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Effect of Bio EM and Panchagavya on Growth, Yield and Quality of Bhendi (*Abelmoschus esculentus* L. Moench) Hybrid CO4

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A B S T R A C T

Bioelectromagnetism (BioEM) is an area which studies the interaction of living biological cells and electromagnetic field. Field experiments were conducted at Horticultural College and Research Institute, Coimbatore during the year 2015-2016 and 2016–2017 to study the effect of Bio Electro Magnetism (Bio EM) and panchagavya (a biostimulant cum organic carbon source derived from cow) on growth, yield, and quality and drought tolerance of Bhendi (*Abelmoschus esculentus L. Moench*). The plot size adopted was 6 m x 3.5 m. In this investigation, among seven treatments imposed, treatment T3 viz., Bio EM + Panchagavya 3% significantly enhanced the biometric and yield parameters during both season I and season II studied. It has also significantly improved the parameters viz., plant height (103.79 cm), number of leaves per plant (77.41), leaf area (182.29 cm^2), number of fruits per plant (24.66) fruit yield (16.33 kg / plot and 18.52 tonnes/ ha), total chlorophyll content (64.63 µg cm^{-2}), total phenol content (2.14 mg g-1) polyphenol oxidase activity (0.842), crude fibre content (11.46 %) and protein content (20.19 %). The values found to be significantly higher than untreated control. The experiment also proved that Bio EM alone produced fruit yield almost equal to the treatment of recommended dose of fertilizer (RDF) but significantly higher than control treatment; Bio EM treatment also increased the drought tolerance level in the plants. The treatment Bio EM + 50% quantity of normal irrigation recorded significantly higher yield and improved the biometric parameters during both seasons than the treatment of 50% quantity of normal irrigation alone.

Introduction

Industrialized agricultural practices have caused extensive soil erosion, excessive use of water in agriculture, increased salinity, fertilizer pollution, plant protection chemical contamination, reduction of socio economic values, degradation to environment, danger to food security, poor quality and reduction in bio diversity. A lack of sustainable

agricultural policy for future generations and the gravity of environmental degradation are drawing attention of scientists, planners and farmers in developing ecologically sound, viable and sustainable farming systems.

Bioelectromagnetism (BioEM) is an area which studies the interaction of living biological cells and electromagnetic field. Researchers have demonstrated that electromagnetic field exists around the human body and the evidence was found using some medical technologies such as electromyography, eletrocardiography and electroencephalogram. This field is known as biofield and the exposure of the said biofield has been referred hereinafter as BioEM treatment.

Scientists have been conducting experiments and observed that bio electromagnetic energy affected growth of plants. Tradition of indigenous knowledge in India is revived through modern scientific research. One such method envisaged is the use of Bio EM and Panchagavya, a biostimulant to enhance plant growth and yield which is achieved without any degradation to environment. It is also achieved with a minimum cost of cultivation. In the present experiment the role of thought transaction (Bio EM) and Panchagavya in enhancing crop yield, without harmful side effects on human health and the environment was investigated.

The experiment was conducted withbhendi or lady's finger commonly known as Okra (*Abelmoschus esculentus* L) which belongs to the family Malvaceae. It is an important fruit vegetable crop cultivated in various states of India. The vegetable has a great commercial demand due to its nutritional values. In India it is grown in an area of 0.231 million hectares with the production of 6.35 million tonnes (Indian Horticulture Database, 2015).

As the movement of electrical energy in a medium generates a magnetic field, the Life Force in the human body also generates a kind of magnetism which is called bio magnetism. Vethathiri (1993) defined the life force current in a living system is composed of very minute 'life-force particles' circulating throughout the physical body of a living system. Circulation of the life-force particles is akin to the 'electrons' in an electric current flowing through a wire. He further stated that these life-force particles generate bio- magnetism or the Bio Electro Magnetic (Bio EM) field. Hence there exists a close connection between life force and BioEM. Waechter (2002) hypothesized that "Qi" or the "life-force" is closely related to the Bio EM energy. Dhamodharan (2004) experimented with the SKY (Simplified Kundalini Yoga) meditation system using Electroencephalogram (EEG) and indicated that human mental frequencies were systematically reduced from Beta to Alpha, Alpha to Theta and Theta to Delta level during different stages of meditation.

Although science has earlier tested such energies in plants, in the above mentioned studies, the scientific facts to support such claims are for the first time seeing reproducible and significant results in experimental observations. Master meditators of SKY system of Yoga from "Temple of Consiousness", Aliyar, Tamilnadu, India are the source of BioEM treatments. Nayak and Altekar (2015) conducted experiments and found an enhanced and significant impact of *human energies of consciousness* on adaptive micropropagation response and callus induction of two plant species, *Withania somnifera* and *Amaranthus dubius*.

Another similar experiment was conducted on Casein Enzyme Hydrolysate and Casein Yeast Peptone by Trivedi *et al.,* (2015). They have concluded that Biofield treatment (*human energies of consciousness*) did cause a significant change in structure characterization, along with an increase in

particle size, melting temperature and maximum decomposition temperature as compared to control sample. In one of the latest research findings communicated (Dean Radin *et al.,* 2013), it has been proven with quantum mechanics experiments (a well-known 2 slit experiment) that conscious will influences the matter (mind will influence the photon).

Researchers consider that the prospect of using cheap magnetic energy to improve the properties of soil and plant growth and development may be of great practical importance (Mohamed and Ebead, 2013). Magnetic field has been found to improve food reserve utilization and help for better absorption and assimilation of nutrients by plants (Kavi, 1977) and photosynthetic activities (Lebedev *et al.,* 1977).

The foundation of this research lies in the hypothesis that thoughts transmit Bio Electromagnetic energy (BioEM).

The Bio EM energy favorably influences plant growth. Thus the results of various experiments indicate that energy generated by meditation can be utilized to interact with plant metabolism to achieve increased growth and yield.

These findings serve as the key motivation factor for the present investigation of the effect of thoughts transmitted Bio EM energy on the target plant which results in improvement of plant growth, yield and other qualities. Based on this view, this study was conducted to elucidate the effect of BioEM and pachagavya (biostimulant) on growth, yield and drought tolerance of Bhendi (*Abelmoschus esculentus* L. Moench) hybrid CO 4.

Materials and Methods

A field experiment was carried out during 2015- 2016 and 2016-2017 at College orchard, Horticultural College and Research Institute, Coimbatore, Tamil Nadu Agricultural University. The soil was clay loam in texture with alkaline pH (7.99), EC (1.00), low available Nitrogen (233 kg/ ha), high available phosphorus (23.00 kg/ ha) and high potassium (1052 kg/ ha). The experiment was laid out in randomized block design with seven treatments and three replications *viz.,* T_1- Bio EM, T_2- Panchagavya 3% + T_3- Bio EM + Panchagavya 3%, T_4- Bio EM+ 50 % Irrigation T_5- 50% Irrigation alone,T_6- RDF NPK @ 200:100:100 kg/ ha and T_7- Control. The plot size adopted was 6.0 x 3.5 m and the crop was irrigated through drip irrigation.

The BioEM treatment was given to the bhendi crop everyday morning and 3% panchagavya was sprayed to the respective treatments (T_2 and T_3) once in a fortnight from establishment of the crop to till harvest of fruits. The observation on biometric and yield parameters *viz.,* Plant height (cm) Number of leaves per plant, Leaf area (cm^2), Total chlorophyll (µg cm^{-2}), Total phenols (mg g^{-1}) Polyphenol Oxidase (OD $min^{-1}g^{-1}$), number of fruits per plant, yield (Kg/ plot), yield (tonnes/ha), crude fibre content (%) and Protein content (%) was recorded on five randomly selected plants respectively. The results recorded were statistically analysed (Panse and Sukhatme, 1967). Leaf area was measured using leaf area meter. Total Cholorophyll and total phenol content was analysed using Yoshida *et al.,* (1971) and Bray and Thorpe 1954. Polyphenol oxidase activity was estimated by the method formulated by Augustine *et al* (1985). Quality parameters *viz.,* Protein content and crude fibre content were estimated using the method devised by Lowry *et al* (1951) and Maynard (1970).

Results and Discussion

The SKY system of meditation is based on linking one's mind with life force in the body. It is also referred by other names as Kundalini energy in ancient yoga and bioenergy in the ancient Indian acupressure for self-healing. The life force current in a living system, is collectively termed as life force particles. Circulation of life force particles is akin to the electrons. These life force particles generate biomagnetism (BioEM) or the bio electromagnetic field (Vethathiri, 1993). The Bio EM was focused on plants to interact with plant metabolism and produce enhanced growth, yield and improve other parameters. In addition, effect of Panchagavya individually and in combination with Bio EM was elucidated. One of the major effects studied was drought tolerance, where plants received only 50 % quantity of irrigation.

The panchagavya spray is known to provide organic carbon which facilitates increase in the concentration of microorganisms which in turn increases soil nutrient availability and thereby crop yield (Sarkar *et al.*, 2016).

In the present investigation during season I, T_3 (BioEM + Panchagavya 3 %) significantly enhanced the biometric and yield parameters *viz.*, plant height (103.28 cm), number of leaves per plant (78.54), leaf area (183.76cm^2),

Total chlorophyll content (66.13 µg cm^{-2}), Total phenols (2.28 mg g^{-1}), Polyphenol Oxidase activity **(**0.866 OD $min^{-1}g^{-1}$), number of fruits per plant (24.50), fruit yield (16.33 kg/plot and a total yield of 18.63 tonnes /ha (23% higher over control), crude fibre content (11.64 %), and protein content (20.98 %) compared to all other treatments (Table 1). In the investigation during season II, again T_3 (Bio EM + Panchagavya 3 %) proved its superiority by significantly improving the above said biometric and yield parameters (Table 2). Pooled analysis of consolidated data for two seasons also showed that, the treatment T3 recorded significantly the highest value with respect to plant height (103.79 cm), number of leaves per plant (77.41), leaf area (182.29 cm^2), total cholorophyll (64.63µg cm^{-2}), total phenol (2.14mg g^{-1}) polyphenol oxidase (0.842 OD $min^{-1}g^{-1}$), number of fruits per plant(24.66), fruit yield (16.33 kg / plot and a total yield of 18.52 tonnes/ ha (30.5 % higher over control), crude fibre content(11.46 %) and protein content (20.19 %). The values were found to be significantly superior over control (Table 3).

Effect of bio EM and panchagavya on growth parameters

The ultimate aim of any experiment is to find out that whether there is any benefit by way of higher yield and reduction in cost of cultivation by adopting any specific technology. The present field experiments clearly indicate that treatments Bio EM+ 3 % Panchakavya or Bio EM alone resulted in significantly higher fruit yield over control. Further, the treatment T4 (Bio EM+50% reduced irrigation) significantly recorded higher yield than the treatmentT5 (50% reduced irrigation alone) indicating the development of drought tolerance of the crop under with Bio EM treatment.

Significant increase in yield of bhendi fruits due to the treatment effects is also presented in terms of percent increase in yield of fruits per hectare. Consolidated data for Season I and Season II indicated that the yield increase was 30.50 % higher in T_3 (Bio EM + Panchakavya) over control. Similarly there was 22% higher yield in T_1 (Bio EM alone) over control. The treatment T_4 (Bio EM + 50 % reduced irrigation) registered 8 % increased yield over T_5 (50% reduced irrigation alone).

Similar increase in yield was achieved by Trivedi and Patil (2011) who reported on

multiple year results on Alphonso mangoes in Asia. The mango study showed yield increases and pest infestation decreases over a four year time period versus control trees which on the contrary showed lower yields and increased pest pressure.

Overall, treatment of Bio EM with panchagavya (3%) significantly influenced the growth and yield parameters of bhendi and that was elucidated through the positive response on plant height (103.79 cm), number of leaves per plant (77.41) and leaf area (182.29 cm^2). The plant height was found to be significantly higher which might be attributed to the influence of Bio EM in combination with frequent application of panchagavya at regular intervals that might have increased the nutrient availability and uptake by plants. Similar findings have been reported by Patil *et al.,* (2012) wherein exposure to the biofield treatment has caused an enhancement in growth and anatomical characteristics of herbs like *Pogostemoncablin,* that is commonly used in perfumes and alternative medicine.

Leaf area, being the fundamental determinant of the quantum of photosynthesis through its effective interception of light energy and fixation of CO_2, facilitates leaf dry matter production of crop plants (Shibbles and Webber, 1996). Panchagavya provides flexibility which enables the specific nutritional requirements of the crop to be met at different stages of its growth. The effect of nitrogen in enhancing the leaf area was well established and increased optimum levels usually had positive relationship with growth (Sarro *et al.,* 1989).

Bio EM played a role in the total leaf area and ultimately greater leaf area aids the plant to synthesize more metabolites exhibiting high photosynthetic rate during the period of growth and development (Mahadevan, 1988). This is also in line with the findings on James *et al.,* (2002).

Next to T_3, T1 (Bio EM alone) recorded higher fruit yield over control. From the present investigation, it is evident that Bio EM has favorably influenced plant growth and yield. Further, with regard to positive influence on drought tolerance, treatment T_4 (Bio EM + 50 % reduced irrigation) registered higher yield than the treatment T_5 (50 % irrigation alone).

From the study, it is evident that Bio EM has influenced the water use efficiency by registering improved growth and yield under 50 % reduced irrigation. Similar results were observed in the yield attributing parameters of chick pea and mustard crop after biofield energy treatment, as an alternative way to increase the production and yield (Trivedi *et al.,* 2015)

Effect of Bio EM and panchagavya on yield, biochemical and quality parameters

Bio EM in combination with panchagavya resulted in improved plant growth which directly influenced the yield and quality. This might be due to plant response to thought transaction in subtle frequency through SKY (Simplified Kundalini Yoga) meditation (Letchoumanane, 2014).

Panchagavya, being a natural and organic product, was found to enhance the fruit yield. Induction of Bio EM energy via thought transaction in theta frequency registered substantially higher yield. Trivedi (2012) tested the impact of biofield treatment applied to lettuce and tomato seeds and transplants and found treated plants exhibited increase in total yield of fruits and also total chlorophyll content of leaves (Fig. 1).

Table.1 Effect of BioEM and panchagavya on biometric, yield and quality parameters in Bhendi (Season I)

Treatments	Plant height (cm)	Number of leaves per plant	Leaf area (cm^2)	Total cholorophyll (µg cm^{-2})	Total phenols (mg g^{-1})	Polyphenol Oxidase (OD $min^{-1}g^{-1}$)	Number of fruits per plant	Yield (Kg/ plot)	Yield (tonnes/ ha)	Crude fibre content (%)	Protein content (%)
T1	97.67	74.57	176.52	63.00	2.16	0.841	23.04	15.42	17.88	11.52	19.67
T2	92.37	64.51	164.22	52.26	1.78	0.743	18.12	14.17	16.50	10.71	18.35
T3	103.28	78.54	183.76	66.13	2.28	0.866	24.50	16.33	18.63	11.64	20.98
T4	94.67	70.74	173.98	54.51	1.93	0.806	20.95	15.44	17.25	11.44	18.98
T5	86.88	62.50	126.76	51.32	1.53	0.733	18.41	14.30	16.64	10.58	17.26
T6	94.41	66.14	162.95	52.79	1.75	0.763	19.23	15.24	17.22	11.00	17.90
T7	83.33	51.92	115.13	45.56	1.44	0.606	16.46	13.30	16.22	9.83	15.95
Mean	**93.23**	**66.99**	**157.62**	**55.08**	**1.84**	**0.77**	**20.10**	**14.89**	**17.19**	**10.96**	**18.44**
SED	0.6881	0.6657	0.8915	0.5798	0.1056	0.0136	0.3117	0.1661	0.1449	0.0925	0.2278
CD (0.05)	1.4994	1.4504	1.9425	1.2632	0.2301	0.0296	0.6791	0.3618	0.3158	0.2015	0.4964

Legend: T_1- Bio EM; T_2-Panchagavya 3%; T_3- Bio EM + Panchagavya 3%; T_4- Bio EM+ 50 % Irrigation; T_5- 50% Irrigation; T_6- RDF NPK @ 200:100:100 kg/ ha; T_7- Control

Table.2 Effect of BioEM and panchagavya on biometric, yield and quality parameters in Bhendi (Season II)

Treatments	Plant height (cm)	Number of leaves per plant	Leaf area (cm^2)	Total cholorophyll (µg cm^{-2})	Total phenols (mg g^{-1})	Polyphenol Oxidase (OD $min^{-1}g^{-1}$)	Number of fruits per plant	Yield (Kg/ plot)	Yield (tonnes/ ha)	Crude fibre content (%)	Protein content (%)
T1	100.97	72.73	174.93	62.32	1.97	0.771	23.24	15.29	17.55	10.66	19.22
T2	92.73	63.21	163.44	52.32	1.62	0.712	18.22	14.45	16.24	9.66	17.56
T3	104.30	76.28	180.83	63.13	2.01	0.819	24.82	16.41	18.41	11.28	19.56
T4	98.20	69.18	172.33	52.78	1.93	0.767	20.85	14.93	17.22	10.57	18.45
T5	90.59	61.37	121.68	48.42	1.53	0.701	18.53	13.48	15.74	10.04	17.25
T6	95.89	64.38	161.07	50.90	1.75	0.737	19.37	14.50	16.73	10.24	18.12
T7	88.56	49.07	111.06	43.85	1.44	0.585	16.53	11.93	14.62	9.51	15.62
Mean	**95.89**	**65.17**	**155.05**	**53.39**	**1.75**	**0.73**	**20.22**	**14.43**	**16.65**	**10.28**	**17.97**
SED	0.6950	0.5472	0.5525	0.4671	0.0863	0.0078	0.2620	0.1704	0.1906	0.1391	0.1607
CD (0.05)	1.5151	1.1922	1.2039	1.0178	0.1881	0.0170	0.5708	0.3713	0.4153	0.3032	0.3502

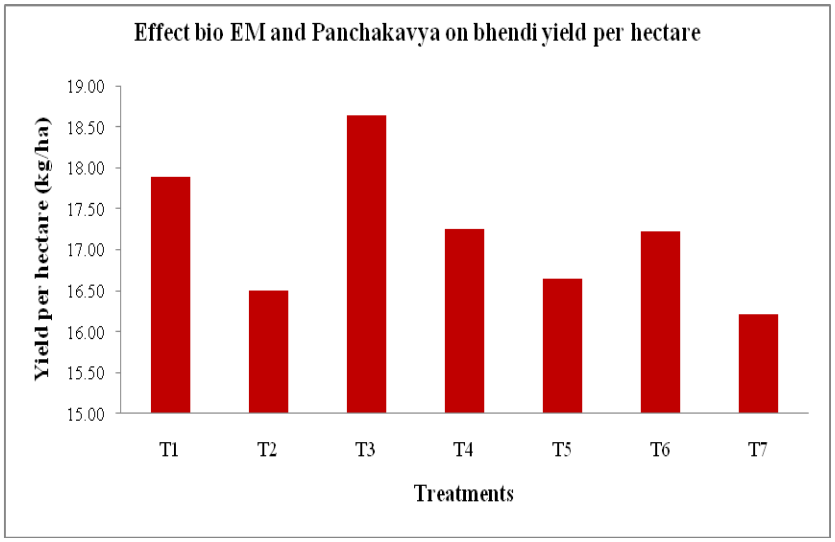
Legend: T_1- Bio EM; T_2-Panchagavya 3%; T_3- Bio EM + Panchagavya 3%; T_4- Bio EM+ 50 % Irrigation; T_5- 50% Irrigation; T_6- RDF NPK @ 200:100:100 kg/ ha; T_7- Control

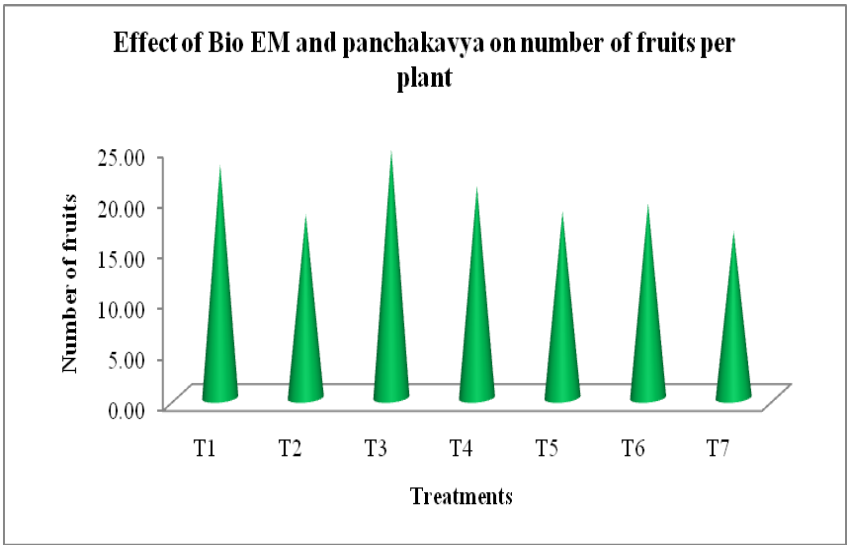
Table.3 Effect of BioEM and Panchagavya on biometric, yield and quality parameters in Bhendi (pooled analysis for two seasons)

Treatments	Plant height (cm)	Number of leaves per plant	Leaf area (cm^2)	Total cholorophyll ($\mu g\ cm^{-2}$)	Total phenols ($mg\ g^{-1}$)	Polyphenol Oxidase ($OD\ min^{-1}g^{-1}$)	Number of fruits per plant	Yield (Kg/ plot)	Yield (tonnes/ ha)	Crude fibre content (%)	Protein content (%)
T1	99.32	73.65	175.73	62.66	2.07	0.806	23.14	15.42	17.72	11.09	19.44
T2	92.55	63.86	163.83	52.29	1.69	0.728	18.16	14.17	16.39	10.18	17.88
T3	**103.79**	**77.41**	**182.29**	**64.63**	**2.14**	**0.842**	**24.66**	**16.33**	**18.52**	**11.46**	**20.19**
T4	96.43	69.96	173.16	53.65	1.93	0.789	20.90	15.44	17.24	11.00	18.98
T5	88.74	61.93	124.22	49.87	1.53	0.717	18.47	14.30	16.19	10.31	17.26
T6	95.15	65.26	162.01	51.84	1.74	0.749	19.30	15.24	16.98	10.62	18.11
T7	85.95	50.49	113.09	44.70	1.44	0.596	16.49	13.30	15.42	9.67	15.69
Mean	**94.56**	**66.08**	**156.33**	**54.23**	**1.79**	**0.747**	**20.16**	**14.89**	**16.92**	**10.62**	**18.22**
SED	0.6916	0.6093	0.7417	0.5265	0.0964	0.0111	0.2879	0.1661	0.1693	0.1359	0.1971
CD (0.05)	1.4247	1.2552	1.5278	1.0845	0.1987	0.0228	0.5931	0.3421	0.3488	0.2961	0.4061

Legend: T_1- Bio EM; T_2-Panchagavya 3%; T_3- Bio EM + Panchagavya 3%; T_4- Bio EM+ 50 % Irrigation; T_5- 50% Irrigation; T_6- RDF NPK @ 200:100:100 kg/ ha; T_7- Control

Fig.1 Effect of BioEM and Panchagavya on yield and parameters in Bhendi





Similar results were observed by other scientists also. Nayak and Altekar (2015) found enhanced adaptive micropropagation response and callus induction of two plant species, *Withania somnifera* (L.) Dunal and *Amaranthus dubius* due to the treatment of human energies of consciousness. Trivedi *et al.*, (2015) recorded significant change in Casein Enzyme Hydrolysate and Casein Yeast Peptone due to Biofield treatment (human energies of consciousness). They have observed significant increase in particle size, melting temperature and maximum decomposition temperature. They have recorded variation in bonding and structure of the experimental material due to biofield treatment.

Anandhi *et al., (2018)* have recorded significant Influence of gamma rays on germination, survival and pollen sterility in black gram (*Vigna mungo* L.) mutants. The finding proves that energy in every form alters metabolic process in plants. Panchagavya contain several natural organic materials such as cow dung and cow urine

which is a rich source of organic carbon. Hence it improves soil biological activity and thus increases plant growth. It is also conjectured that the strength of Bio EM energy increases as the mental frequency decreases**.** Besides, application of panchagavya increased the metabolic functions of the plant which ultimately increased growth and yield. This is in accordance with the findings of Cynthia (2003) and Ranjit Chatterjee and Bandhopadhyay (2014).

BioEM in combination with panchagavya also significantly increased the biochemical parameters *viz.,* the Total chlorophyll content(64.63 µg cm^{-2}), Total phenols (2.14 mg g^{-1}), Polyphenol Oxidase activity **(**0.842 OD $min^{-1}g^{-1}$) and quality parameters *viz.,* crude fibre content (11.46 %), and protein content (20.19 %**).** This increased effect is attributed to the fact that the effects of Bio EM regulate DNA, RNA, protein synthesis, gene action and cell division in plants (Lipton, 2009). In another study with carrots, the results concluded that, Biofield treatment caused the numerical improvement in yield along with nematode control. In addition, the treatment caused statistically significant increase in Vitamin A content (Shind *et al.,* 2015) an important quality parameter of carrot.

Besides, panchagavya influences biochemical constituents by improving the physical, chemical and biological properties of soil and provides carbon as an energy source to nitrogen fixing bacteria and thus proves its biological function (Satheesh and Balasubramanian, 2003). It is also reported to increase the permeability of plant membranes resulting in higher metabolic activity thereby increased the yield. This is in accordance with the findings of Gore and Srinivasa, (2011).Thus, from the above experiment, it can be concluded that the treatment T_3 (BioEM + Panchagavya 3 %) significantly enhanced the biometric, yield and quality parameters of bhendi plants compared to all other treatments.

Besides, treatment T_4 (BioEM + 50 % reduced irrigation) also recorded significantly higher values under reduced irrigation level (drought) with regard to biochemical, yield and quality parameters compared to T_5 (50 % reduced irrigation alone). Thus, Bio EM treatment registered its significance even under reduced irrigation level (50 %) which can be well explored for farming areas having water scarcity issues.

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