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Chemical and biological properties of soil as influenced by application of sunflower residue compost to *kharif* urdbean

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Abstract
The field experiment was conducted at MARS, UAS, Dharwad during *kharif*, 2014 and 2015 with 6 treatments consisting of FYM at 5 t ha^{-1}, sunflower residue used as mulch, sunflower residue with compost culture applied 15 days before sowing, incorporation of chopped sunflower residue applied 15 days before sowing, sunflower residue decomposed for 75 days with compost culture, sunflower residue + FYM at 5 t ha^{-1} applied 15 days before sowing. Pooled analysis indicated that among the different management practices sunflower residue decomposed for 75 days with compost culture recorded significantly higher seed yield, number of branches per plant, number of pods per plant and total dry matter(1070 kg/ha, 6.33, 27.6 and13.79g, respectively) compared to others and they were on par with the FYM at 5t/ha (1021 kg/ha, 5.77, 27.2 and 12.63g, respectively).Similar trend was observed with dehydrogenase activity, and available nutrient status of soil.

Keywords: sunflower residue, compost culture, organic manure, urdbean

Introduction
In India, Urdbean (*Vigna mungo* L. Hepper) is grown on 3.2 m ha area with a production of 13.26 lakh tonnes. In Karnataka, it is grown on an area of 1.6 lakh hectares with a production of 0.64 lakh tonnes (Anon., 2012) [1]. The productivity of urdbean in Karnataka is 400 kg/ha which is less than average productivity of India (414 kg/ha). One of the reasons for low productivity is poor management of the crop as it is grown on marginal lands, low fertile soils and with inadequate fertilizer. There is scope to enhance the productivity of urdbean by applying organic manures which help to increase the nutrient availability by improving physical, chemical and biological properties of soil. Under the situation of non availability of farm yard manure (FYM), crop residue composts can be prepared within 75 days from compost culture (consisting of *Trichoderma viridae*, *Phanerochaete chryzosporium*, *Pleurotus*, *Aspergillus sydowii*) and used for enhancing the nutrient status of soil. In India, sunflower is cultivated on an area of 0.82 million ha and in Karnataka, it is grown on an area of 4.3 lakh ha with average potential yield of 4–6 t/ha crop residue and will produce approximately 17.2 lakh tons of sunflower residue and 0.75, 0.25 lakh t of N and P, respectively which will be burnt generally. It can be converted to compost with the help of compost culture and added to the soil to improve the nutrient status of soil. Hence a study was initiated to compare the sunflower compost with FYM and sunflower residue in different forms without compost preparation.

Material and Methods
The field experiment was conducted at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad during *kharif*, 2014 and 2015 under rainfed condition. Which is situated at 15º26' N latitude and 75º01' E longitude and at an altitude of 678 m above mean sea level. The research station comes under Northern Transition Zone (Zone 8) of Karnataka The soil type of experimental site was medium black clay soil with available N, P2O5 and K2O of 219, 24.2 and 387 kg/ha respectively The field experiment was laid out in randomized complete block design with four replications. There were 6 treatments consisting of T1-FYM at 5 t ha^{-1} applied 15 days before sowing, T2-sunflower residue used as mulch at the time of sowing, T3-sunflower residue with compost culture applied 15 days before sowing, T4-incorporation of chopped sunflower residue applied 15 days before sowing, T5-sunflower

residue decomposed for 75 days with compost culture (*Trichoderma viridae*, *Phanerochaete chryzosporium*, *Pleurotus*, *Aspergillus sydowii*), T6-sunflower residue + FYM at 5 t ha $^{-1}$ applied 15 days before sowing. Recommended dose of fertilizer (25:50:0 of N, P_2O_5 and K_2O kg/ha) was common to all the treatments and sunflower residue was applied @ 4t ha $^{-1}$. Urdbean genotype DBGV-5 was sown on third week of June in both the years.

Results and Discussion

Pooled analysis of 2014 and 2015 (table1) indicated that among the different management practices sunflower residue decomposed for 75 days with compost culture recorded significantly higher seed yield, number of branches per plant, number of pods per plant and total dry matter (1070 kg/ha, 6.33, 27.6 and13.79g, respectively) compared to others and they were on par with the FYM at 5t/ha (1021 kg/ha, 5.77, 27.2 and 12.63g, respectively).

The higher dehydrogenase activity in soil was observed in sunflower residue at 4 t/ha decomposed for 75 days with compost culture (47.52 µg TPF g^{-1} day^{-1}) than other treatments However, it was on par with FYM at 5 t/ha applied 15 days before sowing (47.48 µg TPF g^{-1} day^{-1}). The available nitrogen, phosphorus and potassium in soil were also higher with this treatment (228.06, 29.12, 403.60 kg/ha) over other treatments followed by FYM at 5 t/ha applied 15 days before sowing (226.36, 28.56, 397.65 kg/ha). The increase in available nutrients in soil due to organic materials application could be attributed to the greatest application of soil microbes which could convert organically bound nitrogen to inorganic form (Badnur *et al.*, 2000) [2].

Significantly lower dehydrogenase activity in soil (38.79 µg TPF g^{-1} day^{-1}) was observed in sunflower residue at 4 t/ha used as mulch at the time of sowing. However, lower available nitrogen, phosphorus and potassium was observed in sunflower residue at 4 t/ha used as mulch at the time of sowing (222.81, 18.95, 364.58 kg/ha) compared to sunflower residue at 4 t/ha decomposed for 75 days with compost culture and FYM at 5 t/ha applied 15 days before sowing. The lower yield, dehydrogenase activity and available nutrient status in freshly applied sunflower residue can be attributed to Allelopathic effect of sunflower residue on succeeding crops (Narwal *et al*., 1999). When sunflower residue was turned to compost in 75 days by compost culture, its allelocompounds (phenols, terpenes) was reduced by biodegradation and at the same time organically bound nutrients were converted to inorganic form, hence available nutrient status was increased in soil and resulted into higher yield of urdbean.

Table 1: Growth and yield parameters of urdbean and soil health parameters as influenced by sunflower residue management techniques (pooled)

Treatments	Seed yield (kg/ha)	Number of branches per plant	Number of pods per plant	Total dry matter/plant (g)	Dehydrogenase activity (µg TPF/g/day)	Available Nitrogen (kg/ha)	Available Phosphorus (kg/ha)	Available Potassium (kg/ha)
T1: FYM at 5 t ha-1	1021	5.77	27.2	12.63	47.48	226.36	28.56	397.65
T2: Sunflower residue mulch at the time of sowing	819	4.61	15.6	9.09	38.79	222.81	18.95	364.58
T3: Sunflower residue with compost culture applied 15 days before sowing	893	5.09	20.8	11.06	40.22	223.14	22.35	369.25
T4: Incorporation of chopped Sunflower residue before 15 days of sowing	864	4.35	18.4	8.87	47.52	228.06	29.12	403.60
T5: Sunflower residue decomposed for 75 days with compost culture	1070	6.33	26.2	13.79	43.84	224.78	25.23	378.58
T6: Sunflower residue and FYM at 5 t ha-1 applied 15 days before sowing	975	5.27	23.5	12.03	43.51	224.74	24.51	380.87
S.Em+	42	0.37	1.78	0.83	0.79	0.99	1.03	2.81
CD (P=0.05)	126	1.51	5.36	3.25	2.38	2.99	3.11	8.47

References

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