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ON THE EFFECT OF COTTON WASTE COMPOST, ZARKHEZ AND COWDUNG MANURE ON SUNFLOWER YIELD

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Cotton waste compost at 5 kg/9 m^2 area when applied to sunflower plants prior to sowing resulted in 19.5 % increase in number of germinated seeds. Combination of cotton waste compost and cowdung manure (1 : 1), however, resulted in 25.5 % increased germination as compared to control. Maximum yield of sunflower seeds and its oil content was obtained from plants grown in plots with cotton waste compost. Test of significance among various treatments indicated that effectiveness of cotton waste compost was significantly above other treatments both at 5 % and 1 % level of probability. Cotton waste compost, therefore, seems to be a better fertilizer for crops and can be used in place of cowdung manure and other fertilizers.

Key words: Cotton waste compost, Zarkhez, Cowdung manure, Sunflower.

INTRODUCTION

Inter-departmental committee for the disposal of organic waste in Newzealand [1] conducted research on mechanics of soil improvement through incorporation of compost into the soil. Addition of composts to the soil is known to improve water holding capacity, and organic and trace element status. Besides, compost nitrogen is slowly released in the soil for the plant whereas in chemical fertilizers, nitrogen gets easily volatilized and leached out. Twenty five percent increase in the yield of *Petra hybride* crop [2] was noted when cow dung manure and garbage compost (1 : 1) was applied to soil. In previous communication cotton waste was converted into compost with 76 % yield [3]. This compost rich in organic matter, was chemically compared with cowdung and was found to possess 1.18 %, 0.527 % and 1.1 % more nitrogen, phosphates and potassium respectively. Nutritive effect of cotton waste compost over cowdung manure and zarkhez was determined in field experiments by cultivating sunflower. Besides, comparative evaluation of cotton waste compost with cowdung manure and zarkhez (compost commercially manufactured from domestic garbage by Farooq Composting Fertilizer Corporation (FCFC) Karachi), and a mixture of cotton waste compost and cowdung manure on germination, growth, flowering, yield of sunflower seeds and their oil content was made.

MATERIALS AND METHODS

Compost was prepared from cotton waste procured from a local cotton waste processing factory, using chinese method of composting [4]. Cowdung and zarkhez were purchased from the market. Cotton waste compost (CWC), cowdung manure (CM), zarkhez (Z); and 1 : 1 mixture of cotton waste compost and cowdung manure (CWC-CM), along with field soil (control) were chemically analyzed according to Bhide [5] and Standard Methods [6].

The experiment was laid out in randomized complete block design in triplicate. Entire field was divided into 15 plots 3 x 3 m each. Five kg of treatment material (CWC, CM, Z, CWC-CM) was separately added to each plot. Equal numbers of sunflower seeds were sown 16 cm apart in each treated plot and watered accordingly. Control plots without treatment material were run simultaneously.

Sunflower seeds (*Helianthus annus*) procured from local market were used. Sunflower was selected because of its adaptability, drought resistant qualities and short cropping pattern [7]. Plant density/unit area, height, number of flowers per plant, diameter of flowers, seed weight, yield per plot and oil content were determined. Collected data were statistically analyzed using analysis of variance technique [8]. Randomized block test at 5 % and 1 % probability was used to test the difference among various fertilizers. Oil was estimated by soxhlet extraction using petroleum either (b_p, 40 - 60°.).

RESULTS AND DISCUSSION

Experimental plots had sandy soil with pH 6.8, organic matter 3.0 %, ash 97 %, nitrogen 0.20 %, phosphate 0.1 %, potassium 0.3 % and C/N 9/1. Chemical analysis of different treatment used in this experiment, is given in Table 1. Cowdung manure (CM), cotton waste compost: Cow dung manure (CWC-CM), and cotton waste compost (CWC)

Table 1. Chemical composition of soil, cowdung manure, cotton waste compost and zarkhez.

		pH	% Organic matter	Ash	Nitrogen %	Phosphate	Potassium	C/N
1.	Soil (control)	6.8	3.0	97	0.2	0.1	0.3	9/1
2.	Cowdung manure (CM)	7.80	58.0	42	1.60	1.1	1.56	22/1
3.	Cotton waste compost (CWC)	7.5	56.0	44	2.5	0.92	1.4	13/1
4.	Zerkhez	8.4	37.0	63	1.30	0.68	0.68	17/1
5.	Cowdung manure: Cotton waste compost (1 : 1) (CWC-CM)	7.6	57.0	43	2.0	1.0	1.5	17/1

had 7.8, 7.6 and 7.4 pH with 58 %, 57 % and 56 % organic matter respectively. pH of zarkhez was noted to be more alkaline (8.4) with less organic matter (37 %) and correspondingly a higher ash content i.e. 63 %. CWC and CWC-CM had respectively 2.5 % and 2.0 % nitrogen compared to 1.6 % in CM. Phosphate and potassium did not show much variation in the three treatments mentioned above. Zarkhez had much lower nitrogen, phosphate and potassium content i.e. 1.3 %, 0.68 %, 0.68 % respectively. Cowdung manure had slightly higher C/N (22/1), whereas CWC-CM, and CWC compost had 17/1, 17/1 and 13/1 C/N ratio respectively. Initiation of seeds germination was noted within 4-6 days in all sets of experiments. In CWC no germination took place after 7 days, however in rest of the treatments germination of seeds continued for 15 days (Table 2). This early germination of seeds in plots with CWC is probably due to comparatively better stable (13/1) C/N condition as well as availability of nutrients in balanced and simpler forms for ready germination. Other fertilizers either had higher C/N ratio, or nutrients in complex form, hence needed more time for oxidation and breakdown into soluble elements to be available to the seeds for germination.

Table 2. Effect of various treatments on germination of sunflower seeds.

S. No.	Treatment	% Increase in germination with respect to control
1.	Control (soil) no treatment	–
2.	Cotton waste compost (CWC)	19.5 %
3.	Cow dung manure (CM)	16 %
4.	Zerkhez (Z)	21.3 %
5.	1 : 1 Cotton waste compost Cow dung manure (CWC–CM)	25.5 %

It is evident from Table 2 that germination increased significantly employing all four types of treatments over control (Soil). CWC-CM showed 25.5 %; and 21.3 % increase in germination/plot with respect to control. These values were significant both at 5 % and 1 % level of probability, however CWC (19.5 %) and CM (16 %) values were significant at 5 % level probability only. Difference in effectiveness among treatments themselves with respect to germination is insignificant.

Effect of various organic treatments on growth of plant, flowering, yield of seed and oil content is tabulated in Table 3. Analysis of variance show that efficiency of CWC, CWC-CM, Z and CM alone with respect to yield of seeds is significantly higher to that of control at both 5 % and 1 % level of probability. Further it was observed that CWC had significantly higher yield of seeds both at 5 % and 1 % probability when compared with the yield from CM and Z. However, no significant difference was observed between CWC and CWC-CM crops yields.

Oil content of seeds from plants grown in plots with various treatments, was found to be significantly higher than control, both at 5 % and 1 % level of probability. Test of significance between various treatments indicated that yield of oil from cotton waste compost was significantly

Table 3. Effect of various treatments on sunflower.

S. No.	Treatment	Average height of plant (cm)	Number of flowers per plot	Average diameter of flower (cm)	Weight of 1000 grains (gm)	Yield of seeds 100m^2 (Kg)	% Oil content of seeds
1.	Control soil (no fertilizer)	85	14	13	47.0	9	23
2.	Cotton waste compost (CWC)	151	31	14	62.0	29	46
3.	Cowdung manure (CM)	177	27	15	57.0	27	32
4.	Zarkhez (Z)	138	30	14	55.0	26.5	34
5.	1 : 1 C. waste compost: C. dung manure (CWC-CM)	168	34	13.5	47.0	28	28

higher at both levels when compared with Z, CM and CWC-CM mixture.

It is obvious that CWC gave significantly higher yield of seed and oil. On an average height seed weight was recorded. Though CWC-CM mixture had highest number of plants and flowers per plot, the diameter of flowers was less (13.5 cm) and had seeds with lighter weight. A comparison, therefore drawn on density of crop/square foot area versus yield of crop (Fig. 1) indicated that CWC-CM mixture had highest density of 0.45 per square ft. area i.e. 6 % more than CWC which led to insufficiency of nutrients to plants, though organic matter, nitrogen, potassium and phosphate were more or less in equal ratios as to CWC.

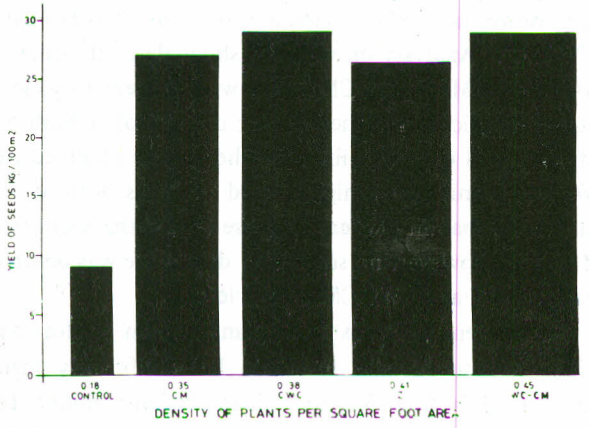

Fig. 1. Density of sunflower plants/square foot plot area on different treatments.

Similarly zarkhez had second highest density (0.41) but less organic matter, nitrogen, phosphates and potassium which resulted in comparatively stunted plants with light seed weights, and correspondingly reduced yield of seeds. Overall results indicated significant effectiveness of CWC over CM. Moreover CWC-CM would have resulted in improved yields had plants been thinned out at initial stage to the same number as in CWC. It may therefore be assumed that composted cotton waste is a better fertilizer than locally available cow dung manure and zarkhez. CWC moveover if applied in proper dosages in combination with cow dung manure (1 : 1) is likely to result in a significant improvement in yield of crop.

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