52.5 ^c	7.0 ^b	11.6 ^{ab}	274.3 ^b	220.0 ^c	2.3 ^b	1.9 ^b
PT	*	*	*	*	*	*	*	*
Drying method (D)								
Drying	60.7 ^a	61.9 ^a	7.2 ^a	11.4 ^a	400.0 ^a	320.5 ^a	3.2 ^b	2.4 ^a
Surface Drying	70.8 ^a	62.9 ^a	7.2 ^a	11.3 ^a	418.2 ^a	362.9 ^a	4.1 ^a	2.4 ^a
D	NS	NS	NS	NS	NS	NS	*	NS
PT x D	NS	NS	NS	NS	NS	NS	NS	NS
CV%	23.6	11.8	3.5	1.7	28.4	26.1	22.3	16.1

NS- not-significant, *- significant at $P < 0.05$

Different letters in a column for each character indicate significant differences at $P < 0.05$

Sepehri *et al.* (2017) reported that hydro priming improved germination rate of aged groundnut seeds.

A higher number of pods per plant was recorded in primed treatments in *Maha* season compared to non primed treatment (Table 2). In *Yala* season the highest number of pods was recorded in 24 hour aerated treatment with soaking, 8

and 12 hour soaking, and 8 and 12 hour aerated soaking treatments (Table 2). In *Maha* season the lowest net plot yield was recorded in non-primed treatment. In *Yala* season 12 hour aerated soaking treatment and non primed treatment were recorded the lowest net plot yield. Priming times and drying methods were not significantly affected on shelling percentage of ground nut in both seasons.

Table 2. The effect of hydro priming techniques on growth parameters of ground nut in *Maha* 2019/2020 and *Yala* 2021 Season

Treatments	Number of pods per plant		Net plot yield (g)		Shelling %	
	<i>Maha</i>	<i>Yala</i>	<i>Maha</i>	<i>Yala</i>	<i>Maha</i>	<i>Yala</i>
<u>Primed time (PT)</u>						
8 hours soaking	28 ^a	31 ^{ab}	482.5 ^a	479.9 ^{ab}	62.2 ^a	73.4 ^a
12 hours soaking	27 ^a	34 ^{ab}	488.7 ^a	410.3 ^{ab}	68.2 ^a	73.1 ^a
24 hours soaking	22 ^{ab}	25 ^b	360 ^{ab}	352.9 ^{ab}	64.7 ^a	71.5 ^a
8 hours aerated soaking	22 ^{ab}	33 ^{ab}	357.5 ^{ab}	542.4 ^a	65.5 ^a	58.6 ^a
12 hours aerated soaking	21 ^{ab}	33 ^{ab}	335 ^{ab}	286.5 ^b	66.5 ^a	71.9 ^a
24 hours aerated soaking	29 ^a	38 ^a	375 ^{ab}	363.9 ^{ab}	62.7 ^a	71.9 ^a
Non-priming	15 ^b	25 ^b	242.5 ^b	342.7 ^b	67.5 ^a	72.3 ^a
PT	*	*	*	*	NS	NS
<u>Drying method (D)</u>						
Drying	25 ^a	34 ^a	406.1 ^a	379.9 ^a	64.6 ^a	69.4 ^a
Surface Drying	21 ^b	29 ^a	350.8 ^a	422.4 ^a	65.8 ^a	71.1 ^a
Drying method	*	NS	NS	NS	NS	NS
PTxD	NS	NS	NS	NS	NS	NS
CV%	18.36	26.46	7.62	26.86	7.62	14.87

NS- not-significant, *- significant at $P < 0.05$, different letters in a column for each character indicate significant differences at $P < 0.05$ level

Conclusions

Hydro priming is a simple technique to improve germination, vigor, growth, and yield parameters of aged (partially deteriorated) groundnut seeds. All the

tested hydro primed treatments can be recommended to farmers for better results considering many seed quality parameters.

References

- Sepahri A, Rouhi HR 2017. Effect of hydropriming on morphological and physiological performance of aged ground nut (*Arachis hypogaea* L.) seeds. Iranian Journal of Field Crop Science special issue: 45-53.
- Steel RGD, Torrie JH 1980. Principles and Procedures of Statistics. A Biometrical Approach. 2nd ed. McGraw-Hill, New York, USA.