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EFFECT OF VERMI-COMPOST AND SESBANIA ACCULATA GREEN MANURING ON INDIAN FALLOW LAND TORIA OILSEED PRODUCTION

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Abstract: A field experiment was carried out during summer and winter season of 2004-05 and 2014-15 to study the effect of nutrient management by using value added vermi bio-manures and green manuring effect on Toria crop in sandy loam soil at abandoned Farm land of Indian Veterinary Research Institute, Bareilly, U.P., India. Result indicated that application of vermi bio-manure @ 10t/ha produced more yield than green manuring. In both years vermi compost manuring produced more yield in comparison to green manuring during 2004-05 and 2014-15. The reason might be that vermi-compost supplied early nutrients than the green manuring. Among the Toria varieties PT-330 produced maximum yield (13.2 and 11.4 q/ha) in both the trials. Oil content was also found higher (33.7% and 36.3%) in the P-330 variety and followed by PT-570. Second maximum green yield 12.5 q/ha and 10.7q/ha and wherein oil content was observed 36.4% and 34.5%, respectively. Soil fertility status was improved during long term effects (10 years) process in both green manuring and vermi-compost application trials. Major and minor nutrients were increased due to availability of more organic carbon, increase soil moisture contents and higher soil microbial activities during the period of 10 years.

Introduction: During green revolution, high yielding crop varieties were introduced with the extension of irrigated area, application of high analysis fertilizers NPK and increased cropping intensity that propelled India towards self sufficiency in food production. In the process, relative contribution of organic manure as a source of plant nutrient declined substantially. Indian farmers were basically organic farmers before the advent of inorganic fertilizers and pesticides. Agriculture practices across the world have impacted the ecology of our planet in such severe and violent ways that unless we change to a more ecological path, our soils and biodiversity will be irreparably destroyed and lost to the world. (Sujata, 2017).

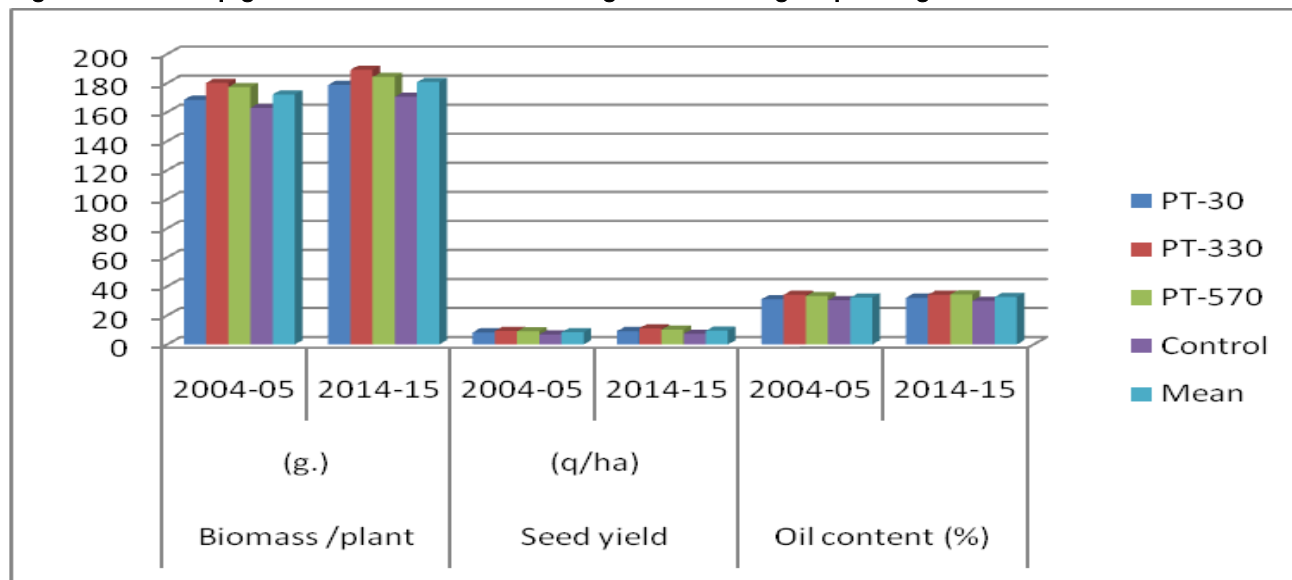
Material and methods: Two agronomic trials at Govt. farms in India were conducted in 2004-05 and 2014-15. Trials were initiated during summer/rainy season. Sesbania acculata for in situ green manuring crop was grown prior to oilseed crops. In successive Rabi/winter season Toria crops were grown. North India suitable released short duration oil seed crop varieties from Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttrakhand, India namely three cultivars viz. PT-30, PT-330 and PT-570 were grown with organic package of practices sesbania green manuring *in situ*.

incorporated in the soil after 70 DAS. Sesbania crop added green biomass in the soil @ 132 q/ha. In other trial vermin-bio compost @ 10 tonnes/ ha before sowing of Toria varieties was applied . Layout had 4 x 2 treatments and with 4 Replications and Plot Size was 5 x 4m². The experimental design R B D was followed. Bio-Fertilizers (Azatobacter and Phosphorus solubilizing bacteria) were also added to enhance the soil fertility. The above experiment was conducted at ICAR-IVRI at Jhanda block and Fodder farm, respectively during 2004-05 and 2014-15. Irrigation was applied with good quality of water from deep submersible pump set. The analysis of soil and water were carried out. Vermi-compost was prepared with earthworm species “Jai-Gopal” which was developed at ICAR-IVRI. Jai-Gopal earthworm is a very hard species which can survive at 45°C of field conditions. Waste materials intake of Jai-Gopal than the other earthworm local species. Five plant samples were collected from each treatment for experimental observations. Control treatment no and green manuring was applied to the controlled treatment except bio-fertilizers.

Results: Table 1 : Toria crop grown after sesbania acculata green manuring crop during 2004-05 and 2014-15

Variety	Plant Height (CM)		No. of leaves/plant 45 DAS		Biomass /plant (g.)		Seed yield (q/ha)		Oil content (%)	
	2004-05	2014-15	2004-05	2014-15	2004-05	2014-15	2004-05	2014-15	2004-05	2014-15
PT-30	93.2	93.8	11.2	12.4	168.5	178.8	8.3	9.2	31.1	32.1
PT-330	95.5	97.9	12.9	14.1	180.1	189.1	9.3	11.1	34.2	34.2
PT-570	95.0	97.2	11.9	13.3	177.2	184.2	9.1	10.2	33.4	34.4
Control	88.2	88.3	9.3	9.2	162.9	170.6	6.8	7.3	30.5	30.1
Mean	92.97	94.3	11.32	12.25	172.17	180.67	8.37	9.45	32.3	32.7

Fig. 1 : : Toria crop grown after sesbania acculata green manuring crop during 2004-05 and 2014-15



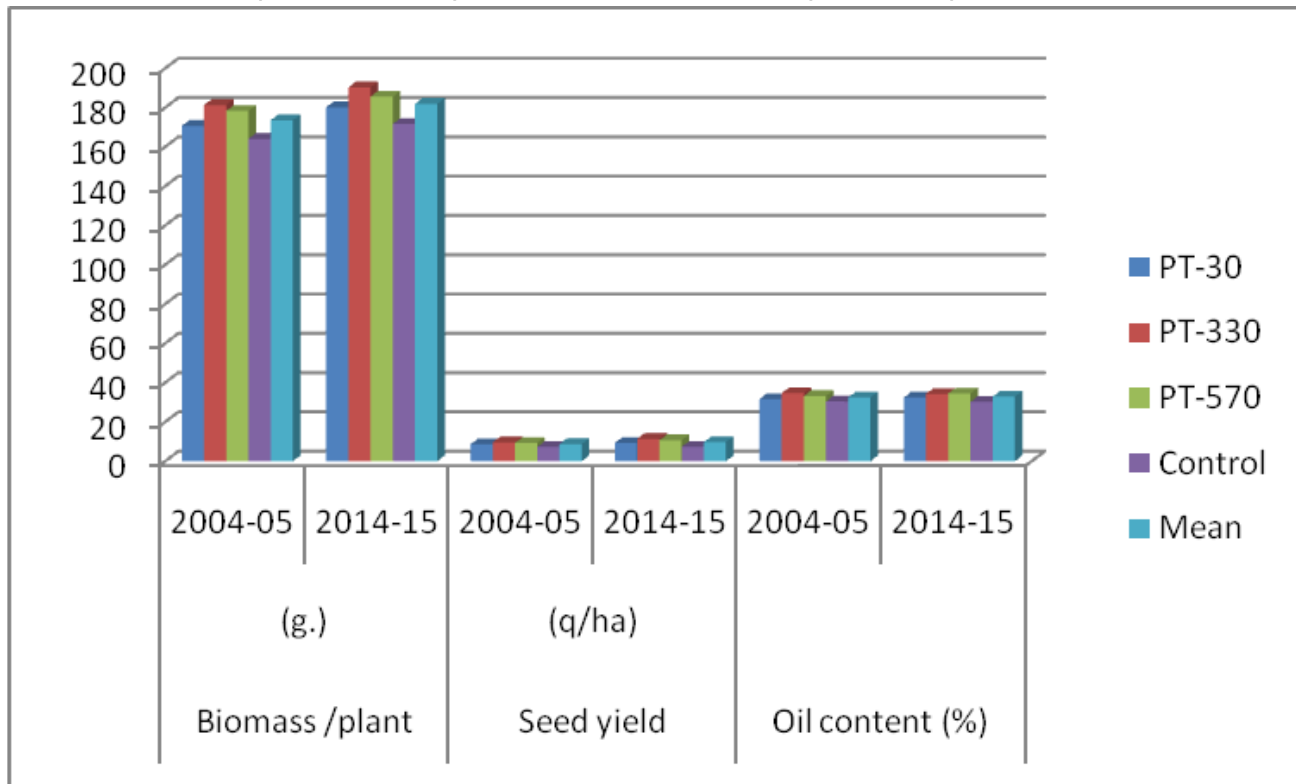
Discussion: Effect of Green Manuring : Biomass of Sarbania was incorporated into soil @ 132 q/ha. It was having 2.9% Nitrogen on dry matter basis. Green manuring added 67 kg N/ha to the soil and saved Rs. 775/- per ha (2004-05). Hence, this additional N₂ and other nutrients increased growth parameters and yield attributing characteristics in the Toria crop. This increase was responsible to higher seed and oil yield of the Toria/mustard over the control. However, this increase was lower in comparison to vermi-bio compost application to Toria crop. It is reported that the rice-wheat-sesbania green

manuring sequence being more stable with minimum inputs requirement and may be adopted by resource poor farmers (CRS, 2005). Data shows that PT330 produced maximum seed yield (9.62q/ha and 11.4 q/ha) grain followed by PT570. The oil content was also higher in the similar trends of these varieties.

Results: Table 2 : Toria crop grown after vermi-bio-manuring crop during 2004-05 and 2014-15

Variety	Plant Height (CM)		No. of leaves/plant 45 DAS		Biomass /plant (g.)		Seed yield (q/ha)		Oil content (%)	
	2004-05	2014-15	2004-05	2014-15	2004-05	2014-15	2004-05	2014-15	2004-05	2014-15
PT-30	93.3	94.5	11.3	12.6	170.7	180.2	8.61	9.34	31.6	32.4
PT-330	96.6	98.1	13.1	14.4	181.3	190.3	9.62	11.4	34.6	34.3
PT-570	95.1	97.3	12.4	13.6	178.3	185.6	9.32	10.7	33.2	34.5
Control	89.3	89.4	10.7	9.7	164.1	171.7	7.3	7.3	30.4	30.2
Mean	93.5	94.82	11.87	12.57	173.57	181.95	8.71	9.68	32.45	32.85

Fig. 2 : Toria crop grown after vermi-bio-manuring crop during 2004-05 and 2014-15



Effect of Vermi-Compost on yield :

Vermi-compost was added @ 10q/ha which is at higher rate in comparison to Sesbania in situ green manuring @ 132q/ha. Vermi-bio-manure released faster and early nutrients than the green manuring. This early and quick release of essential nutrients may fulfill the nutritional requirements of the field crop. Earthworms make the organic manure as value added bio-product in the form of bio-manure. Bio-manure contains some growth promoter enzymes also. This releases plant nutrients faster near the plant root system (Natrajan, 2003, Smail, 2005). Fallow lands provides native habitats that encourages diversity and inable a constant flow between species, maintaining ecosystem connections between farms. As a result, beneficial micro organisms contribute to a rise in detritus activity of the soil, increased nitrogen fixation, increase

in nutrient cycles and replenishments of depleted nutrients (Sujata, 2017). It is reported that application of 2.5 t/ha vermi-compost or FYM + 75% recommended fertility level gives 5-10% higher seed yield over the recommended fertilizer 80N : 40P : 0K kg/ha (DRMR, 2017). The similar trend was found in above trials conducted at ICAR-IVRI farm.

Varietal effect :

Cultivar PT 330 produced maximum yield (9.9 q/ha and 11.4 q/ha) under organic conditions over the others and followed by PT 570 (9.3 q/ha and 10.7 q/ha) in 135 days. It might be positive effect of higher uptake of plant nutrients and production –translocation of more photo-synthetes from source to sink at the reproductive stage. Hence, 15 days longer crop duration of PT330 which was harvested @ 135 days. While other crops were harvested at 120 days after sowing. This longer duration may increase in pod size and grain weights. Oil content might be increased due to enhanced supply of sulphur from soil and longer production of photo-synthesis. Soil microbes contributes to humus-enriched soils; they facilitate nutrients uptake and enhance micro nutrients exchange capacity (Kuruganthi, 2015). Jai Gopal had beneficial effect on yields over the green manuring. Toria cultivars PT330 performed better during 2004-05 to 2014-15 under Indian fellow land conditions.

Economic values :

There is a economic gains in the vermi-compost over the green manuring. Green manure takes 70 days for as crop growth period at the cost of commercial crop while vermi-compost involves transportation cost. However, farmers can prepare vermi-compost on the field under the trees/sheds. Earthworm like 'Jai-Gopal' can prepare good quality bio-manure in 60 days. Vermicompost can save upto 50% cost of recommended dose of chemical fertilizers while green manuring can save 25% chemical fertilizers of recommended dose.

Recommendations :

Farmers may adopt vermi-composting for organic farming . Green manuring may be second substitute for organic toria seed production under fellow land Indian condition.

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Keywords: organic manure, toria, green manuring, yield

Sesbania Acculata Cultivation – Green Manuring Crop

2004-05



2014-15



Vermi Composting and broadcasting of Toria crop seed 2004-05



Toria Harvesting organic yields 2004-05



Organic Farming Information Board 2004-05

