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Influence of Seed Priming on Germination of Pea (*Pisum sativum*)

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Abstract

Purpose: The Seed priming is an efficient method for synchronizing germination and increasing seed vigor. The experiment was performed in Sindh Agriculture University, Tando Jam, Sindh, Pakistan, to study and quantify the effect of different types of seed priming on the seed germination percentage and shoot and root length of pea.

Methodology: The experiment was laid down in randomized complete block design with split plot arrangements. Five different priming treatments we used; T1 Soaking in water for 12 hours, T2 Soaking in 50^{o}C hot water for 10 minutes, T3 Soaking in 2% NaCl solution for 10 minutes, T4 Soaking in 50% H2SO4 solution for 10 minutes, T5 Control (no priming).

Findings: The results indicated a significant/ high effect of the priming treatments on the germination percentage, length of shoot, and length of roots. The highest germination percentage about (98%), the highest length of shoot about (4.26 cm), and the highest length of root about (10.92 cm) were observed from T3. The lowest germination percentage about (76%), the lowest length of shoot about (2.24cm), or the lowest length of root about (1.12 cm), result was observed from the (T5). These treatments were followed by germination percentage of about (94%), shoot length about (3.54 cm), and the length of root about (9.74 cm) from T2. It was followed by germination percentage of (88%) shoot length about (3.34 cm), length of root about (8.28 cm) from T1. This was followed by the germination percentage about (86%), shoot length about (2.44 cm), and length of root about (8.4 cm) from T4.

Conclusion: Result of this experiment show significant effect of the priming treatment on the majority of seed germination and growth of components in the pea grain, including seed germination percentage, shoot and root length of pea.

Recommendations: The study recommended that farmers to adopt seed priming. These practices among smallholder's farmers should focus on enhancement of farmer awareness and know about seed priming. When farmers see that seed does not germinate properly like they expect, they should apply seed priming treatments.

Keywords: *Pea, priming, germination percentage, shoot and root length*

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1.0 INTRODUCTION

Pea (*Pisum sativum*) is one of the important rabi season pulse crops of the world which acts as very good source of vegetative protein for human and animal nutrition. In crop production, field stand establishment determines the plant density, uniform growth, crop management options and productivity of land. For expensive crop like pea, it is particularly important that seeds germinate rapidly and uniformly, tolerate adverse germination conditions and produce healthy seedlings [1] Seed priming is one of the techniques widely employed to ensure good crop establishment with optimum plant population as several research studies on priming treatments have been reported with positive advantage of enhancement of germination percentage under adverse conditions [2]

The most cultivars are developed for new and dry seed because it holds a extreme amount of protein, vitamins, carbohydrates, and mineral like iron, planet seen at dawn, and metallic mineral [3]. Growing the development and yield of pea plants and added business-related plants is deliberate an main aim; skilled are many material determinants that influence and harm the development stages of many plants, to a degree salinity on strawberry, sweet sprinkle, edible grain, cucumber, and bean [4-9], and dryness stress on faba grain, barley, carbohydrate vegetable, maize and grain plants [10-16].

Pea is cultured on the broad types of soils. Droplet develops well where the soil is well exhausted along the pH range of 6 to 8. To receive good yield and value beginning, soil concedes possibility hold good natural matter. Farm yard fertilizer that is best source of natural resources is used as event of land readiness. Soil test concede possibility be finished to see the inadequacy (as argued in vitamin administration division) in the soil. Environment plays a essential role for sowing and place of crop turn in the season. The Peas belong to the leguminoseae family there are two sub-species of garden pea: *Pisum sativum* sub-species heartens, and the filed pea *P Sativum* sub-species arvense. Both these these sub- species have edible pods. Peas are thought to have originated in Ethiopia and parts of Europe and Asia. Peas are an excellent human food, either eaten as a vegetable or in soup. Cooked green peas are a rich source of protein, a good source of vitamin A, B, and C, and contain a high proportion of minerals.

1.1 Climate

Peas are cool season crop and grow best in cool weather with ample moisture. Peas are grown on many kinds of soil, from light sandy loams to heavy clays. Ample drainage is essential for good pea production and for the very early crop, a sandy loam is preferred. When early crop is not a priority, slightly acid soil will be good but peas will not tolerate excess acidity. The most favorable pH is between 6.0 and 7.5 and if pH falls below 5.5, peas will not do well.

1.2 Manures and Fertilizers

Well-rotted FYM at the rate of 20–25 t/ha should be added and worked into the soil. Superphosphate at the rate of 350-400 kg/ha, and 100 kg/ha of potassium sulphate or nuriate of potash should be applied at the final land preparation before sowing. A dressing of nitrogen as ammonium sulphate at the rate of 200-300 kg/ha at the time of pod formation will be beneficial. It is stated that a fertilizer dose of 45 kg/ha N, 90 kg/ha P_2O_5 and 90 kg/ha K_2O produced the best yield of peas [17]. [17] further reported that increased NPK levels resulted in increased yield per hectare. [18] recommended 80-80-40 lbs/acre of NPK for peas in Sindh. [19] And the sheikh claims that sowing peas in mid-season gives a higher yield. [20]

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2.0 METHODOLOGY

The experiment "effect of seed priming with different sources at various soaking duration on germination, shoot and root length of peas was conducted at Sindh Agriculture University Tando Jam, Sindh, Pakistan. The healthy seed materials of peas were obtained from the Hyderabad City. Only viable seeds with uniform size were selected for this experiment. All the peas seeds were rinsed three times with distilled/sterilized water, before treatments.

The experimental treatment and design were: Soaking in water for 12 hours, soaking in 50^{o}C hot water for 10 minutes, soaking in 2% NaCl solution for 10 minutes, soaking in 50% H2SO4 solution for 10 minutes, and a control. The priming materials were used in this study using Completely Randomized Design (CRD), with the following concentration as a treatment.

Treatment: Priming Method

T1: Soaking in water for 12 hours

T2: Soaking in 50oC hot water for 10 minutes

T3: Soaking in 2% NaCl solution for 10 minutes

T4: Soaking in 50% H2SO4 solution for 10 minutes

T5: Control (no priming)

2.1 Set up

The 2% NaCl solution was prepared by dissolving 20g of NaCl in 1 litre of distilled water. It is worth to the mention that time of the implementation of priming treatment has been accomplished considering the suggestive result of the other researchers. In seed priming treatment, the researchers placed 50 seeds in each treatments and the priming solution later rinsed with distilled water and then dried. In order to investigate germination percentage, shoot and root length of peas, the 50 seeds from each treatment were placed in to the glass petri dish between two layers of the tissue paper. About 10 m/l of the distilled water was added to each petri dish and then they were transferred to laboratory in order to attain 25-30^{0}C required for germination. After a week, the germinated seeds were counted. Then through the following formula, the percentage of seed germination was obtained.

$$\text{Germination \%} = \frac{\text{Number of germinated}}{\text{Number of planted seed}} \times 100$$

After 7 days, root and shoot lengths were measured after randomly selecting five plants from each treatments.

3.0 RESULTS AND DISCUSSION

It was found that there are many changes that occurs in the pea after use of different priming. Many changes were found in the pea such as seed germination percentage (%), shoot length (cm) and the length of roots (cm).

3.1 Seed Germination Percentage

The great variation was recorded in term of germination percentage of pea seeds. The great source variation on seed germination percentage (figure1) highest germination percentage about (98%) was found from T3. The lowest germination percentage of pea seeds about

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(76%) result was observed from the (T5) Control, these treatments were followed by (94%) T2, (88%) T1 and the (86%) T4.

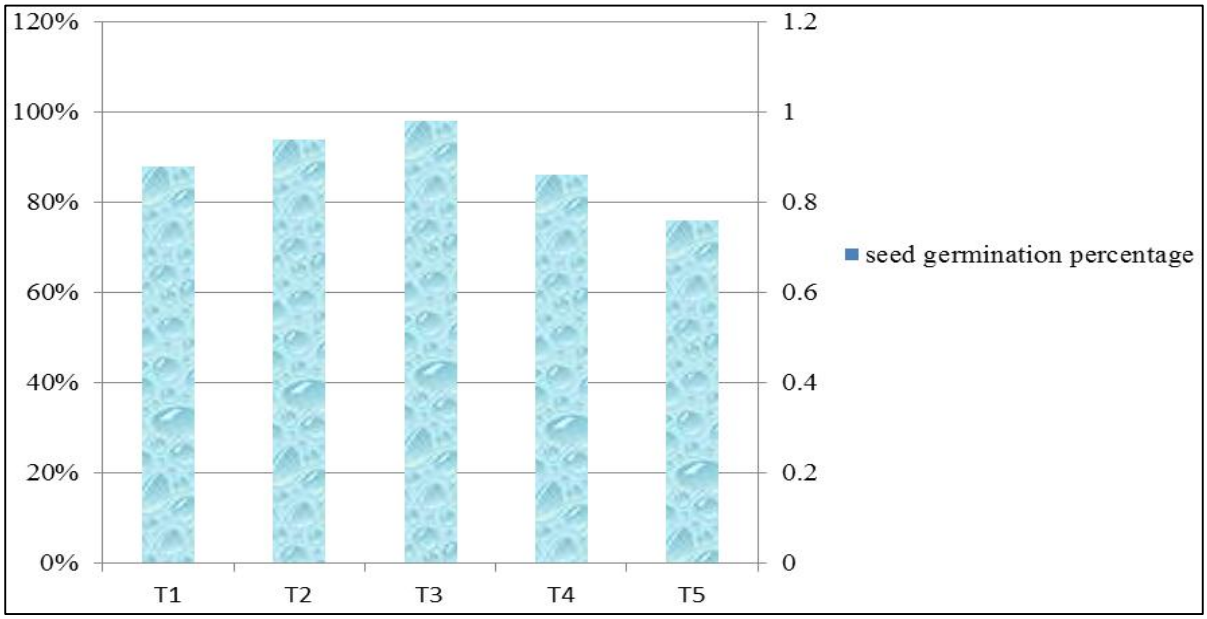

Figure 1: Seed germination percentage of pea

3.2. Shoot Length

The great variation was recorded in term of shoot length of pea plant. The great source variation on shoot length (figure 2), highest shoot length is about (4.26 cm), was found from T3, Additionally, the lowest shoot length of pea about (2.24 cm) result was observed from the (T5) Control, these treatments were followed by (3.54 cm) T2, (3.34 cm) T1 and the (2.44 cm) from T4.

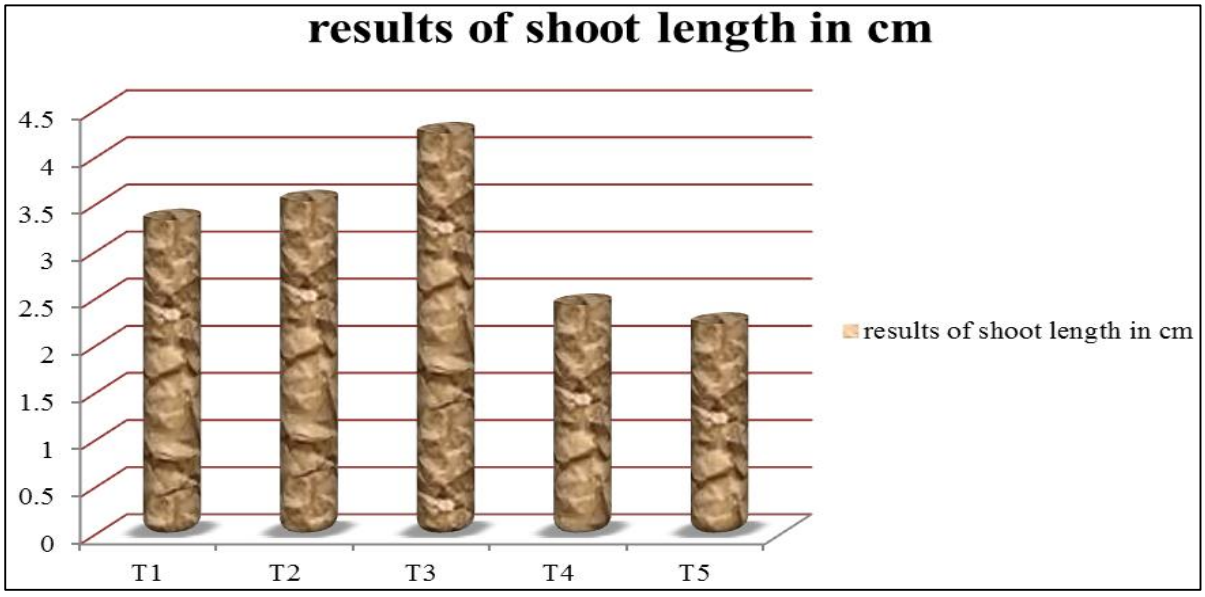

Figure 2: Shoot length of pea cm

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3.3 Root Length

The great variation was recorded in term of root length of pea plant. The great source variation on root length (figure3) highest root length is about (10.92 cm) was found from T3. Additionally, the lowest root length of pea about (1.12 cm) result was observed from the (T5) the control group, these treatments were followed by (9.74 cm) T2, (8.28 cm) T1 and the (8.4 cm) from T4.

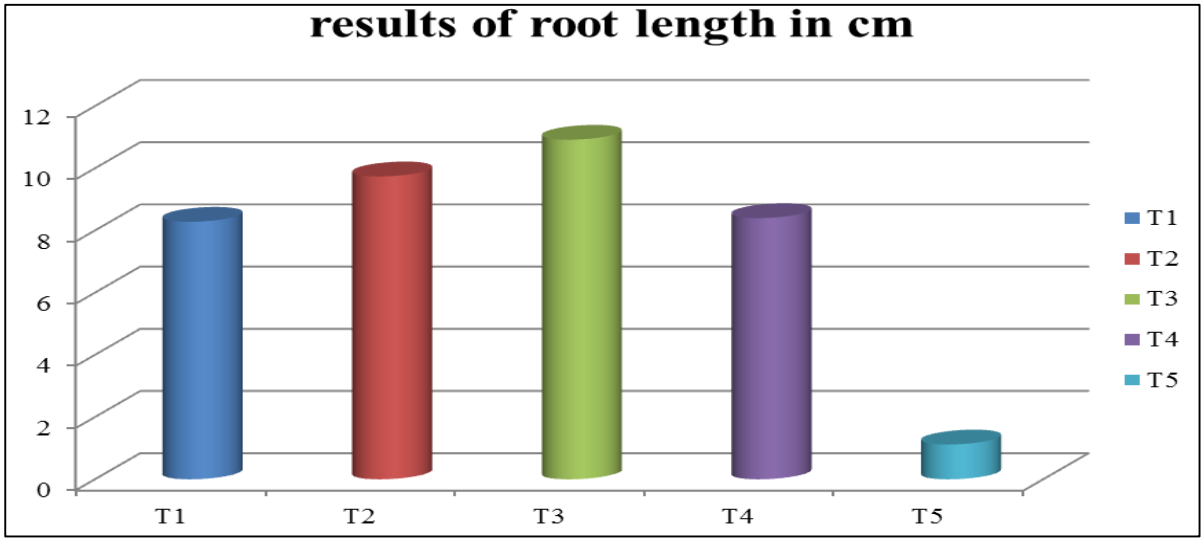

Figure 3: Root length of pea cm

4.0 CONCLUSION

Result of this experiment show significant effect of the priming treatment on the majority of seed germination and growth of components in the pea grain, including seed germination percentage, shoot and root length of pea The Highest germination percentage about (98%), The highest length of shoot about (4.26 cm), and The highest length of root about (10.92 cm) was observed from T3. Additionally, the lowest germination percentage about (76%), the lowest length of shoot about (2.24cm), or the lowest length of root about (1.12 cm), result was observed from the (T5) control. These treatments were followed by germination percentage about (94%), shoot length about (3.54 cm), and the length of root about (9.74 cm) T2, germination percentage about (88%) shoot length about (3.34 cm), length of root about (8.28 cm) T1 and the germination percentage about (86%), shoot length about (2.44 cm), length of root about (8.4 cm) from T4.

5.0 RECOMMENDATIONS

The study recommended that effects of seed priming. These practices among smallholder's farmers should focus on enhancement of farmer awareness and know about seed priming. When you see that seed does not germinate properly than you should be apply seed priming treatments.

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Conflict of Interest

The authors declares no conflict of interest.

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