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Beejamritha Elixir: Nurturing Seeds of Green Gram and Cowpea for Flourishing Germination

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ABSTRACT

Background: Beejamritha is an organic formulation used in agriculture, particularly for enhancing seed germination and seedling growth. This study investigates the effectiveness of Beejamritha solution also documents the preparation process of Beejamritha, studies its impact on seed germination percentages and assesses growth parameters. The study also evaluates germination index and vigor index to gauge seedling health and analyzes seedling resilience to water stress, including survival and mortality rates. Through these analyses, it aims to provide insights into the potential benefits of organic treatments for sustainable crop growth.

Methods: The research, conducted in 2024, evaluated seed germination rates of legume plants using a completely randomized design with seven treatments. Treatments included varying concentrations of Beejamritha (25%, 50%, 75%, 100%), cow dung solution, cow urine solution, and a control treated with water. Parameters measured included germination percentage, germination rate, shoot length, root length, seedling length, and seed vigor index at 7 days after sowing (DAS).

Result: Beejamritha at 25%, 50% and 75% concentrations notably improved seed germination and vigor. Pure cow urine solution showed the lowest germination rates. Interestingly, 100% cow dung extract resulted in the strongest seedling length and vigor index for green gram and cowpea, suggesting its potential as a beneficial seed priming agent for Odisha's farmers. Despite these positive impacts on germination and vigor, green gram seedlings demonstrated better drought resilience post-germination compared to cowpea.

Key words: Beejamritha, Organic farming, Priming, Seed vigor index, Sustainable agriculture.

INTRODUCTION

India's agricultural landscape, boasting 4.5 million hectares of arable land, ranks second globally in vegetable production, trailing only behind China. With a population of 1.3 billion, predominantly vegetarian, the nation requires a substantial annual food production of 5-6 million tons to meet demand. However, pest-related crop losses have historically posed challenges, leading to heavy reliance on synthetic chemicals for crop protection.

In response to the environmental concerns associated with chemical pesticides and fertilizers, organic farming has gained traction in India over the past two decades.

Organic farming in India emphasizes the use of locally available and cost-effective inputs to maximize returns on investment for farmers. The surge in demand for organic products both domestically and internationally has led to increased export revenue (Vyankatrao, 2019). Moreover, organic produce is lauded for its superior health benefits, flavour profiles, and nutrient density compared to conventionally grown counterparts (Ebrahimi *et al.,* 2021; Jain *et al*., 2021; Pavithra *et al*., 2025).

Traditional Indian knowledge, as documented in ancient texts like Charak Samhita and Sushrut, has long recognized the agricultural benefits of cow urine and cow dung. These natural ingredients are integral to organic farming practices in India, forming the basis of liquid organic formulations such as Panchagavya and Jivamritha (Reshma *et al*. 2018).Various experimental trials have been conducted to enhance productivity through the application of Panchagavya and Beejamrita (Ajay *et al*., 2022; Lal *et al*., 2022).

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Beejamritha, a solution made from cow urine and cow dung, is particularly renowned for its efficacy in safeguarding seeds during germination and establishment against bacterial and fungal diseases (Kala *et al*., 2022). The widespread use of Bijamrita in Indian agriculture highlights its role in sustainable farming, blending traditional knowledge with modern practices. (Istaitieh *et al*., 2024; Jha *et al*., 2020; Patel *et al*., 2020; Kumar *et al*., 2020; Devapatni, 2023).

MATERIALS AND METHODS

The present study was carried out at the Organic Research Farm unit of MS Swaminathan School of Agriculture,

Centurion University, Paralakhemundi campus, during March 2024, in the Rabi season. The research aimed to assess the seed germination rate of cowpea and green gram under various organic solutions at different concentrations. The experiment followed a completely randomized design with seven treatments including a control group treated with water (Table 1).

Data were collected from each replication, and various observations such as germination percentage, germination rate, shoot length (cm), root length (cm), seedling length, and seed vigor index were measured and recorded for both treated and non-treated (control) seeds. A total of 350 seeds that were identical in size and weight were taken for experiment, 50 seeds in each treatment which is done in seedling trays. The experiment has been carried out using random block design in that seedling tray.

Preparation of beejamritha solution

The Beejamritha solution was prepared following the protocol outlined with slight modifications (Table 2) . Initially, 2 liters of water were measured and placed in a container or small tank. Next, 500 grams of fresh cow dung and 2 liters of cow urine were collected from a cow shed. These were then combined by adding the cow urine and cow dung to the 2 liters of water in the container. The mixture was stirred thoroughly until complete homogenization was achieved. Subsequently, 500 grams of lime were mixed thoroughly with the prepared solution. Finally, the solution was combined with 500 grams of soil, ensuring thorough mixing (Kumari *et al*., 2022).

Preparation of cow dung extract

Fresh desi cow dung was collected from the shed and measured. Then, 10 liter of water and one kilogram of fresh cow desi dung were mixed, and the mixture was continuously swirled until it was well mixed. The mixture was then filtered three times using a clean cotton cloth. Following filtration, five liters of water were added to ensure complete extraction of essential nutrients from the solution. Finally, clear cow dung extract was obtained.

Preparation of cow urine extract

For preparation of cow urine extract first 500 ml of fresh cow urine was taken in a bucket then 5 ml of water was added to it after that it was properly stirred. The cow urine extract is 20% concentrated. Following which the seeds are dipped inside.

Seed priming method

Different concentrations ranging from 10% to 100% were prepared for the various solutions. Each solution was placed in a container for 24 hours before sowing where the seeds immersed for treatment. In efforts to enhance seedling growth and germination, several approaches, including seed priming, seed coating, and seed hardening, have been employed to precondition seeds. These methods aim to improve seed vigor, uniformity, and resistance to environmental stressors, ultimately leading to better germination rates and seedling establishment. 50 seeds were counted and dipped into the different concentrated solution and considered the treatment for 24 hours. Then seeds were taken out from the solution and placed on the seedling tray equally. For their growth, germination and succeeding water was spread continuously throughout the days. After placing in the seedling tray regularly water spraying must important for their germination up to 7 days. After 7 days of the germination of these seeds, and data was collected for further study.

RESULTS AND DISCUSSION

The germinated plants from each of the five different treatments were evaluated for assessment of root, shoot, and seedling length at 7 DAS. Measurements were taken for 10 uprooted plants using scales or graph paper and the average root, shoot and seedling length was calculated for each treatment.

In green gram, organic seed priming with T1 resulted in a lower seed count compared to the control, while T2 exhibited an equal number of seedling germinations as the control (Sripathy *et al*., 2023). Notably, there was no increase observed in the seed count relative to control, and the seed count was lower in T6.

In cowpea, organic seed priming with T4 resulted in a higher seed count compared to control. T2, T3 and control exhibited similar seed counts, with all showing the least germination. T1 shows a 33.33% increase that of control, T2 shows 100% similar with control, T3 sows similar germination to control. T4 and T6 shows increase that of control. T5 shows 66% increase that of control.

Germination was monitored from day 4 to day 7, allowing for a comprehensive comparison of germination rates across various treatments. The germination percentage was calculated for both green gram (Fig 1) and

Table 1: Shows treatments details.

	Treatments
T1	25% Concentration of Beejamrit solution
T2	50% Concentration of Beejamrit solution
T3	75% Concentration of Beejamrit solution
T4	100% Concentration of Beejamrit solution
T5	Cow dung solution (100% concentrated)
T6	Cow urine (100% concentrated)
T7	Control/Water

Table 2: Ingredient used for preparation of beejamrita.

Ingredient	Quantity
Water	2 l
Lime	500 gm
Soil	500 gm
Cow urine	2 l
Cow dung	500 gm

Cowpea (Fig 2) on 7 DAS. In green gram, T2 exhibited the highest seed germination rate, comparable to that of the control group and all the treatment shows higher germination percentage except T6 resulted in a lower seed germination percentage.

In cowpea, T2 and T3 demonstrated similar effects on germination compared to the control group, with no significant increase in germination percentage observed across any treatments.

Effect of seed priming on root and shoot length

Organic seed priming in green gram with T1 shows a 33.3% decrease that of control, T2 shows 35 % decrease that of control, T3 shows 12.5% decrease that of control, T4 shows 28.7% decrease that of control, T5 shows 28.7% decrease that of control, T6 shows 50.8% decrease that of control. The shoot length on the 7th day shows a maximum in T7 control condition.

The treatment T1 and T5 with cowpea shows 75.2% increase that of control. Whereas, the treatment T2 shows 25% increase that of control. T4 shows 100%, T3 and T6 shows highest root length that is 150% increase that of control.

Effect of seed priming on seedling length

Organic seed priming in green gram with T1 shows a 5.6% decrease that of control, treatment 2(50%) Beejamrit solution shows 10% decrease that of control, treatment 3 (75%) Beejamrit solution shows an 8.5% increase that of control, treatment 4 (100%) Beejamrit solution shows 5% decrease that of control, treatment 5 (10%) cow dung solution shows an 9.2% increase that of control, treatment 6 (20%) cow urine solution shows 3% decrease that of control. The shoot length of 7th day shows maximum in T5 treated condition. The root, shoot length and the seedling growth in green gram.

The treatment T1 in Cowpea shows 16.62% increase that of control. Whereas the treatment T2 shows 16% decrease that of control. T3 shows the 2nd highest seedling length 58% increase that of control and T6 shows the highest seedling length shows 108% increase that of control. T4 show shoot length is 33% increase that of

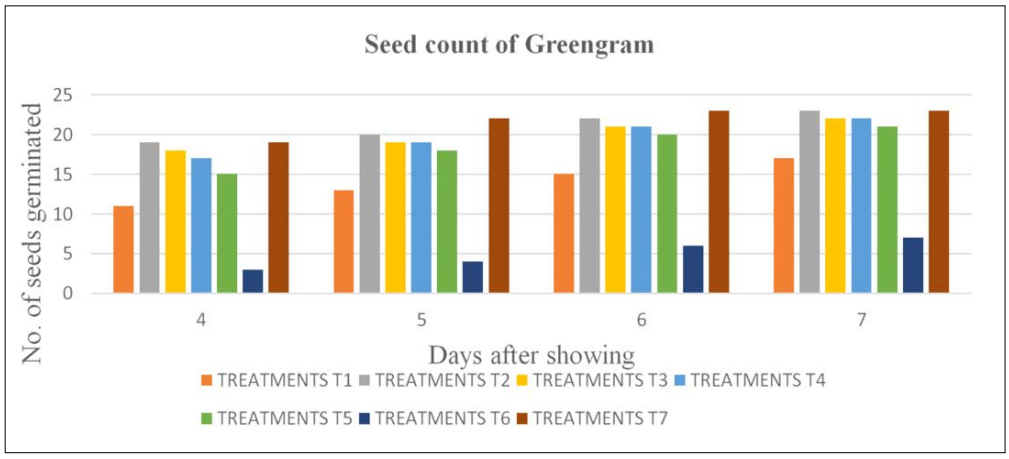

Fig 1: Seed count in green gram up to 7 days after sowing (DAS).

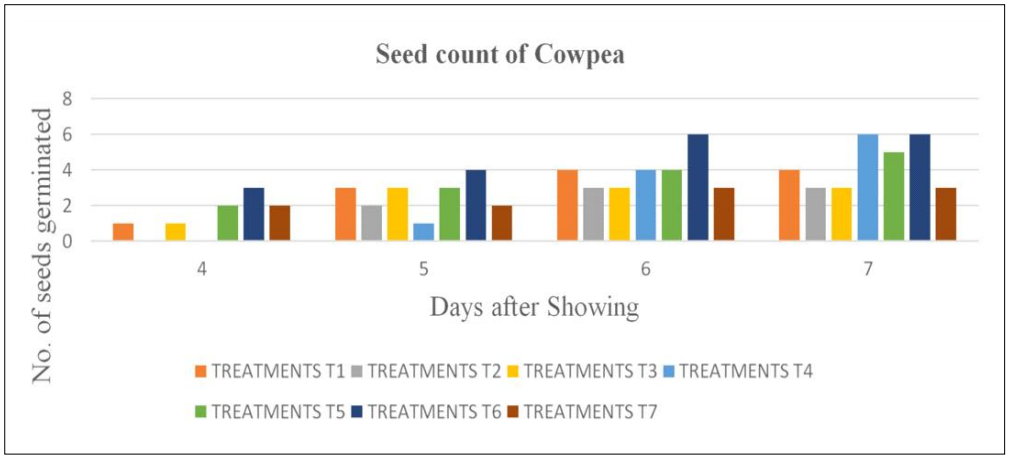

Fig 2: Seed count in Cow pea up to 7 DAS.

control and T5 shows similar effect with control. The root length, shoot length and seedling growth in cowpea.

The effect of organic seed priming on seed vigor index

The seed vigor index was determined where T2 showed the highest increase among the evaluated treatments on green gram seeds, with a notable 40.25% increase compared to the control. Conversely, T6, exhibited the most significant decrease in seed vigor, with a 48.35% reduction compared to the control. T5 resulted in a substantial 15.41% increase in seed vigor compared to the control. T1, T3, and T4, demonstrated changes in seed vigor ranging from slight decreases to modest increases, indicating varying effects based on concentration. These findings suggest a significant influence of solution concentration on seed vigor, with the 50% Beejamrit solution yielding the most favourable enhancement in green gram seeds. A seed lot is considered to be more vigorous when its seed vigor index is elevated (Rani *et al*., 2020). The effect of seed priming on seed vigor.

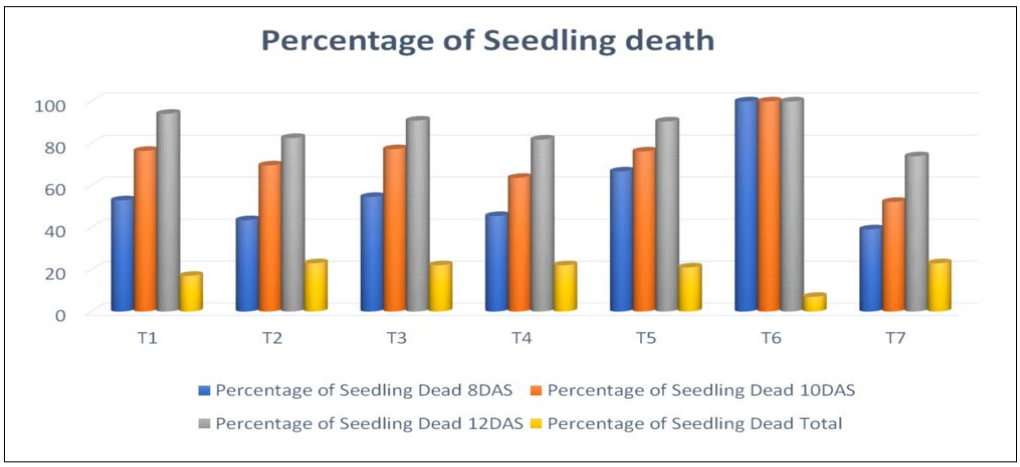

Fig 3: The seedling mortality in green gram.

Table 3: Impact of Beejamrita treatment on green gram (*Vigna radiata*).

Treatments	Germination%	Root length (cm)	Shoot length (cm)	Seedling length (cm)	Seed vigor index
T1 (25% of Beejamrit solution)	68	3.5	6.5	10	680
T2 (50% of Beejamrit solution)	92	2.8	6.4	9.2	1000
T3 (75% of Beejamrit solution)	88	3.0	8.5	11.5	765
T4 (100% of Beejamrit solution)	88	2.6	6.7	9.3	739
T5 (100% cow dung)	84	5.2	6.7	11.9	823
T6 (100% cow urine)	56	5.4	4.8	10.2	368
T7 (water)	92	1.3	9.3	10.6	813
Standard error (SE)	8.76	0.31	0.60	0.38	71.87
Standard difference(SD)	23.17	0. 11	1.58	1.02	190

Table 4: Impact of Beejamrita treatment on cowpea (*Vigna ungiculata*).

Treatments	Germination%	Root length (cm)	Shoot length (cm)	Seedling length (cm)	Seed vigor index
T1 (25% of Beejamrit solution)	66	3.5	3.5	7	471
T2 (50% of Beejamrit solution)	50	2.5	2.5	5	500
T3 (75% of Beejamrit solution)	50	4.5	5	9.5	263
T4 (100% of Beejamrit solution)	100	4	4	8	625
T5 (100% cow dung)	82	2.5	3.5	6	683
T6 (100% cow urine)	100	7.5	5	12.5	400
T7 (water)	50	4	2	6	416
Standard error (SE)	8.6	1.69	0.43	0.97	53.51
Standard difference (SD)	23. 6	0.64	1.14	2.57	143.59

The seed vigor index in cowpea shows a maximum in T5 treatment which is the 64.18% increase that of control. The seed vigor is more in T1, T2, T4, T5 and less in T6 followed by T3, which is 48.8% lowest that of the control.

Effect of organic seed priming on seedling mortality of green gram and cowpea

A lot of research explores Marthandan *et al*. (2020) and Chen *et al*. (2021) the diverse responses on morphological, physiological, biochemical, and molecular-of seed priming techniques aimed at augmenting drought tolerance in crop plants. It investigates how these methods impact the external characteristics, internal functions, chemical compositions and genetic expressions of seeds, all in pursuit of enhancing their ability to withstand periods of drought stress (Shariff *et al*., 2017 ; Sakthivel *et al*., 2022).

The impact of organic seed priming on seedling mortality rates under drought stress was investigated over 15, 20, and 25 days after germination in green gram (Fig 3). Among these, T6 exhibited the highest mortality rate, with all seedlings succumbing to drought stress. Conversely, T3 and T5 demonstrated the lowest mortality rates. Overall, the study demonstrates that varying concentrations of both Beejamritha and cow dung solutions have discernible impacts on seedling mortality, with higher concentrations generally associated with higher mortality rates.

The experiment evaluated germination percentage, shoot length, seedling length, root length, and seedling vigor index. A 25% Beejamritha solution decreased seed count, while a 50% solution showed similar germination rates to the control, without a significant increase in seed count. Pure cow urine reduced seed count, and the 20% cow urine solution had the lowest germination rate.

In green gram, the highest germination percentages shown in Table 3 were in T2, T7 and T3,T4 (92%, 92%, and 88%, respectively). T5, using 100% cow dung extract, showed the best seedling length and vigor, suggesting its potential as an effective seed priming agent for farmers in Odisha.

Seed priming improved germination and vigor. Under drought stress, T6 had 100% seedling mortality, while T3 and T5 had the lowest mortality. The control group's mortality increased from 39% to 73% between 0 and 12 DAS.

In cowpea, T4 and T6 had the highest germination rates (100%). T3, T5 and T7 produced the longest green gram seedlings, with T2 having the highest seed vigor index shown in Table 4. T6 showed the longest cowpea seedlings and highest germination.

The study highlighted that Beejamritha solutions (25%, 50%, and 75%) significantly improved germination and vigor compared to other treatments.

CONCLUSION

The experiment highlights the effectiveness of various seed priming agents, including Beejamritha solutions, cow dung, and cow urine, in enhancing seed germination and Vigor, particularly in cowpea cultivation. Treatments with Beejamritha solutions showed notable improvements in seed germination and Vigor indices. However, while priming didn't significantly impact green gram parameters, it did enhance resilience to drought stress post-germination. Overall, these findings offer promising insights for small to marginal farmers in Odisha, suggesting cost-effective techniques to improve crop production, particularly in cowpea and green gram cultivation. Further research can explore the optimization of seed priming methods, including different concentrations of Beejamritha solution, cow dung, and cow urine. Investigating the effects of varying soaking durations, drying techniques, and priming temperatures could provide insights into maximizing seedling vigor and crop yield.

Conflict of Interest

There are no conflicts of interest to declare on behalf of all authors.

REFERENCES

Ajaykumar, R., Harishankar, K., Sivasabari K., Rajesh, kumar, P., Saranraj, T., Aravind, J., Kumaresan, S. (2022). Effect of liquid rhizobium with organic Bio-stimulants on growth, yield attributes and yield of leguminous blackgram [*Vigna mungo (*L.) Hepper]. Legume Research. 45(12): 1587-1592. doi: 10.18805/LR-4999.

Chen, X., Zhang, R., Xing, Y., Jiang, B., Li, B., Xu, X., Zhou, Y. (2021). The efficacy of different seed priming agents for promoting sorghum germination under salt stress. PloS one.16: e0245505.

Devapatni, M.K., Prashar, J., Singh, M., Menon, S., Singh, G. (2023). ITK based Organic Formulations in Crop Production: A Review. Ecology environment and conservation. October Special Issues. pp 124-129.

Ebrahimi, M., Souri, M.K., Mousavi, A., Sahebani, N. (2021). Biochar and vermicompost improve growth and physiological traits of eggplant (*Solanum melongena* L.) under deficit irrigation. Chemical and Biological Technologies in Agriculture. 8: 1-14.

Istaitieh, M., Najafabadi, M.Y., Edwards, A.M., Todd, J., Van Acker, R., Rajcan, I. (2024). Genetic study for seed germination and shattering in *Euphorbia lagascae* in response to different seed treatments. Heliyon. 10: e27975.

Jain, D., Jain, P., Bhojiya, A.A., Jain, R.K., Choudhary, R., Sharma, S.K., Jat, G. (2021). Microbiological and enzymatic properties of diverse Jaivik Krishi inputs used in organic farming. Indian Journal of Traditional Knowledge (IJTK). 20: 237-243.

Jha, B., Kumar, O., Naik, S., Sarkar, P.K., Choudhary, J., Shinde, R. (2020). Efficacy of seed treatment with bijamrita and bavistin on seedling growth of Maize (*Zea mays*) and Finger millet (*Eleusine corona*). International Journal of Agriculture Science and Research. 10: 119-128.

Kala, B.K., Esther, P. and Sundari, V.S. (2022). Influence of bijamrita as priming media to enhance seed germination and seedling growth of selected leafy vegetable. International Journal of Environmental Science. 13: 1091-1103.

Kumar, R., Kumar, S., Yashavanth, B.S., Meena, P.C., Ramesh, P., Indoria, A.K., Kundu, S., Manjunath, M. (2020). Adoption of Natural Farming and its Effect on Crop Yield and Farmers' Livelihood in India. ICAR-National Academy of Agricultural Research Management, Hyderabad, India.

Kumari, S., Meena, L., Raghavendra, K.J., Karwal, M. (2022). Jeevamrit/ Jeevamrutha: Organic concoctions for natural farming. Agriculture and Food: E-Newsletter. 4: 40-42.

Lal, G., Lal, S., Chaudhary, N., Choudhary, M., Meena, S., Kumar, N. (2022). Performance of green gram varieties under organic production system. Legume Research. 44(1): 36-40. doi: 10.18805/LR-4970.

Marthandan, V., Geetha, R., Kumutha, K., Renganathan, V.G., Karthikeyan, A., Ramalingam, J. (2020). Seed priming: A feasible strategy to enhance drought tolerance in crop plants. International Journal of Molecular Sciences. 21.

Patel, S.K., Sharma, A., Singh, G.S. (2020). Traditional agricultural practices in India: An approach for environmental sustainability and food security. Energy, Ecology and Environment. 5: 253-271.

Pavithra R., Padmavathi, S., Kumar, S.B., Suganthi, S., Satheeshkumar, P., Kamaraj, A. (2025). Additive response of biofertilizers on seed yield and quality in cowpea. Legume Research. 48(3): 423-429. doi: 10.18805/LR-4934.

Rani, P., Kaur, G., Rao, K.V., Singh, J., Rawat, M. (2020). Impact of green synthesized metal oxide nanoparticles on seed germination and seedling growth of *Vigna radiata* (Mung Bean) and *Cajanus cajan* (Red Gram). Journal of Inorganic and Organometallic Polymers and Materials. 30: 4053-4062.

Reshma, Sujith, G.M., Devakumar, N. (2018). Growth and yield of Cowpea [*Vigna unguiculata* (L.) Walp] as influenced by jeevamrutha and panchagavya application. Legume Research. 42(6): 824-828. doi: 10.18805/LR-3932.

Sakthivel, S., Dhanapal, A.R., Balakrishnan, E., Selvapitchai, S. (2022). Quantitative and qualitative analysis of bottle gourd (*Lagenaria siceraria*): Impact of organic liquid fertilizer. Energy Nexus. 5: 100055.

Shariff, A.F., Sajjan, A.S., Babalad, H.B., Nagaraj, L.B., Palankar, S.G. (2017). Effect of organics on seed yield and quality of green gram (*Vigna radiata* L.). Legume Research-An International Journal. 40(2): 388-392. doi: 10.18805/lr.v0i0f.11297.

Sripathy, K.V., Singh, C., Ramesh, K.V., Pal, G., Kumar, A., S.P., J.K., Garlapati, V.K. (2023). Interference of Nanoparticulates in seed invigoration of green gram. Plant Physiology and Biochemistry. 195: 256-265.

Vyankatrao, N.P. (2019). Effect of Bijamrita and other organic liquid treatments on seed germination and seedling growth of legume crops. Online International Interdisciplinary Research Journal. 9: 59-68.