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Study of the Effect on Seeds of Trigonella Foenum and Beta Vulgaris; Leafy Vegetables Germination: A Useful Guide for Agricultural Practitioner

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Abstract: ***'Germination' is the emergence of radical and plumule of seed embryo, resulting in the formation of seedling. A fully developed seed contains an embryo along with food reserves wrapped in a seed coat. Various aspects like water, air, temperature and light or darkness plays a control, key factor necessary for seed germination process. These essential key factors can be explored as natural parameter for seed germination study and a specific parameter utilized can prove to be efficient to break seed dormancy. The present research is focused on consideration of natural parameter of light and dark condition along with a treatment of hot water and Normal unheated water on seeds of Trigonella foenum (Fenugreek) and Beta vulgaris (Palak). Seed germination study under these parameters within the sample and in-between the sample carried by research statistical analysis gives varied results. The efficiency of parameters and treatment; provides apparent potency in breaking seed dormancy without a necessity of seed boosters application in farming practices. The experiment carried develops a useful guide for agricultural practitioner involved in cultivation and production of leafy vegetables.***

Keywords: Germination, fenugreek seeds, Beta vulgaris

1. Introduction

The term 'seed' in the strict botanical sense is defined as ovule developed after fertilization that contains an embryo (embryonic axis and cotyledons) and reserve tissue (sometimes absent), both being protected by a seed coat (integument). (Fenner M)., (Beltrati CM Paoli AAS.). ***'Germination'*** is the emergence of radical and plumule of seed embryo, resulting in the formation of seedling. Different plants need different variables for germination which depends on the ecological factors such as air, temperature, water, light or darkness, dormancy etc. Thus plants seed closely dependent on these natural ecological factors helps in the improvement of germination rate with further increase in the proportion of the quality and quantity produce. Successful germination and seedling establishment are crucial steps for maintenance and expansion of plant populations and recovery from perturbations. (de Melo RB., Franco AC. *et.al.)* A vast or a varying number of seeds are produced by a plant. Thus, some seeds may lack embryo, termed as Empty seeds.

Water as a key factor, activates the hydrolytic enzymes. These enzymes breaks seed coat. Oxygen is required for seed germination for aerobic respiration which is up-taken from an atmosphere through soil pores/substrate pores. Temperature; an important factor affects seed germination. The optimum temperature to most of crops is between 25^{o}C to 40^{o}C. Few plant species can germinate below 25^{o}C to 4^{o}C while above 40^{o}C is extremely above the optimum which will not germinate the seed. (Washa B.) Cold climatic conditions favourable crops seeds germinate at low temperature. This signifies the effect of temperature as a control key factor in the process of germination. Cold stratification is a process that induces the dormancy breaking prior to light emission that promotes germination. (Baskin and Baskin, Carol C. and Jerry M.)

Light or darkness is another important factor that controls the germination of seed. Although most of the literature in various research do declare that light have no effect on seed germination instead most of plants are reported to germinate earlier and successfully in the dark place compared to the light place but dark place is not declared in any published scientific research as a factor affecting germination. (Neff, M. N., L. Sanderson *et. al.*)

It's clear that these factors have either or other way of effect in germination process. In the field of agriculture and farming germination has greater impact on the rate of successivity of market produce to gain profits in huge amounts. Leafy vegetables farming in-turn is one of the major crops selected by farmers in the field of agriculture practice as it has greater advantage since within a minimum period of growth periodical cycle a harvested product is available in due course for customers in the market. Due to its huge consumption and high demand on daily basis, there is an influential effect in a market for this produce with potential increase in economic growth of farmers in less span of time.

However, a study of germination carried under normal ecological factors (without a necessity of seed germination booster's application) by a simple treatment of water application such as hot water and Normal tap water becomes an important aspect. The research study focuses on cost effectiveness and a provision of a tool to guide farmers in agricultural techniques. The present research carried; results into its own way of solution developing the efficiency and specificity for a considered species of ***Trigonella foenum (Fenugreek)*** and ***Beta vulgaris (Palak).***

2. Materials and Methods

Seeds of ***Trigonella foenum (fenugreek)*** and ***Beta vulgaris (Palak)*** bought from local nursery were soaked in a tap water for 15 minutes and another set soaked in a hot water for 15 minutes. Seeds after soaking were transferred in a set of tray containing a platform of various sections of wet blotting paper prepared for the study of two parameters such as;

a) Germination of seeds in dark and direct sunlight by using normal unheated water.
b) Germination of seeds in dark and direct sunlight by heating water known as hot water.

Random numbers of seeds were allowed in every section and a set of triplets for each were utilized both for dark and light condition. The moisture was maintained by fulfilling the requirement with normal unheated water treatment and hot water treatment to concerned sets. The seeds were kept for 6 days for germination for both dark and light condition and the observations was noted. Special treatment of mechanical or any inorganic and organic matter was prohibited during complete research study.

3. Results and Discussion

The % average of seed germination In-between the sample is given in ***table 1.1*** followed by a graphical presentation in **fig.1.1** while the results; within the sample is given in ***table 1.2*** and ***table 1.3*** followed by graphical presentation in ***figure 1.2*** and ***figure 1.3*** respectively

Table 1.1

	Seeds	Normal Unheated Water (In-between)	Hot Water Treatment (In-between)
% Average of seeds germination in Dark	*Trigonella foenum (Fenugreek)*	66.66	72.68
	Beta vulgaris (Palak)	75	68.51
% Average of seeds germination in Light	*Trigonella foenum (Fenugreek)*	29.66	58.88
	Beta vulgaris (Palak)	74.66	46.42

Table 1.2

Seeds	Conditions	Normal Unheated Water (Within Sample)
Trigonella foenum (Fenugreek)	% Average of seeds germination in Dark	66.66
	% Average of seeds germination in Light	29.66
Beta vulgaris (Palak)	% Average of seeds germination in Dark	75
	% Average of seeds germination in Light	74.66

Table 1.3

Seeds	Conditions	Hot Water Treatment (Within Sample)
Trigonella foenum (Fenugreek)	% Average of seeds germination in Dark	72.68
	% Average of seeds germination in Light	58.88
Beta vulgaris (Palak)	% Average of seeds germination in Dark	68.51
	% Average of seeds germination in Light	46.42

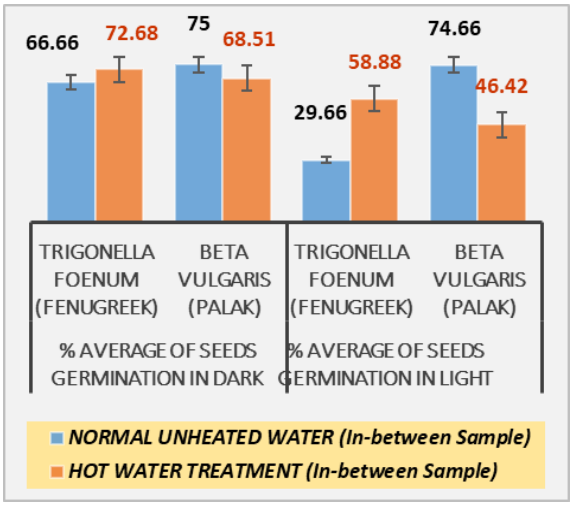

Figure 1.1

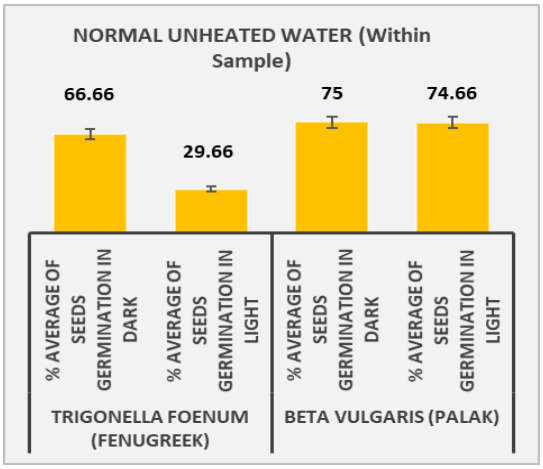

Figure 1.2

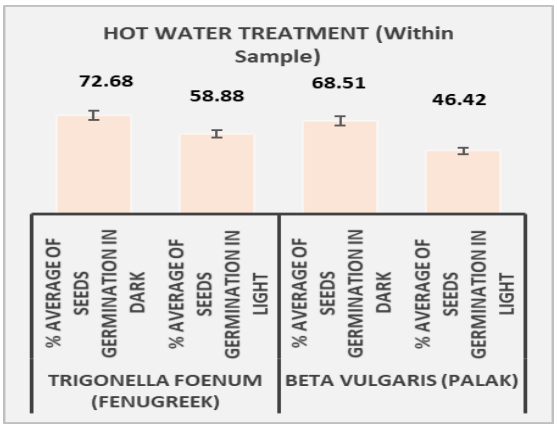

Figure 1.3

4. Conclusion

The Diagonal relationship in research statistical analysis; In-between the sample shows that *Trigonella foenum* has a germination when treated with Hot Water under dark condition i.e. 72.68%. While *Beta vulgaris* shows high rate of germination when treated with Normal unheated water in Dark condition i.e. 75.00%. In both the cases the % average is seen high in dark but contradictory against the rate of germination as one by a treatment of hot water and the other by normal unheated water.

The treatment carried In-between the sample under light condition on *Trigonella foenum* show a high germination rate by hot water treatment i.e. 58.88%.While; the rate of germination in *Beta vulgaris* is observed to be high when treated by Normal unheated water i.e. 74.66%.

In above mentioned cases the specificity of results enlightens clearly for *Trigonella foenum* and *Beta vulgaris* seeds in-order to increase the rate of germination when in '**Dark condition.**' However, a specific treatment of hot water seems efficient for *Trigonella foenum* and the Normal unheated water for *Beta vulgaris*. This proves a potency of needed prior treatment before sowing the seeds in a farm based on a condition required for high rate of germination to increase the produce.

The experimental results when compared within the sample viz. Parallel relationship in research statistical analysis; under normal unheated water treatment; shows comparatively greater germination rate for *Trigonella foenum* in dark condition i.e. 66.66 >29.66%. While that for *Beta vulgaris* the rate of germination is seen quite high than that in light condition i.e. 75>74.66%. This concludes the efficiency for seeds treatment at independent level on an individual basis.

However, the experimental results observed within the sample viz. Parallel relationship in research statistical analysis; carried by hot water treatment shows the greater germination rate in a dark condition than that of light condition for seeds of *Trigonella foenum i.e. 72.68 >58.88%*.While; similar results observed in *Beta vulgaris* with greater germination rate in dark condition. 68.51 > 46.42%.

Hence, it is advisable and recommendable from the above research parameter to step up for the process needed for greater amount of produce. Utilization of it in proper way creates cost-effectiveness during cultivation on a large scale with a reduction of cost of seed boosters.

Therefore, following natural treatment of ecological factor that breaks seed dormancy has been easily established from the research for a specific leafy vegetable and proven for 'future value' as a tool to guide agricultural practitioners.

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