

# EFFECT OF ENRICHED COMPOSTS AND DIFFERENT LEVELS OF N-P-K FERTILIZERS ON PLANT HEIGHT AND DRY MATTER PRODUCTION OF SUNFLOWER GROWN IN SANDY CLAY LOAM SOIL

S.SRINIVASAN AND M.VAMSHI

DEPT. OF SOIL SCIENCE & AGRICULTURAL CHEMISTRY, FACULTY OF AGRICULTURE ANNAMALAI UNIVERSITY- ANNAMALAINAGAR- 608 002

## ABSTRACT

The present investigation comprises a pot experiment on sunflower cv. Sunbred was carried out to study the effect of different levels of chemical fertilizers and different enriched organic composts. It was conducted during April-July, 2017 at the pot culture yard of Department of Soil Science & Agricultural Chemistry, Faculty of Agriculture, Annamalai University, Annamalainagar. The initial soil of the pot experiment was sandy clay loam in texture with a pH of 7.4 and EC of 0.44 dSm<sup>-1</sup>. A pot experiment was conducted with the treatments of five levels of factor-A (EC<sub>0</sub>-Control, EC<sub>1</sub> – EFYM, EC<sub>2</sub> – EWHC, EC<sub>3</sub> – ENLC, EC<sub>4</sub>-ESDC ).and four levels of factor-B (CF<sub>0</sub>-Control, CF<sub>1</sub>-75% RDF, CF<sub>2</sub>-100% RDF, CF<sub>3</sub>-125% RDF) (20 treatment combinations), laid out in factorial completely randomized design (FCRD) with three replications. Recommended dose of N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O for sunflower is 60:90:60 kg ha<sup>-1</sup> respectively were applied in the form of urea, SSP and MOP, respectively. Sunflower cv. Sunbred was grown as a test crop. The results revealed that application of enriched composts and different levels of chemical fertilizers significantly increased the plant height and dry matter production of sunflower at 30, 60 and at harvest stages of sunflower. Among the different treatments, the combined application of CF<sub>3</sub>-125% RDF + enriched water hyacinth compost (EWHC) recorded the highest plant height 149.40 cm and dry matter production of 99.82 g pot<sup>-1</sup> at harvest stage of sunflower.

(Key words: Sunflower, plant height, dry matter production, chemical fertilizers, enriched composts)

## INTRODUCTION

India is one of the largest oilseeds producing country with largest area under oilseeds sharing 14% of India country's gross cropped area accounting for 1.4% of the gross domestic product and 8% of the valuable of all the agricultural products. Sunflower (*Helianthus annuus* L.) is the second most important oilseed crop next to soybean containing oil of high quality (unsaturated fatty acids as linolenic and linoic acids (900 g kg<sup>-1</sup>), anticholesterol properties and has become boon for the people suffering from cardiac

diseases. Use of enriched FYM decreases the nutrient losses. Enriched organic manures minimize the excess use of fertilizers for optimum yield and quality of crops without harming soil and environmental health (Vipen bhadu *et al.*, 2017). Water hyacinth (*Eichhornia crassipes* Mart.(Solms.) belonging to the family Pontederiaceae, aptly known as the worst aquatic weed found abundantly in almost all types of wetlands varying from small fish ponds to big riverine lakes. As water hyacinth decays, there is a sharp increase in nutrient levels in water body, which ultimately creates the problem of eutrophication in aquatic system. Saw dust from all types of trees, soft or hard can be used in compost pile for making the compost. This study aimed to study the integrated incorporation of enriched composts and N,P<sub>2</sub>O<sub>5</sub>,K<sub>2</sub>O fertilizers on sunflower growth and dry matter production of sunflower.

## MATERIALS AND METHODS

A pot experiment was conducted during April-July, 2017 at the pot culture yard of Department of Soil Science & Agricultural Chemistry, Faculty of Agriculture, Annamalai University, Annamalainagar. The initial soil of the pot experiment was sandy clay loam in texture with a pH of 7.4 and EC of 0.44 dSm<sup>-1</sup>. The fertility status of soil with respect to nitrogen, phosphorus, potassium availability was 228 (low), 10.2 (low) and 317 (high) kg ha<sup>-1</sup>, respectively. This experiment was conducted with the treatments of five levels of factor-A and four levels of factor-B (20 treatment combinations) laid out in factorial completely randomized design (FCRD) with three replications. Sunflower cv. Sunbred was grown as a test crop and supplied with different enriched composts (Control, EFYM, EWHC, ENLC, ESDC) and different levels of fertilizers (Control, 75% RDF, 100% RDF and 125% RDF) as per the treatment schedule. The recommended dose of N: P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O for sunflower is 60:90:60 kg ha<sup>-1</sup> respectively were applied in the form of urea, SSP and MOP, respectively. Half dose of N and entire dose of P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O were applied basally and remaining quantity of N was applied at 30 DAS. The different levels of P<sub>2</sub>O<sub>5</sub> (SSP) were used for enrichment with different organic manures and applied as basal.

**Table 1. Treatment details of pot culture experiment with sunflower cv. Sunbred**

Factor A- (Four levels)	CF <sub>0</sub> -Control	CF <sub>1</sub> -75% RDF	CF <sub>2</sub> -100% RDF	CF <sub>3</sub> - 125% RDF	
Factor B – (Five levels)	EC <sub>0</sub> -Control	EC <sub>1</sub> – EFYM	EC <sub>2</sub> – EWHC	EC <sub>3</sub> – ENLC	EC <sub>4</sub> -ESDC

## RESULTS AND DISCUSSION

### Plant height (cm)

The data on plant height recorded at various growth stages (30, 60 and at harvest) as influenced by different levels of chemical fertilizers and enriched composts are presented in table 2,3 and 4. It was found that there was a significant increase in the plant height with the increase in the levels of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O. The lowest plant height was recorded in control (CF<sub>0</sub>) (24.8, 85.40 and 118.7 cm) at 30, 60 DAS and at harvest, respectively. The highest plant height was recorded in the treatment CF<sub>3</sub> (48.26, 111.94 and 143.42

cm) at 30, 60 DAS and at harvest, respectively. Among different enriched composts, enriched water hyacinth compost (EC<sub>2</sub>) recorded the highest plant height (43.65, 106.32 and 137.47 cm) at 30, 60 DAS and at harvest, respectively. This was followed by the treatment received enriched farm yard manure EC<sub>1</sub> (41.60, 101.30 and 134.50) at 30, 60 DAS and at harvest, respectively. The lowest values were recorded in control EC<sub>0</sub> (36.60, 94.00 and 127.15 cm) at 30, 60 DAS and at harvest, respectively.

The combined effect of inorganic fertilizers and enriched composts showed significant increase in plant height. The highest plant height of 52.8, 124.60 and 149.40 cm were recorded with the treatment (T<sub>18</sub>) (CF<sub>3</sub>.EC<sub>2</sub>) which was received 125% RDF (N:K<sub>2</sub>O) + 125% P<sub>2</sub>O<sub>5</sub> (SSP) enriched water hyacinth compost (T<sub>18</sub>). It was followed by the treatment (CF<sub>3</sub>.EC<sub>1</sub>) (T<sub>17</sub>) received 125% RDF (N: K<sub>2</sub>O) +125% P<sub>2</sub>O<sub>5</sub> (SSP) enriched farm yard manure (50.70, 113.80 and 146.10 cm) at 30, 60 DAS and at harvest, respectively. The plant height of sunflower was increased from 30 DAS to harvest stage due to the application of different levels of chemical fertilizers and enriched composts. Enriched water hyacinth compost in enhancing physico-chemical properties of the rhizosphere and the root growth and vigour which lead to the significant increase in plant height and was able to establish its supremacy over inorganic fertilizers. Similar views were expressed by Naga Raju *et al.* (2010).

#### Dry matter production (DMP) (g pot<sup>-1</sup>)

Application of different levels of inorganic fertilizers and enriched composts significantly increased dry matter production in sunflower at 30, 60 DAS and at harvest stage are given in table 10. Among the various levels of inorganic fertilizers tried, control (CF<sub>0</sub>) recorded the DMP of 8.90, 36.51 and 73.27 g pot<sup>-1</sup> at 30, 60 DAS and at harvest stage, respectively. It was increased by CF<sub>1</sub> recorded 13.06, 42.99 and 2.22 g pot<sup>-1</sup> at 30, 60 DAS and at harvest stage, respectively. Application of 100% RDF (CF<sub>2</sub>) registered the dry matter production of 16.46, 48.01 and 89.00 g pot<sup>-1</sup> at 30, 60 DAS and at harvest stage, respectively.

Among the different enriched composts, application of enriched water hyacinth compost (EC<sub>2</sub>) recorded the DMP of 16.41, 48.67 and 89.44 g pot<sup>-1</sup> at 30, 60 DAS and at harvest stage, respectively. With respect to interaction effect, the highest dry matter production of 20.96, 57.29 and 99.82 g pot<sup>-1</sup> were registered with 125% RDF (N: K<sub>2</sub>O) + 125% P<sub>2</sub>O<sub>5</sub> (SSP) enriched water hyacinth compost (T<sub>18</sub>) (CF<sub>3</sub>.EC<sub>2</sub>) and it was followed by the treatment (T<sub>17</sub>) registered 20.13, 54.79 and 97.10 g pot<sup>-1</sup> at 30, 60 DAS and at harvest stage, respectively, which was received 125% RDF (N: K<sub>2</sub>O) + 125% P<sub>2</sub>O<sub>5</sub> (SSP) enriched farm yard manure. T<sub>18</sub> was not on par with T<sub>17</sub>. This could also be due to the multiple effect of inorganic nutrients besides organic source led to remarkable increase in dry matter accumulation and rapid mineralization of nutrients and steady supply of inorganic nutrients, presence of required organic acids, quick absorption of nutrient ion released slowly and made available during the entire crop growth period. Similar results were reported in soybean by Chaturvedi *et al.* (2010).

**Table 1. Effect of different levels of chemical fertilizers and enriched composts on plant height at 30 DAS in sunflower cv. Sunbred**

	Plant height (cm) at 30 DAS
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Chemical Fertilizers	Enriched Composts					
	EC <sub>0</sub>	EC <sub>1</sub>	EC <sub>2</sub>	EC <sub>3</sub>	EC <sub>4</sub>	Mean
CF <sub>0</sub> -Control	29.10	31.60	32.90	30.40	30.80	24.80
CF <sub>1</sub> -75% RDF	34.70	38.80	40.80	36.90	36.70	37.68
CF <sub>2</sub> -100% RDF	39.0	45.60	48.10	43.20	41.10	43.40
CF <sub>3</sub> -125% RDF	43.50	50.70	52.80	48.40	45.90	48.26
Mean	36.60	41.60	43.65	39.70	38.60	40.02
Factors	EC		CF		EC X CF	
S.Ed	0.30		0.27		0.59	
CD (p=0.05)	0.62		0.56		1.20	

Table 2. Effect of different levels of chemical fertilizers and enriched composts on plant height at 60 DAS in sunflower cv. Sunbred

Chemical Fertilizers	Plant height (cm) at 30 DAS					
	Enriched Composts					
	EC <sub>0</sub>	EC <sub>1</sub>	EC <sub>2</sub>	EC <sub>3</sub>	EC <sub>4</sub>	Mean
CF <sub>0</sub> -Control	81.70	86.90	89.80	84.60	84.40	85.40
CF <sub>1</sub> -75% RDF	92.40	97.60	100.10	95.30	95.20	96.10
CF <sub>2</sub> -100% RDF	97.90	107.20	110.80	103.80	100.50	104.00
CF <sub>3</sub> -125% RDF	104.10	113.80	124.60	109.90	107.30	111.94
Mean	94.00	101.3	106.32	98.40	96.80	99.35
Factors	EC		CF		EC X CF	
S.Ed	0.57		0.53		1.13	
CD (p=0.05)	1.17		1.09		2.30	

Table 3. Effect of different levels of chemical fertilizers and enriched composts on plant height at harvest stage of sunflower cv. Sunbred

Chemical Fertilizers	Plant height (cm) at 30 DAS					
	Enriched Composts					
	EC <sub>0</sub>	EC <sub>1</sub>	EC <sub>2</sub>	EC <sub>3</sub>	EC <sub>4</sub>	Mean
CF <sub>0</sub> -Control	114.00	120.70	123.40	117.80	117.60	118.70
CF <sub>1</sub> -75% RDF	126.00	131.10	133.80	128.40	128.30	129.52
CF <sub>2</sub> -100% RDF	131.30	140.10	143.30	137.20	134.00	137.18
CF <sub>3</sub> -125% RDF	137.30	146.10	149.40	143.70	140.60	143.42
Mean	127.15	134.50	137.47	131.77	130.10	132.20

Factors	EC	CF	EC X CF
S.Ed	0.65	0.62	1.28
CD (p=0.05)	1.33	1.27	2.60

**Table 4. Effect of different levels of chemical fertilizers and enriched composts on dry matter production DMP (g pot<sup>-1</sup>) at 30 DAS in sunflower cv. Sunbred**

Chemical Fertilizers	DMP (g pot <sup>-1</sup> ) at 30 DAS					
	Enriched Composts					
	EC <sub>0</sub>	EC <sub>1</sub>	EC <sub>2</sub>	EC <sub>3</sub>	EC <sub>4</sub>	Mean
CF <sub>0</sub> -Control	7.30	9.67	10.63	8.65	8.25	8.90
CF <sub>1</sub> -75% RDF	11.58	13.65	14.87	12.79	12.44	13.06
CF <sub>2</sub> -100% RDF	13.95	17.86	19.21	16.18	15.12	16.46
CF <sub>3</sub> -125% RDF	16.54	20.13	20.96	18.79	17.46	18.77
Mean	12.34	15.32	16.41	14.10	13.31	14.29
Factors	EC		CF		EC X CF	
S.Ed	0.21		0.18		0.39	
CD (p=0.05)	0.43		0.38		0.80	

**Table 5. Effect of different levels of chemical fertilizers and enriched composts on dry matter production DMP (g pot<sup>-1</sup>) at 60 DAS in sunflower cv. Sunbred**

Chemical Fertilizers	DMP (g pot <sup>-1</sup> ) at 60 DAS					
	Enriched Composts					
	EC <sub>0</sub>	EC <sub>1</sub>	EC <sub>2</sub>	EC <sub>3</sub>	EC <sub>4</sub>	Mean
CF <sub>0</sub> -Control	34.20	37.59	39.06	36.07	35.67	36.51
CF <sub>1</sub> -75% RDF	40.57	44.00	45.74	42.45	42.10	42.99
CF <sub>2</sub> -100% RDF	44.22	50.00	52.59	47.40	45.85	48.01
CF <sub>3</sub> -125% RDF	47.68	54.79	57.29	51.69	49.32	53.35
Mean	41.66	46.59	48.67	44.40	43.23	44.91
Factors	EC		CF		EC X CF	
S.Ed	0.36		0.34		0.71	
CD (p=0.05)	0.74		0.69		1.45	

**Table 6. Effect of different levels of chemical fertilizers and enriched composts on dry matter production DMP (g pot<sup>-1</sup>) at harvest stage of sunflower cv. Sunbred**

Chemical Fertilizers	DMP (g pot <sup>-1</sup> ) at harvest stage					
	Enriched Composts					
	EC <sub>0</sub>	EC <sub>1</sub>	EC <sub>2</sub>	EC <sub>3</sub>	EC <sub>4</sub>	Mean
CF <sub>0</sub> –Control	70.10	74.70	76.81	72.61	72.15	73.27
CF <sub>1</sub> – 75% RDF	78.98	83.54	86.16	81.33	81.11	82.22
CF <sub>2</sub> –100% RDF	83.97	91.18	95.00	88.52	86.37	89.00
CF <sub>3</sub> –125% RDF	88.75	97.10	99.82	93.91	90.96	94.10
<b>Mean</b>	80.45	86.63	89.44	84.09	82.64	84.64
<b>Factors</b>	<b>EC</b>		<b>CF</b>		<b>EC X CF</b>	
<b>S.Ed</b>	0.43		0.42		0.86	
<b>CD (p=0.05)</b>	0.89		0.87		1.76	

**CONCLUSION**

From the pot-culture experiment, it is concluded that there was a significant increase in the plant height with the increase in the levels of fertilizers. The highest plant height of 48.26, 111.94 and 143.42 cm were recorded in the treatment CF<sub>3</sub> (125% RDF) at 30, 60 DAS and at harvest stage, respectively. Among the different enriched composts, application of EWHC (EC<sub>2</sub>) recorded the highest plant height of 43.65, 106.32 and 137.47 cm at 30, 60 DAS and at harvest stage, respectively. Application of 125% RDF (N and K<sub>2</sub>O) significantly influenced the dry matter production of sunflower. Among the different enriched composts, application of (EC<sub>2</sub>) enriched water hyacinth compost recorded the DMP of 16.41, 48.67 and 89.44 g pot<sup>-1</sup> at 30, 60 DAS and at harvest stage, respectively in sunflower.

**REFERENCES**

- Chaturvedi, S., A.S. Chandel, V.C. Dhyani and A.P. Singh. 2010. Productivity, profitability and quality of soybean (*Glycine max*) and residual soil fertility as influenced by integrated nutrient management. **Indian J. Agron.**, **55**(2):133-137.
- Masaka, J. and S. Ndhlovu. 2007. The effect of different forms of water hyacinth (*Eichornia crassipes*) organic fertilizers on leaf growth rate and yield of Rape (*Brassica napus*). **International Journal of Agricultural Research**. **2**(3):254-260.
- Naga Raju, A.P. and H.K. Mohan Kumar. 2010. Effect of micronutrients and bio inoculants on growth and yield of soybean (*Glycine max* (L.)). **Mysore J. Agrl. Sci.**, **44**(2):260-265.
- Vipen Bhadu, N.J., Chaudhari, and B.A. Patel, 2017. Influence of organic manure enrichment on growth and yield of crops and soil properties: A review, *Indian J. Chemical studies* 5(5): 925-928.

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