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EFFECT OF INORGANIC FERTILIZERS AND HERBAL LEAF EXTRACTS ON BIOCHEMICAL PARAMETERS OF BLACK GRAM (*Vigna mungo* L)

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ABSTRACT
Green manures play a key role in providing subsequent crops with nutrients, maintaining soil quality, and helping to control weeds and pests . The most important features of a green manure are large dry matter production and high ability to fix nitrogen. Green manure can be used directly or after composting as a nutrient input that will, after decomposition, be taken up by crops to produce biomass and grain. The effectiveness of green manuring as a soil fertility management technology depends on the stage of crop during incorporation, placement (incorporated or surface placement), nutrient content and carbon to nitrogen ratio of material which influences decomposability and mineralization. In the present study, the efficacy of certain organic and inorganic fertilizers on the biochemical parameters such as chlorophyll, protein and carbohydrates were analyzed. It was found that the Di ammonium phosphate and leaf extract either singly or in combination showed higher biochemical activity.

KEY WORDS: Black gram, carbohydrate, chlorophyll, inorganic fertilizers, organic fertilizers, protein.

INTRODUCTION
Vigna mungo, known as black gram, black lentil, white lentil, black *matpe* bean, is a bean grown in Indian subcontinent. It, along with the mung bean, was placed in *Phaseolus*, but has since been transferred to *Vigna*. At one time it was considered to belong to the same species as the mung bean. The product sold as "black lentil" is usually the whole urad bean or *urad dal*. The product sold as "white lentil" is the same lentil with the black skin removed. Black gram originated in India, where it has been in cultivation from ancient times and is one of the most highly prized pulses of India. It is an erect, suberect or trailing, densely hairy, annual herb. The tap root produces a branched root system with smooth, rounded nodules. The pods are narrow, cylindrical and up to six cm long. The nutritional analysis revealed that these beans possess rich protein content; hence, their protein isolates can be easily made. Protein isolate can serve as a nutritional supplement because protein malnutrition is one of the major problems in the developing countries and animal proteins are more expensive as compared to plant protein and so people are more dependent on plant proteins (Butt and Baloat, 2010). Black gram seeds are highly nutritious containing high amount of protein (24 – 26%) and are reported to be rich in potassium, phosphorus and calcium. It is also reported to be rich in vitamins A, B and B_3. The increase in crop productivity is by way of helping in solubilization of insoluble phosphorus, stimulating growth by providing hormones, vitamins and growth factors. The availability of phosphorus to legume crop is a key constraint in its production. The soil microorganisms are responsible for transfer of the immobilized soil phosphorus into available form through which phosphorus is easily available to these legume crops (Singh *et al.*, 2008). Makeen *et al.* (2007) suggested that the main pigments of black gram is chlorophyll a. Erulan *et al.* (2009) have studied the effects of seaweed liquid fertilizer (*Sargassum polycystum*) on seed germination, growth, yield, biochemical parameters and pigment characteristics of *Cajanus cajan*. Organic manures such as Farm Yard Manure, green manure in the form of leaf extracts, etc. when incorporated into the soil not only add the nutrients such as nitrogen etc. but the soil is enriched by the fixation of the atmospheric nitrogen.

MATERIALS AND METHODS
A study was conducted to assess the effect of leaf extracts on biochemical parameters of black gram.

Collection of various materials
Red sandy loam soil was collected from Kovaipudur Pirivu, Coimbatore.

Collection of seeds
The seeds of black gram (*Vigna mungo* L.var.co.6) were procured from Department of Pulses, Tamil Nadu Agricultural University, Coimbatore.

Collection of *Ocimum basilicum* and *Lantana camara*
Ocimum basilicum and *Lantana camara* leaves were collected from Kovaipudur Pirivu, Coimbatore. Leaf extracts were taken afresh by grinding the leaves in a mixie and filtering with the help of a muslin cloth.

Farm yard manure
Farm Yard Manure (FYM) is prepared basically using cow dung. It is highly useful to increase the fertility of the soil.

Herbal extract
1. *Ocimum basilicum* L.
The other names are basil, garden basil and sweet basil. The plant belongs to the family Lamiaceae. Basil is a low growing (30 – 100 cm) annual plant. It has slightly hairy stem and ovate, entire to slightly toothed leaves. The plant is generally used in treatments for problems concerning

digestion and nervous system. Leaves are taken (fresh or dried) in case of fever, abdominal cramps, gastro-enteritis, nausea and poor digestion.

2. *Lantana camara* L.

Lantana camara L. belongs to the family Verbenaceae. It grows as a perennial shrub. Leaves are opposite, ovate with very small rounded teeth, somewhat rough and hairy. Leaves are aromatic when crushed. Flowers are borne in dense clusters. Fruits are fleshy, greenish that changes to black and each fruit contain one seed. The methanolic extract of *Lantana camara* show healing of gastric ulcers and also prevents development of duodenal ulcers in rat.

Chemical Fertilizer

1. Di-Ammonium Phosphate

Di-Ammonium Phosphate (DAP) is used as a chemical fertilizer. When applied to plant, it temporarily increases the soil pH resulting in increased growth of the plant.

2. Super Phosphate

- It is a cost effective fertilizer for pasture development.
- Ideal for capital or maintenance applications
- Readily available phosphorus and sulphur.
- Super phosphate sulphur is a readily available form of sulphate for plants to absorb.

Methods

The soil was cleaned by removing stones and other unwanted materials. The red soil and sand soil were mixed in the ratio of 1: 1 and also FYM is well mixed and filled in pots having 7 kg capacity. A study was conducted to assess the effect of leaf extracts (*Ocimum basilicum* and *Lantana camara*) and chemical fertilizer (di-ammonium phosphate and super phosphate) singly and in combination on the biochemical parameters. The treatments were given at every 10 days interval *i.e.*, on 25th day, 35th day and 45th day after sowing the seeds. The leaf extracts and chemical fertilizers were used singly and in combination also to observe the change in biochemical parameters.

Treatment details:

T_0-Control
T_1-Di-ammonium phosphate (DAP) – (1%)
T_2-Super phosphate (SP) – (1%)
T_3-Leaf extract of *Ocimum basilicum* (extract 1) – (1%)
T_4-Leaf extract of *Lantana camara* (extract 2) – (1%)
T_5-Combination of both the leaf extracts
T_6-DAP + leaf extracts 1 and 2
T_7-DAP + SP + leaf extracts 1 and 2

BIOCHEMICAL PARAMETERS

Chlorophyll – estimated on 35th, 45th and 55th days **(Arnon, 1949)**

Protein – estimated on 35th, 45th and 55th days **(Lowry *et al.*, 1951)**

Total carbohydrate – estimated on 35th, 45th and 55th days **(Hedge and Hofreiter , 1962).**

The above parameters were estimated by collecting leaf samples.

RESULTS & DISCUSSION

The experiments were conducted in black gram (*Vigna mungo* L.) with two different leaf extracts (*Ocimum basilicum* and *Lantana camara*) and chemical fertilizers such as di-ammonium phosphate and super phosphate on the biochemical parameters. All the parameters have been statistically analysed.

TABLE : 1 Influence of inorganic fertilizers and leaf extracts on the chlorophyll "a", chlorophyll "b" & "Total" chlorophyll content (mg / g) of black gram (*Vigna mungo* L.)

Treatment	Chlorophyll 'a' (mg / g)			Chlorophyll 'b' (mg / g)			'Total' Chlorophyll (mg / g)		
	35th day	45th day	55th day	35th day	45th day	55th day	35th day	45th day	55th day
T_0	2.38 ± 0.02	1.75 ± 0.03	0.84 ± 0.04	2.03 ± 0.05	0.86 ± 0.03	0.71± 0.06	2.75 ± 0.07	1.44 ± 0.02	1.68 ± 0.05
T_1	3.02 ± 0.03	4.01 ± 0.03	8.34 ± 0.01	2.28 ± 0.04	2.23 ± 0.05	4.84 ± 0.04	3.24 ± 0.01	3.55 ± 0.04	7.67 ± 0.21
T_2	2.68 ± 0.02	1.88 ± 0.01	6.34 ± 0.01	2.72 ± 0.04	1.22 ± 0.03	3.95 ± 0.07	3.48 ± 0.05	1.82 ± 0.03	6.00 ± 0.06
T_3	5.34 ± 0.03	2.52 ± 0.03	2.37 ± 0.03	3.95 ± 0.07	1.56 ± 0.05	1.83 ± 0.02	5.61 ± 0.07	2.38 ± 0.04	2.56 ± 0.13
T_4	5.33 ± 0.02	2.21 ± 0.02	5.13 ± 0.02	3.19 ± 0.08	1.74 ± 0.04	3.09 ± 0.02	4.92 ± 0.08	2.42 ± 0.04	4.76 ± 0.02
T_5	3.36 ± 0.03	3.02 ± 0.01	0.94 ± 0.02	2.04 ± 0.07	1.77 ± 0.03	4.80 ± 0.03	3.13 ± 0.06	2.76 ± 0.03	4.65 ± 0.04
T_6	4.20 ± 0.03	2.03 ± 0.03	1.83 ± 0.02	3.39 ± 0.04	1.28 ± 0.06	1.84 ± 0.06	4.67 ± 0.03	1.92 ± 0.08	2.36 ± 0.06
T_7	2.86 ± 0.02	3.46 ± 0.03	6.57 ± 0.02	2.22 ± 0.05	2.07 ± 0.12	1.46 ± 0.04	3.10 ± 0.04	3.23 ± 0.07	3.17 ± 0.05
SEd	0.02045			0.04341			0.05195		
CD (P < 0.05)	0.04113			0.08728			0.10445		

Values are mean ±SD of three samples in each group
SEd – Standard Error Deviation
CD – Critical Difference

Biochemical Parameters

The biochemical parameters such as chlorophyll a, chlorophyll b, total chlorophyll, protein and carbohydrate were analysed on 35th, 45th and 55th days and the results are tabulated.

Chlorophyll

The maximum chlorophyll 'a' was observed in T_3 (*Ocimum basilicum*) on 35th day and the value was found to be 5.34 mg / gm (Table – 1).On 45th and 55th day, the chlorophyll content increased in T_1 (DAP) and the values

were 4.01 and 8.34 mg / g.The chlorophyll 'b' content was more in T_3 on 35th day (3.95 mg / g). On 45th and 55th day, the maximum chlorophyll 'b' was found in T_1 (DAP) and the values were 2.33 and 4.84 mg / g. The highest total chlorophyll content was obtained in T_3 (*Ocimum basilicum*) on 35th day and the value was 5.61 mg / g. On 45th and 55th day, the maximum total chlorophyll content was found to be 3.55 and 7.67 mg / g in T_1 (DAP). Least chlorophyll content was observed in control plants (T_0) on 35th, 45th and 55th day and the readings were found to be 2.38, 1.75, 0.84 mg / g (chlorophyll 'a'), 2.03, 0.86, 0.71 mg / g (chlorophyll 'b') and 2.75, 1.44 and 1.68 mg / g (total chlorophyll) respectively .The observations of the present work agrees with the previous findings obtained in other vegetable crops (Arisha and Beadisi, 1999 and Al-Tarawneh, 2005). Abbasniayzare (2012) have shown that the use of biofertilizers (NK and Barvai) increases the chlorophyll content. According to Mahla *et al.* (1999), the application of NAA and mixtalol NAA spray, increased the chlorophyll contents in leaves of black gram.

Protein

The highest protein content was present in T_4 on 35th and 45th day and the readings were 0.82 and 2.26 mg / g. On 55th day, the protein content increased in T_3 and the value was 5.20 mg / g (Table – 2). The protein content was low in control plants on 35th, 45th and 55th day and the readings were 0.40, 1.64 and 3.05 mg / g respectively. Experiment in chick pea by Mohammadi *et al.* (2010) has shown that application of green manure increases the protein content of the seed. In *Amaranthus dubius,* Manoharan *et al.* (2011) showed an increase in the amount of carbohydrate and protein in plant treated with cyanospray compared to other treatments.

TABLE 2: Influence of inorganic fertilizers and leaf extracts on the Protein and carbohydrate content of black gram (*Vigna mungo* L.)

Treatment	Protein content (mg / g)			Carbohydrate Content (mg / g)		
	35th day	45th day	55th day	35th day	45th day	55th day
T_0	0.40 ± 0.03	1.64 ± 0.05	3.05 ± 0.08	26.96 ± 0.28	56.44 ± 0.17	58.46 ± 0.22
T_1	0.66 ± 0.07	1.92 ± 0.05	3.27 ± 0.05	62.01 ± 0.34	64.10 ± 0.17	72.85 ± 0.33
T_2	0.58 ± 0.08	2.16 ± 0.08	3.73 ± 0.07	72.30 ± 0.49	81.13 ± 0.39	93.14 ± 0.17
T_3	0.51 ± 0.05	1.86 ± 0.05	5.20 ± 0.05	52.08 ± 0.22	63.66 ± 0.17	97.21 ± 0.28
T_4	0.82 ± 0.07	2.26 ± 0.12	4.53 ± 0.07	81.60 ± 0.28	100.10 ± 0.29	104.76 ± 0.41
T_5	0.56 ± 0.12	1.88 ± 0.07	3.89 ± 0.07	84.13 ± 0.28	106.00 ± 0.17	108.27 ± 0.35
T_6	0.56 ± 0.07	1.82 ± 0.07	3.56 ± 0.07	63.29 ± 0.22	70.61 ± 0.28	94.28 ± 0.22
T_7	0.63 ± 0.07	2.02 ± 0.08	4.80 ± 0.08	64.06 ± 0.22	78.86 ± 0.28	105.87 ± 0.31
SEd	0.05834			0.23035		
CD (P < 0.05)	0.11731			0.46317		

Values are mean ±SD of three samples in each group
SEd – Standard Error Deviation
CD – Critical Difference

Carbohydrate

The carbohydrate was higher in T_5 (*Ocimum basilicum* and Lantana *camara*) and the values were found to be 84.13, 106 and 108.27 mg / g on 35th, 45th and 55th day respectively (Table – 2). Minimum carbohydrate content was shown by control plants on 35th, 45th and 55th day and the readings were observed to be 26.96, 56.44 and 58.46 mg / g respectively. Rajula and Padmadevi (2000) have recorded an increase in biochemical parameters like chlorophyll, protein and carbohydrate in *Helianthus annus* L. by the use of cyanopith and cyanospray.

REFERENCES

Abbasniayzare, S. K., Sedaghathoor, S. and Dankaer, M.N.P. (2012) Effect of biofertilizer application on growth parameters of *Spathiphyllum illusion. American Eurasion J. Agric. and Environ. Sci.,* **12 (5)** : 669-673.

Al-Tarawneh, A. A. (2005) Effects of two types of organic manure and NPK on growth, yield and quality of lettuce and strawberry. M.Sc. Thesis, Mu'tah University, Jordan.

Arisha, H.M. and Beadisi, A. (1999) Effect of mineral fertilizers and organic fertilizers on growth, yield and quality of potato under sandy soil conditions. *Zagazig J. Agric. Res.*, **26:** 391-405.

Arnon, D. E. (1949) Copper enzymes in isolated chloroplast. *Pl. Physiol.*,**24** : 1-5.

Butt, M. S. and Baloat, R. (2010) Nutritional and functional properties of some promising legumes protein isolates. *Pak. J. Nutr.* **9(4):** 373-379.

Erulan, V., Soundarapandian, P. Thirumaran, G. and Ananthan, G. (2009) Studies on the effect of *Sargassum polycystum* extract on the growth and biochemical composition of *Cajanus cajan* L. Mill. sp.. *American Eurasian J. Agric. and Environ. Sci.*, **6 (4)** : 392-399.

Hedge, J. E. and Hofreiter, B.T. (1962) Determination of total carbohydrate by anthrone method. In : Carbohydrate chemistry (Eds.), Whistler, R.L. and Be Miller, J.N., Academic Press, New York, P. 17.

Lowry, O. H., Rosenbrough, N. S., Farr, A.L. and Randall, R.J. (1951) Protein measurement with folin phenol reagent. *J. Biol. Chem.*, **193** : 267-273.

Mahla, C.P.S., Dacheech, R.C. and Kulhari, R.K. (1999) Effect of plant growth regulators on growth and yield of black gram *(Vigna munga* L. Hepper) at varying levels of phosphorus. *J. Crop Res.*, **18 (1)** : 163-165.

Makeen K., Sureshbabu, G., Lavanya, G.R. and Abraham, G. (2007) Studies of chlorophyll content by different methods in black gram (*Vigna mungo* L.). *International Journal of Agricultural Research*, **2** : 651-654.

Manoharan, G., Chitradevi, K. and Malliga, P. (2011) Effect of cyanopith and cyanospray biofertilizer on *Amaranthus dubius*. *International Journal of Environmental Sciences*, **2**: 352-360.

Mohammadi, K., Ghalavand, A. and Aghaalikhani, M. (2010) Study of efficacies of green manure application as chick pea pre plant. *World Academy of Science, Engineering and Technology*, **46**: 233-236.

Rajula, R.G. and Padmadevi, S.N. (2000) Effect of industrial effluents without and with BGA on the growth and biochemical content of the seedlings of the *Helianthus annus* L., *Asian Journal of Microbiology and Biotechnology Environmental Sciences*, **2 (34)** : 151-154.

Singh, R.P., Gupta, S.C. and Yadav, A.S. (2008) Effect of levels and sources of phosphorus and PSB on growth and yield of black gram (*Vigna mungo* L. Hepper). *Legume Research*, **31 (2)** : 139-141.