IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Influence of ZBNF components on the growth and yield of Wheat in combination with FYM, Biofertilizer and Nitrogen

Kethireddi Bharadwaj

Department of Agronomy, School of Agriculture, Lovely Professional University, Phagwara, Punjab, India (144411)

ABSTRACT

To study the influence of ZBNF components on the growth and yield in combination with FYM, biofertilizer and nitrogen, a field experiment was conducted with 12 treatments in randomized block design with 3 replications. Zero Budget Natural Farming or Subash Palekar's Natural Farming is a farming method where the cost inputs in growing and harvesting can be considered zero as the minimum resources used will be compensated with the profits gained as this farming method do not need any kind of external inputs such as fertilizer or pesticide. The components of ZBNF are Bijamrita, Jeevamrita, Acchadana (Mulching) and Whaapasa (Moisture). These above components are used in this experiment in combination with FYM, biofertilizer and N. Plant height, Tillers per meter, Dry matter accumulation, Yield and yield attributing characters were significantly higher in T12 which was the combination treatment of ZBNF components, FYM, biofertilizer and 100% Nitrogen. Though the yield in T12 was the highest, the estimated yield was achieved with T10 which was also a combination treatment with 50% N. Application of ZBNF components in combination of FYM, biofertilizer and N has outstandingly improved the growth and yield of wheat.

Keywords: Zero Budget Natural Farming, Bijamrita, Jeevamrita, FYM, Biofertilizer, Wheat

1. INTRODUCTION

Wheat is a major food source and the second most-produced cereal crop all over the world after maize (2018-19). It has a production of up to 764.49 million tons globally. In India, Wheat is the second most-produced cereal crop after rice with a production record of 106.21 million tons (2019-20). Wheat production had been significantly improved by 20% in this decade (2010-20). The grain of wheat is consumed in various ways depending upon region to region.

After the introduction of the green revolution in the late 1960s, the production of cereal crops like wheat has been extensively increased but in the long run, its impact on environmental damage and soil fertility was severe. So now inorganic inputs are being substantially reduced in agriculture and are being replaced with organic inputs. Organic inputs include manures, biofertilizers, and liquid formulations. Organic manures commonly used in wheat cultivation are farmyard manure, poultry manure, vermicompost, green manure, and rice residue. Though the mentioned manures are more, available manures are less. Not all farmers consider manure as an alternative to fertilizer but instead, they consider it as an unavailable need. The most common manures considered by farmers are farmyard manure, vermicompost, poultry litter, and poultry manure. Organic manures are widely considered in agriculture because they improve soil organic matter, soil fertility, soil microbial activity, and maintain soil aggregate stability. Organic manures are of low cost and easily available sources of nutrients for most of the cereal crops, however, the problem resides in the slow release of nitrogen from manure and building of P and K in soil (Jamal et al., 2018). Widely used manure in India is farmyard manure and the major nutrient sources available in farmyard manure are 0.55% nitrogen, 0.28% phosphorus, and 0.52% potassium (Singh et al., 2019).

Organic inputs like biofertilizers are used to amplify the availability of plant nutrients. Biofertilizers are called Plant Growth Promoting Rhizobia (PGPR) which are soil-borne bacteria that can aggressively colonize the rhizosphere or plant roots or both when applied to seed that amplify the growth and yield of plants (Kumar et al., 2014).

Liquid formulations used in agriculture are bijamrita, jeevamrita, panchagavya, and vermiwash. But in these, bijamrita and jeevamrut can be considered as a feasible option since these are low cost and easily available. Panchagavya is comparatively more effective than bijamrita but at the same time, it is also costly. Vermiwash is also effective but the availability is less in contrast to bijamrita and jeevamrita. Bijamrita has two main components, cow dung and cow urine which contains several microorganisms like bacteria, certain fungi, actinomycetes which are responsible for the effectiveness of Bijamrut. (Swaminathan., 2005). Bijamrut (Bija=seed, Amrut=elixir), also known as Bijamritha is is an indigenous biofertilizer used for seed treatment. It shows an increment in germination, protects from phytopathogenic disease and increased till ring and plant robustness (Palekar., 2006). Treatment of seeds with Bijamrita is prepared from natively accessible ingredients. Before sowing coating of seeds with Bijamrita protect the crop from various seed and soil-borne pathogens. Jeevamrita is made of cow dung, cow urine, pulse flour, jaggery, and a handful of soil to promote microbial population. Some of the research studies on jeevamrita concluded that it promotes crop growth & productivity (Boraiah et al., 2013). Furthermore, Jeevamrita and Bijamrita are also known as pillars of Zero Budget Natural Farming.

Zero Budget Natural Farming, as the name implies, is a farming method where the cost input in growing & harvesting the plants is zero. This means that farmers do not need to purchase fertilizers and pesticides to ensure the growth of crops (Bishnoi et al., 2017). The word 'zero' means that the cost included in this farming will be compensated with the profits gained. Four pillars or components of ZBNF are Bijamrita, Jeevamrita, Acchadana (Mulching) & Whaapasa (Moisture). This farming concept is introduced by Shri. Subhash Palekar by which he was awarded the Padmashri award.

Nitrogen is a vital factor for plants because it is a central component of many plant systems and their internal as well as external metabolic processes and contains a major component of chlorophyll and amino acids (building blocks of proteins). It could be termed as a "Backbone" of plants. The application of a small amount of N fertilizer causes rhizobia and encourages the growth of strong mung bean seedlings when soil N levels are low. Mung bean cannot efficiently repair atmospheric N during the early growth stages before the branches develop, because it has few or no rhizobia. Application of N fertilizer at increasing levels during the early growth period promotes vegetative growth and create favorable conditions for obtaining high yield. Therefore, the current study was studied to check the influence of ZBNF components on the growth and yield of Wheat in combination with FYM, Biofertilizer and Nitrogen.

2. MATERIALS & METHODS

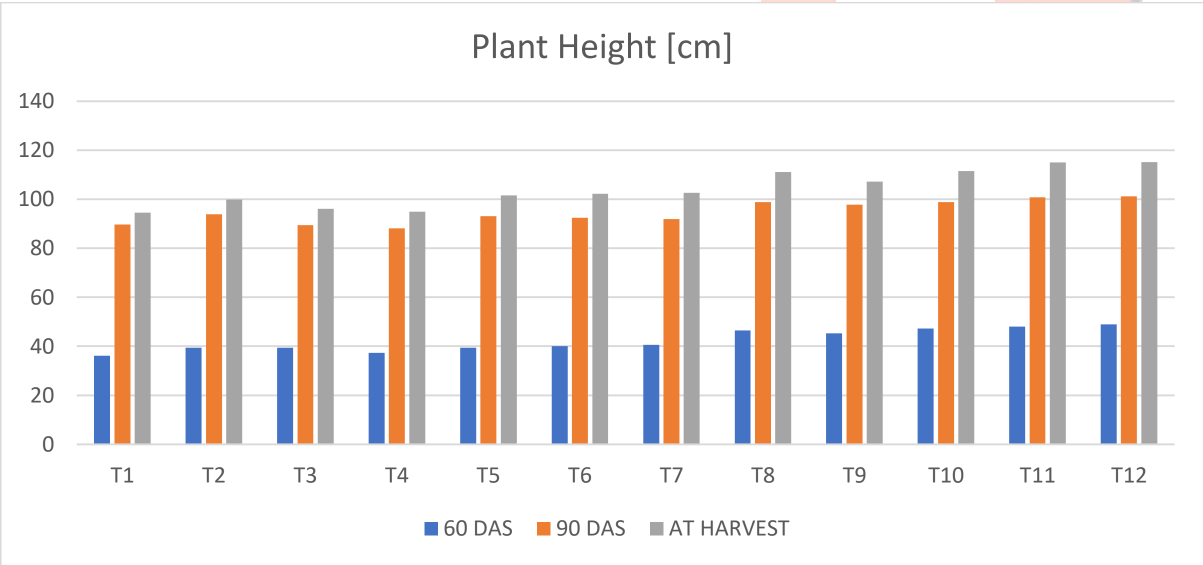
The experiment was conducted from November 2020 to April 2021 at research farm of Department of Agronomy, Lovely Professional University, Hardarspur, Punjab which is located at 31°14'N latitude and 75°41'N longitude in north-west part of India. The soil was sandy clay loam in texture, having slightly alkaline (8.6) pH & E.C of 0.11 mmhos/cm. The organic carbon content is 0.24 which is less than 0.4 indicating that the soil was low in available nitrogen (N). The available phosphorus (P) content is 2.9 (low) and the available potassium (K) content is 213 (high). The experiment consists a total of 12 treatments viz., **[T1]** Control, **[T2]** Recommended dose of Jeevamrita, **[T3]** Recommended dose of Bijamrita, **[T4]** Mulching, **[T5]** T2+T3+T4, **[T6]** T5 + Recommended dose of Biofertilizer (consortium), **[T7]** T6+Recommended dose of FYM, **[T8]** NPK on the basis of soil test, **[T9]** T7 + Recommended dose of N (25%), **[T10]** T7 + Recommended dose of N (50%), **[T11]** T7 + Recommended dose of N (75%), **[T12]** T7 + Recommended dose of N (100%) with 3 replications laid out under Randomized Block Design. The field operations were started after soil sampling on 7th of November and ended on 15th of April. Before field preparation, 1 pre-sowing irrigation was given and after, the field was plowed crosswise by disc harrow, followed by planking. FYM of 15 tons per acre was applied in plots of T7, T9, T10, T11, and T12 two weeks before sowing. At the time of sowing in T8, T9, T10, T11 & T12, 25kg P_2O_5/acre as single super phosphate was applied and 50% of 50kg N/acre as urea as a basal dose. Another 50% of N dosage was applied before 1st irrigation. Before sowing, the seeds of T3, T5, T6, T7, T9, T10, T11, T12 were treated with Bijamrita with the required amount and shade dried. And after the seeds of T6, T7, T9, T10, T11, T12 are inoculated with consortium at the rate of 500g per seeds required for an acre. After thorough preparation of the field, treated seeds of wheat variety *Unnat* PBW 343 (2017) at the rate of 40 kg /acre were sown on Nov. 20, 2020. Mulching is included in multiple treatments such as T4, T5, T6, T7, T9, T10, T11 & T12. It is done after sowing and a thin layer of mulch is applied for moisture conservation and weed control. Jeevamrita foliar application is applied once in every 15 DAS as 10% spray until the crop reaches the harvesting stage. total of 5 irrigations were given to the crop excluding the pre-sowing irrigation. 1st irrigation was given 30 DAS and thereafter irrigations were given at a 20-25 DI. Weeding was done manually in 45 DAS and 90 DAS. Harvesting & Threshing was done on 15th of April and the data has been recorded. Finally, the data was analyzed using SPSS software.

3. RESULT & DISCUSSION

3.1. Growth Studies

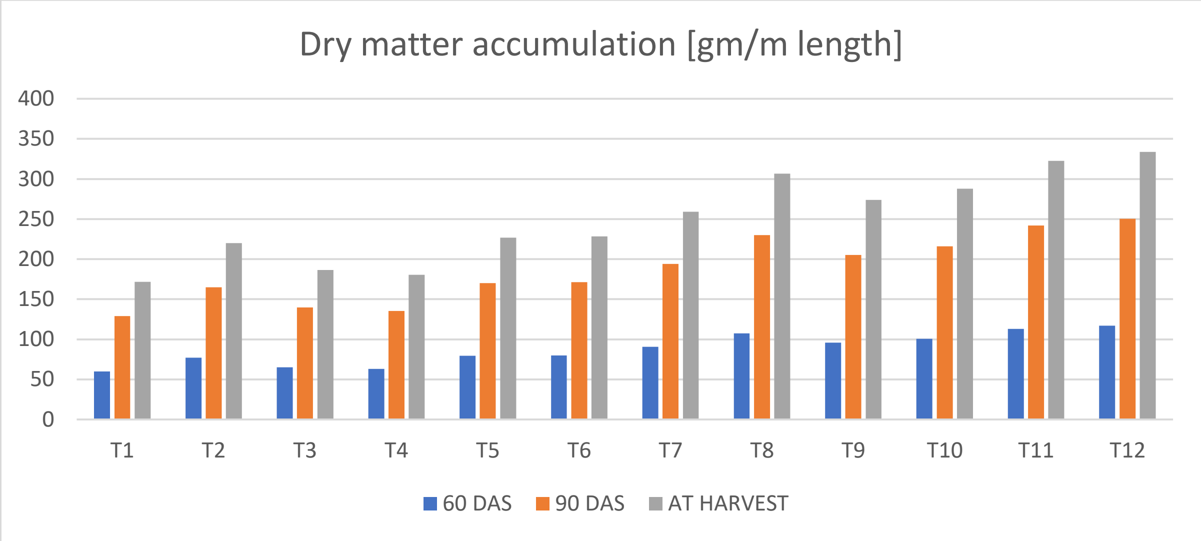
3.1.1. Plant height

The plant height recorded under T12 at all crop growth stages was maximum, but it was analytically at par with T11 at harvest. On the contrary, T6 and T7 are also at par in height statistically in all growth stages. The minimum plant height was shown in T1 and T4 succeeding it. T3 has shown gradual increase in height on par with T2 until 60DAS but after growth rate started to decline. T2 and T5 has shown a gradual incline in height until harvest time. Though T10 includes only 50% N its height is on par with T8 which includes only inorganic amendments.



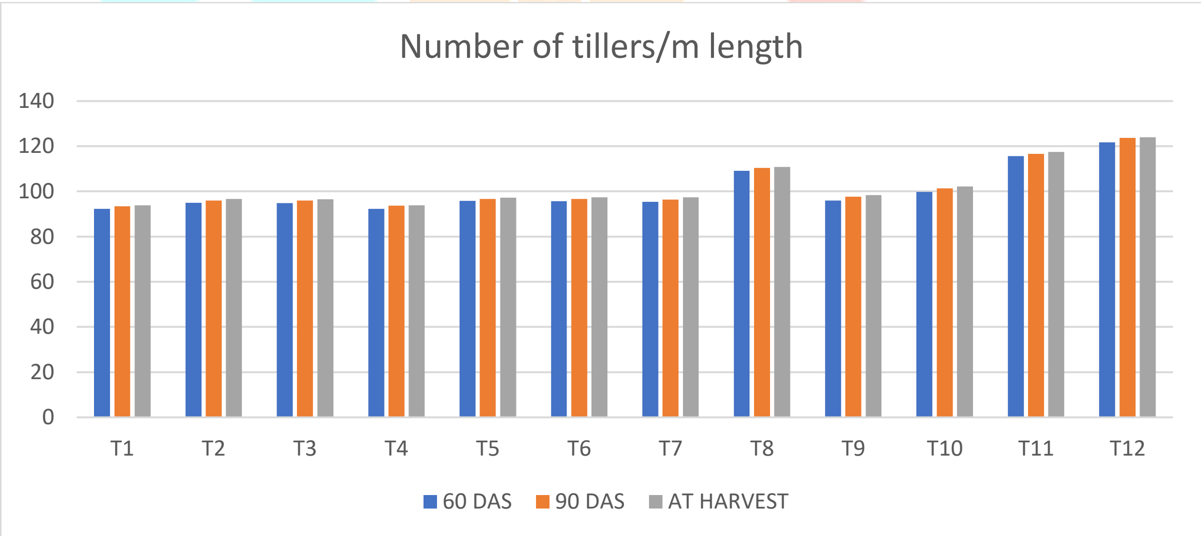
3.1.2. Dry matter accumulation

Dry matter accumulation recorded in T12 at all crop stages was maximum though in par with T11. The minimum dry matter accumulation is recorded in T1 followed by T4 and T3. At 60 and 90DAS, dry matter accumulation in T6 and T7 is nearly same but at harvest there is a slight variation. T5 in all stages has been superior to T2 and significant variation has been recorded. Dry matter accumulation in T8 is on par with T10 at 60DAS but 90DAS slight variation is recorded.



3.1.3. Number of tillers/m length

At all the recorded stages of crop growth, the maximal tiller count was noted under T12 followed by T11 and minimal tiller count was noted was in T1 followed by T4 and T3. Number of tillers recorded in T6 and T7 were non-significant in all recorded crop growth stages. Number of tillers recorded in T8 was on par with T10 as same as T2 and T5. Number of tillers recorded in T1 to T7 were significantly lower compared to T8 to T12.



3.2. Yield Studies

3.2.1. Spike length

The maximum length of the spike (11.93 cm) was obtained by T12 which was significantly superior to T8 though on par with T11. The minimum length of spike was obtained by T1 followed by T4. T5 spike length is clearly more compared to those of T6 and T7. Though spike length of T8.T9 and T10 are close to 11cm there is no significant variation.

3.2.2. Number of grains per spike

The maximum number of grains in a spike was observed in T12 followed by T11. T8, T9 and T10 although superior to other treatments, grain count in the spike has no significant variation. Number of grains in spike in T6 and T7 are on par with each other. Minimum number of grain count is observed in T1 followed by T4.

3.2.3. Straw Yield

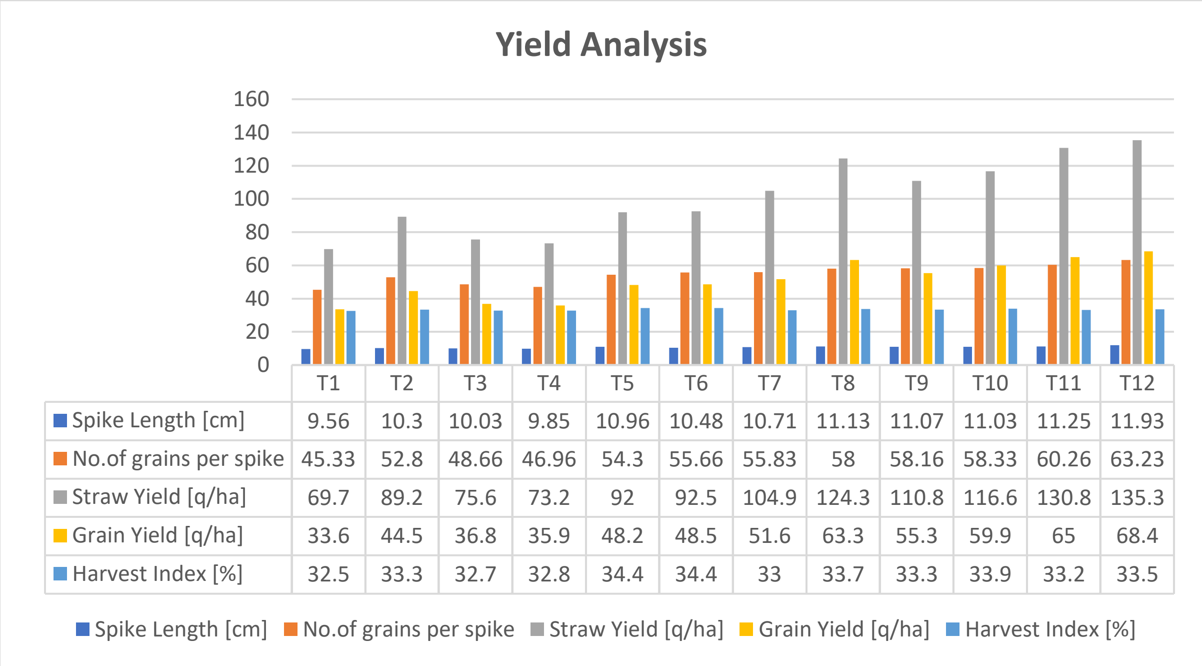
The maximum number of straw yield was recorded in T12 followed by T11. T8 is superior to T9 and T10 though in close to T11. Straw yield of T7 was far more superior compared to T5 and T6 which were on par with each other. Straw yield of T2 is though inferior to T5 but far more superior to T3. The minimum straw yield was observed in T1 followed by T3.

3.2.4. Grain Yield

The maximum grain yield was observed in T12 which was followed by T11. Grain yield of T8 is close to T11 though superior to T9 and T10. Grain yield of T7 was superior compared to T5 and T6 which were on par with each other. The minimum grain yield was observed in T1 followed by T3.

3.2.5. Harvest Index

HI is usually calculated by using formula $\frac{Economical\,Yield}{Biological\,Yield} \times 100$. In this formula, Economical yield is Grain yield and Biological yield is Straw yield + Grain yield. The maximum H.I is obtained by T6 followed by T5. The minimum H.I is obtained by T1 followed by T3. The yield data recorded is clearly shown in the below figure.



	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
Spike Length [cm]	9.56	10.3	10.03	9.85	10.96	10.48	10.71	11.13	11.07	11.03	11.25	11.93
No.of grains per spike	45.33	52.8	48.66	46.96	54.3	55.66	55.83	58	58.16	58.33	60.26	63.23
Straw Yield [q/ha]	69.7	89.2	75.6	73.2	92	92.5	104.9	124.3	110.8	116.6	130.8	135.3
Grain Yield [q/ha]	33.6	44.5	36.8	35.9	48.2	48.5	51.6	63.3	55.3	59.9	65	68.4
Harvest Index [%]	32.5	33.3	32.7	32.8	34.4	34.4	33	33.7	33.3	33.9	33.2	33.5

Conclusion

Application of ZBNF components in combination with FYM, Biofertilizer and Nitrogen remarkably improved the growth, yield and productivity of wheat crop. Also, the estimated yield was achieved in the treatment which includes 50% N and other organic amendments which proves that the estimated yield can be achieved with a proper integration of organic and inorganic amendments.

References

BHARGAVI Y. P. S. (2019). EFFECT OF BEEJAMRUTHA ON SEED GERMINATION, VIGOUR, AND ENZYME ACTIVITY IN BLACKGRAM SEEDS. Andhra Pradesh Journal of Agricultural Sciences, 5(2), 142-145.

BISHNOI R., & BHATI A. (2017). An overview: Zero budget natural farming. Trends in Biosciences, 10(46), 9314-9316.

Boraiah B., Devakumar N., Shubha S., & Palanna K. B. (2017). Effect of Panchagavya, Jeevamrutha, and Cow Urine on Beneficial Microorganisms and Yield of Capsicum (Capsicum annum L. var. grossum). Int. J. Curr. Microbiol. App. Sci, 6(9), 3226-3234.

Boricha U. K., Parmar B. R., Parmar A. B., Rathod S. D., Patel M. V., & Pandey A. K. Effect of pre-sowing treatments on seed germination and seedling growth of guava

Hooda V. S., & Malik Y. P. (2019). Effect of Farmyard Manure and Nitrogen Application on Growth and Productivity of Wheat under Long Term Experimental Conditions. Current Journal of Applied Science and Technology, 1-7.

Jamal A., & Fawad M. (2018). Application of different organic manures in optimizing optimum yield for wheat in calcareous soil. World News of Natural Sciences, 20, 23-30.

Kumar A., Maurya B. R., & Raghuwanshi R. (2014). Isolation and characterization of PGPR and their effect on growth, yield, and nutrient content in wheat (Triticum aestivum L.). Biocatalysis and Agricultural Biotechnology, 3(4), 121-128.

Kumar V., Raghuvanshi N., & Singh R. A. (2017). Effect of a different combination of growth and yield of wheat. Bulletin of Environment, Pharmacology, and Life Sciences, Vol. 6, Special issue [2] 2017: 395-398.

Kulkarni M. V., Patel K. C., Patil D. D., & Pathak M. (2018). Effect of organic and inorganic fertilizers on yield and yield attributes of groundnut and wheat. International J. of Chemical Studies, 6(2), 87-90.

Maher M. M., Shylla B., Sharma D. D., & Sharma U. (2020). Influence of different soilless substrates and jeevamrit on flowering and fruiting behavior of strawberry (Fragaria X ananassa Duch.) cv. Chandler. Journal of Pharmacognosy and Phytochemistry, 9(4), 428-432.

Pandia S., Trivedi A., Sharma S. K., & Yadav S. (2019). Evaluation of Jeevamrut and its Constituents against Alternaria Leaf spot of Mung bean in-vitro and under Cage House Condition in Rajasthan. Int. J. Curr. Microbiol. App. Sci, 8(9), 2240-2251.

Patel U. Studies on the effect of integrated nutrient management and bio enhancer on the productivity of Onion (Allium cepa L).

Potkile S. N., Bhale V., Deshmukh J., Dandge M., & Choudhary A. (2017). NutrientManagement through Organic Sources in Soybean-Wheat Cropping Sequence Under Irrigated Condition. International Journal of Pure & Applied Bioscience, 5(5), 1035-1041.

Ram M., Davari M. R., & Sharma S. N. (2014). Direct, residual, and cumulative effects of organic manures and biofertilizers on yields, NPK uptake, grain quality, and economics of wheat (Triticum aestivum L.) under organic farming of rice-wheat cropping system. Journal of Organic Systems, 9(1), 16-30.

Sharayu S. Dalavi, Poonam P. Shinde Pratap, and V. Naikwade. (2014). Effect of Bijamrut on seed germination and growth. Conservation of Natural Resources and Biodiversity for Sustainable Development, 68.

Singh A. S., & Lal E. P. (2019). Impact of organic liquid formulation, jeevamrutha on photosynthetic pigments of Ocimum basilicum L.(sweet basil) under NaCl induced salinity stress. Plant Archives, 19(2), 1997-2001.

Singh P., Agrawal V. K., & Singh Y. V. (2019). Effect of potassium and FYM on growth parameters, yield, and mineral composition of wheat (Triticum aestivum L.) in alluvial soil. J. Pharmacognosy and Phytochem, 8(3), 24-27.

Sreenivasa M. N., Naik N., & Bhat S. N. (2010). Beejamrutha: A source for beneficial bacteria. Karnataka Journal of Agricultural Sciences, 22(5).

Thies J. E., Singleton P. W., & Bohlool B. B. (1995). Phenology, growth, and yield of field-grown soybean and bush bean as a function of varying modes of N nutrition. Soil Biology and Biochemistry, 27(4-5), 575-583.

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, 09(03), 59-68.