

Research Article – Agriculture

Effect of organic and inorganic fertilizer on phytochemical constituents in sunflower

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Abstract

The present study was conducted to characterize the effect of organic and inorganic fertilizer on the phytochemical constituents of sun flower. The phytochemical constituent such as chlorophyll a, chlorophyll b, total chlorophyll and carotenoid content were analyzed. From the result it was observed that both the treatments had significantly improved the phytochemical constituents of sunflower. Among the treatments, organic fertilizer is found to be more efficient than inorganic fertilizer over control. The present work indicates towards the beneficial effect of organic and inorganic fertilizers for the improvement of sunflower.

Key words: Sunflower, organic fertilizer, Inorganic fertilizer and phyto chemical constituents

Introduction

Sunflower (*Helianthus annuus* L) is the fifth most important source of edible oil after soybean, rapeseed, cotton and peanut due to high content of edible oil (38 – 52%) and protein (40% - 44%) and its high contents of unsaturated fatty acid as well as to lack of cholesterol has a desirable quality. The vital role of sunflower crop depends mainly on the characteristics of the oil produced, which can be used directly or after processing in food and non food industries. It is being cultivated over area of 1.71 million hectare production of 0.94 million tones. Sunflower is highly exhaustive crop; it will be difficult to meet the demand of plant through fertilizer alone. Now a day's increase in the prices of chemical fertilizers lack of consistency in feeding the soil and endangering human health caused to the increase of the use of manure for soil fertility (Mokhtariniya and Saidat, 2011). Hence to reduce the cost and causes of

chemical fertilizer can be replaced by organic and inorganic fertilizer to fasten yield. Use of these fertilizers in combination with the appropriate ratio may beneficial in increasing crop yields and maintain soil health and also organic fertilizer improves soil fertility by increased water – holding capacity, decrease in soil corrosion, improves amount of oxygen and promotes beneficial organisms and productivity (Cassman *et al.*, 1995; Hamza and Abd – Elhady, 2010). Cassman *et al.*, 1995 investigated the effects of organic and inorganic fertilization on seed and oil yields of sun flower and found that the highest values of seed oil content and oil yield were produced from sunflower plants received the nitrogen fertilizer at the recommended rate (30 Kg N/ field) alone or in combinations with 20 and 30 m³ farm yard manure. So the present study was conducted to find out the effect of organic and inorganic fertilizer on phytochemical constituents of sunflower.

Material and Methods

The seeds of sunflower var. CO – 2 obtained from Tamil Nadu, Agricultural University (TNAU), Coimbatore, were used for this study.

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Table.1. Effect of organic and Inorganic fertilizers on Chl. a content in sunflower.

| DAS | C | AWC | MWC | PWC | A+M+P | N | P | K | N+P+K |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 7 th | 0.500 | 0.550 | 0.520 | 0.530 | 0.730 | 0.530 | 0.520 | 0.550 | 0.640 |
| 15 th | 0.630 | 0.790 | 0.760 | 0.760 | 0.860 | 0.610 | 0.609 | 0.608 | 0.730 |
| 30 th | 0.700 | 0.810 | 0.820 | 0.790 | 0.930 | 0.730 | 0.770 | 0.730 | 0.820 |
| 60 th | 0.750 | 0.870 | 0.860 | 0.830 | 0.930 | 0.810 | 0.770 | 0.790 | 0.870 |
| 90 th | 0.410 | 0.510 | 0.509 | 0.490 | 0.540 | 0.340 | 0.380 | 0.390 | 0.450 |

Table. 2. Effect of organic and Inorganic fertilizers on Chl.b content of sunflower.

| DAS | C | AWC | MWC | PWC | A+M+P | N | P | K | N+P+K |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 7 th | 0.350 | 0.410 | 0.400 | 0.380 | 0.470 | 0.340 | 0.350 | 0.340 | 0.430 |
| 15 th | 0.550 | 0.650 | 0.630 | 0.630 | 0.710 | 0.510 | 0.520 | 0.520 | 0.670 |
| 30 th | 0.580 | 0.660 | 0.670 | 0.620 | 0.720 | 0.550 | 0.540 | 0.540 | 0.670 |
| 60 th | 0.700 | 0.730 | 0.710 | 0.690 | 0.740 | 0.640 | 0.610 | 0.570 | 0.730 |
| 90 th | 0.280 | 0.320 | 0.330 | 0.310 | 0.370 | 0.250 | 0.290 | 0.300 | 0.320 |

Table 3. Effect of organic and Inorganic fertilizers on carotenoid content of sunflower.

| DAS | C | AWC | MWC | PWC | A+M+P | N | P | K | N+P+K |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 7 th | 0.210 | 0.345 | 0.320 | 0.310 | 0.360 | 0.245 | 0.240 | 0.261 | 0.310 |
| 15 th | 0.230 | 0.441 | 0.400 | 0.375 | 0.470 | 0.270 | 0.285 | 0.305 | 0.395 |
| 30 th | 0.300 | 0.450 | 0.425 | 0.413 | 0.515 | 0.353 | 0.358 | 0.361 | 0.490 |
| 60 th | 0.395 | 0.540 | 0.525 | 0.440 | 0.620 | 0.510 | 0.525 | 0.490 | 0.570 |
| 90 th | 0.220 | 0.340 | 0.325 | 0.308 | 0.440 | 0.225 | 0.240 | 0.240 | 0.345 |

The soils were treated with different doses of organic and inorganic fertilizers such as T1 – Control, T2 – AWC, T3 – MWC, T4 – PWC, T5 – AWC + MWC + PWC, T6 – N Sources, T7 – P sources, T8 – K sources and T9 – N + R +K sources and kept separately. The seeds were sown immediately at the botanical garden, Department of Botany, Annamalai University. All the Cultural Practices were carried out during the study the photo synthetic pigments were analyzed.

Results and Discussions

The effect of organic and inorganic fertilizers on phytochemical constituents on sunflower was observed at different growth stage (7 days to 90 Days). The Chl – a, Chl – b were higher with the treatments than control (Table – 1&2). Data also indicated that total chlorophyll content increased with advancement up to 60 days than decline. Among the treatments combined treatments of organic fertilizer reported highest reading.

The results indicated that both organic and inorganic fertilizer significantly improved the carotenoid content of sunflower. The chlorophyll context was increased with increase of different growth stages up to 60 days after sowing and then found to decrease. The highest value of caroteinoid content was observed at combined treatments of organic fertilizer.

In both fertilizer the combined treatment reported highest values than individual treatments. Among the treatments organic fertilizer seems to be more efficient for Improvement (Table. 3).

The significant difference in available nutrients due to application of different organic sources and mainly due to varying nutrient composition of crop residues and organic manures (Abou – khadrah *et al*, 2000). The availability of N, P, and K was higher in compost treatment which might be attributed to the faster rate of decomposition and mineralization in compost than inorganic fertilizer was reported by several workers. Bio fertilizers play vital role in increasing the number of micro organisms and accelerate certain microbial process in plants which can change the available from of many nutrients for crops (Fallahi *et al.*, 2008). Nitrogen is considered as the key element in increasing productivity but large ratios of fertilizers nitrogen loss to the environment could cause a serious environmental problem such as ground water contamination. Nitrogen fertilizer application and seed biopriming can increase quantitative and qualitative yield of sunflower.

Fertilizer management is one of the most important factors in successful cultivation of crop affecting yield quality and quantity (Tahmosbi *et al.*, 2011). Overdose of different chemical

fertilizers is one of the causes for the degradation of environment and soil. Bio fertilizers are the newest and most technically advanced way of supplying mineral nutrients of crops. Compared to chemical fertilizers, their supply nutrient for plant needs, minimize leaching and therefore improves fertilizer use efficiency (Seyed sharifi, 2009). Soleimani (2008) reported that application of nitrogen fertilizers increased the phytochemical constituents of sunflower.

References

Abou – Khadrah, S.H., A.A.E. Mohamed, N.R. Gerges and Z.M. Diab, 2000. Response of four sunflower hybrids in lower nitrogen fertilizer levels of phosphor in bio- fertilizer. *J. Agric. Res, Tanta Univ.*, 28 (1): 105-118.

Cassman, K.G., R.Steiner and A.E. Johnson, 1995. Long term experiments and productivity indexes to evaluate the sustainability of cropping system in: *Agricultural Sustainability: Economic, Environmental and statistical consideration*. Eds., Payne, B., V.R and Wiley R, UK.

Fallahi, J., A. Koocheki and P. Rezveni Moghadeen, 2008. Effects of biofertilizers on quantitative and qualitative yield of chamomile (*Matricaria recutita*) as a

medicinal plant. *Journal of Agricultural Research.*, 7: 127 – 135.

Hamza, M.A.M., and E.S.E. Abd-Elhady, 2010. Effect of organic and inorganic fertilization on vegetative growth volatile oil of marjoram (*Majorana hortensis* L.) plant. *Journal of soil sciences and agricultural Engineering*, 1(8), 839 – 851.

Mokhtariniya, S., and S.A. Siadat, 2011. The study of using zeolite integrated with sheep manure before composting in reducing the consumption of chemical fertilizer in corn cultivation in light textured soils in Khuzestan, Iran. *American journal of Scientific Research*, 32: 90-97.

Seyed Sharifi, R., 2009. *Industrial Plants*. University of Mohaghegh Ardabili and Amidi press. 422 pp.

Soleimani, R.,2008. Effect of rate and time of nitrogen application on grain yield and its components in spring safflower. *Iranian Journal of Crop Sciences*. 10 (1): 47-59.

Tahmasbi. D., R. Zarghami, A.V. Azghandi and M. Chaichi, 2011. Effects of nanosilver and nitroxin biofertilizer on yield and yield components of potato mini tubers. *Int. J. Agric. Biol.*, 13: 986 – 990.