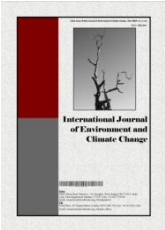

International Journal of Environment and Climate Change

12(10): 1279-1286, 2022; Article no.IJECC.89082
ISSN: 2581-8627
(Past name: British Journal of Environment & Climate Change, Past ISSN: 2231–4784)

Influence of Presowing Seed Treatments with Organic Manures and Botanicals on Plant Growth, Yield and Yield Attributing Traits of Yellow Mustard (*Sinapis alba* L.) Variety (ISP-186)

Boya Raga Sudha [a*], Bineeta M. Bara [b] and Abhishek Kumar Pal [c]

[a] Department of Seed Science and Technology, Naini Agriculture Institute, SHUATS, Prayagraj, Uttar Pradesh, India.
[b] Department of Genetics and Plant Breeding, Seed Science and Technology, Naini Agriculture Institute, SHUATS, Prayagraj, Uttar Pradesh, India.
[c] Department of Genetics and Plant Breeding, Faculty of Agriculture, Seed Science and Technology, Naini Agriculture Institute, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj-211007, (U.P), India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJECC/2022/v12i1030926

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/89082

Original Research Article

Received 14 April 2022
Accepted 28 June 2022
Published 29 June 2022

ABSTRACT

The present investigation was conducted during *Rabi* season in the year (2021-2022) at post graduate Central Research Farm, Department of Genetics and plant Breeding, Naini Agriculture Institute, Sam Higginbottom University of Agriculture Technology And Sciences, PRAYAGRAJ-211007 (U.P) with a goal to evaluate the influence of presowing seed treatments with organic manures and botanicals on plant growth, yield and yield attributing traits of yellow mustard (*Sinapis alba*) Variety (ISP -186) and to find out suitable seed priming method for mustard under Randomized Block Design with 13 priming treatments which are replicated thrice. The results revealed that treatment T_6 Jeevamruth (7%) has recorded maximum Rate of emergence(97.52), plant height (131.07cm) ,Number of Branches (13.60),Days to 50% flowering(40.36), Days to Maturity(99), Number of silique/plant (83.45), Number of seeds\silique(13.47), seed yield/plant(4.73), seed yield/plot(56.44), Biological yield (250.67),Harvest index (41.00).significance mean sum of squares due to seed priming treatments were observed for all the characters under study viz., Field emergence percentage, Plant height (30, 60, 90 DAS), Number of branches/plant,

**Corresponding author: E-mail: ragasudha795@gmail.com;*

Days to maturity, Number of silique/plant, Number of seeds/plant, seed yield/plant(g), Seed yield/plot(g), Biological yield(g), Harvest index (%) which were highly significant at 5% level of significance indicating presence of good amount of variability among the treatments for these characters.

Keywords: Panchagavya; Jeevamruth; Beejamruth; Neem leaf extract.

1. INTRODUCTION

Yellow mustard is an important oilseed crop belonging to family cruciferous (Brassicaceae). Yellow mustard is natural amphidiploids having chromosome no (2n=36). The origin place of mustard is China, north eastern India from where it has extended up to Afghanistan via Punjab. Among various oilseed crops grown in India, rapeseed- mustard group of crops (Brassica spp., Family Brassicaceae) comprising Indian rape (Toria), Indian mustard (Raya), oilseed rape (Gobi Sarson), Ethiopian Mustard (African Sarson), yellow Sarson, brown Sarson and Taramira, are next to soybean in terms of area and production [1-6].

India is the third largest mustard producer in the world after China and Canada with 12% of world total production. Edible oil industry body C00IT has estimated the countrys mustard seeds production rise 29 percent to 109.50 lakh tonnes in the rabi season of 2021-22 crop year [7-13]. The output of mustard seeds which is grown in rabi season, stood at 85 lakh tonnes in the previous year (COOIT 2022). As per the COOIT, mustard seed production is estimatedat 109.5 lakh tonnes in 2021-22.the area under coverage has been pegged at 87.44 lakh hectares while the average yield seen at 1,270kg per hectare. In uttar Pradesh, the production is projected to increase from 13.5 lakh tonnes to 15 lakh tonnes.

Indian mustard is a winter season crop that requires relatively cool temperature, a fair supply of soil moisture during the growing season and a dry harvest period. It needs well drained sandy loam soil and has a low water requirement of (240-400 mm) which fits well in the rain-fed cropping system. Mustard contributes about 10% of the world oilseeds production, 5- 7% of the global production of vegetable oil, and nearly 7% of protein meal Among the seven edible oilseeds cultivated in India, rapeseed-mustard contributes 28.6% in the total oil seeds products and rank second after groundout sharing 27.8% in the India's oilseed economy [14-18]. These crops also serve as raw material for various industrial products. Protein rich oilseed meal obtained after oil extraction is used as animal feed.

Seed pre-sowing treatment will modify the physiological and biochemical nature of seeds, so as to get the characters that are favourable for drought tolerance. Although it varies from crop to crop, the principle remains same. When dry seeds are soaked in water/chemical solutions the quiescent cells get hydrated and germination initiated. It also results in enhanced mitochondrial activity leading to the formation of high energy compounds and vital biomolecules [19-23]. The latent embryo gets enlarged. When the imbibed seeds are dried again, triggered germination is halted. When such seeds are sown re-imbibition begins and the germination event continues from where it is stopped previously.

Panchagavya is known to boost immunity and promote plant growth. Cow dung and cow urine are the key ingredients of the preparation. It is usually mixed with water and is usedto irrigate the fields. It canalso be used as spray [24-28]. According to Hindu dharma, Panchagavya has high significance. It can be used as an Ayurvedic medicine and it has good potential as an organic fertilizer and pesticide [29]. Panchagavya also contains many vitamins, amino acids. It contains gibberlins and auxins which regulate the growth of plants.

Jeevamruth is low cost improvised preparation that enriches the soil with indigenous microorganism required for mineralization from native cow dung, cow urine, horse gram and jaggery [30]. Jeevamruth serves as the rich source of micro organisms that fix nitrogen, solubilize phosphorous, also rich in source of of carbon, potassium, nitrogen and many micro nutrients [31] Jeevamruth is applied to plants, the microorganism present in the jeevamruth improves soil quality and helps plants to absorb nutrients present in the soil faster and improves plant growth and production [32-36].

Beejamruth, a mix of cow dung, cow urine, water, lime, and a handful of soil has been given importance in sustainable agriculture since age old days. It is also one such organic known to protect the crop from harmful soil borne and seed borne pathogens [37].

The neem extract increased shoot height, number of leaves, number of buds and number of flowers. Mainly green neem leaves and water are the key ingredients of the preparation. This leaf extract can beused for nursey and kitchen gardens. Neem extract was found as most effective agent in controlling leaf spot (82.33%) and wilt (41.34%) in comparison to control under field conditions [38] Neem leaf extract actsas potential source for the management of severe diseases in addition to its positive effects on growth parameters.

Aim: To study the effect of different presowing treatments on growth and yield characters of yellow mustard.

2. MATERIALS AND METHODS

The present investigation was carried out at Field Experimentation Centre of the Department of Genetics and Plant Breeding, Naini Agriculture Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.) during *Rabi 2021 - 2022*. The details material and methods used for the Influence of Pre sowing seed treatments with Organic Manures and Botanicals on Plant growth, Yield and Yield Attributing traits of Yellow Mustard (*Sinapis alba*) Variety – ISP – 186 was made to identify the effect of seed primimg of different kinds on seed quality parameters of mustard and to find suitable seed priming method for mustard. For this purpose, 13 priming treatments including control on yellow mustard seed variety ISP- 186 used to study under field conditions during , Rabi 2021-2022. The treatments were T0- Control, T1- Panchagavya (3%), T2- Panchagavya (5%), T3- Panchagavya (7%), T4- Jeevamruth (3%), T5- Jeevamruth (5%), T6- Jeevamruth (7%), T7- Beejamruth (3%), T8- Beejamruth (5%), T9- Beejamruth (7%), T10- Neem leaf extract (3%), T11- Neem leaf extract (5%), T12- Neem leaf extract (7%) The mustard seeds were primed with above different priming agents in above different concentrations and intensities for a given duration. After priming seeds were dried to initial moisture content at room temperature. After that the primed seeds were used to grow under field conditions. Field experiment was laid out in Randomized Block Design (RBD) with three replications during Rabi 2021-22. Data were recorded for 11 characters i.e.

Pre-harvest characters viz., Field emergence percentage, Plant height (30, 60, 90), number of branches (30, 60, 90), 50% of flowering and Days to maturity.

Post–harvest characters viz., number of silique/plant, number of seeds/silique, seed yield/plant (g), seed yield/plot (g), biological yield (g), harvest index (%). Analysis of variance (Table-1) for the data revealed that significance mean sum of squares due to seed priming treatments were observed for all the characters under study viz., Field emergence percentage, Plant height (30, 60, 90), number of branches (30, 60, 90), 50% of flowering and Days to maturity, number of silique/plant, number of seeds/silique, seed yield/plant (g), seed yield/plot (g), biological yield (g), harvest index (%). which were highly significant at 5% level of significance indicating presence of good amount of variability among the treatments for these characters.

3. RESULT AND DISCUSSION

3.1 Growth Attributes

Seed priming is a technique to reduce emergence time, accomplish uniform emergence time, better algometric (changes in growth of plant parts over time) attributes and provide requisite stand in many horticultural and field crops. Various pre-hydration or priming treatments have been employed to increase the speed and synchrony of seed germination. The treatments showed significant effect of pre-sowing seed treatment on Field emergence. The mean performance of field emergence ranged from 84.62 % to 97.52 % with the mean value of 91.52 %. The minimum field emergence was exhibited by treatment T0 [control](84.62 %), while maximum field emergence was recorded in treatment T6 – Jeevamruth-7 % (97.52) followed by T9 - Beejamruth 7% (94.32) and T12 – Neem leaf extract 7% (92.80) were significantly higher than other significant treatments. plant height at 90 DAS. The mean performance of plant height at 90 DAS ranged from 111.97 cm to 131.07cm with the mean value of 123.19 cm. The minimum plant height was exhibited by treatment T0 - control (111.97 cm), while maximum plant height was recorded for treatment T6- Jeevamruth -7% (131.07 cm) followed by T9 - Beegamruth 7% (129.07 cm), T3 – Panchagavya 7% (125.20cm), T5 - Jeevamruth 5% (124.27 cm), T12 - Neem leaf extract 7% (123.93 cm), T11 - Neem leaf extract 5% (123.19 cm), T4 - Jeevamruth 3% (122.97cm), T2-Panchagavya 5% (122.37 cm), T1 - Panchagavya 3% (121.93), T10 – Neem leaf extract 3% (121.53 cm), were at par to each other. The treatments showed significant effect of pre-sowing seed treatment on number of branches at 90 DAS. The mean performance of

Table 1. Mean performance of different treatments for pre harvest characters in yellow mustard (*Sinapis alba*) CV. ISP-186

Treatment Symbols	Treatments	Field Emergence (%)	PH 90 DAS	No.of branches	50% flowering	Days to maturity
T0	Control	84.62	111.97	9.00	47.75	118.56
T1	Panchagavya (3%)	91.32	121.93	9.23	44.61	105.73
T2	Panchagavya (5%)	93.14	122.37	10.34	44.56	102.66
T3	Panchagavya (7%)	95.40	125.20	11.30	44.01	101.63
T4	Jeevamruth (3%)	88.41	122.97	11.97	44.86	111.67
T5	Jeevamruth (5%)	89.64	124.27	12.77	42.46	109.42
T6	Jeevamruth (7%)	97.52	131.07	13.60	40.36	99.51
T7	Beejamruth (3%)	91.55	119.37	11.63	43.89	118.18
T8	Beejamruth (5%)	92.10	120.63	11.93	42.43	111.96
T9	Beejamruth (7%)	94.32	129.07	12.83	40.80	107.96
T10	Neem leaf extract (3%)	88.71	121.53	10.40	45.44	113.69
T11	Neem leaf extract (5%)	91.82	123.19	11.40	42.75	109.37
T12	Neem leaf extract (7%)	92.80	123.93	12.60	41.01	101.93
	C.V.	2.16	1.35	1.97	3.64	2.50
	S.E.	1.14	0.96	0.13	0.92	1.57
	C.D. 5%	3.34	2.80	0.38	2.68	4.58
	C.D. 1%	4.52	3.79	0.52	3.63	6.21

Table 2. Mean performance of different treatments for postharvest characters in yellow mustard (*Sinapis alba)*

Treatment symbols	Treatments	No.of silique/plant	No.of seeds/silique	Seed yield/plant (g)	Seed yield/plo t (g)	Biological yield (g)	Harvet index (g)
T0	Control	40.91	10.53	3.09	40.21	182.00	16.84
T1	Panchagavya (3%)	63.64	11.46	3.17	40.63	187.53	21.70
T2	Panchagavya (5%)	65.44	11.73	3.40	41.95	192.57	21.80
T3	Panchagavya (7%)	68.36	11.86	3.54	43.10	195.33	21.84
T4	Jeevamruth (3%)	68.05	12.47	3.33	43.60	204.87	23.49
T5	Jeevamruth (5%)	68.54	12.53	3.60	45.32	210.80	24.20
T6	Jeevamruth (7%)	83.45	13.47	4.73	56.44	250.67	41.00
T7	Beejamruth (3%)	65.04	11.67	3.25	40.37	196.17	18.40
T8	Beejamruth (5%)	66.55	12.07	3.36	44.36	198.83	22.56
T9	Beejamruth (7%)	75.88	12.67	4.24	47.34	221.83	26.77
T10	Neem leaf extract (3%)	62.85	11.53	3.21	40.34	202.93	17.83
T11	Neem leaf extract (5%)	66.71	12.06	3.42	43.33	206.23	21.96
T12	Neem leaf extract (7%)	68.03	12.33	4.08	44.14	212.97	25.90
	C.V.	3.50	1.83	10.88	5.55	6.21	11.69
	S.E.	1.35	0.13	0.22	1.41	7.34	1.58
	C.D. 5%	3.93	0.37	0.65	4.13	21.42	4.61
	C.D. 1%	5.33	0.50	0.89	5.59	29.03	6.25

number of branches at 90 DAS ranged from 9.00 to 13.60 with the mean value of 11.46. The minimum plant height was exhibited by treatment T0 - control (9.00), while maximum plant height was recorded for treatment T6- Jeevamruth 7%(13.60) followed by T9 - Beejamruth 7% (12.83) and T5 – Jeevamruth – 5% (12.77) were at par to each other. The minimum 50% flowering was exhibited by treatment T6 - Jeevamruth (40.36), while maximum 50% flowering was recorded for treatment T0 - control (47.75) followed by T10 – Neem leaf extract 3% (45.44), T4 – Jeevamruth 3% (44.86), T1 – Panchagavya 3% (44.61), T3 - Panchagavya 5% (44..56), T7 - Beejamruth 3% (43.89) was at par to each other(CD 5%=2.68). The use of botanical extracts recorded less days to produce 50% flowers when compared to control. Janardhan (2014) also noted that treatment with botanical extract including neem leaf extract taken 2-3 days less from control to flowering. The minimum Days to maturity was exhibited by treatment T6 – Jeevamruth 7% (99.51), while maximum Days to maturity was recorded for treatment T0- control (118.56) followed by T7 – Beejamruth 3% (118.18) was significantly higher in comparison to other treatments. The treating of seeds with the beejamruth will increase the growth parameters of seeds like field emergence, plant height,days to flowering .The results are revealed by the experiments done by the [31].

3.2 Yield Attributes

The mean performance of number of silique/plant ranged from 40.91 to 83.45 with a grand mean of 66.71. Among the significant treatments, T6 – Jeevamruth 7% (83.45) and T9 - Beejamruth 7% (75.88) and T5 – Jeevamruth 5% (68.54) T3 – Panchagavya 7% (68.36), T12– Neem leaf extract 7% (68.03), T4 – Jeevamruth 3% (68.05), T11- Neem leaf extract 5% (66.71), T8 - Beejamruth 5% (66.55), T2- Panchagavya 5% (65.44) were significantly higher than other significant treatments. Number of seeds/silique were significantly higher in treatments, T6 – Jeevamruth 7% (13.47) and T9 - Beejamruth 7% (12.67). In treatments T6– Jeevamruth 7% (4.73) and T9 – Beejamruth 7% (4.24), T12 – Neem leaf extract 7% (4.08) and T3 – Panchagavya 7% (3.54) were significantly higher than other significant treatments in seed yield/plant. The effect of pre-sowing seed priming on seed yield per plant was found to be significant and similar results of seed yield per plant was observed by Somasundaran et al., The mean performance of number of seed yield/plot ranged from 40.21 to 56.44 with a grand mean of 44.14. Among the significant treatments, T6 – Jeevamruth 7% (56.44) and T9 - Beejamruth 7% (47.34), T5 – Jeevamruth 5% (45.32) and T – Jeevamruth 3% (43.60) were significantly higher than other significant treatments. The mean performance of biological yield ranged from 182 to 250.67 with a grand mean of 204.83 . Among the significant treatments, T6- Jeevamruth 7% (250.67), T9- Beejamruth 7% (221.83), T12–Neem leaf extract 7% (212.97), T5- Jeevamruth 5% (210.80), T8- Beejamruth 5% (198.83), were significantly higher than other significant treatments. The mean performance of harvest index ranged from 16.84 to 41.00 with a grand mean of 23.41. Among the significant treatments, T1- Panchagavya (3%), T2- Panchagavya (5%), T3 - Panchagavya (7%), T4- Jeevamruth (3%), T5- Jeevamruth (5%), T7- Beejamruth (5%), T8- Beejamruth (7%), T9- Beejamruth (7%), T10 - Neem leaf extract (3%), T11- Neem leaf extract (5%), T12- Neem leaf extract (7%). Where significantly higher with T6 – Jeevamruth (7%). The treating of seeds with the beejamruth will increase the yield parameters like no of seeds per siliqua, no of siliqua per plant,seed yield per palnt and seed yield per plot .The results are revealed by the experiments done by Vyankatrao [37].

4. CONCLUSION

It is concluded from the present study that the seeds of yellow mustard (Variety- ISP 186) were treated with Jeevamruth – 7% (T6) showed significant increase in growth, yield and yield attributing traits followed by Beejamruth – 7% (T9) as compared to control (untreated) seeds. These recommendations are based on six months experimentation and therefore further investigation is needed to arrive at valid recommendation

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Anonymous; 2012. Available:http://www.faostat.org. Food and Agricultural Organization of the United Nations.
2. Akshay Kunghatkar L, Chaurasia AK, Bineeta M, Bara, Surya Prakash Meena. Influence of seed hardening techniques on vigour, growth and yield in chickpea *[Cicer*

arietinum (L.)]. The Pharma Innovation Journal. 2018;7(7):528-531.
3. Bhateshwar DC, Prabha D, Jangid D, Salman M. Effect of seed priming with Botanicals on Plant Growth and Seed Yield of Lentil *(Lens culinaris M.)*. International Journal of current Microbiology and Applied Sciences. 2020;9(7):3484-3499.
4. Bhardwaj D, Ansari MW, Sahoo RK, Tuteja N. Biofertilizers function as key player in sustainable agriculture by improving soil fertility, plant tolerance and crop productivity. Microbial Cell Factories. 2014;13:66.
5. Bhateswar, Deepti Prabha, Deepak Jangid and Mohammad Salman. Effect of seed priming with botanicals on Plant growth and seed yield of lentil *(Lens Culinaris L.)* International Journal of Current Microbiology and Applied sciences; 2020.
6. Badavath Neha, Abhinav Dayal, Bineetha M. Bara, Ramteke PW. Influence of PreSowing Treatments on Germination and Seedling vigour of Wheat *(Triticum durum L.)*, International Journal of Pure Applied Bioscience. 2018;6(2):1578-158.
7. Jandaik S, Sharma V. Antifungal potential of panchagvya against soil borne fungal pathogens associated with capsicum nurseries. International invention journal of agricultural and soil sciences. 2016;4(2):22-26.
8. Khan NA, R. Mir M. Khan S. Javid, Samiullah L. Effects of gibberellic acid spray on nitrogen yield efficiency of mustard grown with different nitrogen levels. Plant Growth Regu. 2002;38:243–247.
9. Kharbade VJ, Bhabhulkar VP, Bhabhulkar PS. Response of mustard (*Brassica juncea L.).* to sukphur and zinc applications on vertisols. Annulas of plant physiology. 1995;(9):130-132.
10. Kumar Premi OP, Thomas L. Rapeseed - Mustard cultivation in India - an overview. National Research Centre on Rapeseed - Mustard, Bharatpur (Rajasthan). 2015;303 - 321.
11. Kumar vineet, Knadpal, Diwedi Ashish, Sagar Vipin Kumar, Kumar Vikasah andSharma Dinesh Kumar. Effect of nitrogen and zinc fertilizers rates on growth, yield and quality of Indian mustard (*Brassica juncea L.)*. International Journal of Agricultural Sciences. 2016;8(6):1031-1035.
12. Kumar, Raman, Trivedi SK. Effect of levels and sources of sulphur on yield, quality and nutrient uptake by mustard (*Brassica juncea*). Progr. Agric. 2012;12(1):69- 73.
13. Kumar, Santosh, Verma SK, Singh TK, Singh, Shyambeer. Effect of nitrogen and sulphur on growth, yield and nutrient uptake by Indian mustard (*Brassica juncea*) under rainfed condition. Indian J. Agric. Sci. 2011;81(2):145- 149.
14. Manjunadh J, Dayal A, Nagar S, Rai PK. Influence of Biofertilizer and Organic Seed Treatment on Growth and Yield Attributing Traits of Mustard (*Brassica nigra L.)* Variety (Pusa-21). International Journal of Plant & Animal Science. 2021;33(20):149-157.
15. Maurya MK, Chaurasia AK, Mahesh M. Effect of organic, Inorganic seed priming method treatments on plant growth and yield in yellow mustard *(Brassica juncea L. czern & coss)*. International Research Journal of Plant and Crop Sciences. 202;6(1):184-187.
16. Islam MT, Faruq AN. Effect of Some Medicinal Plant Extracts on Damping-off Disease of Winter Vegetable. 2012;17(11):1498-1503,
17. Nazareth SM, Girish K, Fathima SK. Efficacy of herbal powders on seed mycoflora and seed quality of oilseed. Journal of Biopesticides. 2020;11(2):106-113.
18. Reddy YR, Rai PK, Rai AK, Bara BM. Study on the effect of different Pre- sowing seed Treatment on seed Quality of Mustard *(Brassica nigra L.)* International Journal of Current Microbiology and Applied Sciences. 2019;8(9):26-32.
19. Kamatchi Kala B, Esakiammal Alias Eswari R. Effect of Panchagavya on Seed Germination, Seedling Growth and Nutrient Content of Some Leafy Vegetables. 2019;6:6.
20. Farooq, Muhammad, Muhammad Usman, Faisal Nadeem, Hafeez ur Rehman, Abdul Wahid, Shahzad MA Basra, and Kadambot HM Siddique. Seed priming in field crops: potential benefits, adoption and challenges." Crop and Pasture Science. 2019;70 (9):731- 771.
21. Fabio Mielezrski, Mark A. Bennett, Elaine M. Grassbaugh, Andrew F. Evans. Radish Seed Priming Treatments. Journal of Seed Technology. 2016;37(1):55-63.
22. Hussein MM, Balbaa LK, Gaballah MS. Salicylic Acid and salinity effects on

growth of Maize plants. Research Journal of Agriculture and Biological Sciences. 2007;3(4):321- 328.

23. Janardhan JS. Effect of botanicals on seed yield and storability of urdbean [*Vigna mungo L. Hepper*]. M.Sc. Agri. Thesis submitted to M.P.K.V. Rahuri; 2014.
24. Vaughan JG. Multidisciplinary subject of taxonomy and origin of Brassica crop.Bio. Science. 1997;27.
25. Saha BN, Islam W, Khan AR. Effect of Azadirachtin on the growth and development of the pulse beetle, *Callosobruchus chinensis L*. Journal. Asiat. Soc. Bangladesh Sci. 2006;32(1):69-65.
26. Sanoj Kumar, Gabrial M Lal, Prashant Kumar Rai. Effects of Seed treatments with botanical, chemical, on seed yield and quality traits in Groundnut (*Arachis hypogea L.)* Journal of Pharmacognosy and Phytochemistry. 2017;6(4):10-13.
27. Jaybhaye MM, Bhalerao A. Influence of Vermiwash on Germination and Growth Parameters of Seedlings of Green gram (*Vigna radiata L.)* and Black gram (*Vigna mungo L.).* International Journal of Current Microbiology and Applied Sciences. 2015;4(9).634-643.
28. Khalequazzman KM. Seed treatment with Rhizobium Biofertilizer for controlling Foot and Root Rot of Chickpea. International Journal of Scientific Research in AgriculturalSciences. 2015;2(6):144-150.
29. Dharma K, Rathore R, Chauhan RS, Tomar S. Panchagavya (Cowpathy); An Overview. International Journal of Cow Science. 2005;1(1):1-15.
30. Gore NS, Sreenivasa MN. Influence of liquid organic manures on growth, nutrient content and yield of tomato (Lycopersicon esculentum Mill.) in the sterilized soil. Karnataka Journal of Agricultural Sciences. 2011;24(2).
31. Devkumar N, Shubha S, Gouder SB, Rao GGE. Microbial analytical studies of traditional organic preparations beejamruth and jeevamruth, Rahmann G and Aksoy U (Eds) Proceedings of the 4th ISOFAR Scientific Conference. "Building Organic Bridges", at the Organic World Congress; 2014 Istanbul, Turkey.
32. Rao MSL, Kulkarni S, Lingaraju S, Nadaf HL. Bio-priming of seeds: A potential tool in the integrated management of alternaria blight of sunflower. Helia. 2009;32:107–114.
DOI: 102298/HEL0950107R.
33. Raj AK, et al. Response of Bio-priming in okra for vegetable production. Journal of Applied and Natural Science. 2019;11(3):687 – 693.
34. Sarma D, Saikia P, Sarma PK, Hazarika M, Bhattacharya M, Sarma MK, et al. Effect of Seed Priming of Toria *(Brassica nigra L Var. Napus L.)* on drought Tolerance and its Yield Performance. Indian Journal of Dry land Agriculture Research and Development. 2014;29(1): 35-39.
35. Senthilmurugan S, Sattanathan G, Vijayan P, Pugazhendy K, Tamizhazhagan V. Evaluation of different concentration of Vermiwash on seed germination and biochemicals response in (*Abelmoschus esculentus L*.). International Journal of Biology Reasearch. 3(1):228- 231.
36. Sohali AS, Chaurasia AK, Bara BM. Effect of seed priming Methods on Germination and Vigour of Kabuli chickpea *(Cicer kabulium L.)* Seeds. International Journal of Current Microbiology and Applied Sciences. 2018;7(8):1396-1404.
37. Vyankatrao NP, Nya, Aathayle arts., Ved SR. Spare Commerce and Vid, Dadasaheb Pitre Science College Devrukh, Dist, Ratnagiri. Effect of Beejamruth and other organic liquid treatments on seed germination and seedling growth of legume crops. International Interdisciplinary Research Journal. 2019;9(3):2249-9598.
38. Prakash H, Ghosh AK, Rudramurthy SM, Singh P, Xess I, Savio J, Pamidimukkala U, Jillwin J, Varma S, Das A, Panda NK. A prospective multicenter study on mucormycosis in India: Epidemiology, diagnosis, and treatment. Medical mycology. 2019;57(4):395-402.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/89082