International Journal of Agriculture and Environmental Research

ISSN: 2455-6939

Volume: 10, Issue: 02 "March-April 2024"

EFFECT OF BIOENZYME SUPPLEMENTATION ON YIELD OF PRETREATED MUNG BEAN SEED

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DOI: https://doi.org/10.51193/IJAER.2024.10205

Received: 06 Mar. 2024 / Accepted: 20 Mar. 2024 / Published: 12 Apr. 2024

ABSTRACT

The yield of the crop depends on the growth which is directly controlled by healthy seedling emergence. To get better quality product pretreatment of seed can be a good alternative. The study was designed to analyze the effect of seed pretreatment with silica and fungicide along with foliar spray of bioenzyme on the growth and biochemical parameters of mung bean. The work was undertaken with twelve different treatments given in blocks of 2× 2 m^2 area selected by randomized block design. The effect on growth was assessed with the help of different physical parameters and protein, carbohydrate content indicated as biochemical parameters. The concentration of bioenzyme used in the study along with the pretreatment of seeds with silica showed maximum increase in all the studied physical and biochemical parameters. The present work can be used to improve growth at early stage and to enhance biochemical parameters of mung bean.

Keywords: Carbohydrate, Fungicide, Pod length, Protein, Silica

1. INTRODUCTION

Germination and seedling emergence are the major factors that play role in healthy growth of a plant. Any abnormality during emergence of seedling can restraint yield and productions of a crop (Singh *et al.*, 2015). The global seed treatment market is projected to grow from $11.32 billion in 2022 to $26.01 billion by 2029, at a CAGR of 12.62% in forecast period, 2022-2029.Silicon (Si) is a most common metalloid element, founded in the earth’s crust after oxygen (Luyckx *et al.*, 2017). Use of Silica is rapidly gaining attention in agriculture because of its many fruitful impacts on plants. Application of Si fertilizers has resulted in increased plant growth rate,

ISSN: 2455-6939

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higher productivity, protection against a wide range of pathogens, and adaptation to unfavourable environmental conditions (Rao *et al.*, 2019).

Although chemical control with various product is well documented yet very few studies on seed treatment with silica powder for the protection of seed and their effect on quality are carried out in Madhya Pradesh and elsewhere in India (Lal *et al.*, 2016).

The bioenzyme is produced through fermentation of a mixture of fruit and vegetable peel waste, brown sugar, and water. It has been found to be highly effective in composting, reducing pest infestations, according to Saravan *et al.* (2013). Additionally, vegetable waste can generate volatile fatty acids and nitrogen compounds that are beneficial to plants (Bo *et al.*, 2007). The garbage enzyme performs similarly to enzymes in achieving high degradation levels in less time. Researchers suggest that this enzyme can be used in four categories: decomposition, composting, transformation, and catalysis (Oon J., 2008).

Mung bean stands out as a vital pulse crop cultivated across diverse regions, spanning from tropical to sub-tropical climates globally. Its versatility extends to serving as an effective component in crop rotation systems, particularly in arid agricultural regions, thriving under both dry and irrigated conditions. The significance of mung bean encompasses economic, nutritional, fodder, and agricultural spheres, where it also plays a crucial role as a green manure crop to enhance soil fertility.

The study was designed to evaluate the potential of pretreatment with fungicide and silica along with supplementation of bioenzyme in improving growth and biochemical parameters of mung bean.

2. MATERIALS AND METHODS

A field experiment was conducted at Loharpipliya village, district Dewas (M.P.) during March – June 2023 having mean temperature 33.8ºC. Mung bean (*Vigna radiata*) seeds MI731-3 variety used for the study was purchased from Indian Agriculture Research Institute (IARI) Indore, Madhya Pradesh. Seeds were sowed in a block of area 2×2 m^2in black soil. Mode of irrigation was flood irrigation and field was irrigated every 10^{th} day after sowing. At the time of sowing and flowering NPK and urea mixer was applied. Pesticide was sprayed at the interval of 15 days twice after sowing. Randomized block design was used and each block represented a single treatment. To nullify the effect of other factors on the growth of mung bean, control was designed which was without any treatment of bioenzyme as well as silica. Following treatments were given at interval of fifteen days after sowing.

Table 1: Treatments given to mung bean crop

Treatment	
T1/ C	Without any treatment
T2	1ml bioenzyme/L water
T3	2ml bioenzyme/L water
T4	3ml bioenzyme/L water
T5	Fungicide pretreated seed only
T6	Fungicide pretreated seed + 1ml bioenzyme/L water
T7	Fungicide pretreated seed + 2ml bioenzyme/L water
T8	Fungicide pretreated seed + 3ml bioenzyme/L water
T9	Silica pretreated seed only (silica will be used in powder form)
T10	Silica pretreated seed + 1ml bioenzyme/L water
T11	Silica pretreated seed + 2ml bioenzyme/L water
T12	Silica pretreated seed + 3ml bioenzyme/L water

For pretreatment, fungicide (Vitavax) and silica powder (Agribooster^{TM}) at the rate of 2g/100 g and 5 g/ 100g respectively were given for duration of 3 hrs before sowing mung seeds. Foliar spray of Bioenzyme was given at the vegetative, flowering and fruiting stage after sowing.

After harvesting various physical parameters viz pod length(cm), weight of pod (g), plant height (cm), fresh weight of 10 grains (g), dry weight of 10 grains (g)and yield (1000 seeds in g) were taken.

Protein and carbohydrate content was determined in seeds of mungbean by the method given below

Protein content: The estimation of protein was done using Folin Ciocalteau reagent at 660 nm (Lowry *et al.*, 1951). The standard curve prepared with 40-200 µg of BSA was used for calculation.

Carbohydrate Content: It was determined by the method of Hedge and Hofreiter (1962). Carbohydrates form blue green color complex with anthrone on dehydration by conc. H_2SO_4 which is measured colorimetrically at 630nm.

ISSN: 2455-6939

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3. RESULT AND DISCUSSION

Results are expressed as mean ± SD. P value was calculated to determine significant change. p value < 0.05 indicates significant difference, p value < 0.01 indicates highly significant difference and p value < 0.001 indicates extremely significant difference.

Table 2: Physical observation of mung bean at the time of harvesting

S.No	Treatment	**Pod length (cm)**	**Pod weight (g)**	**Fresh weight in g (10 grain)**	**Dry weight in g (10 grain)**	**Final plant height (cm)**
1	T1	7.26±0.2	9.34±0.37	1.68± 0.2	1.32± 0.02	27.2± 0.2
2	T2	7.46±0.3 ns (2.75%)	9.65±0.11 ns(3.33%)	1.80± 0.04ns (7.14%)	1.58± 0.03*** (19.69%)	34.7± 0.1** (27.5%)
3	T3	7.81±0.3** (8.02%)	9.92±0.26 ns(6.2%)	1.75± 0.2ns (4.1%)	1.60± 0.02*** (21.21%)	31.2± 0.3* (14.7%)
4	T4	8.13±0.1* (11.98%)	10.12±0.12*(8.35%)	1.88± 0.1ns (11.9%)	1.68± 0.05*** (27.27%)	35.3± 0.6*** (29.7%)
5	T5	7.43±0.2 ns (2.34%)	9.42±0.10 ns (0.85%)	1.86± 0.07ns (10.7%)	1.48± 0.005*** (12.12%)	32.6± 0.9* (19.8%)
6	T6	8.2±0.6*** (13.41%)	10.33±0.19* (10.59%)	2.06± 0.13* (22.6%)	1.93± 0.04*** (46.21%)	40.9± 0.6*** (50.3%)
7	T7	8.8±0.4** (21.71%)	10.43±0.30* (11.67%)	2.63± 0.2** (56.54%)	2.48± 0.05*** (87.87%)	35.06± 0.3*** (30.88%)
8	T8	9.16±0.3*** (26.69%)	10.20±0.09* (9.20%)	2.40± 0.2* (42.8%)	2.03± 0.03*** (53.78%)	39.5± 0.1*** (45.2%)
9	T9	8.8±0.4** (21.71%)	9.52±0.13 ns(1.92%)	2.23± 0.2* (32.7%)	2.01± 0.03*** (52.27%)	33.6± 0.1** (23.5%)
10	T10	9.06±0.1*** (25.31%)	10.56±0.09** (13.06%)	1.78± 0.04 ns (5.9%)	1.66± 0.03*** (25.75%)	33.4± 0.6** (22.7%)
11	T11	10±0.3*** (38.31%)	10.30±0.03* (10.27%)	2.80 ± 0.13* (66.6%)	2.60 ± 0.06*** (96.96%)	46.6± 0.1*** (71.3%)
12	T12	11.06±0.3*** (52.97%)	11.85±0.03*** (26.87%)	1.71 ± 0.02ns (1.78%)	1.47 ± 0.04*** (11.36%)	38.9± 0.1*** (43.01%)

*, **,*** significant at 0.05, 0.01 and 0.001 probability level, respectively

ISSN: 2455-6939

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Table 3: Yield and biochemical parameters in harvested mung bean

S.No	Treatments	**Protein(mg/gm)**	**Carbohydrate (mg%)**	**Yield (1000 grain wt. in g)**
1	T1(control)	69.35± 0.6	381.4±1.9	168.4±.2
2	T2	90.86± 1.0*** (31.01%)	413.3±1.0*** (8.36%)	182.2±.2*** (+8.19%)
3	T3	91.86± 0.07*** (32.45%)	438.9±.1.2*** (15.07%)	176.3±.3*** (+4.6%)
4	T4	94.21± 0.04*** (35.84%)	427.06±2.6***(11.97%)	188.2±.3*** (11.7%)
5	T5	81.26± 0.88*** (17.17%)	398.7±1.2***(4.53%)	172±.1ns (+2.38%)
6	T6	98.9± 1.35*** (42.60%)	456.8±1.8***(19.76%)	206.1±.3*** (+22.3%)
7	T7	94.92± 4.6*** (36.87%)	468.9±2.7***(22.94%)	263.5±.5*** (+56.4%)
8	T8	102.6± 0.6*** (47.94%)	472.7±2.0***(23.93%)	242±.5*** (+56.4%)
9	T9	82.22± 0.84*** (18.55%)	401.3±1.0**** (5.21%)	223.6±.2*** (+32.77%)
10	T10	102.9± 1.52*** (48.37%)	471.3±1.7***(23.57%)	178.2±.1*** (+5.8%)
11	T11	117± 1.2*** (68.70%)	468.7±3.6***(22.88%)	281.2 ±.2*** (66.9%)
12	T12	103± 3.2*** (48.20%)	493.2±2.5***(29.31%)	172.2 ±.2*** (+2.25%)

*, **, *** significant at 0.05, 0.01 and 0.001 probability level, respectively

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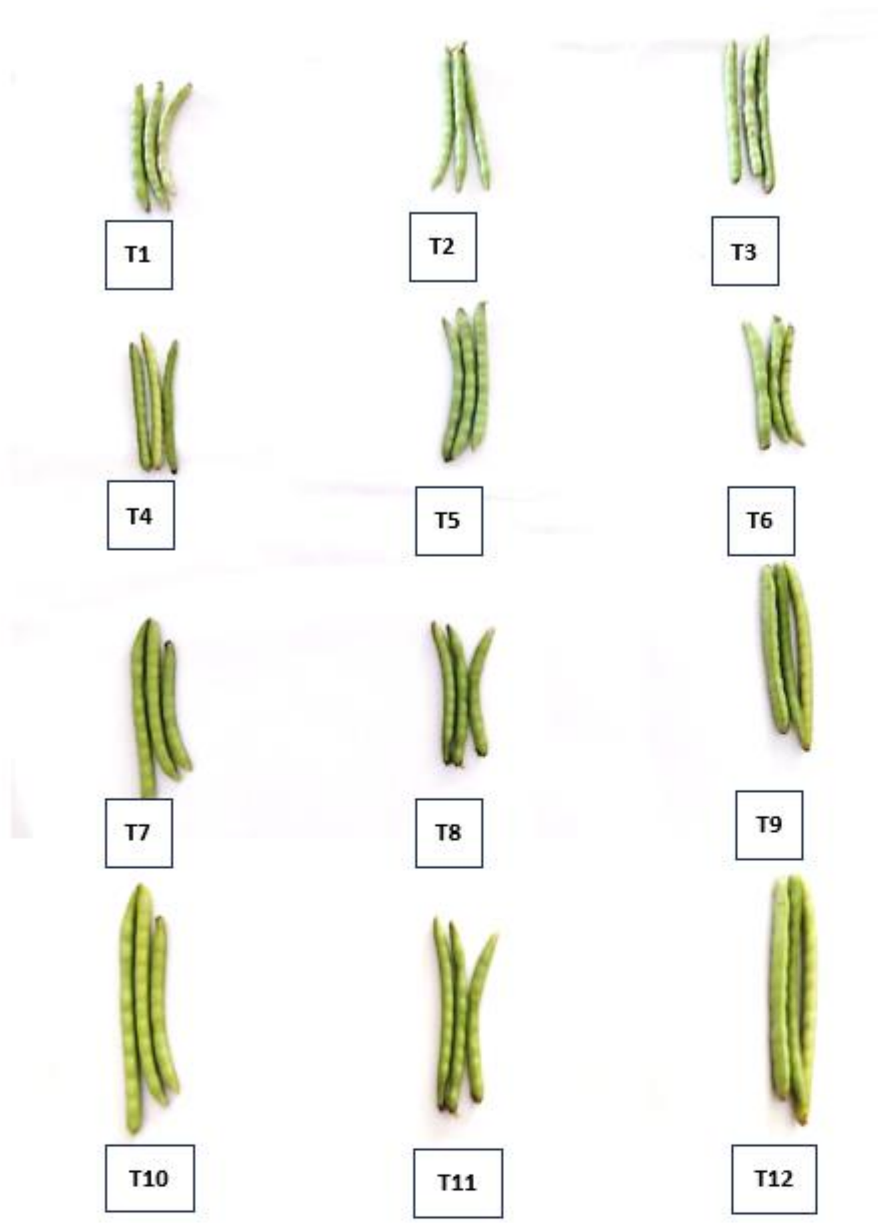

Fig 1: Pod length after harvesting

3.1 Physical parameters and Yield: As shown in figure 1 and 2, the pod length and weight showed increase with increasing concentration of bioenzyme. Fungicide pretreatment alone or with bioenzyme resulted in significant improvement in pod length and weight of harvested mung bean. Pretreatment of mung seed with soluble silica alone showed increase in pod length. However, pretreatment with soluble silica along with highest concentration bioenzyme showed the best result in case of pod length and weight of harvested mung bean. Manna *et al.*, 2012 found increment in growth, yield and quality of chilli by application of biozyme. According to them different components of biozyme viz. precursors of hormone, enzymes, protein and other micronutrients proved beneficial in enhancing growth and productivity of chilli.

The fresh weight of mung seeds showed no significant change on application of bioenzyme alone. However, seed pretreated with soluble silica or fungicide along with foliar spray of bioenzyme caused significant increase in fresh weight. The dry weight of mung seed showed highly significant increment in all the applied treatment collated to control. Increment in fresh and dry weight was reported in chick pea leaves supplemented with samples containing bioenzymes (Singh *et al.*, 2020). Foliar application of seaweed extracts also resulted in enhanced dry mass of green gram as reported by Pramanik *et al.*, 2013.The present study results are supported by the work of Gore *et al.*, 2007 who showed that biozyme application on green chilli improved its growth and yield significantly. Application of bioenzymes at the concentration 3 ml/L resulted in highest increase in growth and Yield of Rose as reported by Naik *et al.*, 2009.

Fungicide seed pretreatment proves to be beneficial for plant by enhancing seedling emergence, plant vigor, root mass by providing protection against various pathogens (Da Silva *et al.*, 2017). Rodriguez-Brljevich 2010, reported that seed dressing with fungicide resulted in increased photosynthesis and plant vigour. Some fungicides have shown to direct crop enhancement even in the absence of fungal infection by reducing oxidative stress (Testa *et al.*, 2015), increasing photosynthesis (Amaro., 2020).

Pretreatment of seed with silicon dioxide nanoparticles have shown to stimulate pre germination metabolic events like water imbibition, cell elongation, division, activation of reserve mobilizing enzymes etc (Ali *et al.*, 2021)). The seed nanopriming with suitable concentration of nSiO2 resulted in increased weight of root, shoot and seedling collated to control which indicates enhancement in seed vigour (Hasanaklou *et al.*, 2023). Jiang 2022 concluded from the study on rice that use of silicon-based material used for seed treatment can affect seed germination at various rates depending upon concentration.

According to Begam *et al.*, 2020, increment in yield of rice on application of biozyme obtained from seaweed may be due to optimum absorption of minerals and other essential elements which results in enhanced translocation of products from source to sink. Deepika and Tiwari, 2021 showed increased yield of capsicum by supplementation of biozyme might be attributed to increased use of macro and micronutrient and other growth stimulating substances present in biozyme.

3.2 Biochemical Parameters: All the treatments used in the present study resulted in significant enhancement in protein content of mung bean. The seed treatment with either fungicide or

ISSN: 2455-6939
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soluble silica was seen to increase protein content of mung seed significantly with further increment on foliar application of bioenzyme. Similar results were obtained by supplementation of bioenzyme in the study conducted on fenugreek by Patel *et al.*, 2023. Mitra and Mandal 2010 reported enhancement in uptake of nutrients was positively correlated with supplementation of biozyme granule. Bioenzyme prepared from citrus fruits contain macro and micronutrients which are necessary for formation of complex molecules required to enhance growth and development of plants (Rungta *et al.*, 2022). The pretreatment of seed alone or with foliar spray of bioenzyme resulted in significant increment in carbohydrate content of mung bean. Sau *et al.*, 2015 also reported increment in total sugar in guava on application of bioenzyme. Similar results were seen in pear by Inomata *et al.*, 1992.

4. CONCLUSION

The present work concludes that seed pretreatment can be a good way to control seedling emergence at early stage. The seed treatment with silica gave better results than fungicide. The foliar application of bioenzyme in continuation with seed pretreatment resulted in the best outcome both in the terms of growth and biochemical parameters for mung bean. So, the use of silica for seed pretreatment along with foliar spray of bioenzyme is suggested for the farmers to improve yield along with quality of mung bean. However, changing climatic conditions pose a challenge in the above work. In the future, effect of silica on pretreated seed can be assessed on different crop and different soil type.

Acknowledgement

We express our sincere thanks to Dr. Suresh T. Silawat, Principal, Govt. Holkar Science College, Indore (M.P.) for providing necessary laboratory facilities and encouragement. We highly oblige MPCST, Bhopal for providing funds to pursue above work.

REFERENCES

[1] Ali L.G., Nulit R., Ibrahim M.H., Yien C.Y.S. (2021). Efficacy of KNO_3, SiO_2 and SA priming for improving emergence, seedling growth and antioxidant enzymes of rice (*Oryza sativa* under drought. Sci Rep nature Publish Group UK. 11:1-11.

[2] Amaro, A.C.E., Baron, D., Ono, E.O., Rodrigues, J.D.(2020). Physiological effects of strobilurin and carboxamides on plants: An overview. Acta Physiol. Plant, 42, 4.

[3] Begam S., Kuruwanshi V.B., Guhey A., Dewangan Y.K. (2020). Impact of biozyme on physiological and biochemical for optimization of rice (*Oryza sativa* L.) yield. The Pharma Innovation Journal. 9(11): 301-305.

[4] Bhavani Prakash, (2011). How to make and use garbage enzyme. Retrieved from http://www.ecowalkthetalk.com.

ISSN: 2455-6939

Volume: 10, Issue: 02 "March-April 2024"

[5] Bo, Z., Pinjing, H., Fan, L., and Liming, S. (2007). Enhancement of Anaerobic Biodegradability of Flower Stem Wates with Vegetable Wastes by Co-Hydrolysis. ISSN: 1001-0742.

[6] Da Silva M.P., Tylka G.L. and Munkvold G.P. (2017). Seed treatment effects on maize seedlings coinfected with *Rhizoctonia solani* and *Pratylenchus penetrans*. Plant Dis. 101:957-963.

[7] Deepika and Tiwari S.P. (2021). Effect of different Biozyme concentration for maximum yield potential in *Capsicum annum* L. International Journal of Chemical Studies. 9(2): 432-436.

[8] Gore A. K., Jadhav S. B., Gore A. K. and Ghuge T. D. (2007). Effect of different bioenzymes on growth, flowering and yield of green chilli (*Capsicum annuum* L.) variety "Pusa Jwala". J. Soils and Crops. 17: 105-09.

[9] Hasanaklou N.T., Mohagheghi V., Hasanaklou H.T., Ma'mani L., Malekmohammadi M., Moradi F., Dalvand Y. (2023) Seed nano-priming using silica nanoparticles: effects in seed germination and physiological properties of *Stevia Rebaudiana* Bertoni. Chemical and Biological Technologies in Agriculture. 10:1-13.

[10] Hedge J.E. and Hofreiter B.T. (1962). In: Methods in Carbohydrate Chemistry. Vol.17, (Eds.,) Whistler, R.L. and BeMiller, J.N., Academic Press, New York, 420.

[11] Inomata Y.S., Oikawa S., Shinokawa T. and Suzuki E.(1992). The effect of gibberellins treatment on flowers of Japanese pear (*Pyrus pyrifolia*) after late frost damage..Bulletin of the Fniit Trees Research Station. 23: 123-136.

[12] Oon J. (2008). http://veg4planet.blogspot.in/2008/07/garbage -enzyme-anti-greenhouse-effect.html .

[13] Jiang Y, Yang J, Li M, Li Y, Zhou P, Wang Q, Sun Y, Zhu G, Wang Q, Zhang P, *et al.* (2022). Effect of Silica-Based Nanomaterials on Seed Germination and Seedling Growth of Rice (*Oryza sativa* L.). *Nanomaterials.* 12(23):4160.

[14] LalB., Gautam P., Raja R., Tripathi R., Shahid M., Mohanty S., Panda B.B., Bhattacharyya P., Nayak A.K. (2016).Weed seed bank diversity and community shift in a four-decade-old fertilization experiment in rice-rice system. Ecol. Eng., 86: 135-145.

[15] Lowry O. H., Rosebrough N. J., Farr A. L., Randall R. J. (1951). Protein measurement with the Folin phenol reagent. Journal of Biological Chemistry. 193(1): 265–75.

[16] Luyckx M., Hausman J. F., Lutts S., Guerriero G. (2017). Silicon and plants: Current knowledge and technological perspectives. *Front. Plant Sci.* 8:411.

[17] Manna D., Sarkar A., Maity T.K. (2012). Impact of biozyme on growth, yield and quality of chilli [*Capsicum annuum* L.]. Journal of Crop and Weed. 8(1): 40-43.

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[18] Mitra B. and Mandal B.K. (2010). Performance of rice-rice cropping system with varying form level and time of application of biozyme. Indian Journal of Environment and Ecoplanning. 17(1-2): 325-330.

[19] Naik P.G., Jature S.D., Phad G.N. (2009). Effect of bioenzymes on growth and yield of rose (*Rosa indica* L.) cv. GLADIATOR. The Asian Journal of Horticulture. 4(2): 289-291.

[20] Patel M.A., Chauhan J., Maitreya B. (2023). Effect of Bio-Enzyme on Biochemicals of Fenugreek Leaves. International Association of Biologicals and Computational Digest. 2(1): 75- 81.

[21] Pramanik K., Bera1 A.K. (2013). Effect of seedling age and nitrogen fertilizer on growth, chlorophyll content, yield and economics of hybrid rice (*Oryza sativa* L.). International Journal of Agronomy and Plant Production. 4(S):3489-3499.

[22] Rao B., Gao L., Dai H., Hong Z., Xie H. (2019). An efficient and sustainable approach for preparing silicon fertilizer by using crystalline silica from ore. JOM. 71:3915–3922. doi: 10.1007/s11837-019-03630-5.

[23] Rodriguez-Brljevich, C., Kanobe, C., Shanahan, J.F., Robertson, A.E. (2010). Seed treatments enhance photosynthesis in maize seedlings by reducing infection with *Fusarium* spp. and consequent disease development in maize. Eur. J. Plant Pathol. 126: 343–347.

[24] Rungta S., Ojha A., Mishra S.K. (2022). Study of physico-chemical property of bioenzymes produced from organic household waste and their application in daily life. Discovery. 58 (315): 228-234.

[25] Saravan, P., Sathish, K.S., Ignesh, A., and Ajithan, C. (2013). Eco-Friendly Practice of Utilization of Food Waste. (Vol. 2). ISSN: 2319-6718.

[26] Sau S., Ghosh B., Sarkar S., Deb P. (2015). Effect of Foliar Application of Biozyme on Yield and Physicochemical Properties of Rainy Season Crop of Guava (Psidium Guajava L.) cv. Allahabad Safeda in Alluvial Soil of West Bengal. International Journal of Bioresource, Environment and Agricultural Science. 1(4): 176-185.

[27] Singh H., Jassal R. K., Kang J.S., Sandhu S.S., Kang H. and Grewal K. (2015) Seed priming techniques in field crops, ACCR Journals, 36 (4): 251-264.

[28] Singh K., Dhar V., Dhasmana A. (2020). Study the Synergistic Effect of Agro-Waste Compost and Bio-Enzymeson Seed Germination and Plant Growth. East African Scholars J Agri Life Sci. 3(6): 196-201.

[29] Testa G.,Reyneri A., Cardinale F., Blandino M. (2015). Grain yield enhancement through fungicide application on maize hybrids with different susceptibility to northern corn leaf blight. Cereal Res. Commun. 43: 415–425.

