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Effect of various composts alone and in combination with inorganic fertilizers on maize yield and soil health

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ABSTRACT

An experiment was conducted during *kharif* 2005 and 2006 in MPKV, Rahuri, Dist. Ahmednagar (MS) to find out the effect of parthenium compost in maize yield and soil health. The results indicated that application of 50% N through parthenium compost + 50% N through RDF (60:30:30 NPK kg/ha) and 50% N through vermicompost + 50% N through RDF were found at par with each other and recorded significantly higher grain and stover yield of maize over rest of the treatments. Organic carbon status of soil was not influenced by addition of different levels of organic compost and inorganic fertilizer. However, available N, P_2O_5 and K_2O in the soil after harvest of crop was found significantly higher with the application of 50% N through parthenium compost + 50% N through RDF and 50% N through vermicompost + 50% N through RDF.

Key words: Maize, Sources of compost, Inorganic fertilizer, Soil health

Before initiation of chemical dependent agriculture, organic substances were practically the only external source of nutrients to crops. The various implications of commercial fertilizers particularly in decreasing the soil fertility and productivity and the ever increasing cost of chemical fertilizers compels one to think of the use of organic manures (Bhardwaj and Gaur, 1985, Modgal and Singh 1990). However, integrated nutrient supply system (INSS) aimed at sustainable crop production levels with minimum deleterious effect of chemical fertilizers on soil health and least disturbance to ecosystem could be achieved by orchestrating the combined use of inorganic fertilizers and organic manures. This approach restores and sustains soil health and productivity in the long run besides meeting the nutritional deficiencies (Satyajeet and Nanwal 2007). Besides, use of organic manures like farmyard manure, vermicompost, city compost, Parthenium compost as nutrient source in agriculture could be a suitable alternative for maintaining soil fertility and productivity.

MATERIALS AND METHODS

The experiment was conducted at Department of Agronomy, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar (Maharashtra) during *kharif* 2005 and 2006 under DBT- sponsored Parthenium project to find out the effect of different organic sources (Parthenium compost, vermicompost, city compost and farmyard yard manure) and inorganic fertilizers on yield of maize and soil health. The Parthenium compost was prepared by using Parthenium, cow dung slurry, soil, urea and *Trichoderma viridae*. The Parthenium compost contained 2.2% N, 0.3% P and 0.7% K. The experiment with twelve treatments including recommended dose of fertilizer (120:60:60 NPK kg/ha (RDF)). Recommended dose of fertilizer (NPK) + 10 t/ha FYM, 75% N through RDF with 25% N through Parthenium compost, FYM, city compost and vermicompost, 50% N through RDF with 50 % N through Parthenium compost, FYM, city compost, vermicompost and 25% N through each of Parthenium compost, FYM, city compost and vermicompost along with absolute control was laid out in randomized block design (RBD) with three replications. The recommended dose of fertilizer was (120:60:60 NPK kg/ha). The crop was applied with N as per treatment and full dose of P_2O_5 and K_2O was given to all the treatments except absolute control and other agronomic practices were followed as per recommendation.

RESULTS AND DISCUSSION

Maize grain and stover yield

It is evident from the data presented in Table 1 that the application of 50% N through Parthenium compost + 50 % N through RDF was at par with the application of

50% N through vermicompost + 50% N through RDF and recorded significantly higher grain yield of maize over treatments of organic compost added with different levels of RDF, inorganic sources alone and absolute control during both the years of experimentation as well as in pooled mean. However, application of 50% N through vermicompost + 50% N through RDF recorded significantly higher maize stover yield than rest of the treatments during both the years of experimentation and in pooled mean except during 2006 where, it was found at par with the application of 25% N through Parthenium compost + 75% N through RDF , 50% N through parthenium compost + 50% N through RDF. All the organic compost treatments with different combinations of RDF were found superior over inorganic fertilizer alone and absolute control. This might be due to availability of macro and micronutrients along with better physical environment for root growth from the parthenium compost and vermicompost. Sudhakar (1984) reported that the use of Parthenium green manuring was found beneficial for increasing the yield of ratoon rice in Coimbatore. Son (1995) also used different composts *viz*., coir pith, *Ipomea*, water hyacinth, parthenium, paddy straw and sugarcane trash and recorded significantly higher maize grain and stover yield due to application of Parthenium and coir pith compost. Satyajeet and Nanwal (2007) also reported beneficial effect of integrated nutrient management on yield of pearl millet (Table 1).

Soil health

Organic carbon status of soil was not significantly influenced. Availability of N, P and K during both the

Table 1. Effect of Parthenium compost on yield of *kharif* maize as influenced by different treatments

Treatment details*	Maize yield (kg/ha)					
	Grain			Stover		
	2005	2006	Pooled	2005	2006	Pooled
Control	2818	2718	27.68	5094	4853	4974
RDF (NPK only)	4735	4315	4525	6357	6015	6186
GRDF (NPK + 10 t FYM/ha)	5310	4817	5064	7793	7579	7686
25% N through PC + 75% N through RDF	5317	4953	5135	7801	7701	7751
25% N through FYM + 75% N through RDF	4887	4617	4752	6481	6189	6335
25% N through CC + 75%N through RDF	5083	4830	4957	6493	6090	6292
25% N through VC + 75%N through RDF	5431	5013	5222	7443	7043	7243
50% N through PC + 50% N through RDF	5618	5571	5595	8073	7673	7873
50% N through FYM + 50% N through RDF	5044	4823	4934	6511	6215	6363
50% N through CC + 50% N through RDF	5291	5016	5154	7623	7420	7522
50% N through VC + 50% N through RDF	5732	5511	5622	8516	8016	8266
25% N through PC+ 25% N through FYM + 25% N through CC + 25% N through VC	3337	2941	3139	5387	5079	5233
LSD (P=0.05)	218	260	253	423	435	413

*RDF – Recommended dose of fertilizer, GRDF- General recommended dose of fertilizer,
FYM – Farmyard manure, PC – *Parthenium* compost, CC – City compost, VC – Vermicompost

Table 2. Effect of Parthenium compost residual status on soil characters as influenced by different treatments

*Treatments	Organic carbon (%)	Available N (kg/ha)	Available P_2O_5 (kg/ha)	Available K_2O (kg/ha)	Organic carbon (%)	Available N (kg/ha)	Available P_2O_5 (kg/ha)	Available K_2O (kg/ha)
	2005				2006			
Absolute control	0.81	151.37	17.29	367.41	0.82	153.37	18.20	370.00
RDF (NPK only)	0.83	183.14	18.89	381.83	0.84	185.39	19.01	382.28
GRDF (NPK + 10 t FYM/ha)	0.83	195.83	18.93	392.03	0.84	195.89	19.02	392.18
25% N through PC + 75% N through RDF	0.84	196.55	19.23	394.00	0.85	197.13	20.21	395.33
25% N through FYM + 75% N through RDF	0.83	195.00	19.00	391.53	0.84	196.01	20.88	392.08
25% N through CC + 75% N through RDF	0.86	193.74	18.73	385.18	0.87	192.74	19.42	386.29
25% N through VC + 75% N through RDF	0.85	196.82	19.01	394.47	0.86	199.01	19.88	395.20
50% N through PC + 50% N through RDF	0.87	204.14	21.75	398.71	0.88	205.18	22.03	400.00
50% N through FYM + 50% N through RDF	0.85	198.47	20.01	393.88	0.86	199.47	21.05	393.29
50% N through CC + 50% N through RDF	0.86	195.53	19.52	387.31	0.87	197.14	20.71	387.18
50% N through VC + 50% N through RDF	0.88	205.33	22.14	400.08	0.88	204.88	24.43	405.32
25% N through PC+ 25% N through FYM + 25% N through CC + 25% N through VC	0.84	171.18	18.41	373.44	0.86	180.41	19.42	380.11
LSD (P=0.05)	NS	5.42	0.40	6.87	NS	5.24	0.48	6.92

*RDF – Recommended dose of fertilizer, GRDF- General recommended dose of fertilizer, FYM – Farmyard manure, PC – *Parthenium* compost, CC – City compost, VC – Vermicompost

years of experimentation was found significantly higher with the application of 50% N through Parthenium compost + 50% N through RDF which was at par with application of 50% N through vermicompost + 50% N through RDF treatment over treatments of organic compost added with different combinations of RDF, inorganic fertilizers alone and absolute control during both the years. However, during 2005, application of 50 % N through Parthenium compost + 50% N through RDF was at par with application of 50% N through vermicompost + 50% N through RDF, 50% N through FYM + 50% N through RDF and 25% N through Parthenium compost + 75% N through RDF and recorded significantly higher K availability in soil after harvest of the maize crop than rest of the organic and inorganic treatment combinations and inorganic fertilizers alone and absolute control. In general, the residual magnitude of N, P and K in soil after harvest of maize was more with integrated use of Parthenium compost and vermicompost along with inorganic fertilizer and absolute control which might be due to availability of nutrients for entire growing season due to slow mineralization of organic sources (Table 2). Similar results were also reported by Pagaria *et al.* (1995), Padole *et al.* (1998) and Mohammed Aijaz (1999).

Considering the alternative uses of parthenium, the compost can be prepared and applied to maize crop at the rate of 2.7 t/ha along with 50 % RDF for improving the yield of maize and fertility status of the soil. Therefore, parthenium compost application could remain viable option compared to inorganic fertilizer for enhancing the productivity of maize and improving the soil fertility.

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