

## Effect of Application of Farmyard Manure, Fertilizer Levels and Different Plant Population Levels on Seed Yield, Nutrient Uptake by Sunflower and Final Nutrient Status of the Soil.

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### ABSTRACT

Field experiment was conducted during *khariif*-2011 at Zonal Agricultural Research Station, University of Agricultural Sciences, Gandhi Krishi Vignana Kendra, Bengaluru to study the effect of application of FYM, fertilizer levels and different plant population levels on seed yield, nutrient uptake and final nutrient status of soil. Results revealed that application of FYM (5 t/ha), higher plant population level of 74074 plants/ha and higher fertilizer level 133 per cent of RDF recorded significantly higher nitrogen, phosphorus, potash, sulphur, zinc and boron uptake which in turn resulted in higher seed and stalk yield in these treatments. Significantly higher build up of nutrients was noticed in lower plant population level 37037 plants/ha over initial soil fertility status.

**Key words** *sunflower, farmyard manure, chemical fertilizer, plant population and nutrient uptake.*

Sunflower is one of the important oil seed crop and its oil is generally considered as premium oil because of its light colour and high level of unsaturated fatty acids which is good for health. Since sunflower oil is having high value in the market, in India sunflower is cultivated in an area of 0.9 m.ha, with total annual production of 0.63 m. tonnes and productivity of 696 kg per ha, (2011-12). The crop has the potential to yield at least 1,000 kg/ha under rainfed conditions, if proper care is taken with the existing hybrids. Under assured rain fall situations, this can be increased up to at least 1,500 kg/ha. The major constraints are inadequate and imbalanced crop nutrition and absence of maintenance of optimum plant population.

Keeping these points in view a field experiment entitled Effect of application of Farmyard manure, Fertilizer levels and different plant population levels on seed yield, nutrient uptake by sunflower and final nutrient status of the soil was conducted at Zonal Agricultural Research Station, Gandhi Krishi Vignana Kendra, University of Agricultural Sciences, Bengaluru, during *khariif* 2011.

### MATERIALS AND METHODS

Soil texture of the experimental site where the experiment was carried out is red sandy loam with 201 kg available nitrogen/ha, 19 kg available phosphorus/ha and 175 kg available potash/ha. Available sulphur, Zinc and Boron status of the soil was 14, 0.84 and 0.25 ppm, respectively.

The experiment was laid out in a split plot design and replicated thrice. Two FYM treatments one with FYM (5 t/ha) another without FYM were allotted to main plot. Factorial combination of three plant populations ( $P_1$ -55555 plants/ha,  $P_2$ -37037 plants/ha and  $P_3$ -74074 plants/ha) and three fertilizer levels ( $F_1$ - 100% RDF,  $F_2$ -125% RDF,  $F_3$ -133% RDF) were assigned to subplots. Limiting nutrients (S, Zn, B) applied as blanket recommendation based on soil test values. Half the dose of Nitrogen and full dose of phosphorus and potash and limiting nutrients are applied as basal dose. Remaining 50 per cent Nitrogen top dressed during 30 days after sowing. The crop was sown on July 17<sup>th</sup> 2011. The crop received good rainfall throughout the crop duration. Temperature, mean relative humidity, sunshine hours per day and open pan evaporation did not deviate much from the normal. The crop was harvested at maturity stage, seed yield per net plot of each treatment was recorded. Five plants were selected in each net plot area for measuring nutrients uptake. Soil samples were collected treatment wise after the harvest of crop. Soil and plant samples were analysed for the availability and uptake of N, P, K, S, Zn and B.

### RESULTS AND DISCUSSION

#### Effect of application of FYM on nutrient uptake and yield:

Application of FYM (5 t/ha) recorded significantly increased nutrient uptake of nitrogen, potassium sulphur and zinc (102 kg/ha, 114 kg/ha, 12.1 kg/ha and 712 g/ha, respectively) as compared to control (94 kg/ha, 104 kg/ha, 10.8 kg/ha and 556 g/ha, respectively), whereas higher

**Table 1. Effect of FYM, plant population levels and fertilizer levels on nutrient uptake and seed yield and oil yield of sunflower.**

Treatments	Nitrogen (kg/ha)	Phosphorus (kg/ha)	Potassium (kg/ha)	Sulphur (kg/ha)	Zinc (g/ha)	Boron (g/ha)	Seed yield (kg/ha)	Oil yield (kg/ha)
<b>Farmyard manure (FYM)</b>								
M <sub>1</sub> -No FYM (Control)	94	24.1	104	10.8	556	289	2095	844
M <sub>2</sub> - FYM (5 t/ha)	102	26.1	114	12.1	712	294	2215	900
S. Em.±	0.42	0.42	1.2	0.04	20.3	4.91	100	38.8
C.D (0.05)	2.55	NS	7.5	0.26	123	NS	NS	NS
<b>Plant population (plants/ha)</b>								
P <sub>1</sub> -55555 (60 x 30cm)	101	25.9	115	11.8	617	297	2140	867
P <sub>2</sub> -37037 (60 x 45 cm)	84	23.1	82	10.2	573	249	2036	821
P <sub>3</sub> -74074 (60 x 22.5 cm)	109	26.5	130	12.5	711	327	2289	928
S. Em.±	2.03	0.54	2.0	0.24	18.1	5.14	50	22.0
C.D (0.05)	5.80	1.5	5.8	0.69	52	14.8	146	64
<b>Fertilizer level (RDF= 90:90:60 NPK kg/ha)</b>								
F <sub>1</sub> - 100 % RDF	97	23.9	100	10.8	596	280	2146	875
F <sub>2</sub> - 125 % RDF	96	24.2	104	11.1	667	282	2134	861
F <sub>3</sub> - 133 % RDF	102	27.2	124	12.1	639	312	2185	880
S. Em.±	2.03	0.54	2.0	0.24	18.1	5.14	50	22.0
C.D (0.05)	5.80	1.5	5.8	0.69	52	14.8	NS	NS

but non significant increase in uptake of phosphorus and boron (26.1 kg/ha and 294 g/ha, respectively) was noticed with application of FYM (5 t/ha) as compared to control (24.1 kg/ha and 289 g/ha, respectively). Higher nutrient uptake with application of FYM (5 t/ha) is attributed to higher seed yield (2215 kg/ha) and stalk yield (5853 kg/ha). This might be due to improvement in physical, chemical and biological properties of soil by addition of organic manure. These results are in conformity with the findings of Kademani, *et al.*, 2003.

#### Effect of plant population on nutrient uptake and yield:

Among the different plant population levels significantly higher uptake of nitrogen, phosphorus, potassium, sulphur, zinc and boron (109 kg/ha, 26.5 kg/ha, 130kg/ha, 12.5 kg/ha, 711 g/ha and 327 g/ha, respectively) was noticed with higher plant population level of P<sub>3</sub>- 74074 plants/ha as compared to P<sub>2</sub>-37037 plants/ha (84 kg/ha, 23.1 kg/ha, 82 kg/ha, 10.2 kg/ha, 573 g/ha and 249 g/ha, respectively). Higher nutrient uptake in higher plant population level is attributed to more below and above ground competition for nutrients and all the applied resources are effectively utilized, which in turn resulted in higher seed yield (2289 kg/ha) and stalk yield (7247 kg/ha). This result is in conformity with the findings of Dev and Sarawgi, 2004.

#### Effect of plant population on nutrient uptake and yield:

Significant differences in nutrient uptake were observed among different fertilizer level treatments. Significantly higher nitrogen, phosphorus and potassium, sulphur and boron uptake (102kg/ha, 27.2 kg/ha, 124 kg/ha, 12.1 kg/ha, 312 g/ha respectively) were recorded with application of 133 per cent RDF (120: 120: 80, N: P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O) as compared to application of 100 per cent RDF (90: 90: 60, N: P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O)(97 kg/ha, 23.9 kg/ha, 100 kg/ha,10.8 kg/ha and 280 g/ha, respectively). Higher stalk yield (6531 kg/ha) and seed yield (2185 kg/ha) recorded with these treatments had resulted in higher nutrient uptake. These findings are in line with those of Reddy, *et al.*, 2007, Taha, *et al.*, 1999 and Legha and Giri, 1999.

#### Nutrient status of soil after harvest of crop:

Fertilizer levels and application of FYM (5 t/ha) did not influence the final nutrient status of soil significantly but different plant population levels significantly influenced the final nutrient status of soil. Significantly higher build up of nitrogen, phosphorus, potassium was noticed with adoption of lower plant population level of P<sub>2</sub>-37037 plants/ha over initial values under lower plant population. This might be due to the fact that under lower plant population there was lower uptake of nitrogen, phosphorus and

**Table 2. Final nutrient status of soil as influenced by application of FYM, plant population and fertilizer levels.**

Treatments	Nitrogen (kg/ha)	Phosphorus (kg/ha)	Potassium (kg/ha)	Sulphur (ppm)	Zinc (ppm)	Boron (ppm)
<b>Farmyard manure (FYM)</b>						
M <sub>1</sub> -No FYM (Control)	200	20	177	13.1	0.93	0.32
M <sub>2</sub> - FYM (5 t/ha)	201	19	177	13.1	0.87	0.28
S. Em.±	2.9	0.44	0.86	0.03	0.05	0.02
C.D (0.05)	NS	NS	NS	NS	NS	NS
<b>Plant population (plants/ha)</b>						
P <sub>1</sub> -55555 (60 x 30cm)	191	21	177	12.9	0.82	0.26
P <sub>2</sub> -37037 (60 x 45 cm)	210	20	181	13.2	0.93	0.34
P <sub>3</sub> -74074 (60 x 22.5 cm)	200	18	172	13.2	0.95	0.29
S. Em.±	3.3	0.50	1.34	0.11	0.04	0.01
C.D (0.05)	9.7	1.44	3.9	NS	NS	0.03
<b>Fertilizer level (RDF= 90:90:60 NPK kg/ha)</b>						
F <sub>1</sub> - 100 % RDF	202	19	176	13.2	0.94	0.29
F <sub>2</sub> - 125 % RDF	201	20	175	13.0	0.81	0.27
F <sub>3</sub> - 133 % RDF	199	19	180	13.1	0.95	0.32
S. Em.±	3.3	0.50	1.34	0.11	0.04	0.01
C.D (0.05)	NS	NS	3.9	NS	NS	NS
<b>Initial nutrient status of soil</b>	<b>201</b>	<b>19</b>	<b>175</b>	<b>14</b>	<b>0.84</b>	<b>0.25</b>

potassium by sunflower than in the higher plant population level. Which might directly reflected in the more accumulation of available nitrogen phosphorus and potassium in soil. This result is in conformity with the findings of Dev and Sarawgi, 2004.

For effective utilization all the applied nutrients and also to get higher seed yield along with application of 133 per cent RDF and FYM (5 t/ha) maintenance of higher plant population level 74074 plants/ha is also essential.

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Received on 06-01-2014

Accepted on 26-01-2014