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Effect of herbal extracts and di-ammonium phosphate on the biochemical parameters of green gram (*Vigna radiata* L. – var. Co6)

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ABSTRACT

Biological inputs through seed and foliar nutrition are ideal for improving crop yield and are environmentally safe. It is also gaining more attention in recent past years because of its biosafety nature. Hence, an experiment was conducted to study the influence of herbal extracts (sweet basil and Lantana) and DAP singly and in combination on the biochemical parameters of green gram (*Vigna radiata* L.). There were six treatments T₁(DAP – 2%), T₂(Sweet basil leaf extract (10%)), T₃(Lantana leaf extract (10%)), T₄(DAP 2% and sweet basil leaf extract (10%)), T₅(DAP 2% and Lantana leaf extract (10%)) and T₆(DAP 2% and Lantana leaf extract (10%) and sweet basil leaf extract (10%)) with control red soil. The biochemical parameters observed indicated that chlorophyll 'a' was maximum in T₆ plants on 45 DAS T₁ plants on 60 DAS and T₄ plants on 75 DAS. Chlorophyll 'b' was more in T₅ on 45 DAS and on 60 and 75 DAS it was more in T₂ plants. Total chlorophyll was more in T₂ on 45 DAS, and T₅ showed more contents on 60 and 75 DAS. Protein content was more in T₆ plants on 45th and 60th DAS and T₄ plants showed maximum protein content on 75 DAS. Total carbohydrates content was maximum in T₃ on 45 and 75 DAS and on 60 DAS it was in T₆ plants. Highest content of ascorbic acid was observed in T₅ on 45 and 60 DAS and in T₆ on 75 DAS. From the investigation it is concluded that the foliar application of herbal extracts of Lantana and sweet basil could be an ideal and suitable green manure for green gram.

Key words: biochemical parameters, green gram, green manure, herbal extracts.

INTRODUCTION

The old traditional agriculture practice was based on some kind of rotational system and was entirely dependent on soil organic matter and manure. But the modern agriculture practice, intensive and continuous due to increased human population and pressure on land, is based on development of improved varieties of crops, chemical fertilizers and pesticides. But the tropics where the human populations are more and poor do not have the adequate infrastructure, particularly economy, necessary for sustained intensive agriculture. In such a context it is essential that agriculture practices give priority to agro-forestry or herbaceous legume based cropping system based on local conditions and regulates soil fertility by biological processes. This could be done by increased efficiency of the use of natural resources which is otherwise known as organic farming.

Green manures can be used to interrupt pest and disease cycles in much the same way as crop rotation. Particular green manures can be used to control root knot nematodes and root rot fungal pathogens, reducing the need to use toxic chemical for soil. Like green manuring, green leaf manuring is also being practiced. It is always good for soil treatments, if soil contain any chemical or waste like oil, alkali or some other non-degradable material. The toxic material can be degraded by using green leaf manure and improve soil water holding capacity, porosity, nutrient value and pH [1].

Pulses are the world's major source of plant protein. The productivity of green gram is declined due to inadequate plant stand heavy flower drop and immature pod abscission leading to poor seed setting besides unfavourable environment. Therefore, the solution to increase the productivity is to develop a method by which the seed vigour and viability could be maintained. The present study was conducted to assess the effect of DAP along with herbal leaf extracts on biochemical parameters of the seedlings at different stages of growth.

MATERIALS AND METHODS

Pot culture experiment

The pot culture experiment was conducted at Avinashilingam Deemed University for Women, Coimbatore -641 043, Tamil Nadu, India. Red sandy loam soil was collected from Karimangalam, Dharmapuri (District), Tamil Nadu, India. Seeds of green gram (*Vigna radiata* Var. Co.6) were bought from Department of Pulses, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India. *Lantana* and sweet basil leaves were collected from Avinashilingam University campus. Leaf extracts were prepared by grinding the leaves, filtered and used afresh. The soil was cleaned absolutely by removing stones and other unwanted materials and was homogenized properly by mixing red soil and sand at 1 : 1 ratio and filled in pots having 7 kg capacity. The treatments were given as foliar spray on 30th day, 45th day and 60th day after sowing (DAS) the seeds. The dosage was as per the recommendations of Tamil Nadu Agricultural University, Coimbatore.

Treatments

- | | | | |
|----|----------------|---|---|
| 1. | T ₀ | - | Control |
| 2. | T ₁ | - | DAP(Di-Ammonium Phosphate) – 2% |
| 3. | T ₂ | - | Sweet basil leaf extract (10%) |
| 4. | T ₃ | - | <i>Lantana</i> leaf extract (10%) |
| 5. | T ₄ | - | DAP – 2% and sweet basil leaf extract (10%) |
| 6. | T ₅ | - | DAP – 2% and <i>Lantana</i> leaf extract (10%) |
| 7. | T ₆ | - | DAP – 2% and <i>Lantana</i> leaf extract (10%) and sweet basil leaf extract (10%) |

Analysis of biochemical parameters

Biochemical parameters Chlorophyll [2], Protein [3], Total carbohydrates [4] and Ascorbic acid [5] were estimated on 45, 60 and 75 DAS for leaves.

Statistical Data Analysis

The data obtained from various biochemical observations were subjected to statistical analysis as per the procedure outlined by [6]. Based on the results inferences were drawn whenever the treatment differences were significant, critical differences were worked out.

RESULTS AND DISCUSSION

The results of the experiments conducted on *Vigna radiata* with the foliar spray of sweet basil, *Lantana camara*, Di-ammonium phosphate on biochemical parameters were statistically analysed and presented below (Table 1 and 2).

Biochemical Parameters

Chlorophyll

Chlorophyll 'a', 'b' and 'total' chlorophyll were observed on 45, 60 and 75 DAS. The maximum content of chlorophyll 'a' was observed in T₆ (DAP + Sweet basil + *Lantana* spray) on 45 DAS as 399.2 mg/g. Later it was increased on 60 DAS in T₁ (DAP) as 570.86 mg/g and on 75 DAS it was in T₄ (DAP + Sweet basil spray) 811.73 mg/g (Table 1). The maximum chlorophyll 'b' content was observed in T₅ (DAP + *Lantana*) on 45 DAS as 282.99 mg/g and it was increased in T₂ (Sweet basil spray) on 60 DAS and 75 DAS as 285.09 mg/g and 399.04 mg/g respectively. Total chlorophyll content was maximum in T₂ (Sweet basil spray) on 45 DAS as 80.80 mg/g and it showed an increase to 165.16 mg/g and 236.42 mg/g in T₅ (DAP + *Lantana* spray) on 60 DAS and 75 DAS. All the chlorophyll contents (a, b and total) were least in control plants on 45, 60 and 75 DAS as 285.04, 314.06, 320.25, 106.09, 118.64, 163.05, 56.55, 77.40 and 105.12 respectively.

According to [7] chlorophyll 'a', 'b' and 'total' chlorophyll contents were found to be significantly increased in leaves of plants treated with *Cyanospray* and *Cyanopith* 500 g/sq.m. Humic acid application significantly influenced total chlorophyll content and this effect was mainly on chlorophyll 'b' content. Foliar 200 ml/L and soil 20 ml/L humic acid application resulted in the highest total chlorophyll content of pepper [8]. Combined application of DAP and herbal extracts might have supplied the required nutrients for the enhancement of chlorophyll contents in the present study.

TABLE 1 INFLUENCE OF HERBAL EXTRACTS AND DAP ON THE CHLOROPHYLL CONTENTS OF GREEN GRAM

Treatments	Chlorophyll 'a' (mg / g)			Chlorophyll 'b' (mg / g)			'Total' chlorophyll (mg / g)		
	45 DAS	60 DAS	75 DAS	45 DAS	60 DAS	75 DAS	45 DAS	60 DAS	75 DAS
T ₀	285.04	314.06	320.25	106.09	118.64	163.05	56.55	77.40	105.12
T ₁	333.64	570.86	613.24	132.62	184.09	206.12	63.21	111.84	175.01
T ₂	334.75	361.92	696.45	118.64	285.09	399.04	80.80	133.47	232.08
T ₃	363.84	370.90	749.11	164.60	179.55	248.18	71.55	130.66	138.85
T ₄	379.88	437.09	811.73	201.14	159.91	299.28	77.40	142.31	137.12
T ₅	252.72	347.09	572.74	282.99	106.03	388.94	71.31	165.16	236.42
T ₆	399.21	416.73	491.81	142.89	110.92	251.91	60.12	107.35	167.03
SEd	4.2527			1.8557			4.0039		
CD (0.05)	9.2660			4.0433			8.7237		
CD (0.01)	12.9908			5.6687			12.2305		

SEd : Standard Error Deviation; CD : Critical Difference; The values indicate average of three replications.

Protein

The maximum protein content was shown on 45th day, 60th day by T₆ (DAP + *Lantana* + Sweet basil spray) 68.72 mg/g, 77.93 mg/g, on 75 DAS it was more in T₄ (DAP + Sweet basil) as 91.46 mg/g (Table 2). The control plants registered lower content on 45, 60 and 75 DAS (44.72, 48.93 and 58.16 mg/g respectively). Significantly more protein content was recorded in mulberry plants grown in the presence of green manure. The higher nutritional levels of mulberry are attributed to the increased root growth resulting in greater uptake of nutrients from soil [9]. [10] observed significantly higher crude protein content in mulberry leaves by application of green manure.

Carbohydrates

The highest carbohydrates content was found in T₃ (*Lantana* spray) on 45th day and 75th day 46.81 mg/g and 100.65 mg/g respectively. On 60th day it was more in T₆ (DAP + *Lantana* + Sweet basil spray) as 63.61 mg/g. The decreased content of carbohydrates in control plants (T₀) on 45, 60 and 75 DAS was 22.65 mg/g, 26.11 mg/g, 31.77 mg/g respectively. [11] also showed increased morphological and biochemical contents like protein, carbohydrates, amino acids in the seedling of *H. annuus* by using cyanopith and cyanospray.

Ascorbic Acid

Ascorbic acid content was analysed in leaves. The highest ascorbic acid content had been observed in T₅ (DAP + *Lantana* spray) on 45 and 60 DAS (288.86 mg/g and 350.93 mg/g). On 75 DAS ascorbic acid content was more in T₆ (DAP + Sweet basil + *Lantana*) as 538.93 mg/g (Table 2). The lowest ascorbic acid content was observed in control plants T₀ on 45, 60 and 75 DAS as 225.60 mg/g, 238.13 mg/g and 240.16 mg/g respectively.

As per a study by [12] the protein, carbohydrates, reducing sugar and chlorophyll 'a', 'b' and 'total' of soy bean was improved by biodynamic compost. This study supports the concept that organic manuring is ideal and suitable for improving quality of the produces.

TABLE 2 INFLUENCE OF HERBAL EXTRACTS AND DAP ON THE PROTEIN, CARBOHYDRATES AND ASCORBIC ACID CONTENTS OF GREEN GRAM

Treatments	Protein (mg / g)			Total Carbohydrates (mg / g)			Ascorbic acid (mg / g)		
	45 DAS	60 DAS	75 DAS	45 DAS	60 DAS	75 DAS	45 DAS	60 DAS	75 DAS
T ₀	44.72	48.93	58.16	22.65	26.11	31.77	225.60	238.13	240.16
T ₁	51.97	66.70	80.13	31.04	35.19	74.21	231.46	287.02	376.00
T ₂	59.65	61.56	84.99	29.99	45.58	63.55	272.58	337.14	379.60
T ₃	51.90	72.90	83.77	46.81	59.46	100.65	230.86	300.80	386.48
T ₄	52.24	60.91	91.46	33.41	58.67	71.05	248.26	320.82	396.00
T ₅	61.99	75.36	79.25	27.89	62.55	81.84	288.80	350.93	357.20
T ₆	68.72	77.93	85.42	32.102	63.61	69.30	225.60	238.13	538.93
SEd	0.2984			17.7846			81.8674		
CD (0.05)	0.6502			38.7497			178.3754		
CD (0.01)	0.9115			54.3264			250.0793		

SEd : Standard Error Deviation; CD : Critical Difference; The values indicate average of three replications.

CONCLUSION

The concept of green farming actually seeks to re-establish the balance of energy in nature without using the chemical fertilizers and pesticides. This farming system is mainly based upon traditional methods / techniques derived on sound ecological principles. The ill-effects of chemicals used in agriculture have changed the mindset of some consumers of different countries who are now buying organic with high premium for health. From the present study at pot level experiment has proved the utility of herbals as a source of green manuring. Further research investigations at the field level may be conducted to determine the utility for farmers.

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