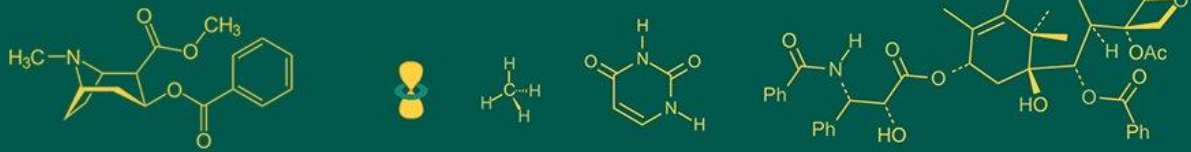


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Effect of seed priming studies on seed germination in groundnut (*Arachis hypogea* L.)

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Abstract

The present investigation was carried out to study the influence of various organic seed priming treatments on seed quality parameters in groundnut. The groundnut cv TMV 7 was imposed with various seed priming treatments with dry powder, liquid, gel and oil *viz.*, turmeric, tender coconut, *Aloe vera* and neem oil. The treated seeds along with hydro priming and unprimed control were evaluated for their seed quality parameters under laboratory condition. The study revealed that the seeds primed with coconut water 50% recorded higher seed germination (96%), root length (23.50 cm), shoot length (16.00 cm), dry matter production (3.53g seedling⁻¹0) and vigour index 3792 as compared to other treatments and control. Coconut water 50 percent induced the maximum germination per cent, shoot length, dry matter production of seedlings and vigour index. So, we can conclude that the 50 percent coconut water can be effectively used for organic priming and is the ideal one followed by *Aloe vera* gel (1%).

Keywords: *Aloe vera*, germination, groundnut, priming, tender coconut

Introduction

Groundnut (*Arachis hypogaea*) is an important leguminous oilseed crop and commonly called as poor man's nut. It is also known as peanut, monkey nut and goober nut. It is the world 13th most important food crop, 4th most important source of edible oil and 3rd most important source of vegetable protein. Groundnut seed contains 44 to 56% oil and 22 to 30% protein on dry seed basis and is a rich source of minerals (phosphorus, calcium, magnesium and potassium) and vitamins (Vinothini *et al.* 2018, Kaba *et al.* 2014) [8, 5]. Good quality seeds having rapid and uniform field emergence is an essential prerequisite for increased yield, quality and ultimately profit to farmers. Uniformity and percentage seedling emergence of direct seeded crops have a major impact on final yield and quality. Slow emergence results in weaker seedlings which are more prone to diseases. Various pre-sowing seed treatments have been practiced to reduce the time between sowing and seedling emergence acknowledged the term "seed priming" coined and showed the beneficial effect of priming. Seed priming is widely used now a day for betterment of seed performance in terms of higher rate of germination and uniformity of establishment. Also, it causes the reduction in emergence time, accomplishment of uniform emergence and betterment of crop stand in many crops. More recently priming with a range of agents like hormones, botanicals, bio-agents and growth regulators is under practice to get the desired benefits during seed germination and later on good performance of the crop (Janmohammadi *et al.* 2008) [4]. Seed quality enhancement techniques, especially seed priming is one of the promising techniques to improve the performance of crop under stress conditions. In the last two decades, seed priming is an effective seed invigoration method, has become a common seed treatment to increase the rate and uniformity of emergence and crop establishment in most of the vegetable and flower crops especially in developed countries. Seed priming with inorganic salts (halopriming) is very easy, low risk and low cost technique to alleviate the salinity hazards of agricultural lands. The halopriming technique is very effective for improving germination and crop establishment under salt stressed conditions (Bakht *et al.*, 2010) [10]. Priming treatments are being used to shorten the time between planting and emergence and to protect seeds from biotic and abiotic factors during critical phase of seedling establishment.

Such earlier and synchronized emergence often leads to uniform crop stand and improved yield (Afzal *et al.*, 2011) [9].

Keeping in view of the above, the present study was undertaken with the priming treatments with organic agents under different vigour tests series of experiments were carried out in laboratory and results acquired marked a beneficial note on priming to be the best strategy for enhance the vigour of the groundnut seeds.

Materials and Methods

The genetically pure and freshly harvested pods of groundnut variety TMV 7 obtained from Oilseeds Research Station, Tindivanam, Tamil Nadu Agricultural University, Coimbatore constituted the study material for the present investigation. To evaluate the performance of the seeds were primed with dry powder, liquid, gel and oil *viz.*, turmeric (*Curcuma longa* @2g/Kg), tender coconut (50%), *Aloe vera* (1%) and neem oil (0.1 ml/L) were used as priming agents. Seeds were soaked in those organic materials for 6 hours with a seed to a solution ratio of 1:1 (weight: volume). After priming, the seeds were removed from the solutions, rinsed in water, shade dried at room temperature and the following seed quality parameters were assessed. The germination test was conducted with 50 seeds in eight replications for each treatment in sand medium. The test conditions of 25±2 °C and 95±2% relative humidity (RH) were maintained in the germination room. At the end of tenth day, the number of normal seedlings (seedlings showing normal root and shoot development) were counted and the mean was expressed as percentage. The germination test was conducted in eight replications with 400 seeds as per ISTA rules (ISTA 2010). Ten seedlings were randomly removed from each treatment carefully so as to remove the plant intact with entire root system. The length of root and shoot length of seedlings was recorded from the base of the seedling to the tip of the top most leaf in each plant and their mean was reported in cm. For dry matter production, the seedlings selected for root and shoot length were placed in a paper cover, shade dried for 24 hours and dried in a hot air oven maintained at 80±2 °C for 24 hours. Then they were cooled in a desiccator, weighed and expressed as gram per 10 seedlings. Vigour index values were computed using the following formula and the mean values were expressed as whole numbers. Vigour index = Germination (%) × Total seedling length (cm) (Abdul Baki and Anderson, 1973) [11]. The data were analyzed statistically adopting the procedure described by Panse and Sukhatme (1985) [7].

Result

The data on physiological parameters influenced due to seed priming under induced salinity condition were determined by roll towel method (ISTA, 2011) and presented in (Tables.1).

Several pre sowing seed management techniques are being adapted to obtain the vigorous seeds. Among them, seed priming occupies an eminent role in which seeds are partially hydrated, while radicle protrusion is prevented and then dried back to the original moisture level (Bradford, 1986 and McDonald, 2000) [12, 13]. Priming not only hastens

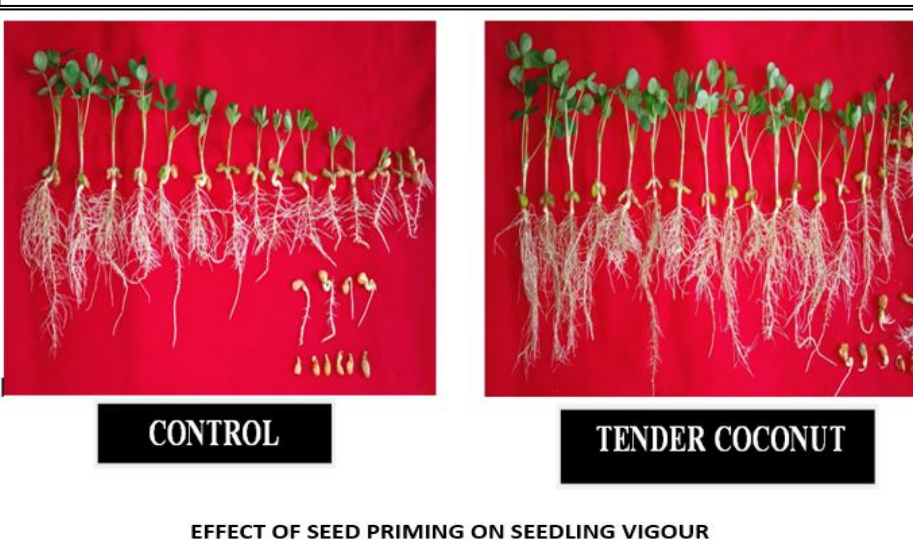
and synchronizes seedling emergence (Basra *et al.*, 2005) [11], but also enhances their tolerance to biotic and abiotic stresses during the critical phases of seedling establishment. Based on the priming agents used for priming, different priming techniques (Hydropriming, halopriming, biopriming, sand matrix priming, orgopriming, drumpriming and osmopriming) are being adapted to obtain higher planting value (Rhaman *et al.*, 2020) [19].

In the present study, seed priming with different organic agents like turmeric powder @ 2g/Kg, tender coconut @ 50%, *Aloe vera* gel @ 1% and neem oil @ 0.1 ml showed significant differences in all the parameters studied over control. Among the different organic agents seed priming with tender coconut @ 50% followed by *Aloe vera* gel were found to be the best for various morphological and physiological parameters studied.

Though a marginal increase of 10-15% in seed germination was found due to seed priming treatments, significant influence on seed vigour especially shoot and root length was found in seed primed with tender coconut @ 50%. Similarly, seedling vigour also significantly higher in tender coconut @ 50% concentration in the groundnut crop. Seeds primed with *Aloe vera* gel @ 1% showed next better performance and the increase in germination was 10 per cent over unprimed seeds. Comparing with hydropriming, seed priming with tender coconut recorded increased germination percentage of 13 per cent (Fig.1 & Table. 1). Biochemical changes like enzyme activation, Gibberellins like substances (Basra *et al.*, 2005) [11] may release during the II phase of germination which triggers the synthesis of hydrolytic enzymes that causes the early availability of high energy compounds and vital biomolecules to the germinating seedling (Renugadevi and Vijayageetha, 2006) [14].

Coconut water is very well known for its content of enzymes and growth promoting substances especially cytokinin. Combination of these beneficial factors might have contributed towards germination improvement. Mamaril and Lopez (1997) [6] reported similar positive effect of coconut water in increasing biomass and fruit yield of sweet pepper. Seed priming with other organics such as neem oil and Turmeric (*Curcuma longa*) powder were also effective in enhancing the germination level significantly, over control.

The root length of 23.5cm was observed in seeds treated with coconut water 50% which is on par with *Aloe vera* gel (21.1 cm). The highest shoot length and vigour index was recorded in coconut with values 16.0 cm and 3792 respectively (Fig 2&3). *Aloe vera* leaf extract is a very excellent source of plant nutrients, such as calcium, iron, magnesium, potassium, phosphorous and zinc (Dagne *et al.*, 2000). Growth hormones in coconut water might have increased the average dry weight of the plant which can be due to increased cell division within the apical meristem of seedling roots. Coconut water and *Aloe vera* leaf extract showed better performance on seed physiological and cytogenetical parameters in seeds and also priming will improve the radicle length of the seeds when compared to control (Dilek *et al.*, 2016) [17].



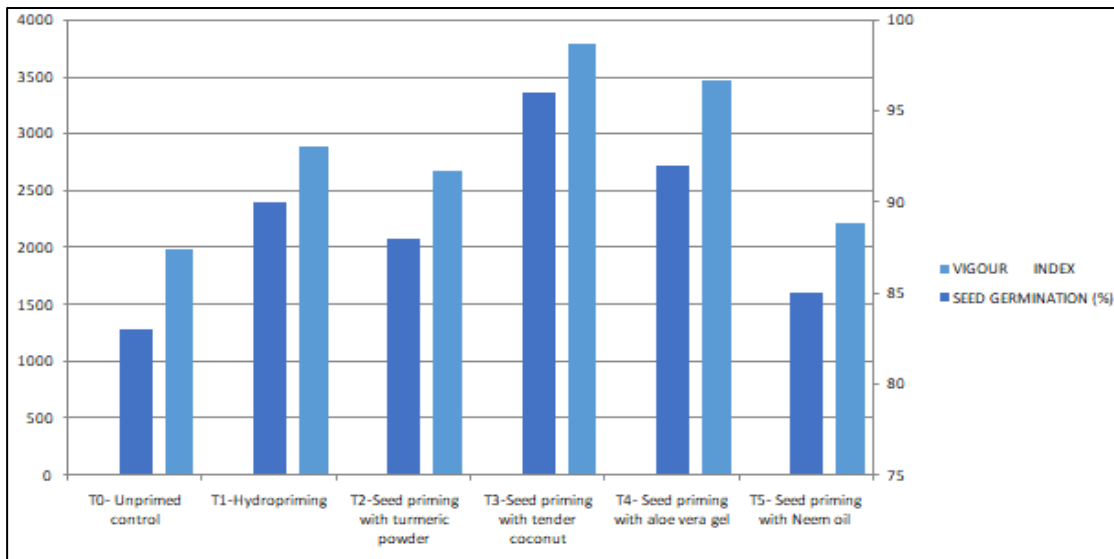


Fig 1: Effect of seed priming with different organic matter on seed germination and vigour index in groundnut cv TMV 7

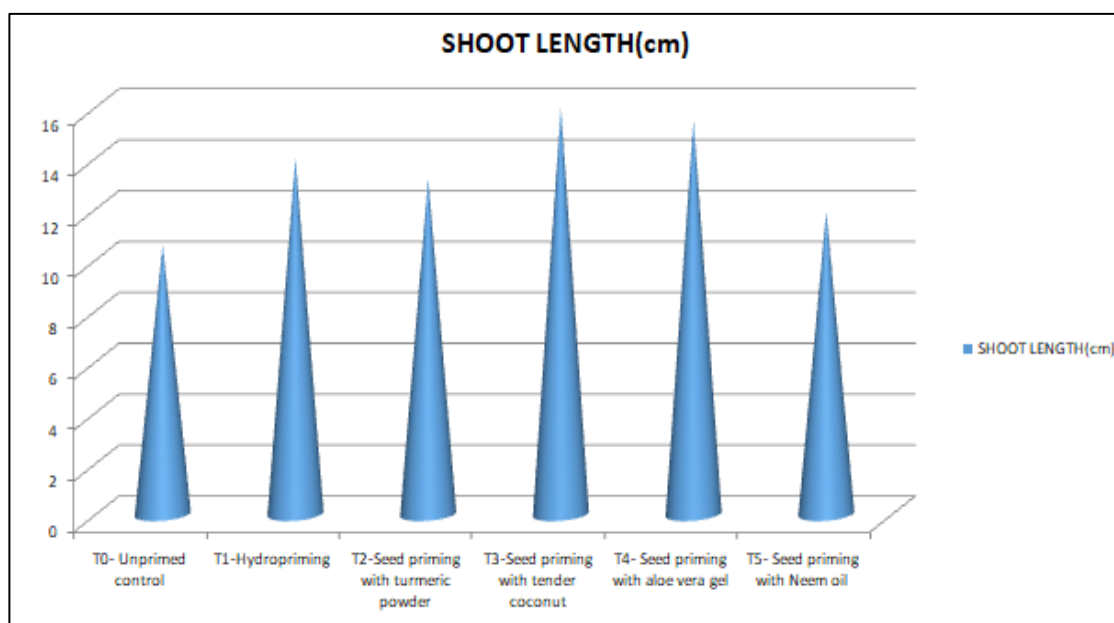


Fig 2: Effect of seed priming with different organic matter on shoot length (cm) in groundnut cv TMV 7

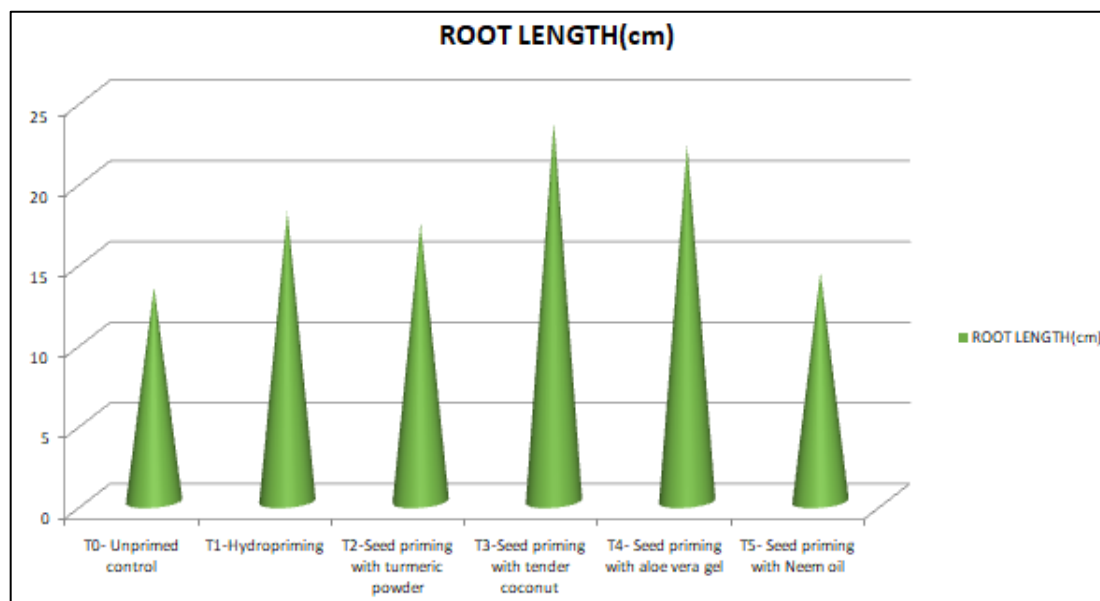


Fig 3: Effect of seed priming with different organic matter on root length (cm) in groundnut cv TMV 7

Table 1: Effect of seed priming on seed quality Parameters in Groundnut cv TMV 7

Treatments (T)	Seed germination (%)	Shoot length (cm)	Root Length (cm)	Vigour index
T ₀ -Unprimed control	83	10.6	13.3	1984
T ₁ -Hydropriming	90	14.0	18.0	2880
T ₂ -Seed priming with turmeric powder	88	13.2	17.2	2675
T ₃ -Seed priming with tender coconut	96	16.0	23.5	3792
T ₄ - Seed priming with <i>Aloe vera</i> gel	92	15.5	22.1	3459
T ₅ - Seed priming with Neem oil	85	11.9	14.2	2219
Mean	89	13.5	18.05	2834
SEd.	1.721	0.81	1.156	165.486
CD (p=0.05)	3.792	1.785	2.548	364.557

Conclusion

From the above experiment, best suitable seed priming treatments and the optimum concentration of tender coconut @ 50% was found to be best seed priming treatment among the other organic treatments with comparison of primed and unprimed seeds. Thus, the study proved the supremacy of organic seed priming treatments with dry powder, liquid, gel and oil viz., turmeric, tender coconut, *Aloe vera* and neem oil to enhance the quality parameters of groundnut variety. So, we can conclude that the 50 per cent tender coconut water can be effectively used for organic seed priming and is the ideal one followed by *Aloe vera* gel (1%).

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