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ORGANIC SEED PRIMING – A FEASIBLE APPROACH FOR INDUCING GERMINATION EFFICIENCY IN COTTON (*Gossypium hirsutum L.)*

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ABSTRACT

Seed priming is a pre-sowing treatment which leads to a physiological state that enables seed to germinate more efficiently and vigorously. During subsequent germination, seeds which are primed exhibit a faster and more synchronized germination and young seedlings are often more vigorous and resistant to abiotic stresses than seedlings obtained from unprimed seeds. Priming which always involves soaking seed in predetermined amounts of water or limitation of the imbibition time. A laboratory study was conducted during Aug 2019 in the Department of Agronomy, Faculty of Agriculture, Annamalai University, Chidambaram Taluk, Cuddalore District, to determine the effects of seed priming on germination and growth of cotton seedlings. The experiment was laid out in randomized block design with three replications. The treatment comprised of five treatments T_1- Control (no priming), T_2-hydro priming, T_3- NSKE, T_4- panchagavya @ 3% and T_5- Liquid bio-fertilizer (Azo gold). The study clearly showed that among the treatments T_4 – seed priming with panchagavya @ 3% showed superior response and next in order was seed priming with liquid bio-fertilizers and least with unprimed seeds. The result evidently proved that seed priming with panchagavya @3% will be an appropriate seed priming method for cotton and it was having considerable increase in germination and growth of cotton. This priming method is cost effective and eco-friendly. This is an alternative cost effective and feasible technique which enhanced and advanced seed germination in cotton.

Keywords: cotton, seed priming- Hydro priming, NSKE, panchagavya and liquid bio-fertilizer.

INTRODUCTION

India got the first place in the world in Cotton acreage with around 126.07 lakh hectares under cotton cultivation which is around 37 per cent of the world area of 363.3 lakh hectares. Approximately 62% of cotton in India is cultivated as rainfed cotton and 38 per cent as irrigated cotton. In terms of productivity India ranks poorly compared China (1764 Kg /ha) and USA (955 Kg/ ha). During 2018-19 India's productivity is estimated at 453.43 Kg / ha.

Cotton (Queen of fibre crop) is often called as white gold. True to its name cotton supports the largest agro-based industry in India and cotton industry ranks first in agro-based industry. Around 6 to 6.5 million farmers grow the crop. Cotton is the backbone of textile industry, which consumes 59% of the country's total fibre production. It accounts for 34% of the country's export. Along with the industry, which it sustains, it touches the country's economy at several points including employment and export earnings. (Status paper of Indian cotton, Directorate of cotton development Government of India, Jan 2017).

Major constraints in cotton production are nearly 65% cotton area is rainfed, mainly in the Central and Southern States and cotton crop is highly prone to pest and diseases. The cotton seed is relatively small and a weaker germinator than other crops . To overcome these constraints seed priming is the effective method.

Poor stand establishment is a major constraint to crop production. Soil dryness is the most impeding factor affecting germination and emergence. Seedbed conditions are typically harsh, with temperatures higher than 40°C resulting in rapidly drying soils, which form a crust on some soil types. (Weaich, Bristow & Cass, 1992; Nabi *et al*., 2001). Germination occurs only after seed imbibition of sufficient water to activate growth. This imbibition is affected in drying soil by low soil water potential, decreased hydraulic conductivity and decreased seed-soil contact. (Hadas, 1977; Brar *et al*., 1992). Under such conditions seed water uptake rates and total germination have been shown to be greatly decreased (Collis-George & Hector, 1996). Rapid germination and emergence can help the seedling escape from some of these stresses. Seed priming have several benefits.

Seed priming is the process in which the seeds are hydrated to allow metabolic process of germination to take place not sprouting. It improved seed performance, provides faster and synchronized germination with certain physiological, biochemical, cellular and molecular changes. (Soeda *et al*., 2005).

Seed soaking or seed priming is a simple method of treating seeds with needed inputs in liquid or slurry status for better germiability, vigour and crop growth. (Bradford 2002). There is an urgent need to reduce the use of chemical fertilizers and pesticides in agriculture and horticulture due to environmental concern and alternative to chemicals are being sought to improve crop establishment and health. Best way is the use of organics nutrients or growth regulators to seed or roots, which may promote plant growth, including supply of organic nutrients production of plant hormones, antibiotic or enzyme; induced systemic resistance. Hence, priming of seeds with organics which are safe, eco-friendly, economical and easily available. Organic seed priming provides hardiness to high temperature, low moisture especially in semiarid tropics. Seed priming had

advantage of faster germination, higher seedling vigour resulting in higher crop productivity. Seed priming benefits include faster emergence, better stands and a lower incidence of re-sowing, more vigorous plants, better drought tolerance, earlier flowering, earlier harvesting and higher grain yield owing to reduced competition from weeds. The main advantage of organic seed treatments include increased phosphate levels, nitrogen fixation and root development. (Jayanth kumar *et al.*,2017)

Hydropriming is the simplest method of seed priming, which relies on seed soaking in pure water and re-drying to original moisture content prior to sowing. No use of additional chemical substances as a priming agent makes this method a low-cost and environmentally friendly. The main disadvantage of hydropriming is uncontrolled water uptake by seeds. This is a consequence of free water availability to seeds during hydropriming, so that the rate of water uptake depends only on seed tissue affinity to water. (Taylor *et al.*, 1998)

Panchagavya possess almost all the major nutrients, micro nutrients and growth hormones enhances the metabolic activity of plants and supports better seed invigoration (Saritha *et al* 2013). The increase in root length and shoot length may be due to the presence of plant growth promoting substances produced by bacteria that are present in panchagavya. (Sreenivasa and Naik, 2009)

Seed priming with neem derivatives would be more economical to farmers. Neem seed derivatives applied before seed was sown not only affected the development of pest and insect but also increases the seedling vigour. In addition a significant increase in dry weight of seedlings obtained from neem treated seeds, without concomitant increase in seedling root and shoot length, indicated that the neem treatments produced robust seedlings. The possible role of active principals of neem, such as azadirachtin in promoting the vigour of rice seedling. (Saxena *et al*. 1984).

In panchagavya presence of naturally occurring, beneficial, effective micro organisms (EMO's) predominately lactic acid bacteria (*Lactobacillus*), yeast (*Saccharomyces*) and actinomycetes (*Streptomyces*) which are highly beneficial for enhancing growth attributes, yield attributes and crop yield. (Sumit Pal and Neelam Patel 2020)

Liquid bio-fertilizers are suspensions that have agriculturally useful microorganisms, which fix atmospheric nitrogen and solubilize insoluble phosphate and make it available for the plants. Bio-priming a seed treatment system that integrates the biological and physiological aspects of enhancing growth, disease control and increase in yield, involves coating the seed under warm, moist conditions (Parvatha Reddy 2012). Keeping this in view this study was planned to impart the significant role of priming on cotton.

Materials and Method:

The lab study was conducted during Aug 2019 at the Department of Agronomy, Faculty of Agriculture, Annamalai University, Chidambaram Taluk, Cuddalore District, to identify the impart of priming on cotton for

getting vigorous seedlings. . The experiment was laid out in randomized block design with five treatments replicated thrice T_1- Control (no priming), T_2- hydro priming , T_3- NSKE, T_4- panchagavya @ 3% and T_5- Liquid bio-fertilizer(Azo gold). The variety used for this study is Surabhi. For this required number of seeds were soaked in water, NSKE, Panchagavya and liquid bio-fertilizer over night and the primed seeds were kept in petri dishes and allowed to germinate. Before commencement of experiment, petri dishes were thoroughly cleaned with distilled water. Petri dishes each having two layers of germination paper and seeds were provided with control medium which are placed in germinator at 25^0 C for 8 days and data were collected at every 24 hours. Seeds with ruptured seed coat and radical length of more than 2 mm were considered to be germinated. From the petridish seedlings were randomly selected for measurement of root length, shoot length. Seedlings were put in different envelopes and oven dried at 72^0 C for 48 hours to measure dry weight. For calculating germination indices following formulas were used.

1.Germination percentage (%) = (n/N)×100%

Where

N= no. of germinated seeds

n= total number of seeds used

2. Vigour index = SL×GP

Where

SL =Seedling length

GP= Germination percentage

Results and Discussion

Seed priming with panchagavya @3% significantly increased germination percentage, vigour index, shoot length, root length, fresh weight of seedling, dry weight of seedling and finally plant height at 15 DAS. This is due to presence of naturally occurring, beneficial, effective micro organisms (EMO's) predominately lactic acid bacteria (*Lactobacillus*), yeast (*Saccharomyces*) and actinomycetes (*Streptomyces*) which are highly beneficial for enhancing germination %, vigorous index, growth attributes, yield attributes and crop yield. This is supported by Somasundaram and Sankaran (2005). This was followed by seed priming with liquid bio-fertilizer. Least was recorded with control (no seed priming).

Conclusion

All the priming methods had positive influence on seed germination and growth. From the above discussion it is very clear that use of panchagavya @3% have provided better results as compared to other priming methods in cotton crop. The use of panchagavya has enhanced not only the germination, vigour and growth but also produce quality cotton without any chemical in the form of fertilizers. Organic seed priming

increases the germiability and vigour of cotton seeds. Hence it is suggested that these natural products the Indian farmers will be benefited financially and the people will be benefited by getting organically produced product without any harmful effects.

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Table: 1. Effect of seed priming on germination %, VI, root length, shoot length, fresh weight of seedling, dry weight of seedling and plant height 15 DAS

Treatments	Germination %	Vigour index	Root length (cm)	Shoot length(cm)	Fresh weight of seedling (g)	Dry weight of seedling (g)	Plant height 15 DAS (cm)
T_1	83.12	1921.73	11.03	12.09	5.52	1.49	35.18
T_2	86.50	2294.84	12.78	13.75	6.16	1.50	36.72
T_3	89.87	2693.40	14.54	15.43	6.81	1.57	38.27
T_4	**94.27**	**3198.58**	**16.54**	**17.39**	**7.46**	**1.66**	**39.91**
T_5	90.91	2773.66	14.79	15.72	6.83	1.59	38.38
CD (0.05%)	3.35	205.03	1.73	1.65	0.61	0.065	1.50
Sed	1.67	102.5	0.865	0.825	0.305	0.0325	0.75