

Identification Of Variations In Plant Morphology Through Different Methods Of Gypsum Application In Tulsi (*Ocimum basilicum*)

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Abstract: This study characterized the influence of Gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) a chemical fertilizer on Tulsi (*Ocimum basilicum*) plant. The experiment was conducted with five different methods of treatments Viz. Control, Incineration, Broadcasting, Lines and spots and constant 1 ton /hec gypsum applied to the field for observing morphological variability through a randomized completely block design with four replications. Data was recorded on plant height, Plant weight, Stem weight, Leaf weight and Number of leaves. There was a great significance observed in Plant height, Plant weight and Stem weight. Interesting high morphological variability was seen constantly in the Spots treatment. Hence, the results suggest that Spots treatments works best to achieve better growth at 1 ton /hec application of gypsum.

Key words: Gypsum, Treatments, Days after plantation (DAP), NS – Not significant, S- Significant.

1. INTRODUCTION

Ocimum is cultivated in India on a commercial scale. It is grown in various parts of the country viz. in west Bengal, Maharashtra, Uttar Pradesh, Madhya Pradesh, Bihar, Jammu, Assam etc. The oil of sweet basil owes its importance to its extensive use in condemnatory products, cosmetics, and toiletry, perfumery and confectionery industries, particularly in European countries. Therefore it has immense export value. The volatile oil was shown to have bactericidal, insecticidal and also medicinal properties. The sweet basil oil includes protein (14%) carbohydrate (61%) and relatively high concentrations of vitamins A & C (Sharma *et al.*) It is an erect, much branched sub shrub 30-60cm tall, with simple opposite green or purple leaves that are strongly scented and hairy stems. Tulsi's extracts are used in ayurvedic remedies for common colds, headaches, stomach disorders, inflammation, heart disease, various forms of poisoning, and malaria. Tulsi to be an effective treatment for diabetes by reducing blood glucose levels. The plant contains mainly phenols, aldehydes, tannis, saponin and fats. The essential oil components are eugenol (about 71%) Eugenol methyl ether (20%), nerol, caryophyllene, selinene, alpha-pinene, camphor, cineole, linalool and carvacrol (3%). The volatile oil is reported to possess anti bacterial and insecticidal properties. It inhibits the in vitro growth of *mycobacterium tuberculosis* and *micrococcus pyrogenes* variety aureus. It has marked insecticidal activity against mosquitoes. The present study was done to investigate the best treatment method upto a 1ton/hect gypsum application.

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2. MATERIALS AND METHODS:

The present study was undertaken to study the influence of different methods of gypsum application on the plant yield/morphology of *Ocimum basilicum*. The experiments were laid out at Central institute of Medicinal and Aromatic plants, Regional centre, Uppal, Hyderabad.

3. EXPERIMENTAL SITE

The experimental site is located at the altitude of 542 m above mean sea level with a geographical bearing of $78^{\circ} 8'$ longitudes and $17^{\circ} 32'$ latitude.

3.1. Weather condition

Semi-arid tropical climate zone of Hyderabad has the average rainfall of 800 mm per year.

3.2. Soil characteristic of experimental site

The soil of the experimental field was a red sandy loam (alficustochrept) with pH 7.4 (1.25 soils to solution ratio), EC - 0.42 ds/m, organic C - 0.3%, total N - 0.03%, available P - 10 ug/g soil and exchangeable K - 128 ug/g soil.

3.3. Experimental details

In this experiment gypsum was applied to the soil in different methods to observe its influence on the growth and development. The experiments were conducted in field and the details of the treatments and layout are presented here:

SNO	Treatment	Details treatment	Quantity, g/plot
1.	T1	Control	1840
2.	T2	Incorporation	1840
3.	T3	Broadcasting	1840
4.	T4	Lines application	1840
5.	T5	Spots	1840

3.4 Plantation

Nursery: Nursery beds of size 1x1x1 m were prepared and mixed with well prepared manure. Seeds of the *Ocimum* sp were broadcasted in the beds and covered with dry grass. The beds were irrigated twice a day till the seeds germinated.

After the seeds germinated the grass was removed and the beds irrigated once a day for twenty days. Fully grown seedlings of size 4-6" were planted in poly bags as per the lay out plan.

Treatment imposition: Gypsum was applied 10 days after planting.

Maintenance: The crop was kept weed free and regularly irrigated

4. OBSERVATIONS - MORPHOLOGICAL CHARACTER'S

Observations were taken at 30 days interval starting from 10 days after planting. In each treatment five plants were removed at random from the plants and washed under tap water. The plants were partitioned in to lamina, petiole and stem. Fresh and dry weights of individual components were taken separately. Later observations were recorded. Details about the observations recorded are presented here:

S.No	Days after planting	Code
1	15	Stage I
2	45	Stage II
3	75	Stage III
4	105	Stage IV

Details about the methods followed in observations:

A) Height of plant (cm)

The height of the regular plants was measured from the base of the plant and expressed as average in cms.

B) Number of leaves/plant

The number of fresh and entire leaves were recorded and expressed as average.

C) Weight of leaves (g)

Five plants from each treatment were selected randomly. After cleaning, the plants were separated in to leaves, stems and roots. The weight of the leaves of each plant was taken by using electronic balance and it is expressed as average.

D) Weight of stem (g)

Five plants from each treatment were selected randomly. After cleaning, the plants were separated in to leaves, stems and roots. The weight of the stem of each plant was taken by using electronic balance and it is expressed as average

E) Fresh weight of plant (g)

Five plants from each treatment were selected randomly. The fresh weight of the plant of each plant was taken by using electronic balance and it is expressed as average.

5. STATISTICAL ANALYSIS:

Data recorded on plant height, plant weight, stem weight, leaf weight, number of leaves was subjected to analysis of variance, ANOVA ($P < 0.05$).

6. RESULTS AND DISCUSSIONS:

1. The results pertaining to the **Plant height** as influenced by different methods during the experimental period is presented in **Table-1**

Treatment	Days after planting			
	Stage I	Stage II	Stage III	Stage IV
CON	38	45.67	61.67	66.33
IN	42.67	46.67	62.67	67.67
BRD	45	50.67	66	68
LINES	47.33	54.33	67	69.33
SPOTS	51.67	50	67.67	68

(Table -1)

There was an increase in plant height was noticed in every stage in stage I from 38 to 51.67, stage-II from 45.67 to 50, stage -III from 61.67 to 67.67 and in stage-IV from 66.33 to 68. In every treatment gypsum shown significance effect on plant height.

2. The results pertaining to the **Plant weight** as influenced by different methods during the experimental period is presented in **Table-2**.

Treatment	Days after planting			
	Stage I	Stage II	Stage III	Stage IV
CON	50	148.67	199.33	213.33
IN	78.67	187	241.33	251.33
BRD	87	125.67	223.33	225.33
LINES	72.33	161.67	234.33	246.33
SPOTS	66.67	168	292.33	295

(Table 2)

There was an increase in plant weight was noticed in every stage in stage- I from 50 to 66.67, stage-II from 148.67 to 168, stage -III from 199.33 to 292.33 and in stage-IV from 213.33 to 295. In every treatment gypsum shown significance effect on plant height. Maximum growth observed in spots.

3. The results pertaining to the **Number of leaves** as influenced by different methods during the experimental period is presented in **Table-3**.

Treatment	Days after planting			
	Stage I	Stage II	Stage III	Stage IV
CON	118	289.33	181.33	191.33
IN	195.33	354.67	186.67	203
BRD	245.33	264.67	275.33	270
LINES	209.33	290	281.33	296
SPOTS	194.67	280	299.33	302.33

(Table-3)

There was significant growth observed after 45 days of plantation (stage-II) and it was followed till all the stages of plantation.

4. The results pertaining to the **Stem weight** as influenced by different methods during the experimental period is presented in **Table-4**.

Treatment	Days after planting			
	Stage I	Stage II	Stage III	Stage IV
CON	18.67	77	120.33	126.67
IN	30.67	77.33	125.33	132.67
BRD	37	64	147.33	161.67
LINES	31.33	74.33	90.33	134.67
SPOTS	27.33	87.67	164.67	179.67

(Table-4)

Stem height increased simultaneously along the stages I-IV. Maximum Stem weight noticed in spots treatment.

5. The results pertaining to the **Leaf weight** as influenced by different methods during the experimental period is presented in **Table-5**.

Treatment	Days after planting			
	Stage I	Stage II	Stage III	Stage IV
CON	31.33	71.67	79	86.66
IN	48	109.67	116	118.67
BRD	50	61.67	76	63.67
LINES	41	87.33	110.67	111.67
SPOTS	39.33	80.33	127.67	115.33

(Table-5)

Leaf weight increased from stage I-III and in stage –IV it was noticed that there was decrease in leaf weight. In stage III it was 127.67 maximum noticed while in stage-IV it was noticed 115.33 it may because of influence of some other environmental factors.

Analysis of **ANOVA** for different morphological characteristics was presented in Table number 6. The mean data for different treatments was presented in Table number 7.

Analysis of variance (ANOVA):

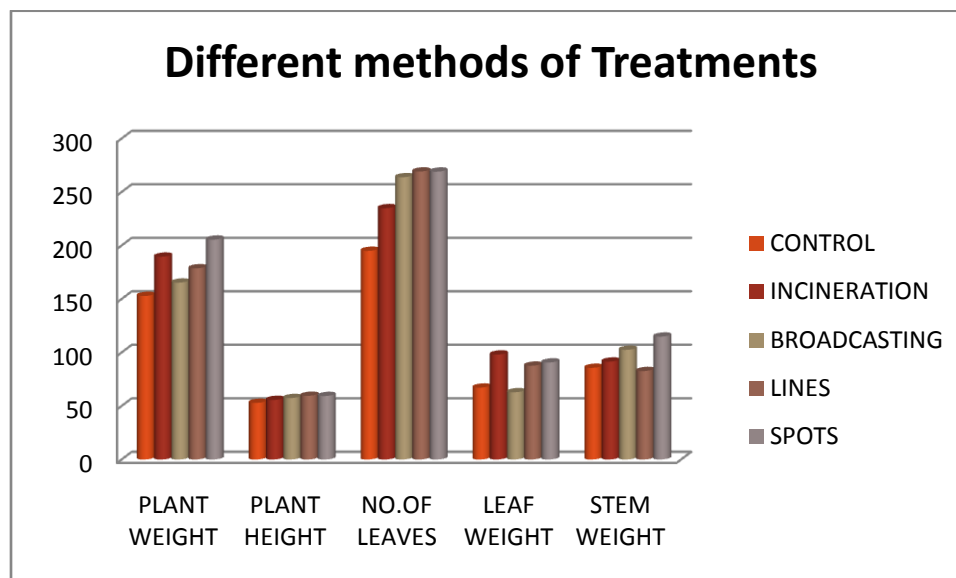
S.NO	PARAMETERS	SOURCE OF VARIATION	df	SS	MS	F cal value	F Tab value	0.05 SIGNIFICANCE LEVEL
1	PLANT WEIGHT	Between samples	4	6735.934	1683.984	4.171	3.06	S
		Within samples	15	105388	7025.864			
2	PLANT HEIGHT	Between samples	4	121.178	30.294	4.2	3.06	S
		Within samples	15	1909.097	127.273			
3	NO.OF LEAVES	Between samples	4	16442.79	4110.698	1.3	3.06	NS
		Within samples	15	47354.29	3156.953			
4	LEAF WEIGHT	Between samples	4	3802.95	950.738	1.05	3.06	NS
		Within samples	15	13555.11	903.674			
5	STEM WEIGHT	Between samples	4	2800.942	700.235	4.38	3.06	S
		Within samples	15	46020.51	3068.034			
	S	SIGNIFICANT						
	NS	NOT SIGNIFICANT						

(Table 6)

Mean data for different treatments is as follows:

CHARACTERS	CONTROL	INCINERATION	BROADCASTING	LINES	SPOTS
PLANT WEIGHT	152.833	189.583	165.333	178.665	205.5
PLANT HEIGHT	52.918	55.67	57.418	59.498	59.335
NO.OF LEAVES	194.998	234.917	263.832	269.165	269.082
LEAF WEIGHT	67.165	98.085	62.835	87.668	90.665
STEM WEIGHT	85.668	91.5	102.5	82.665	114.835

(Table 7)



(Figure 1)

Graph representing \bar{x} (mean) values for different methods of treatments.

CONCLUSIONS:

The results of ANOVA reveal that application of gypsum through different methods shown a great significance in case of plant height, plant weight and stem weight. There was no such significance was seen in case of Number of leaves and Leaf weight among the treatments. Out of all the treatments Spots treatment noticed a constant significance on morphological characteristics of Ocimum. Hence, thus results indicate that spot treatment is best suitable for Ocimum growth at 1ton/hect.

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