

# IMPACT OF ORGANIC AND INORGANIC MANURES ON SUNFLOWER YIELD AND YIELD COMPONENTS

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**ABSTRACT:** A field trial was conducted to investigate the response of sunflower to combined use of different organic manures and inorganic NPK fertilizers. Treatments included: T1= Recommended NPK (120+60+60) considered as control, T2=Poultry manure(PM) @ 6 t ha<sup>-1</sup> +75% recommended dose of NPK, T3=Poultry manure @ 8 t ha<sup>-1</sup> +50% recommended dose of NPK, T4=Buffalo manure (BF) @ 6 t ha<sup>-1</sup>+75% recommended dose of NPK, T5=Buffalo manure @ 8 t ha<sup>-1</sup>+50% recommended dose of NPK, T6=Goat/sheep manure @ 6 t ha<sup>-1</sup> +75%recommended dose of NPK, T7=Goat/sheep manure(GSM) @ 8 t ha<sup>-1</sup>+50% recommended dose of NPK, T8=2 t ha<sup>-1</sup> each of PM+BM+GSM+75% recommended dose of NPK and T9=PM+BM+GSM each @ 2 t ha<sup>-1</sup>+50% recommended dose of NPK. The experiment was conducted in a three replicated randomized complete block design. The results revealed that all the growth, seed yield characters and oil content were significantly affected by conjunctive use of different organic manures and inorganic NPK fertilizers. For the sunflower seed yield and most of its components, T2 ranked 1<sup>st</sup> resulting in 201 cm plant height, 3.71 cm stem girth, 20.70 leaves plant<sup>-1</sup>, 19.49 cm head diameter, 1650.91 seeds head<sup>-1</sup>, 66.04 g seed weight head<sup>-1</sup>, 60.62 g seed index, 2017.7 kg ha<sup>-1</sup> seed yield and 44.34% oil content. The crop under treatment T3 ranked 2<sup>nd</sup> with 197 cm plant height, 3.65 cm stem girth, 20.50 leaves plant<sup>-1</sup>, 19.15 cm head diameter, 1648.51 seeds head<sup>-1</sup>, 65.94 g seed weight head<sup>-1</sup>, 59.77 g seed index, 1997.60 kg ha<sup>-1</sup> seed yield and 44.14% oil content. Rest of the treatments remained inferior in relation to all the growth and yield traits of sunflower. It was concluded that poultry manure and goat/sheep manure @ 6 t ha<sup>-1</sup> or @ 8 t ha<sup>-1</sup> replacing 25% or 50% recommended dose of NPK fertilizers, respectively showed more promising results as compared to buffalo manure, while combined application of poultry, goat/sheep and buffalo manure could not surpass the effectiveness of poultry and goat/sheep manure..

**Key words:** Organic, inorganic, manure, sunflower, yield.

## INTRODUCTION

The significance of farmyard manure is being realized again because of the high cost of commercial fertilizers and its long term adverse effect on soil chemical properties. Besides supplying macronutrients and micronutrients to the soil, fertility of soil improved by using farmyard manure. Ne [10, 14]. There is enough places to replenish the soil by utilizing available sources, such as natural and bio fertilizers. Numerous researchers conducted various experiments to evaluate the impact of inorganic and organic fertilizers application on sunflower [1]. The findings are also supported by Kumar and Sreenivasulu [6]. It is imperative for the farmers to manage soil fertility level for sunflower cultivation with an integrated way of using organic and inorganic manure, as correcting nutrient imbalances not only leads to sustainable high crop yields, but it reduces the need to cultivate unsustainable marginal lands [5]. Experimented different fertilizer sources under integrated nutrient management system in sunflower reported positive effects of integration of nutrients [12]. There is also a positive interaction amongst organic and inorganic manures in relation to nitrogen and other sources [3]. The maximum grain and biological yield of sunflower were obtained while applying poultry manure as an organic source [15]. Application of nitrogen at 100 kg ha<sup>-1</sup> in three equal splits at

sowing, at first irrigation and at flowering and application of chemical fertilizers at 50-75-50 NPK kg ha<sup>-1</sup> along with poultry manure at 8 t ha<sup>-1</sup> in the first and second experiment respectively, appeared to be the most appropriate, economical and suitable nutritional management practices to obtain maximum yield of sunflower [8]. Considering the findings and suggestions given by above quoted scientists, an experiment was conducted to explore the possibility of conjunctive use of organic and inorganic fertilizers and their effects on yield and yield parameters of sunflower under agro-climatic conditions of Tandojam, Sindh province of Pakistan.

## MATERIAL AND METHODS

The field experiment was conducted during 2012 at Students' Experimental Farm, Department of Agronomy, Faculty of Crop Production, Sindh Agriculture University Tandojam to investigate the response of sunflower to conjunctive use of organic manures and inorganic NPK fertilizers. The experiment was laid out in a three replicated randomized complete block design. The plot size kept was 5 x 3m (15m<sup>2</sup>)

## SOIL ANALYSIS

**Table 1: Some physico-chemical properties of experimental soil (0-30 cm depth) during the study year**

Parameters	Soil Characteristic
Texture	Clay loam
CaCO <sub>3</sub> (%)	9.7
EC(dS m <sup>-1</sup> )	0.14 -0.65
pH	7.30 - 7.70
Organic matter (%)	0.62 -0.86
Nitrogen (%)	0.03 -0.05
Available P (mg kg <sup>-1</sup> )	6.3 - 9.4
Available K (mg kg <sup>-1</sup> )	60-110

### Fertilizer application

The nitrogen was applied in the form of urea, P in the form of single super phosphate and K as sulphate of potash. All P, K and half of N was applied at the time of sowing by incorporating in the soil during final seed bed preparation, while remaining N was applied in two equal splits applied as per the plan using different application methods. The organic manures followed by watering were applied two months before the seedbed preparation. The experiment comprised of nine treatments such as T1= Recommended dose of NPK @ 120+60+60 kg ha<sup>-1</sup> (control), T2= Poultry manure @ 6 t ha<sup>-1</sup> +75% recommended dose of NPK, T3= Poultry manure @ 8 t ha<sup>-1</sup> +50% recommended dose of NPK, T4= Buffalo manure @ 6 t ha<sup>-1</sup> +75% recommended dose of NPK, T5= Buffalo manure @ 8 t ha<sup>-1</sup> +50% recommended dose of NPK, T6= Goat/sheep manure @ 6 t ha<sup>-1</sup> +75% recommended dose of NPK, T7= Goat/sheep manure @ 8 t ha<sup>-1</sup> +50% recommended dose of NPK, T8= Poultry manure-buffalo manure-Goat/sheep manure each @ 2 t ha<sup>-1</sup> +75% recommended dose of NPK, T9= Poultry manure-buffalo manure-Goat/sheep manure each @ 2 t ha<sup>-1</sup> +50% recommended dose of NPK

### Observations recorded

The observations of the parameters viz, plant height (cm), stem girth (cm), leaves plant<sup>-1</sup>, head diameter (cm), seeds head<sup>-1</sup>, seed weight head<sup>-1</sup> were recorded on the basis of randomly selected five sample plants from each plot. These sample plants were labeled with certain coding and reading was averaged for data collected replication-wise. For determination of seed yield; plants were harvested from one square meter area of each treatment and after sun drying, seeds were separated, weighted and yield per hectare was determined. Oil content was determined by using following formula: Oil content (%) = total wt. of oil obtained (kg)/total wt. of expelled seed (kg) x100

### Statistical analysis

The data so collected on the growth and yield components were statistically analyzed through deriving analysis of variance techniques to examine the overall significance of differences among treatment means as well as compared to control; while LSD (Least Significant Difference) test was applied to compare and perceive superiority of treatment means and to observe significance of differences, following statistical methods [4]. All these tests were performed by using Statix 8.1 Micro-Computer Statistical Software (USA).

## RESULTS AND DISCUSSIONS

### Yield components

Crop height in sunflower along with better stem thickness gives good stand to plants with optimum productivity. Data shown in Table 2 and 3, indicated that use of integrated nutritional levels i.e. 6 t ha<sup>-1</sup> poultry manure + 75% recommended dose of NPK fertilizers (T<sub>2</sub>) helped in producing significantly taller plants with an average height of (201.00 cm) and thicker plants with a stem girth of (3.71 cm). Accordingly with same manure inputs highest number of average leaves plant<sup>-1</sup> (20.70) were recorded it is mainly considered that number of leaves is generally associated with the plant height. Same was the position in case of head diameter (19.49 cm), seeds head<sup>-1</sup> (1650.91) and weight of seeds head<sup>-1</sup> (66.04 g). Parameters discussed above were considerably reduced under treatments T<sub>1</sub> and T<sub>9</sub>. Combined use of N, P along with FYM resulted in greater seed index, significant increase in plant height, head size and number of seeds per head of sunflower. Our findings agree with above researchers indicating that the poultry manure was more effective to stimulate the sunflower plant growth attributes as compared to goat/sheep manure and buffalo manure [12].

### Seed yield (kg ha<sup>-1</sup>)

The results regarding seed yield ha<sup>-1</sup> of sunflower are influenced by use of different organic and inorganic manures are given in Table-2. It is apparent from the results that seed yield ha<sup>-1</sup> was highest (2017.74 kg) under treatment T<sub>2</sub>, followed by T<sub>3</sub>, T<sub>6</sub> and T<sub>7</sub> with 1997.60 kg, 1994.70 kg and 1962.53 kg seed yield ha<sup>-1</sup>, respectively. The seed yield decreased consistently under treatments T<sub>1</sub> and T<sub>4</sub>. However, minimum seed yield (1683.70 kg) ha<sup>-1</sup> was declined from treatment T<sub>9</sub>. Higher seed yield ha<sup>-1</sup> of sunflower was mainly associated with the greater head diameter, more seeds head<sup>-1</sup> and higher seed weight head<sup>-1</sup>. The LSD test indicates that differences in seed yield ha<sup>-1</sup> were non-significant (P>0.05) between T<sub>2</sub>-T<sub>3</sub>-T<sub>6</sub>-T<sub>7</sub>; hence poultry manure and goat/sheep manure @ 6 t ha<sup>-1</sup> or @ 8 t ha<sup>-1</sup> along with 75% or 50% recommended dose of NPK fertilizers, respectively showed more promising results as compared to rest of the treatments. These findings are in line with those of scientists [2, 7, 12 and 13] who found a positive impact of combined use of NPK and FYM on sunflower yields. They further observed that integrated use of N, P along with FYM resulted in greater seed index value, significant increase in plant height, head size, number of seeds and overall yields per unit area

**Oil content (%)**

It can be seen from the results (Figure 1) that highest oil content (44.34%) was observed under T<sub>2</sub>, followed by T<sub>3</sub>, T<sub>6</sub> and T<sub>7</sub> with average oil content of 44.14, 43.36 and 43.29%, respectively. The oil content continued declining under treatments T<sub>8</sub> and T<sub>1</sub>, with average oil content of 43.19 and 42.89 percent, respectively. However, the lowest oil content of 42.35 percent was noted in case of T<sub>4</sub>. The LSD test indicated that differences in oil content among almost all the

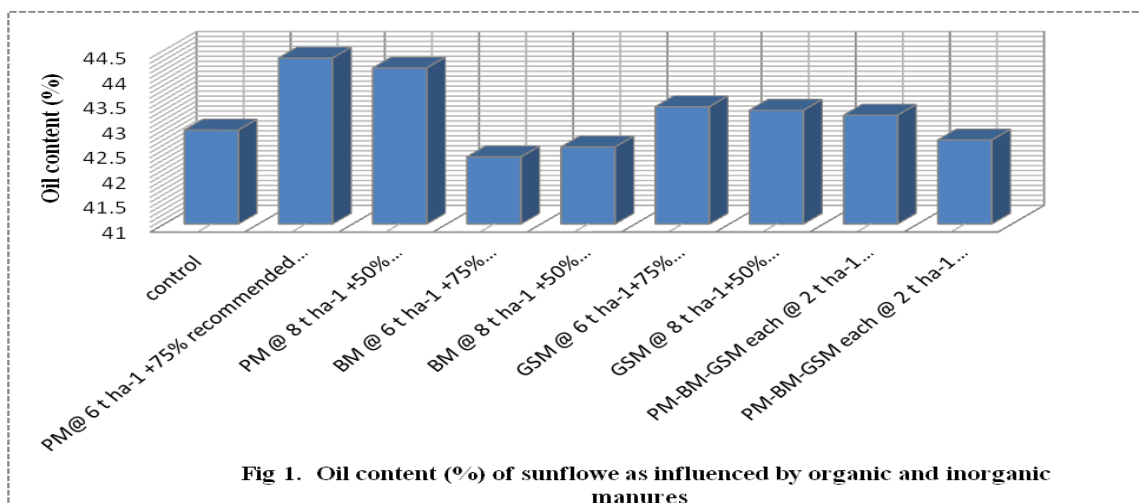
treatments were statistically significant (P<0.05) suggesting that there was marked effect of organic manures and up to 50% recommended dose of NPK inorganic fertilizers could be recommended for obtaining higher oil content of sunflower seeds. However, Poultry manure, followed by goat/sheep manure, proved to be more effective in improving oil content of sunflower seeds as compared to rest of combinations. Integrated use of NP along with FYM results in slight increase in oil content of sun flower seed [13].

**Table 2 Growth and yield of sunflower as influenced by organic and inorganic manures**

Treatments	Plant height (cm)	Stem girth (cm)	Leaves plant <sup>-1</sup>	Head diameter (cm)
T1= Recommended NPK (control)	190.00 c	3.40 c	19.00 c	17.56 c
T2= PM @ 6 t ha <sup>-1</sup> +75% recommended dose of NPK	201.00 a	3.71 a	20.70 a	19.49 a
T3= PM @ 8 t ha <sup>-1</sup> +50% recommended dose of NPK	197.00 a	3.65 a	20.50 a	19.15 a
T4= BM @ 6 t ha <sup>-1</sup> +75% recommended dose of NPK	181.00 d	3.32 c	18.10 d	17.15 c
T5= BM @ 8 t ha <sup>-1</sup> +50% recommended dose of NPK	174.00 e	3.24 d	17.40 e	16.73 c
T6= GSM @ 6 t ha <sup>-1</sup> +75% recommended dose of NPK	193.00 b	3.60 b	20.30 a	18.92 a
T7= GSM @ 8 t ha <sup>-1</sup> +50% recommended dose of NPK	195.00 b	3.58 b	20.10 b	18.84 b
T8= PM-BM-GSM each @ 2 t ha <sup>-1</sup> +75% recommended dose of NPK	175.00 e	3.19 d	17.50 e	16.48 d
T9= PM-BM-GSM each @ 2 t ha <sup>-1</sup> +50% recommended dose of NPK	170.00 f	3.13 e	17.00 f	16.17 d
LSD 0.05%	5.2957	0.1083	0.5363	0.6184

**Table 3 Growth and yield of sunflower as influenced by organic and inorganic manures**

Treatments	Seeds head <sup>-1</sup>	Seed weight head <sup>-1</sup> (g)	Seed index (g)	Seed yield (kg ha <sup>-1</sup> )
T1= Recommended NPK (control)	1511.14 b	60.45 b	52.66 c	1828.48 b
T2= PM @ 6 t ha <sup>-1</sup> +75% recommended dose of NPK	1650.91 a	66.04 a	60.62 a	2017.74 a
T3= PM @ 8 t ha <sup>-1</sup> +50% recommended dose of NPK	1648.51 a	65.94 a	59.77 a	1997.60 a
T4= BM @ 6 t ha <sup>-1</sup> +75% recommended dose of NPK	1475.69 b	59.03 b	48.07 d	1785.58 b
T5= BM @ 8 t ha <sup>-1</sup> +50% recommended dose of NPK	1440.23 c	57.61 c	49.06 d	1742.68 b
T6= GSM @ 6 t ha <sup>-1</sup> +75% recommended dose of NPK	1629.77 a	65.19 a	58.11 b	1994.70 a
T7= GSM @ 8 t ha <sup>-1</sup> +50% recommended dose of NPK	1621.93 a	64.88 a	57.29 b	1962.53 a
T8= PM-BM-GSM each @ 2 t ha <sup>-1</sup> +75% recommended dose of NPK	1418.08 c	56.72 c	45.32 e	1715.87 c
T9= PM-BM-GSM each @ 2 t ha <sup>-1</sup> +50% recommended dose of NPK	1391.49 c	55.66 c	43.30 f	1683.70 c
LSD 0.05%	64.56	2.5822	1.5204	103.69



**Fig 1. Oil content (%) of sunflower as influenced by organic and inorganic manures**

**CONCLUSIONS**

After going through the results it was concluded that treatment T2 (Poultry manure @ 6 t ha<sup>-1</sup> +75% recommended dose of

NPK) followed by T3 (Poultry manure @ 8 t ha<sup>-1</sup> +50% recommended dose of NPK) proved to be more efficient organic manure and inorganic manure (NPK) treatment with positive influence on the growth, seed yield and oil content of

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sunflower. However, goat/sheep manure ranked third for almost all the growth and yield traits of sunflower. It is suggested that poultry manure @ 6 to 8 t ha<sup>-1</sup> may be applied along with 75 and 50% recommended NPK fertilizers for obtaining higher yields and improving organic matter content in the soil.

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