*Biological Forum – An International Journal* 13(3): 200-205(2021)

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

# Effect of Organic and Inorganic Seed Priming on Seed Quality Parameter in Chilli (*Capsicum annum* L.) Seeds

***Ashish Kumar[1]*, A.K. Chaurasia[2] and Marmat Sandip M.[1]***
*[1]M.Sc. Scholar, Department of Genetics and Plant Breeding,*
*NANI, SHUATS, Prayagraj, (Uttar Pradesh), India.*
*[2]Associate Professor, Department of Genetics and Plant Breeding,*
*NANI, SHUATS, Prayagraj, (Uttar Pradesh), India.*

*(Corresponding author: Ashish Kumar*)*
*(Received 25 May 2021, Accepted 28 July, 2021)*
*(Published by Research Trend, Website: www.researchtrend.net)*

**ABSTRACT: Seed priming is a pre-sowing advance activity in which seeds are moderately hydrated among the various concentration solutions to the point where pre-germination metabolism starts without actual germination. Priming could also be a cellular state during throughout that the harmful effects of abiotic stress factors in seeds/plants are hindered by pre-exposure to a stimulus, thus resulting in greater survival. Seeds are then re-dried to the actual weight for proper handling. The experiment of seed priming is conducted in the post-graduate laboratory, Department of genetics and plant breeding, Sam Higginbottom University of Agriculture, Technology & Sciences, SHUATS, Naini, Prayagraj, Uttar Pradesh during 2021 in two varieties of chilli Jyothi-72 and Pusa Sadabahar. The chilli seeds are treated with two organic and two inorganic Treatments with completely different concentrations, to find out the foremost appropriate treatment between organic and inorganic priming. Seeds were treated with $T_0$- Control, $T_1$- Panchagavya 6%, $T_2$- Panchagavya 8%, $T_3$- Moringa leaf extract 4%, $T_4$- Moringa leaf extract 6%, $T_5$- NaCl 1%, $T_6$- NaCl 2%, $T_7$- $KNO_3$ 1%, $T_8$- $KNO_3$ 2%. The treated seeds were immersed for 12 hours for observation of germination percentage, root length, shoot length, seedling length, fresh weight of seedling, dry weight of seedling, seed vigour index I, seed vigour index II. Top paper method is used to find out the result of all observations. Panchagavya (8%) gives better results in overall observations followed by $KNO_3$ (2%) compared to control. The germination percentage is relatively higher in panchagavya (8%). Hence, it is healthy and eco-friendly and could be easily practised as an alternative to producing enormous yield. It was found that all priming treatments showed variance with the control.**

**Keywords:** Priming, Panchagavya, Organic priming, germination percentage.

## INTRODUCTION

Chilli (*Capsicum annum* L.) is an important spice crop belongs to the Solanaceae family which is cultivated in sub tropic and tropic areas where both ripe and unripe fruits are used for different purposes as per required (Hunje *et al.*, 2007). Chilli is diploid in nature containing 12 pairs of chromosomes 2n = 24. Chilli is native to South America or Mexico, with secondary centres in Guatemala and Bulgaria (Salvador, 2002). India, Mexico, Uganda, Nigeria, Japan, Thailand, Turkey, Ethiopia, Indonesia, China, Spain, Nigeria and Pakistan are the main chilli growing countries within the world.

Broadly, chillies are categorized into bell chilli, sweet chilli and hot chilli based on pungency. Chilli is cultivated in a region of 1.98 million hectares with an annual production of 31.132 million tonnes within the planet and having a productivity of 1576.34 kg ha-1. The major chilli producing countries in the world are China, India, Mexico, Indonesia, Korea, Pakistan, Spain, Nigeria, USA, Turkey and Srilanka.

In India, Chilli is growing everywhere, a country under varying agro-climatic zones. Chilli growing states are Tamil Nadu, Andhra Pradesh, Maharashtra, Karnataka, Orissa. India is the major producer of chillies with an annual production of 850000 MT (Murugan, 1998). In India, the area under chilli crop is 364 thousand hectares with an annual production of 37209 thousand MT (National Horticulture board 2018-19). India alone contributes about 50 percent of world production, out of which 90 percent is used for domestic consumption and only six per cent is exported to other countries like the USA, Bangladesh, Nepal and Mexico.

Chilli is a good source of capsaicin, capsaicin is the substance that gives heat intensity to chilli. Chillies are rich in vitamin A, vitamin C, riboflavin and thiamine. Chilli contains about (9g) carbohydrates, (5.3 g) sugar, (1.9 g) protein and (534 micro g) beta carotene per 100 g chill (Panda *et al*., 2010). Chilli occupies an important place in daily diet, Chilli is used as spice essentially used in every Indian spice cuisine due to its pungency, spice taste, appealing odour and flavour and can be utilised in a spread of the way. Chilli fruits are majorly used to make pickles, sauces, ketchup, essence, oleoresins and red chilli powder as a spice.

Seed invigoration techniques such as seed priming which has a remarkable influence on seed quality. Seed priming is a commercially feasible technique for enhancing seed germination and vigour. Seed priming involves the imbibition of seeds in water under controlled conditions to initiate early germination, followed by drying back the seed to its initial moisture content (Pan and Basu 1985).

Priming is a several induced resistance and it is a vital mechanism of resistance phenomena in plants against biotic stresses (Beckers and Conrath, 2007). Priming mechanisms involves the accretion of signalling proteins or transcription factors in an inactive form or the occurrence of epigenetic changes that are modulated upon exposure to stress and developed swiftly resulting in a more efficient defence mechanism (Bruce *et al.*, 2007). Over the past few years, it's become obvious that priming phenomena are also involved within the context of environmental stress (Filippou *et al.*, 2012).

The main objectives include to gauge the effectiveness of various priming methods on seed quality parameter in chilli seeds and also spotting the simplest suitable method for priming in chilli seeds.

## MATERIAL AND METHODS

The present study entitled "Effect of organic and inorganic seed treatments on seed quality parameters in chilli (*Capsicum annum* L.) Seeds" under Postgraduate laboratory of Seed Science and Technology was conducted within the Department of Genetics and Plant Breeding, The Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad during 2020-2021. The lab experiment was analysed by C.R.D (Completely randomized design) with 4 replication and 9 treatments with two varieties of chilli (Jyothi-72 & Pusa Sadabahar) under laboratory conditions. Seed treated with control (untreated), panchagvaya (6% & 8%), moringa leaf extract (4% & 6%), NaCl (2%, 4%), $KNO_3$ (2% & 4%) soaking for 12 hours. Later, primed seeds are dried back to their original moisture content under shade to access the quality parameters. Seeds are placed in the top paper method for all the observations.

The observation on the characters viz., Germination percent (ISTA 2004), Root length (cm), Shoot length (cm), Seedling length (cm), Seedling fresh weight (mg), Seedling dry weight (mg), Seedling vigour index I and Seedling vigour index II (Abdul-Baki and Anderson 1973) were recorded. The experimental data were noted and subjected to statistical analysis for calculating analysis of variance, range, and mean, critical Difference and coefficient of variation (Fisher, 1936).

## RESULT AND DISCUSSION

There is a completely significant difference between the control (untreated seed) and primed seeds in both varieties, as all the traits are affected by the treatments as shown in Table 1. All the seedling characters were affected by Panchagvaya 8% followed by $KNO_3$ 2% effectively in both the varieties ($V_1$- Jyothi 72, $V_2$- Pusa Sadabahar).

**Table 1: Analysis of variance for vigour characters in chilli (*Capsicum annum* L.).**

| Characters | Mean Sum of Squares (MSS) | | | |
|---|---|---|---|---|
| | $V_1$ | | $V_2$ | |
| | Treatment (df = 8) | Error (df = 27) | Treatment (df = 8) | Error (df = 27) |
| **Germination percentage** | 62.6319* | 1.37963 | 83.875* | 1.25 |
| **Root length (cm)** | 1.05562* | 0.02083 | 1.3859* | 0.02833 |
| **Shoot length (cm)** | 2.57629* | 0.01982 | 2.615* | 0.0263 |
| **Seedling length (cm)** | 7.0575* | 0.02843 | 7.02736* | 0.05074 |
| **Seedling fresh wt. (mg)** | 774.09* | 2.98148 | 819.861* | 1.66667 |
| **Seedling dry wt. (mg)** | 8.3025* | 0.06519 | 7.9425* | 0.03731 |
| **Seed vigour index I** | 76623* | 497.033 | 87697* | 366.408 |
| **Seed vigour Index II** | 81275.9* | 532.789 | 89305.7* | 366.335 |

*Significant at 5% &1% level of significance.

The main idea we get from Table 2 is $V_2$ (Pusa sadabahar) shows the better results as compared to $V_1$ (Jyothi 72). It is noted that the Standard Error of Mean (SEM) in some cases $V_2$ is less in comparison to $V_1$, SEM indicates the difference of the population mean from the sample mean. The Standard Error of Difference (SED) should always be greater than the SEM as it quantifies uncertainty. Critical Difference (CD) is used to compare means of various treatments that have an equal number of replications. The Grand mean (GM) of $V_2$ is higher than $V_1$. The higher the coefficient of variance, the greater level of dispersion around the mean. The lower the value of the coefficient of variance, the estimation is more precise. Basically, if the coefficient of variance (CV) is less than 10, it is considered good. From the above statements, it is verified that $V_2$ performed better in respect to all observations under the lab condition as compared to $V_1$.

**Table 2: Mean performance of seedling characters in chilli (*Capsicum annum* L.).**

| Sr. No. | Observations | V1 (Jyothi 72) | | | | | V2 (Pusa Sadabahar) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SEM | SED | CD@1% | GM | CV | SEM | SED | CD@1% | GM | CV |
| 1. | Germination percentage | 0.58729 | 0.83055 | 2.28402 | 80.8611 | 1.45258 | 0.55902 | 0.79057 | 2.17407 | 81.4167 | 1.37322 |
| 2. | Root length (cm) | 0.07217 | 0.10206 | 0.28067 | 3.65833 | 3.94545 | 0.08416 | 0.11902 | 0.32732 | 3.82778 | 4.39746 |
| 3. | Shoot length (cm) | 0.0704 | 0.09955 | 0.27378 | 4.19889 | 3.35306 | 0.08108 | 0.11467 | 0.31533 | 4.48333 | 3.61698 |
| 4. | Seedling length (cm) | 0.0843 | 0.11922 | 0.32785 | 7.89167 | 2.13643 | 0.11263 | 0.15928 | 0.43802 | 8.34444 | 2.69949 |
| 5. | Seedling fresh wt. (mg) | 0.86335 | 1.22096 | 3.35764 | 70.7222 | 2.44152 | 0.6455 | 0.91287 | 2.5104 | 73.0556 | 1.76714 |
| 6. | Seedling dry wt. (mg) | 0.12766 | 0.18053 | 0.49647 | 6.63333 | 3.84895 | 0.09659 | 0.13659 | 0.37563 | 7.025 | 2.74976 |
| 7. | Seed vigour index I | 11.1471 | 15.7644 | 43.3521 | 639.844 | 3.48432 | 9.5709 | 13.5353 | 37.222 | 684.517 | 2.7964 |
| 8. | Seed vigour Index II | 11.5411 | 16.3216 | 44.8844 | 538.394 | 4.28723 | 9.56994 | 13.5339 | 37.2184 | 577.433 | 3.31465 |

The maximum germination percentage in both the varieties (Fig. 1) is noted by $T_2$ – panchagavya 8% recorded with highest germination percentage ($V_1$- 88.25% & $V_2$- 90%) followed by $T_8$- $KNO_3$ 2% ($V_1$- 84.25% & $V_2$- 85.75%). The maximum root length in both the varieties (Fig. 2) is noted by $T_2$- Panchagavya 8% recorded with highest root length ($V_1$- 4.5cm & $V_2$- 4.85cm) followed by $T_8$- $KNO_3$ 2% ($V_1$- 4.224cm & $V_2$- 4.4cm). The maximum shoot length in both the varieties (Fig. 3) is noted by $T_2$- Panchagavya 8% with ($V_1$- 5.55cm & $V_2$- 5.85cm) followed by $T_8$- $KNO_3$ 2% ($V_1$- 5.25cm & $V_2$- 5.55cm). The maximum Seedling length in both the varieties (Fig. 4) is recorded by $T_2$- Panchagavya 8% with ($V_1$- 10.225cm & $V_2$- 10.65cm) followed by $T_8$- $KNO_3$ 2% ($V_1$- 9.475cm & $V_2$- 9.95cm).

The maximum seedling fresh weight in both the varieties (Fig. 5) is recorded by $T_2$- Panchagavya 8% with ($V_1$- 94.5mg & $V_2$- 96.25mg) followed by $T_8$- $KNO_3$ 2% ($V_1$- 88.75mg & $V_2$- 92.75mg). It is noticed that the maximum dry weight in both varieties (Fig. 6) is recorded by $T_2$- Panchaagavya 8% with ($V_1$- 9.05mg & $V_2$- 9.35mg) followed by $T_8$- $KNO_3$ 2% ($V_1$- 8.55mg & $V_2$- 9.225mg). It is noticed that the maximum Seed Vigour I in both varieties (Fig. 7) is recorded by $T_2$- Panchagavya 8% with ($V_1$- 897.3 & $V_2$- 957.675) followed by $T_8$- $KNO_3$ 2% ($V_1$- 798.45 & $V_2$- 853.075). It is noticed that the maximum Seed Vigour II in both varieties (Fig. 8) is recorded by $T_2$- Panchagavya 8% with ($V_1$- 794.05 & $V_2$- 841.575) followed by $T_8$- $KNO_3$ 2% ($V_1$- 720.35 & $V_2$- 791.15).

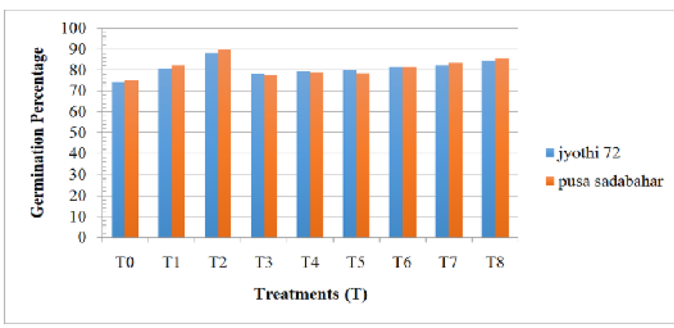


**Fig. 1.** Germination percentage.

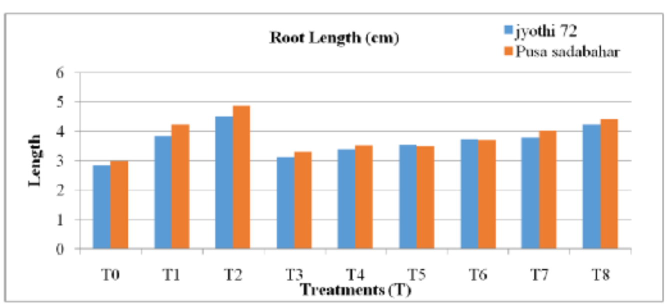


**Fig. 2.** Root Length.

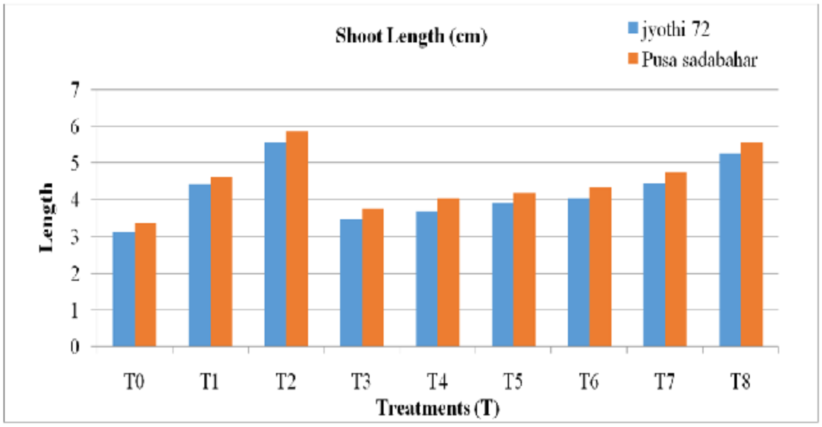


**Fig. 3.** Shoot Length.

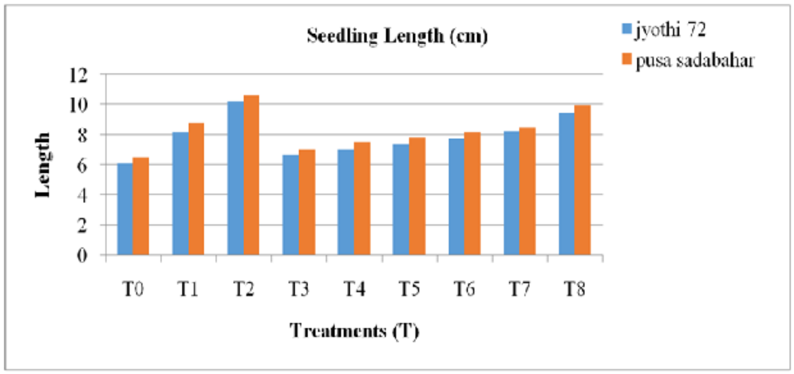


**Fig. 4.** Seedling length.

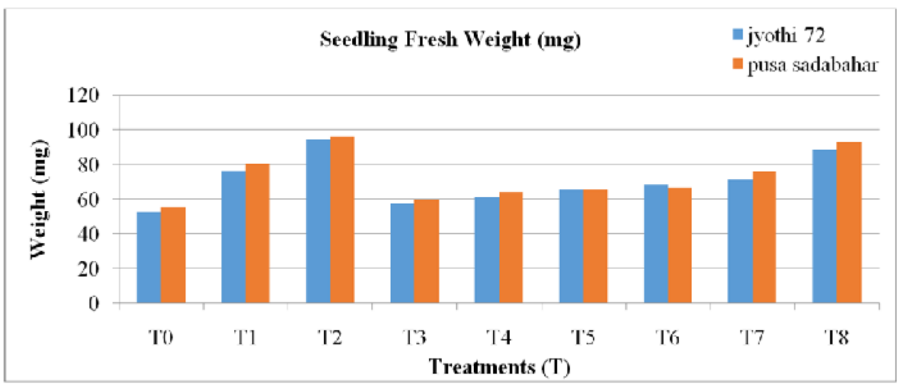


**Fig. 5.** Seedling Fresh Weight.

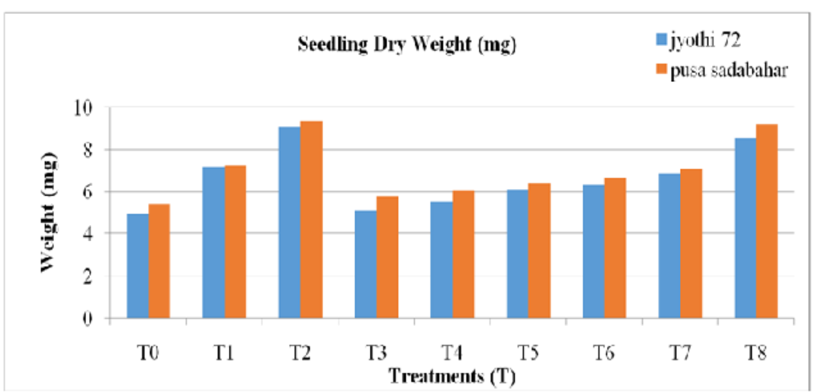


**Fig. 6.** Seedling Dry Weight.

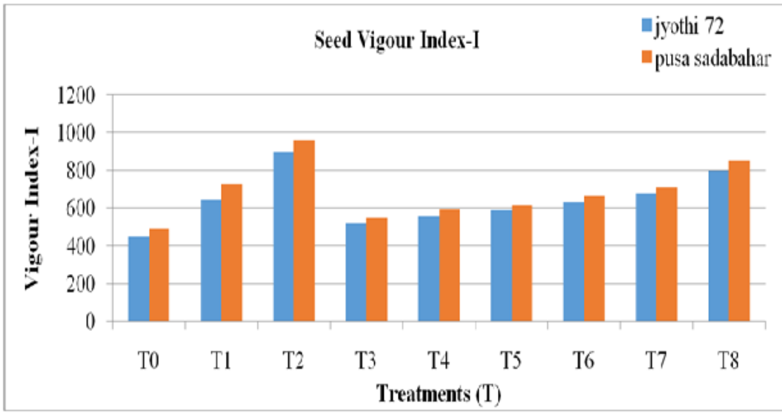


**Fig. 7.** Seed Vigour Index I.

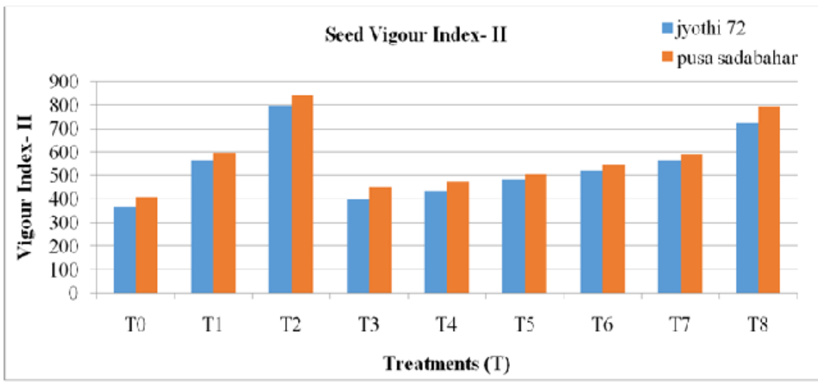


**Fig. 8.** Seed Vigour Index II.

A Similar result was found in (Sreenivasasareddy and Chaurasia, 2021) where organic treatment shows the better results as compare to inorganic treatments. Rajan *et al*., (2020) found that Panchagavya 6% shows better results in comparison to all other biological treatments in seed quality parameters. (Sowmeya *et al.*, 2018) found that Panchagavya 5% seed treatment shows better results than other seed treatments in carrot seeds (Shubha *et al.,* 2014). Found that seed treatment with panchagavya 3% shows better results in soil microbial population, growth and yield in maize crop (Kamatchi *et al*., 2019) found that seed primed with 1% Panchagavya shows effective results in leafy vegetables.

## CONCLUSION

The non-identical priming treatments showed remarkable increases in the germination and vigour in chilli seeds, significantly in lab conditions. Among all the treatments Panchagavya (8%) was found to significant increased the germination and vigour in chillies in both varieties. Soaking of chilli seeds for 12 hours enhanced germinability, a vigour of chilli seeds in comparison to control. The second-best option for treatment is $KNO_3$ (2%). In comparison between organic and inorganic priming, organic priming is better option but priming will be required in higher concentration than inorganic priming. So it can be concluded that seed priming is a simple and fruitful productive approach for upgrading stand establishment, economic yields and tolerance to biotic and abiotic stresses in numerous crops by inducement a series of biochemical, physiological, molecular and subcellular changes in plants.

The success or failure of priming treatments are influenced by a complex interlinkage of factors including species of the plant, liquid potential of priming agent, time of priming, temperature factor, the vigour of the seed, desiccation and conditions of the storage succeeds the priming. The suggested techniques could be adopted by the producers in order to obtain quick and better emergence, production of elite seedlings, and in turn good crop and yield.

## FUTURE SCOPE

In Future, there is a need for investigating the mechanisms of seed improvement due to organic priming with different chemical concentrations and different duration of priming, with these priming techniques, if any in field crops for a better understanding of physiological seed enrichment. It is better to develop a package for on-farm priming that can be adoptable by the farmers for value addition and improved crop performance.

**Acknowledgement.** The authors are thankful to all members of Seed science and technology, Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Sciences, Naini, Prayagraj, Uttar Pradesh for providing all the necessary facilities and support for research.

**Conflict of interest.** Nil.

## REFERENCES


Abdul-Baki, A. A., & Anderson, J. D. (1973). Vigor determination in soybean seed by multiple criteria 1. *Crop science*, *13*(6): 630-633.

Beckers, G. J. M., & Conrath, U. (2007). Priming for stress resistance: from the lab to the field. *Curr. Opin. Plant Biol., 10:* 1–7.

Bruce, T. J. A., Matthes, M. C., Napier, J. A., & Pickett, J. A. (2007). Stressful "memories" of plants: evidence and possible mechanisms. *Plant Sci., 173:* 603–608.

Filippou, P., Tanou, G., Molassiotis, A., & Fotopoulos, V. (2012). "Plant acclimation to environmental stress using priming agents," in *Plant Acclimation to Environmental Stress*, eds N. Tuteja and S. S. Gill (New York: Springer Science and Business Media) (in press).

Hunje, R., Vyakarnahal, B. S., & Jagadeesh, R. C. (2007). Influence of drying methods of fruits on seed quality in Chilli (*Capsicum annum* L.). *Karnataka Journal of Agricultural Sciences*, *20*(2): 269-271.

ISTA (2004). Rules amendments 2001. Seed Science Technology, 29, supplement *2*: 132.

Kamatchi Kala & R. Esakiammal, & Alias Eswari (2019). Effect of Panchagavya on Seed Germination, Seedling Growth and Nutrient Content of Some Leafy Vegetables. *International Journal of Scientific Research in Biological Sciences, 6*(6): 56-60.

Murugan, A. P. (1998). Production outlook for chillies. *Indian Spices*, *35*(2): 16-17.

Pan, D., & Basu, R. N. (1985). Mid-storage and pre-sowing seed treatments for lettuce and carrot. *Scientia horticulturae*, *25*(1): 11-19.

Panda, R., Panda, H., Prakash, K., and Panda, A. (2010). Prospects of Indian Chillies. *Science tech entrepreneur*, pp. 8.

Rajan, R. E. B., Vighneshawaran, G., Kumar, C.P.S., Ruban, J. S., Joshi, J.L. & Muraleedharan, A. (2020) Effect of biological seed priming methods on field performance and seed quality of black gram (*Vigna mungo* L.). Cv. Vbn 5*; Plant Archives Vol. 20*, Supplement 2, 2020 pp. 1672-1674.

Shubha, N., Devakumar, N., Rao, G. G. E.., & Gowda, S. B. (2014). Effect of Seed treatment, Panchagavya application and Organic Farming Systems on Soil microbial population, Growth and Yield of Maize; rahmann g & aksoy u (Eds.) (2014) Proceedings of the 4th ISOFAR Scientific Conference. '*Building Organic Bridges*', at the Organic World Congress 2014, 631-634.

Salvador, M. H. (2002). Genetic resources of chilli (*Capsicum annum* L.) in Mexico. Proceedings of the 16th Int. Pepper Conf., Tampico, Tamaulipas, Mexico, 1012.

Sowmeya, T. V., Macha, S. I., Vasudevan, S. N., Shakuntala, N. M., & Ramesh, G. (2018). Influence of priming on seed quality of fresh and old seed lots of carrot (*Daucus carota* L.). *Journal of Pharmacognosy and Phytochemistry*, *7*(1): 1114-1117.

Sreenivasasareddy, A., & Chaurasia, A. K. (2021). Effect of Organic and Inorganic Seed Treatments on Plant Growth and Yield in Mustard (*Brassica juncea* L.). *Biological Forum – An International Journal*, *13*(1): 196-199.



**How to cite this article:** Kumar, A., Chaurasia, A.K. and Marmat Sandip M. (2021). Effect of Organic and Inorganic Seed Priming on Seed Quality Parameter in Chilli (*Capsicum annum* L.*)* Seeds. *Biological Forum – An International Journal*, *13*(3): 200-205.