Original Article

Studies on the Effect of Flyash and Plant Growth Harmones on the Chlorophyll a, b and Total Chlorophyll Contents in Green Gram Leaves.

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ABSTRACT

The present investigation was conducted to find out the effect of varying levels of fly ash and growth hormones on the determination of chlorophylls. The experiments were conducted in pots with *Green gram leaves* grown with different levels of fly ash concentration, and soil was used (various combinations). The soil of newly formed Chhattisgarh state has been found to be acidic and as a result, it causes aluminium toxicity reduced micro-organism activity Mn and Fe toxicity, Ca, Mg, Mo, N, P and S deficiency. Collectively all these factors reduce chlorophyll contents of plants previous workers have used liming to get rid of aluminium toxicity. In the present work fly ash and plant hormones have been used in the pot experiments in green gram plant to study their effect in chlorophyll contents.

Keywords: Gram Leaves, Chlorophyll, Fly Ash, Aluminium Toxicity.

INTRODUCTION

Fly ash has tremendous potential as a nutrient supplement and plays a favourable role in increasing growth and yield of ground nut[11-15]. Fly ash has similar physicochemical properties with soil. It can mix homogeneously and can improve agronomic properties of soil[16]. Fly ash is the treasure of trace elements. It makes the trace element readily available to the crop when mixed with soil[17,18]. In the present work fly ash has been used to remove soil acidity. Fly ash is good source of trace elements essential for chlorophyll formation[3] other methods were followed to increase chlorophyll content[4,5]. In one case phenol and proline contents in the leaf and stem of mung bean seedlings were affected[6]. Collectively all these factors reduce chlorophyll contents of plants[1] previous workers have used liming to get rid of aluminium toxicity[2]. Auxin increased respiration rates are suggestive of parallel relationship of growth, respiratory activity and found to increase RNA synthesis in tissue of higher plants[19]. Use of fly ash ameliorates soil acidity for maximum uptake

of trace elements from fly ash which acted as a reserve of trace element when mixed in soil. Fly ash helps to retain water in the soil and also helped CO_2 evolution. The plant hormone Indole acetic acid and Gibberellic acid helped protein, oil synthesis and also increased respiration rate. Soil metabolic activities, activities of amylase invertase and protease, chlorophyll a & b, carotenoid and protein content are increased in fly ash amended soil[20-24].

MATERIALS AND METHODS

Acidic soil of Surguja district and fly ash from NTPC korba were mixed homogeneously in different proportions and kept in four kg capacity pots details are as under.

Physico-chemical properties of soil and fly ash combinations were analysed and described in the Table No. 2.

Laboratory methods were employed for physic chemical analysis as per details mentioned in the text book of soil chemical analysis by Hesse. P.R.[7]

Determination of Chlorophyll a, b and total chlorophyll[8]

Principle

Chlorophyll is extracted in 90% acetone at 663 nm and 645 nm are read in spectrophotometer (Spectronic 20). Using the absorption coefficients, the amounts of chlorophyll a, b and total chlorophyll were estimated in the leaves of Green gram.

Procedure

One gram of well mixed representative sample of leaves were finely cut and grinded with 20 ml of 80% acetone. Centrifuged (5000 rpm for 5 minutes) and supernatant liquid were transferred to a 100 ml volumetric flask. The procedure was repeated till residue was colourless. Volume was made upto 100 ml mark with 80% acetone in all three cases individually.

CALCULATION

The amount of chlorophyll were calculated using the formula mentioned below:

(1) mg of chlorophyll a/g leaves = $12.7 (A663) - 2.69 (A_{615}) \times \frac{V}{1000xW}$

(2) mg of chlorophyll b/g leaves = $22.9 (A615) - 4.68 (A_{663}) \times \frac{V}{1000xW}$

(3) mg of chlorophyll /g leaves = $20.2 (A645) - 8.02 (A_{663}) \times \frac{V}{1000xW}$

Where:

A: Absorbance at specific wave lengths.

V: Final volume of chlorophyll extract in 80% acetone

W: Fresh weight of leaves extracted.

RESULT AND DISCUSSION

Details of experimental finding are given in table no. 3.

Amount of chlorophyll a, b and total chlorophyll in the leaves of Green gram plant after fly ash treatment in the acidic soil of surguja district.

Surguja District

See table no. 3.

DISCUSSION

In the present experiment the effect of fly ash, indole acetic acid and gibberellic acid were observed in Green Gram crop in the pot experiment to study chlorophyll contents.

Sewage waste water was effective as reported by Dhankaretal[9] in pot culture.

Green Gram showed increase in chlorophyll contents by the use of pre-treated distillery effluent in some cases[10]. So best growth performance was observed in flyash amended soil, this is so because fly ash ameliorates soil acidity and reduces aluminium toxicity[11].

In the light of above finding the present work was under taken applying 30% fly ash to acidic to the soil and periodical spray of indole acetic acid gibberellic acid and their combined solution (Two Time in 100 days) Better result were obtained as described in table no. 3. Hormones regulate biochemical processes by acting upon specific enzymes. Auxin (IAA) and GA both induce growth by increased anion acid uptake by the cells. Auxin increases RNA synthesis gibberellic increased protein synthesis and prevent leaf senescence[12]. Again Ca from fly ash help auxin induced cell elongation[13]. All these fact confirm the present finding in different plant species where chlorophyll contents increased.

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Table 1. Soil, Fly ash, NPK & plant growth hormones combination used

S. NO.	COMBINATION	SYMBOL USED
1.	Plain Soil.	A
2.	80% soil + 20% fly ash + NPK (400gm: 500gm: 100gm)	B
3.	70% soil + 30% fly ash + NPK (400gm: 500gm: 100gm)	C
4.	70% soil + 30% fly ash + NPK (400gm: 500gm: 100gm) + Indole acetic acid.	D
5.	70% soil + 30% fly ash + NPK (400gm: 500gm: 100gm) + Gibberellic acid.	E
6.	70% soil + 30% fly ash + NPK (400gm: 500gm: 100gm) + Indole acetic acid + Gibberellic acid.	F

Table 2. Physico chemical properties of soil and fly ash combinations

S. No.	Symbol used	Electrical Conductivity in milli mhos/cm	pH	Compound concentration in %					Trace elements in ppm			
				SiO2	Al2O3	P2O5	SO3	Cao	N	Zn	Mo	B
1.	A	0.972	6.34	75	17	0.18	0.251	1.18	0.007	54	3.50	0.30
2.	B	0991	6.40	78	16	0.20	0.30	1.24	0.008	55	4.00	0.32
3.	C	1.09	6.50	80	16	0.22	0.35	1.30	0.008	56	4.50	0.35
4.	D	1.25	6.90	82	15	0.30	0.40	1.40	1.00	58	5.00	0.40
5.	E	1.25	6.90	82	15	0.30	0.40	1.40	1.00	58	5.00	0.40
6.	F	1.25	6.90	82	15	0.30	0.40	1.40	1.00	58	5.00	0.40

Table 3. Amount of chlorophyll in mg/gm leave after 90 days

S. No	Symbol	Amount of chlorophyll in mg/gm leave after 90 days Green gram (Phaseolus Radiatus) chlorophyll		
		chlorophyll a	chlorophyll b	Chlorophyll total
1.	A	3.104	5.647	***8.751
2.	B	3.023	6.336	***9.359
3.	C	3.476	6.607	***10.083
4.	D	3.776	7.153	**10.929
5.	E	3.978	7.518	**11.496
6.	F	4.060	8.363	**12.423

(***: P<0.05, **P=<0.04,*P=ns)