Biospectra : ISSN: 0973-7057, Vol. 19(1), March, 2024, pp. 235-244 **Plant Science**
An International Biannual Refereed Journal of Life Sciences

ISSN : 0973-7057

Formulation and evaluation of eco-friendly foliar spray produced from kitchen wastes for better crop productivity

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Received : 20th December, 2023 ; Revised : 20th January, 2024
DOI:-https://doi.org/10.5281/zenodo.14246025

Abstract- The use or making of foliar supplement or sprays more often prepared using chemicals was followed in modern agriculture. In contrary, the present study was designed to prepare foliar consortia from the daily kitchen domestic wastes collected in day-to-day life. The wastes are promising bio resource with potentially rich important nutritional and growth enhancing component. The study clearly suggests that foliar consortia may supplemented either individually or in a combined forms will enhance the growth of crops to a considerable level. To evaluate the efficacy of prepared, processed foliar consortia treated aerially on some important crops like monocots *Allium cepa, Allium sativum,* and Dicots, *Trigonella foenum- graecum, Vigna radiata* and evaluated through various parameters like plant height, No. of leaves per plant, petiole length, Shoot length, Root length, leaf surface area, No. of roots per plant, and proximate analysis of estimation of chlorophyll, carbohydrates, proteins, total free amino acids. The study clearly suggests that prepared foliar consortia promote the growth- and growth-related components on the study plants at all levels. The crops sprayed with consortia at definite ratio at definite intervals were evaluated for its various parameters. Positively certain parameters have highly affected by the foliar application. Out of 4 different concentrations many of the treated crops showed the notable changes on morphological and biochemical analysis. The observed and evaluated results were tabulated.

Key words: Foliar application, Carbohydrate, Amino acids, Root length, proximate analysis,

INTRODUCTION

Indian subcontinent mainly depends on agriculture and related services for their GDP. One of the most important challenges faced by the world in future is to provide healthy and sufficient food to the human kind as the population is emerging tremendously. It has been predicted that the global food must be increased to 70% in order to meet the requirements of the population in 2050. In this regard it is essential to increase the biological efficiency of the crops both in terms of its productivity and nutritional content through a most suitable organic means.

The foliar application becomes an important supplement selected and practised for the sustainable and productive management of crops. It is the most emerging supplement to feed plants by applying liquid growth enhancements directly to the aerial parts of plants. The absorption of the liquid fertilizer takes place through their stomata and also through their epidermis. Foliar spray although not a substitute for healthy soil, but it can be beneficial source when a plant is suffering from certain nutrient deficiencies.

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Foliar application has proven to be an excellent method of supplying plant requirements for secondary nutrients (calcium, magnesium, and sulphur) and micronutrients (zinc, manganese, iron, copper, boron and molybdenum), while supplementing N-P-K needs for short and or critical plant growth stage periods. It has been found to be the most efficient way to increase yield and improve plant health. Tests have been shown that foliar feeding can increase yields from 12% to 25% when compared to conventional fertilization and also the plants absorb foliar sprays 20 times faster than soil applied nutrients. Therefore, foliar feeding is the method of choice when deficiencies symptoms are noted, and prompt correction of deficiencies is required. Nutrients rapidly absorbed through the foliage, providing the plant with the missing nutrients, and strengthening it. A foliar nutrition precisely given during the specific phenology stages ensures optimal growth, and best possible yield. In relatively low concentrations at these critical stages, foliar nutrition boosts physiological processes of the plant, ensures optimal development, and contributes significantly to higher yields and better quality.

The Wastes that are produced domestically from kitchen are not actually wastes they are called as biomass. These biomasses were considered to be a good resource and it could be converted to an organic material that enhances the growth of crop species. The crop productivity mainly depends upon the substances that supplemented during various growth stages of the crop. The kitchen wastes such as onion peelings, tea dust, coffee grounds, egg shells, black gram seed coat, banana peelings and green vegetable wastes are considered to be a good source of nitrogen, potassium, phosphorus, sulphur, iron and calcium etc. But due to unaware of this potential wealth of kitchen wastes it is discarded in garbage. As a part of waste management and eco-friendly approach the present study was carried out to formulate a novel herbal foliar spray form kitchen for the better productivity on some important crop species such as *Allium cepa, Allium sativum, Trigonella foenum graecum, Vigna radiata*. The main objective of the present study is to collect and segregate the potential kitchen wastes for making an effective foliar spray which enhances the growth and biochemical components on the studied crops.

MATERIALS & METHODS

Some selected domestic kitchen wastes viz., Onion peels, Tea dust, Seed coats of black gram, Banana peels, Egg shells, Cabbages, Other green leafy vegetables were collected on a daily basis to prepare the foliar spray solution.

Preparation of foliar spray solution[1]:

The collected domestic kitchen wastes were made into small pieces and mixed appropriately and allowed to ferment using distilled water for 10 days in a suitable container (20L) along with rice-soaked water, sugarcane juice, tender coconut and jaggery. The waste materials that were allowed to ferment at room temperature at a definite ratio as mentioned below.

Table 1- List of waste materials used to ferment

Sl. No	Waste materials	Quantity
1	Onion peels	500mg
2	Tea dust	500mg
3	Black gram seed coat	500mg
4	Banana peelings	500mg
5	Egg shell	500mg
6	Cabbage & green leafy vegetable waste	500mg
7	Rice-soaked water	1L
8	Sugar cane juice	0.5L
9	Tender coconut	0.5L
10	Jaggery	200gm
11	Water	4L

During the period of process, the plant materials were allowed to ferment stirred well twice a day (morning and evening) to oxygenate the solution. The well processed master solution was filtered and stored in air tight containers at normal room temperature.

Nutritional analysis and physico-chemical properties of foliar nutrient solution:

The selected and better performed foliar solutions were filtered and analysed for its macro and micro nutritional contents by following standard methods.

Experimentation of foliar spray with important crop species:

The study was carried out with the selected crop species which is having a short lifecycle and quick response in their physiological characters. By considering the above things the following crops were selected. The study was performed with two monocots *Allium cepa* L. and *Allium sativum* L. and dicots *Trigonella foenum graecum* L. *Vigna radiata* (L.) Wilczek.

Estimation of Growth & Morphological Parameters:[2,3]

The change in growth and morphological parameters viz., plant height, No. of leaves per plant, Leaf area, Petiole length, Root length and no. of roots per plant were evaluated and represented in the table after foliar application.

Estimation of Chlorophyll Content[4]:

The contents of chlorophyll a, b and total chlorophyll were estimated on the foliar spray treated and non-treated leaves and the contents were expressed as mg g-1 of fresh weight of each treatment. About 1g of fresh leaves after removing the mid rib was weighed and grind with the help of mortar and pestle using 20ml of 80% acetone. The mixture was centrifuged for 5 minutes at 5000 rpm. Supernatant was transferred to a 100ml volumetric flask. Repeat the process until the residue becomes colourless. Make up the volume to 100ml by adding 80% acetone to the mark of the flask. Shake the extract properly and take absorbance reading at 645nm and 663nm against solvent blank.

Calculation:

Chlorophyll a = (12.7 x A663) - (2.69 x A645) x V/1000*W mg g^{-1}

Chlorophyll b = (22.9 x A645) - (4.68 x A663) x V/1000*W mg g^{-1}

Total Chlorophyll = (20.2 x A645) + (8.02 x A663) x V/1000*W mg g^{-1}

The obtained results were tabulated.

Biochemical analysis:

Estimation of total Carbohydrates[5]:

The total carbohydrate content of the treated leaf was estimated by anthrone method and expressed as mg g^{-1} of fresh sample. 100mg of the sample was weighed and hydrolyzed by keeping it in a boiling water bath for one and half an hour, with 2 ml of 2.5N Hydrochloric acid and cooled. Make up the volume to 10ml and centrifuge and 0.5ml was taken for analysis.

Calculation:

$$100 \text{ ml of the sample contains} = \frac{\mu g \text{ of glucose}}{\text{Volume of the sample}} x 100 \text{ mg of glucose}$$

The obtained results were tabulated

Estimation of Protein[6]:

Soluble protein content of leaf was estimated by the Lowry method or Bradford method and expressed as mg g^{-1} of fresh weight. The foliar treated leaves were taken for analysis.

Estimation is usually carried out with buffers used for the enzyme assay. Weigh 5g of the sample and grain with the mortar and pestle in 5-10ml of the buffer. Centrifuge for 5 minutes and use the supernatant for protein estimation.

Calculation:

$$100 \text{ ml of the sample contains} = \frac{\mu g \text{ of protein}}{\text{Volume of the sample}} x 100 \text{ mg of protein}$$

The obtained results were tabulated

Estimation of total free amino acids[7]:

The total free amino acid content of the treated leaf was estimated and expressed as mg g^{-1} of fresh sample.

Weigh 0.5g of the sample and grind it in a pestle and mortar with a small quantity of acid washed sand. To this homogenate, add 5 to 10ml of 80% ethanol and filter of centrifuge. Save the filter or the supernatant and repeat the extraction twice with the residue and pool all the supernatants. Reduce the volume if needed by evaporation and use the extract for the quantitative estimation of total free amino acid. If the tissue is tough, use boiling 80% ethanol for extraction.

Calculation:

Amount of total free amino acid present in the sample,

$$100 \text{ ml of the sample contains} = \frac{\mu g \text{ of amino acid}}{\text{Volume of the sample}} x 100 \text{ mg free amino acid/ml}$$

The obtained results were tabulated.

RESULTS & DISCUSSION

The increase in productivity mainly depends upon both physical and physiological growth of the plant. The crops with more adaptability towards various conditions may have good survival rate but not productivity. The productivity mainly refers to increase in both vegetative and reproductive growth. The productivity of a plant was enhanced by adding supplements in the form of fertilizers, foliar consortia etc., and the application of the supplements are of many ways one such a way is foliar application. The supplements are manufactured by means of chemicals and other heavy metals too. The supplements added to the soil or plant will be absorbed by the plant in a small quantity and majority of the chemical supplements will be washed off to the soil and causing many pollutions to the soil and water. The harmful residues of the chemical supplements which enters into the ecological chain and affects the plants, animals and other biotic system leading to ecological imbalance. To overcome these types of undesirable environmental changes on various agents the present study was framed to produce or create a formulation using domestic wastes produced by day-to-

day life in kitchen. The domestic wastes such as degradable vegetable, fruit and other components were utilized for preparing the foliar supplement.

The biomass obtained from domestic wastes rich in necessary elements for growth and development were selected and processed to make the foliar consortia as per the standard procedures. To determine the efficacy of prepared foliar spray 4 different composition of foliar spray were prepared further. The prepared foliar spray was tested, evaluated and applied on the crop representatives such as *Trigonella foenum - graecum, Vigna radiata, Allium cepa, Allium sativum* with 4 different formulations made according to Table 1. The compositions were made and represented in Table 1. A small amount neem oil was applied equally to all the formulation to avoid fungal infestation on the crop.

The experiment is carried out with physically healthy seeds. The viability of the seeds was tested and tabulated. The table 2 represents the germination and survivability rate. The results of seed viability were found to be higher in monocot crops 100 and 98% of germination without any treatment was made. Whereas the dicot crops showed that more than 75% germination without any treatment on the studied crops.

Table 2 depicts the percentage of survivability of after the application of foliar solution on studied crops *T. foenum-graecum* with 50% survivability and reaches to the maximum of 96% due to the supplementation of the formulation of T3 followed 94.6% on treating the crop with T-1 formulation. The other plant *V. radiata* showed the increase of survivability from 76 to 96% when compared with non-treated seeds. The plant *A. cepa* showed percentage of survivability was maintained at 100% at all the concentration except treatment 2 (T2). The bulb of *A.sativum* also maintained its survivability at all the concentrations. The above evaluation clearly showed that foliar application has considerable effect on survivability of seeds. Similar results were observed in blackgram by Gunasekar *et al.*, (2018)[8] that the organic fertilizers which was applied as foliar spray influence the plant characters including seed quality and resulting in good germination and viability. As per the Kumawat *et al.*, (2009)[9], due to presence of micro and macronutrients, growth hormones and enzymes the seed quality could be enhanced at various level including seed survivability and viability. The data represented clearly indicates the foliar consortia prepared organically intervenes and supports on the survivability of the plants.

Table 14 and 15 represents the physico - chemical examination results made with T2 andT4 formulation which comparatively better performed in many parameters. The pH parameter for the both T2 and T4 is 5.63 and 5.69 respectively. The values are optimum at the levels of pH it supports the growth of the crop. The pH values are important to determine the assimilable efficacy of the crop species. The effective growth and development of plant would enhance due to free amino acids that pass through the plant systems when applied on aerial portion of the leaves and act as a cofactor in enzyme process that can boost photosynthesis and promote the nutrient uptake.[10-12]

The assimilable nitrogen, phosphorus and potassium were also found to be present in an optimum level in the formulation T2 and T4 as required by the crop. The metals ions and micronutrients were also found to be present more considerably at various optimum levels. The metal manganese found to be 49.3 and 48.4 mg/l, Iron (Fe) at 1372 and 1539 mg/l calcium was 1723 mg/l and 1884 mg/l. The other important substance called sulphate was found to 374mg/l and 655 mg/l respectively. Of all the components the metal ions are also found to be present at optimum levels for which it is essentially needed for the growth of crops.

To determine the effect of foliar spray or consortia the studies such as carbohydrate, chlorophyll, proteins and free amino acids were carried out and the data were tabulated.

Out of various formulation treatment carried out the crops treated with T3 and T4 formulation has more carbohydrate content in both *A.cepa* and *A. sativum* with 8.2 and 10.6 mg/g; 18.6 and 20.2 respectively. Similarly, the crop *V. radiata* expressed more carbohydrate content with 16.4 at T2 and 15.4mg/g in T3 treatment. The plant *T. foenum-graecum* showed the 9.4mg/g on T2 treatment. The study clearly shows that foliar consortia have considerable effect on the carbohydrate product during the growth and development.

The proximal analysis of protein is an important metabolic factor which representing physiological strength of plants. Hence the protein analysis was made to study on plants to evaluate the effect of foliar consortia on the physiology of the plants. The study plant, *T. foenum-graecum* has not showed significance difference when

compared with control. The control showed 3.12 mg/g of protein and 2.40 mg/g of protein was found on the T2 treatment.

The protein content of *V. radiata* showed considerable increase from 4.00mg/g in control to 4.60mg/g in T3 and 4.20 mg/g in T4 formulation. The plant *A.cepa* produced more protein when compared with control. The 3.0mg/g and 3.50mg/g of protein was found in the crop treated with T3 and T4 formulation. The crop *A. sativum* showed considerable increase of protein as 4.60mg/g when compared with control showing 3.60mg/g of protein.

The Table 13 shows the parameter total free amino acid content on the study plants showed the following observations. The plant *T. foenum-graecum* showed 2.20 mg/g in the treated plant under T2 formulation and about 2.00mg/g was observed at T3 formulation respectively. Suchitra Rakesh *et al.*, (2017)[13] reported the similar results as the plants sprayed with organic fertilizer interfere the physiology, performance, yield and biochemical changes.

The plant, *V.radiata* sprayed with formulation T1 T2 and T3 showed increased total free amino acid content when compared with control. The monocot crop *A.cepa* exhibited about 1.00 mg/g and 1.30mg/g of free amino acids T3 and T4 formulations. In the crop *A.sativum* all the formulation made T2, T3 and T4 showed considerable increase of free amino acid content when compared with control with 1.80, 1.90 and 2.30 mg/g respectively. The similar results were observed by Subramaniyan, (2005)[14] the crops sprayed with organic compounds is better performed in both quality and yield of the crops.

The table 3-6 showing the growth in the form of morphological parameters of the studied crop species as influenced by the foliar spray were calculated and tabulated. The parameters such as Shoot length, Root length, No. of Roots and size of the leaf were taken and recorded for the present study.

Table 3 the plant, *T. foenum -graecum* showed considerable increase of shoot length of 11.44 cm, Root length of 5.52 cm and no. of leaves was 9. The leaf blade or lamina was increased from 1.56cm^2 and the petiole length of 1.25cm^2 with the crops treated with T2 formulation when compared with control.

Table 4 the plant *V.radiata* showed the increase in morphological parameter when treated with formulations of T3. The shoot length was increased as 24.16cm, Root length 5.62cm and average no. of leaves was 5. The parameter which is responsible for effective photosynthesis was 4.2cm^2 to 4.96cm^2. The petiole length also increased from 0.50 cm and internodal length also increased to 0.80cm were observed and tabulated. Similar results also reported by Kumar and Neeraj (2015)[15] and Kumar *et al.* (2020)[16] in legume. The increase of plant height due to application of organic fertilizer applied aerially for better nutrient uptake, metabolization efficiency resulting in increased cell division and enhancement of cell size.

Table 5 The monocot plant, *A.cepa* was better performed in a consistent manner when it was treated with T4 formulation. The observed data on shoot length, root length, No. of leaves and No. of roots were observed 32.90cm, 18.76 cm and 15.40 (Avg.) and 28.20 (Avg.) respectively. The bulb weight was measured on the treated crops. The weight of the bulb was much varied when compared with the control 0.32 to 0.67 in the T4 formulation. The study exhibited that the T4 formulation was found to be more optimum for increase in bulb weight. The plant species *A. sativum* also has considerable increase in the bulb when compared with control from 0.18 to 0.34 gradually. The increase of bulb weight was a productivity parameter and it clearly shows the spray was improved the size of the bulbs considerably. The works done by Kondapa *et al.*, (2009)[17], Boyhan, *et al.*, (2001)[18], Meena, (2017)[19] and Manna *et al.*, (2016)[20] supported the present results the crops sprayed with organic formulation increased the bulb weight and size to a considerable extent. The Table 10 showed the performance of *A. sativum* growth parameters when treated with various formulations. In the T4 treatment showed the shoot length was increased up to 33.16cm, Root length up to 28.06 cm and average No. of leaves per bulb was 4.80 in treated plants from 4.00 when compared with control. The above results of the work also supported El sayed *et al.,* (2015)[21] the increase in productivity and vegetative characters with enhanced photosynthetic apparatus will give the good reproductive capacity by means of foliar spray.

Finally, the physiological parameters such as total chlorophyll content were observed for 4 studied crop species. The dicot crops *T. foenum graecum* and *V.radiata* have no much variation in the chlorophyll content due to the treatment. The monocot crops species *A. cepa* and *A. sativum* the total chlorophyll content was increased from 0.29 to 0.65mg/g in T4 treatment and 0.49mg/g in T3 treatment hence the foliar consortia have effective and

positive result over the physiological growth of the plant.

The foliar consortia have the source of potassium prepared from the domestic wastes which increases the chlorophyll content and referred as photosynthates in the study plants, the results were also confirmed by Sakpal, (2015)[22] and Sarkar and Pal, (2006)[23] the foliar application with more potassium will make the crop to be more efficient in chlorophyll production and transform the plants physiologically more active. Enhanced potassium will make the plant more active in producing photosynthates which results in higher pod and grain yield.

The overall study exhibits foliar consortia has considerable role in the growth and development of studied crop species. Hence the present study clearly shows the productivity of the plant increased and supports at all levels when treated with various formulation.

Table 1- Showing the composition of foliar spray for different treatments.

S.No.	Treatments	Volume of foliar master solution (ml)	Volume of water (ml)	Volume of neem oil (ml)
1	Control	-	100	2
2	Treatment 1	25	75	2
3	Treatment 2	50	50	2
4	Treatment 3	75	25	2
5	Treatment 4	100	-	2

Table 2- Showing the survivability rate of foliar spray treated *Trigonella foenum-graecum*

Sl. No.	Treatment	% of survival			
		Trigonella foenum-graecum	***Vigna radiata***	***Allium cepa***	***Allium sativum***
1	Control	97.33	97.33	100.00	100.00
2	T1	94.66	96.00	100.00	100.00
3	T2	96.00	94.67	94.44	100.00
4	T3	70.66	93.33	100.00	100.00
5	T4	52.00	94.67	100.00	100.00

Table 3- Showing the growth parameters of *Trigonella foenum-graecum* after foliar spraying.

Treatment	Shoot length(cm)	Root length(cm)	No. Of leaves	Leaf surface area(cm^2)	Petiole length(cm)
Control	10.28 ± 0.64	4.75±0.33	4.20±1.79	1.27±0.11	1.10±0.28
T1	10.88±0.95	4.44±1.02	8.40±1.34	1.53±0.17	1.20±0.06
T2	11.44±0.79	5.52±1.21	9.00±0.00	1.56±0.21	1.25±0.40
T3	7.90±0.44	5.20±1.19	4.20±0.84	1.12±0.24	0.95±0.23
T4	7.60±0.84	5.21±0.75	4.00±0.00	1.03±0.33	0.95±0.16

Table 4- Showing the growth parameters of *Vigna radiata* after foliar spraying

Treatment	Shoot length(cm)	Root length(cm)	No. of leaves	Leaf surface area(cm^2)	Petiole length(cm)	Internodal length(cm)
Control	21.75±0.87	3.30±0.26	2.00±0.00	4.23±0.09	0.20±0.14	
T1	22.31±0.93	4.20±1.13	2.20±1.42	4.74±0.14	0.22±0.24	0.70±0.02
T2	22.83±1.03	4.83±1.61	2.80±0.73	4.81±0.21	0.32±0.28	0.70±0.02
T3	24.16±0.29	5.62±0.92	5.00±0.00	4.96±0.32	0.50±0.08	0.80±0.03
T4	23.10±0.94	4.62±1.72	2.00±0.00	4.08±0.12	0.20±0.45	

Table 5- Showing the growth parameters of *Allium cepa* after foliar spraying

Treatments	Shoot length(cm)	Root length(cm)	No. of leaves	No. of root	Bulb weight(g)
Control	27.94±3.13	11.80±3.51	11.30±3.27	16.40±2.40	0.32±0.01
T1	30.00±2.18	16.08±2.92	12.60±2.70	26.00±2.18	0.46±0.04
T2	31.28±4.37	17.50±3.00	14.30±2.08	31.00±2.25	0.58±0.01
T3	31.56±2.49	17.56±1.48	15.20±1.64	28.00±2.58	0.62±0.03
T4	32.90±4.41	18.76±2.54	15.40±1.88	28.20±2.73	0.67±0.03

Table 6- Showing the growth parameters of *Allium sativum* after foliar spraying

Treatments	Shoot length(cm)	Root length(cm)	No. of leaves	No. of root	Bulb weight(g)
Control	30.10±3.32	14.80±2.16	4.00±0.00	10.80±1.84	0.18±0.02
T1	28.86±5.66	16.44±2.40	4.20±0.71	16.40±3.51	0.21±0.05
T2	27.78±5.62	26.60±2.28	4.00±0.00	18.20±1.92	0.26±0.03
T3	30.36±5.25	27.23±2.22	4.16±0.71	16.00±1.30	0.31±0.03
T4	33.16±5.10	28.06±3.25	4.80±0.45	12.00±1.58	0.34±0.01

Table 7- Showing the chlorophyll content of foliar spray treated plant *Trigonella foenum-graecum*

Treatments	Chlorophyll a ($mg\ g^{-1}$)	Chlorophyll b ($mg\ g^{-1}$)	Total chlorophyll ($mg\ g^{-1}$)
Control	0.14	0.10	0.24
T1	0.05	0.06	0.10
T2	0.07	0.08	0.15
T3	0.05	0.06	0.11
T4	0.04	0.06	0.09

Table 8- Showing the chlorophyll content of foliar spray treated plant *Vigna radiata*

Treatments	Chlorophyll a ($mg\ g^{-1}$)	Chlorophyll b ($mg\ g^{-1}$)	Total chlorophyll ($mg\ g^{-1}$)
Control	0.61	0.35	0.95
T1	0.45	0.19	0.65
T2	0.58	0.23	0.81
T3	0.64	0.26	0.91
T4	0.61	0.25	0.86

Table 9- Showing the chlorophyll content of foliar spray treated plant *Allium cepa*

Treatments	Chlorophyll a ($mg\ g^{-1}$)	Chlorophyll b ($mg\ g^{-1}$)	Total chlorophyll ($mg\ g^{-1}$)
Control	0.19	0.09	0.29
T1	0.18	0.06	0.24
T2	0.19	0.06	0.25
T3	0.26	0.09	0.35
T4	0.33	0.11	0.45

Table 10- Showing the chlorophyll content of foliar spray treated plant *Allium sativum*

Treatments	Chlorophyll a ($mg\ g^{-1}$)	Chlorophyll b ($mg\ g^{-1}$)	Total chlorophyll ($mg\ g^{-1}$)
Control	0.19	0.10	0.29
T1	0.26	0.13	0.40
T2	0.29	0.14	0.43
T3	0.32	0.16	0.49
T4	0.43	0.22	0.65

Table 11- Showing the carbohydrates content of foliar spray treated crops

Treatments	*Trigonella foenum-graecum* ($mg\ g^{-1}$)	*Vigna radiata* ($mg\ g^{-1}$)	*Allium cepa* ($mg\ g^{-1}$)	*Allium sativum* ($mg\ g^{-1}$)
Control	5.40	4.80	1.00	12.60
T1	8.80	7.60	6.00	13.20
T2	9.40	16.40	7.00	17.40
T3	6.00	15.40	8.20	18.60
T4	4.40	8.20	10.60	20.20

Table 12- Showing the protein content of foliar spray treated crops

Treatments	*Trigonella foenum-graecum* (mg g^{-1})	*Vigna radiata* (mg g^{-1})	*Allium cepa* (mg g^{-1})	*Allium sativum* (mg g^{-1})
Control	3.12	4.00	3.00	3.60
T1	1.80	2.40	2.00	2.25
T2	2.40	2.40	2.30	2.30
T3	2.00	4.60	3.20	2.80
T4	1.60	4.20	3.50	4.60

Table 13- Showing the total free aminoacids content of foliar spray treated crops

Treatments	*Trigonella foenum-graecum* (mg g^{-1})	*Vigna radiata* (mg g^{-1})	*Allium cepa* (mg g^{-1})	*Allium sativum* (mg g^{-1})
Control	1.80	1.20	0.90	1.30
T1	1.60	1.80	0.40	1.30
T2	2.20	1.85	0.60	1.80
T3	2.00	2.40	1.00	1.90
T4	1.40	0.60	1.30	2.30

Table 14- Showing the nutritional analysis of T2 foliar liquid formulation

S.No.	Parameters	Unit	Result
1	pH @ 25°C		5.63
2	Electrical Conductivity	mS/cm	3.6
3	Total Nitrogen as N	%	1.02
4	Total Phosphorus as P	%	0.93
5	Potassium as K	mg/L	0.103
6	Total Organic Carbon	%	9.11
7	Arsenic as As	mg/L	BDL [DL 0.1]
8	Lead as Pb	mg/L	BDL [DL 0.1]
9	Cadmium as Cd	mg/L	BDL [DL 0.1]
10	Chromium as Cr	mg/L	0.02
11	Copper as Cu	mg/L	3.21
12	Zinc as Zn	mg/L	18.6
13	Nickel as Ni	mg/L	0.03
14	Manganese as Mn	mg/L	49.3
15	Boron as B	mg/L	19.2
16	Molybdenum as Mo	mg/L	0.01
17	Iron as Fe	mg/L	1372
18	Chloride as Cl	mg/L	600
19	Calcium as Ca	mg/L	1723
20	Magnesium as Mg	mg/L	292
21	Sulphate as SO4	mg/L	374

Table 15- Showing the nutritional analysis of T4 foliar liquid formulation

S.No.	Parameters	Unit	Result
1	pH @ 25°C		5.69
2	Electrical Conductivity	mS/cm	4.43
3	Total Nitrogen as N	%	1.23
4	Total Phosphorus as P	%	0.78
5	Potassium as K	mg/L	0.18
6	Total Organic Carbon	%	8.38
7	Arsenic as As	mg/L	BDL [DL 0.1]
8	Lead as Pb	mg/L	BDL [DL 0.1]
9	Cadmium as Cd	mg/L	BDL [DL 0.1]
10	Chromium as Cr	mg/L	0.01
11	Copper as Cu	mg/L	4.73
12	Zinc as Zn	mg/L	23.7
13	Nickel as Ni	mg/L	0.01
14	Manganese as Mn	mg/L	48.4
15	Boron as B	mg/L	19.5
16	Molybdenum as Mo	mg/L	0.02
17	Iron as Fe	mg/L	1539
18	Chloride as Cl	mg/L	1050
19	Calcium as Ca	mg/L	1884
20	Magnesium as Mg	mg/L	1166
21	Sulphate as SO4	mg/L	654

CONCLUSION

The main aim of present-day agriculture is to increase the healthy productivity of crops in an eco-friendly manner. By keeping this theme as a central idea, the present work was carried out to evaluate and determine the foliar spray made out of domestic wastes which is commonly available in our day-to-day life. Recently many foliar spray or consortia are available in but all are made out of chemicals. The chemicals may cause many dangerous effects on the plants and it may also affect the human systems too. Hence to overcome these problems it is necessary to prepare a eco-friendly foliar spray that should enhance the growth and productivity of the crop at all levels. The present foliar spray which was prepared, tested, treated and evaluated was most reliable and given a good result on enhancing the growth of the plant in both monocots and dicot plants. The present study was taken to the next level and the ways to commercial production will be identified. The study will really helpful to the farmers at all the levels and it is will have a remarkable achievement in the waste management system.

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