



RESEARCH ARTICLE

# Studies on the Effect of Biostimulant Products (Egg Amino acid and Panchagavya) on Soil Nutrients and Crop Yield of Greens

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## ABSTRACT

Good cultivable lands are not only limited but also differs in their production potential. Man made artificial fertilizers are turning its negative facet to farmers slowly destroying the fertility of the soil and decreasing the quality of produce. This has set an alarming situation to farmers and other sector in the field of agriculture. Organic manures play a key role in sustaining crop growth and productivity and use of liquid organic manures as foliar application to boost the leafy vegetables biomass is a viable option owing to quick response. With this background the present investigation was conducted to assess the effect of foliar application of biostimulant products viz., Egg amino acid and Panchagavya at various concentrations from 0.5-3.0 per cent and in combinations on the growth and yield of Greens, Palak and Amaranths and on changes in soil nutrients status. This study demonstrates that the use of organic sprays EAA and Panchagavya could be used as a valuable organic liquid fertilizer for better yield and also without the harmful effects of chemical fertilizers.

Received: 09 Feb 2024

Revised: 19 Feb 2024

Accepted: 03 Mar 2024

**Keywords** : Egg aminoacids, Panchagavya, Greens and Yield

## INTRODUCTION

Man made artificial fertilizers is turning its negative facet to farmers slowly destroying the fertility of soil and decreasing the quality of the produce. This has set an alarming situation for farmer and allied sectors of agriculture. In recent decade, Organic farming gaining impetus due to realization of inherent advantages in sustaining crop production and also in maintaining dynamics soil nutrients. Farmers and consumers have started their races towards organic produce which fetch them high income and provide safe produce for consumption, respectively. Therefore, it is necessary to use bio products like panchagavya and egg amino acid for the production of chemical residue free food crops particularly the vegetables as they have been consumed raw as salad etc. Wide range of biostimulants is available in market as well as produced by the farmers on farm and applied to the crops in liquid formulation to boost the crop growth and yield (Msibi *et al.*,2013). They have been used

as growth promoters and nutrients supplements in organic farming to boost crop production.

Among these organic preparations, panchagavya has been scientifically evaluated for its physical, chemical and biological properties as well as effect on growth and development of many crops . But in case of egg amino acid, research findings on its growth effects on crops could be more manageable. The egg amino acid is liquid organic manure made from egg and other ingredients. Egg amino acid is of great value to both plants and microorganisms in their growth, because it contains various nutrients and types of amino acids. Egg white is a normal source of proteins of famed nutritional and biological advantages. Enzymatic hydrolysis is a particular technique to transform native protein to protein (Abdel-Hamid *et al.*, 2016). Protein hydrolysates are mix of polypeptides, oligopeptides

and amino acids. The last group consists of free amino acids and polypeptides obtained through chemical and/or enzymatic hydrolysis of agro industrial by-products from animal or plant sources or from dedicated biomass crops (Gopal lal Choudhary *et al.*, 2017).

Shifts from conventional farming to organic farming causes nutrient deficiency in crops due to soil nutrient imbalance, which in turn affects the growth and yield of crops. Besides, the effect of egg amino acid on crop growth and yield was not evaluated scientifically. Hence the present study investigated the effect of biostimulant products on soil nutrients and crop yield of greens to optimize the egg amino acid application rate.

## MATERIALS AND METHODS

### Site Description

A field experiment was conducted at Sirumugai farmers field, Coimbatore district to study the effect of egg amino acid and panchagavya as foliar application to increase the growth and yield of greens (palak and amaranthus ) during 2023. The experimental soil was sandy clay loam.

The experiment was laid out in Randomized block design (RBD) with three replications and eight treatments viz., Absolute control ( $T_1$ ),  $T_2$ -Recommended NPK,  $T_3$ - FYM 12.5 t/ha + 3 % panchagavya (15 DAS) + 0.5 % egg amino acid (30 DAS),  $T_4$ - FYM 12.5 t/ha + 3 % panchagavya (15 DAS) & 1.0 % egg amino acid (30 DAS),  $T_5$ - FYM 12.5 t/ha + 3 % panchagavya (15 DAS) & 1.5 % egg amino acid (30 DAS),  $T_7$ - FYM 12.5 t/ha + 3 % panchagavya alone twice (15 & 30 DAS) and  $T_8$ - FYM 12.5 t/ha 1 % egg amino acid alone twice (15 & 30 DAS). The experiment was tested greens sown on April 2023 and first picking was done in June 2023. Hybrid guru agro tech seed were used for amaranthus and palak .

### Method of preparation:

#### Preparation of Panchakavya

In a wide-mouthed vessel, 5 kg of Cow dung and 500 gm of Cow ghee were mixed thoroughly and kept for 3 days. After 3 days, the following ingredients were added and kept for 19 days with regular mixing both in morning and evening hours daily. On the 20th day, 20 liters of panchagavya were ready for use. The container was always kept covered with a mosquito net or cotton cloth.

### Ingredients

1. Fresh cow's urine –3 liters
2. Cow's milk –2 liters
3. Cow's curd –2 liters
4. Jaggery –500 gms
5. Water or sugarcane juice -3 liters
6. Ripe banana fruit -1 bunch (12 nos.)
7. Tender coconut water –3 liters

### Preparation of Egg amino acid

Twenty numbers of ripened lemons were squeezed, and the juice was taken in a plastic container; then, 10 numbers of eggs were kept inside the lemon juice till the eggs were soaked completely for 10 days. After 10 days, eggs were smashed well and 250 g jaggery was added and kept for 10 days. The content was filtered after 10 days and the liquid portion was collected and stored in separate container for foliar spray. For spray treatment, respective percentage of panchakavya and egg amino acid solution was made. After dilution, these solutions have to be filtered before being used for spraying. Solutions were sprayed at 15<sup>th</sup> day and 30<sup>th</sup> day (Winnie and Scaria, 2018)

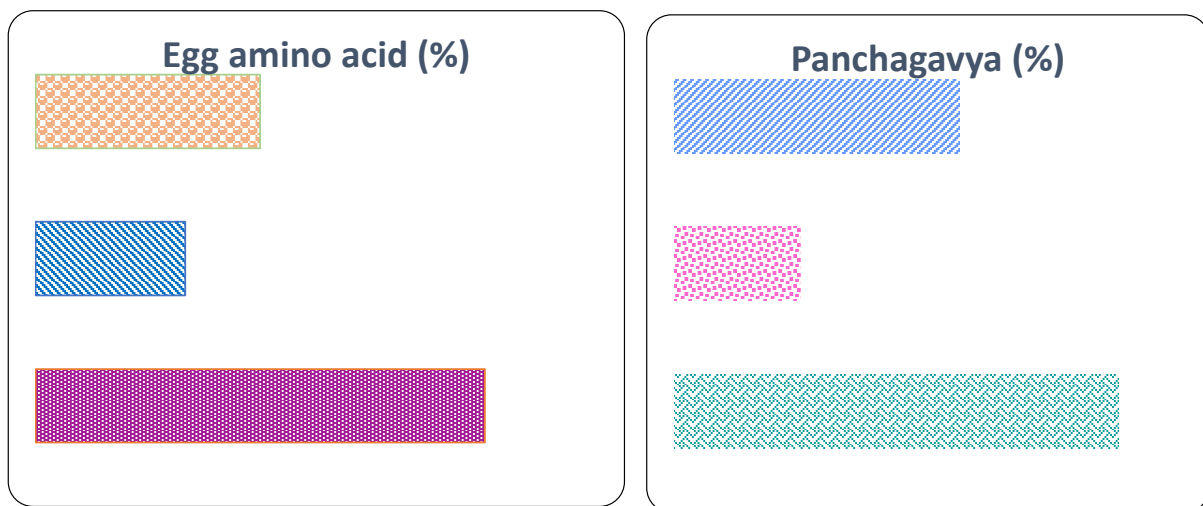
## RESULTS AND DISCUSSION

### Characterization of Panchakavya and Egg amino acid

The samples prepared were analyzed for various nutrient parameters and the data has been presented in (Fig 1). Egg amino acid contain 1.2 percent total nitrogen, 0.4 % total phosphorus and 0.6 % total potassium and in panchakavya ,k total nitrogen content is 0.7 %, total phosphorus content is 0.2 % and total potassium content is 0.5 %. The reason might be due to the nutrients from bioinputs extract become available to the plants faster than from the traditionally applied organic matter (Neff *et al.*, 2003)

### Available nitrogen of soil ( $kg\ ha^{-1}$ )

The available nitrogen status of soil at harvest stage varied between 216 and 238  $kg\ ha^{-1}$  in Palak and 212 and 257  $kg\ ha^{-1}$  in amaranthus due to different treatments (Table 1). The different treatments tried had significant influence on the available nitrogen status of the soil. The control ( $T_1$ ) recorded lowest value (212 $kg\ ha^{-1}$  in Palak and 257  $kg\ ha^{-1}$  in amaranthus). Treatments  $T_6$



**Fig 1 Nutrient Content in Egg Amino Acid and Panchagavya**

**Table 1. Effect of biostimulant products foliar application on Post Soil available major nutrient (kg ha<sup>-1</sup>) status of greens (Palak and amaranthus)**

Treatments	Soil Available Nitrogen Status (kg ha <sup>-1</sup> )		Soil Available Phosphorus Status (kg ha <sup>-1</sup> )		Soil Available Potassium Status (kg ha <sup>-1</sup> )	
	Palak	Amaranthus	Palak	Amaranthus	Palak	Amaranthus
T <sub>1</sub> - Absolute Control	216	212	12.33	11.91	215	220
T <sub>2</sub> -Recommended dose of fertilizers	227	233	18.91	18.39	251	259
T <sub>3</sub> - FYM 12.5 t ha <sup>-1</sup> + 3 % panchagavya (15 DAS) + 0.5 % egg amino acid (30 DAS)	228	217	18.06	18.02	242	248
T <sub>4</sub> - FYM 12.5 t ha <sup>-1</sup> + 3 % panchagavya (15 DAS) & 1.0 % egg amino acid (30 DAS)	224	216	18.26	18.16	253	260
T <sub>5</sub> - FYM 12.5 t ha <sup>-1</sup> + 3 % panchagavya (15 DAS) & 1.5 % egg amino acid (30 DAS)	232	232	18.91	18.38	260	258
T <sub>6</sub> - FYM 12.5 t ha <sup>-1</sup> + 3 % panchagavya (15 DAS) & 2.0 % egg amino acid (30 DAS)	238	257	18.94	18.45	266	262
T <sub>7</sub> - FYM 12.5 t ha <sup>-1</sup> + 3 % panchagavya alone twice (15 & 30 DAS)	218	228	17.96	17.40	235	232
T <sub>8</sub> - FYM 12.5 t ha <sup>-1</sup> 1 % egg amino acid alone twice (15 & 30 DAS)	217	216	16.87	16.58	224	223
SEd	4.24	3.85	0.18	0.16	5.34	4.02
CD (P=0.05)	9.02	7.05	0.38	0.34	11.31	8.06



received the FYM 12.5 t/ha + 3 % panchagavya (15 DAS) & 2.0 % egg amino acid (30 DAS) recorded the highest (238 kg ha<sup>-1</sup> and 257 kg ha<sup>-1</sup>).

**Available Phosphorus of soil (kg ha<sup>-1</sup>)**

The results of the available phosphorus status of soil revealed that the different treatments tried in this experiment had a significant influence on it. The control (T<sub>1</sub>) recorded lowest value (12.33 kg ha<sup>-1</sup> in Palak and 11.91 kg ha<sup>-1</sup> in amaranthus ). Treatments T<sub>6</sub> received the FYM 12.5 t/ha + 3 % Panchakavya (15 DAS) & 2.0 % egg amino acid (30 DAS) recorded the highest (19.84kg ha<sup>-1</sup> and 18.45 kg ha<sup>-1</sup>) .T<sub>5</sub> and T<sub>7</sub> were on par with each other Table (1).

**Available Potassium of soil (kg ha-1)**

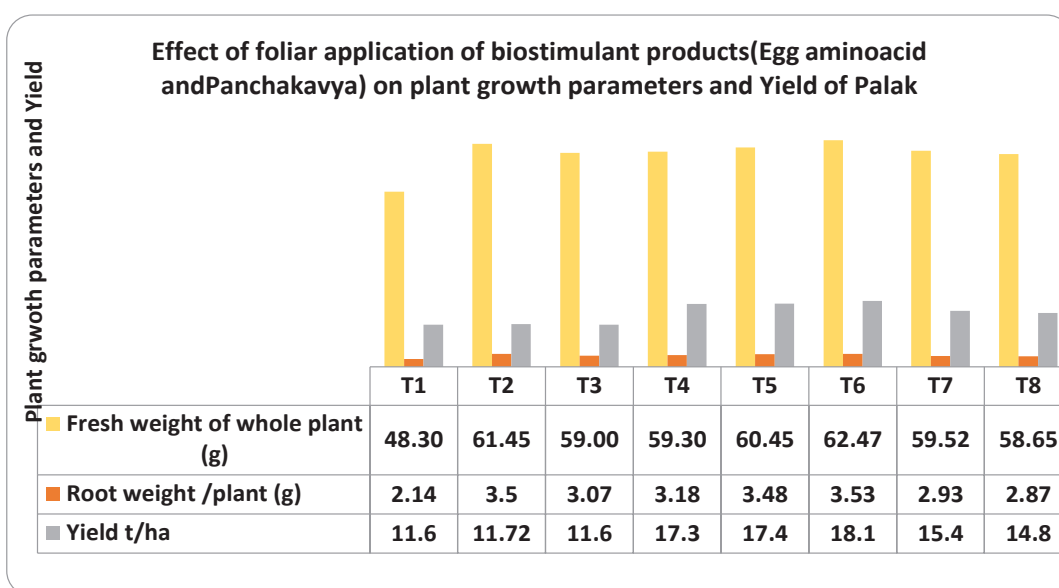
The results of the available potassium status of soil revealed that the different treatments used in this experiment had a significant influence on it. The control (T<sub>1</sub>) recorded lowest value (215 kg ha<sup>-1</sup> in Palak and 220kg ha<sup>-1</sup> in amaranthus). Treatments T<sub>6</sub> received the FYM 12.5 t/ha + 3 % panchagavya (15 DAS) & 2.0 % egg amino acid (30 DAS) recorded the highest (266 kg ha<sup>-1</sup> and 260 kg ha<sup>-1</sup>) . Treatments T<sub>5</sub> and T<sub>7</sub> were on par with each other Table (1). The possible reasons might be because bioinput (egg amino acid and panchagavya) product itself contains appreciable quantity of phosphorus in a readily available in ionic form. The organic acids and organic anions released during the decomposition of organic matter must have hastened the soil’s biological properties and

reduced the activity of phosphorus complexing agent to make phosphorus available to the crop (Somasundaram et al., 2020) .

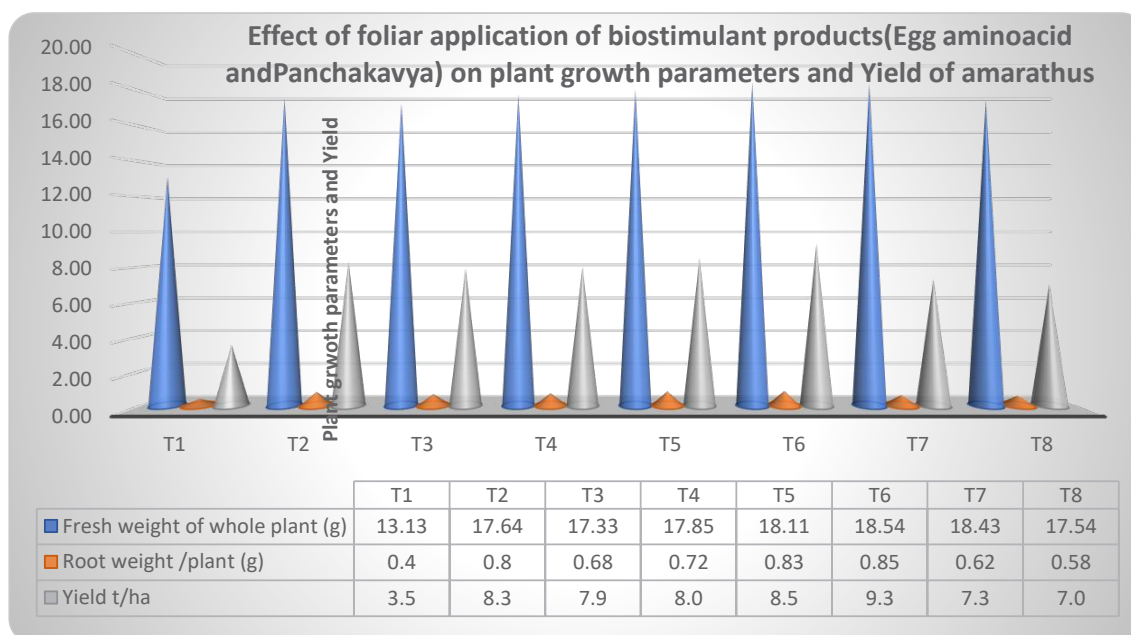
**Yield**

The highest yield of greens s was observed in treatment T<sub>6</sub> receiving FYM 12.5 t ha<sup>-1</sup> + 3 % panchagavya (15 DAS) & 2.0 % egg amino acid (30 DAS) (18.1 t ha<sup>-1</sup>) in Palak and (9.3 t ha<sup>-1</sup>) in amaranths that was significantly superior over control T<sub>1</sub> (11.6 t ha<sup>-1</sup> in Palak and 3.5 t ha<sup>-1</sup> in amaranths) and the following treatments were on par with each other T<sub>2</sub>, T<sub>5</sub> and T<sub>4</sub> (Fig 2 & Fig 3).The reasons might be due to the bioinput products (palak and amaranths ) enhances the growth of plant there by photosynthetic area i.e.leaf area, which ultimately increased the green leaf yield. Similar results were reported by Somasundaram, 2003 and Kanimozhi, 2003.

This could be attributed to the combined effect of inorganic nutrients and organic growth promoters which contains useful microorganisms, nitrogen, calcium, cytokinin, glucose, minerals etc. This might have triggered rapid cell division, proliferation and speedy growth and development of plants. Thus the plants grown with this treatment have produced maximum height, more number of leaves, higher leaf area resulting in production of high fresh weight of plant leading to production of more yield in this treatment. The results of present study are in accordance with those of Arjunan, 2005 in tomato crop.



**Fig. 2 Effect of foliar application of biostimulant products (Egg aminoacid and Panchakavya) on plant growth parameters and Yield of Palak**



**Fig. 3 Effect of foliar application of biostimulant products (Egg amino acid and Panchakavya) on plant growth parameters and Yield of amarathus**

## CONCLUSION

A research effort was undertaken to explore the possibility of using the Bio stimulant products (egg amino acid and panchagavya as foliar spray) for the cultivation of crops. From the study it is observed that egg amino acids (EAA) serves as a promising organic spray for enhanced Palak and amaranthus growth and yield. organic sprays EAA and Panchagavya could be used as a valuable organic liquid fertilizer for better yield and sustaining the soil health.

### Declaration

### Conflicts of Interest:

The authors declare no conflict of interest.

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