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Effect of organic products on plant growth and yield of Wheat

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Abstract— *An experiment was conducted to study the effect of different organic products on wheat variety Amber during Rabi 2015-16 in Randomized Block Design at ASPEE Agricultural Research and Development Foundation, Tansa Farm, Nare, Taluka Wada, Dist Palghar, Maharashtra. The study comprised sixteen different treatments of organic products viz. FYM @ 10 t ha^{-1}, Vermicompost @ 5 t ha^{-1}, FYM @ 5 t ha^{-1} + vermicompost @ 2.5 t ha^{-1}, Noval fertilizer @ 1%, Vermiwash @ 2%, Panchgavya @ 2%, FYM @ 10 t ha^{-1} + Noval fertilizer @ 1%, FYM @ 10 t ha^{-1} + Vermiwash @ 2%, FYM @ 10 t ha^{-1} + Panchgavya @ 2%, Vermicompost @ 5 t ha^{-1} + Noval fertilizer @ 1%, Vermicompost @ 5 t ha^{-1} + Vermiwash @ 2%, Vermicompost @ 5 t ha^{-1} + Panchgavya @ 2%, FYM @ 10 t ha^{-1} + vermicompost@2.5 t ha^{-1}+Noval fertilizer@ 1%, FYM @ 10 t ha^{-1} + vermicompost @ 2.5 t ha^{-1} + Vermiwash @ 2%, FYM @ 10 t ha^{-1} + vermicompost @ 2.5 t ha^{-1} + Panchgavya @ 2% and 100% RDF @ 120:60:40 NPK kg ha^{-1}. Wheat was sown at row spacing 20 cm X 5 cm on flat beds. The results showed that the treatments of FYM @ 10 t ha^{-1} along with vermicompost @ 2.5 t ha^{-1} and spray with Noval fertilizer @ 1% at 30 and 60 days after sowingrecorded highest seed yield of2100 kg ha^{-1} followed by FYM @ 10 t ha^{-1} with vermicompost @ 2.5 t ha^{-1} and Panchgavya @ 2% (2049 kg ha^{-1}). The same treatment proved its superiority in increasing all yield attributing factors along with grain yield of wheat indicating the most effective organic treatment for wheat under North Konkan Coastal Zone of Maharashtra.*

Keywords— Organic products, Vermiwash, Noval fertilizer, Panchgavya.

I. INTRODUCTION

Wheat (*Triticum aestivum* L.) occupies the prime position among the food crops in the world. In India, it is the second important food crop being next to rice and contributes to the total food grain production of the country to the extent of about 25%. It has played a very vital role in stabilizing the food grain production in the country over the past few years. It is the main cereal crop and mainly a *Rabi* (winter) season crop in India. India is the second largest producer of wheat in the world contributing about 94.88 mt. grains with productivity of 2.98 t ha^{-1} from the area of 31.5 m ha (Chhokar *et al*., 2012). India will need to produce about 109 mt. of wheat by 2020 with the annual rate of increase in production of about 2.28 % against present rate of annual increase to about 1 % (Mishra *et al*., 2006). In Maharashtra the non-traditional region for wheat where the area and production are very low. But the productivity of about 1.6 t ha^{-1} explores its possibility of cultivation and to increase the yield level at par with other non-traditional wheat growing belt of India in order to meet the substantial food demand.

People now support chemical-free agricultural production using organic manures as inputs. Some farmers have even started adopting organic farming in the state, though on a smaller scale. Catherine and Ivettte (2007) have observed that a shift to organic farming in developing countries can produce 80 % of the present yield and in the developed countries, it can match up to 90 %. Choubey (2006) using the NSSO survey data on cultivation practices has shown that the north-east hill states have retained traditional practices and have shown inclination towards organic agriculture which could be harnessed for the development of the region with ecological benefits. Kshirsagar (2008) has revealed that organic farming is a system of farm management to create an eco-system which can achieve sustainable productivity without the use of external inputs like chemo-synthetic fertilizers and pesticides. The potential of organic farming in generating socially and environmentally beneficial effects is enormous. However, it is essential to assess its performance in terms of its economics which ultimately influences the adoption of any technology. Ramesh *et al*. (2005) have found that organic farming could give higher or equal yields of different cropping systems compared to chemical farming after an initial period of three years. The so-called transition effect, in which the yield declines in the first 1-4 years of transition to organic agriculture, follows a yield increase

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when soils develop adequate biological activity. Another study (Thakur and Sharma, 2005) on comparative economics of Organic Farming System (OFS) vis-à-vis Inorganic Farming System (IFS) has favoured OFS, in terms of both higher yield as well as profitability. However, no knowledge is available on various economic aspects of organic farming/produce with regards to input-use pattern, potential yield, profitability to farmers, *etc*. in the state. Therefore, the present study was taken up with specific objectives to study the effect of different organic products on wheat cultivation.

II. MATERIALS AND METHODS

The experiment was conducted at ASPEE Agricultural Research and Development Foundation Farm, Village- Nare, Tauka- Wada, district- Palghar in *rabi* season during 2015-16 under Randomized Block Design (RBD) with three replications and sixteen treatments. The experimental site was located at 19.65^0N latitudes and 73.13^0E longitudes with average annual rainfall of 2600 mm.There were 16 treatments consisting of different organic manures as soil application and as spray at 30 and 60 days after sowing. The FYM and vemicompost were added in each treatment block and mixed well with soil before sowing. The Liquid organic manure Panchagavya was freshely prepared at farm and vermiwash was colleted from vermicompost unit at farm whereas noval fertilizer was brought from Navsari Agricultural University, Navsari, Gujarat. The Novel fertilizer was a sap extracted from banana pseudo-stem. This sap is rich source of major nutrients like nitrogen, phosphorus, potash and micro nutrients like iron, boron, molybdenum, magnesium, calcium, sulphur, zinc and copper. This sap also works as a growth promoters like gibbrelic acid and cytokinin. The details of treatments are given in Table 1. Wheat variety 'Amber' was sown in first fortnight of December during 2015-16 after seed treatment with captan @ 2 g kg^{-1} seeds at spacing of 20 cm X 5 cm on flat beds. Nitrogen, phosphorus and potassium were applied at the rate of 120:60:40 kg ha^{-1} in the form of urea, single super phosphate and muriate of potash, respectively. The entire quantity of P and K along with 50 % N was applied as basal dose at the time of sowing and rest 50 % N at 25 DAS. Randomly five plants were selected from each plot and regular biometric observations of crop were recorded from 30 DAS up to harvest. Data were compiled and analyzed using appropriate statistical method.

III. RESEARCH FINDINGS AND DISCUSSION

All the treatments significantly influenced plant growth and yield of wheat over control. Data recorded at harvest indicated that maximum plant height (55.81 cm) was recorded in treatment T_{13}*i.e*. application of FYM @ 10 t ha^{-1} + vermicompost @ 2.5 t ha^{-1} + spray of Noval fertilizer @ 1% at 30 and 60 DAS. Treatment T_7, T_8, T_9, T_{10}, T_{14} and T_{15} remain at par with treatment T_{13}. Minimum plant height (43.07 cm) was recorded in the treatment T_{16} *i.e*. 100% RDF. The increase in plant height due to vermicompost and spray of Novel fertilizer might be due to the fact that both having a rich source of plant nutrients (N, P, K), vital micronutrients (Fe, B, Zn and Me) and secondary elements. The vermicompost improves physicochemical properties, drainage, porosity and aeration of soil. Hence, the establishment of plants was good in plots supplied with vermicompost which resulted in increased height of the plants. The results obtained under the study are in agreement with Channabasanagowda *et al*., (2008).

The beneficial effect of organic manures in combination with each other was also noticed in the yield components namely number of tillers per plant, number of ear head per meter square, ear head length, and 1000 seed weight (Table 1). Higher number of tillers per plant (8.21) were recorded in treatment T_{13}*i.e*. application of FYM @ 10 t ha^{-1} + vermicompost @ 2.5 t ha^{-1} + spray of Noval fertilizer @ 1% at 30 and 60 DAS. Treatment T_7, T_8, T_9, T_{14} and T_{15} remained at par with treatment T_{13}. Minimum number of tillers per plant (5.64) was recorded in the treatment T_{16} *i.e*. 100% RDF. The number of ear head per meter square, ear head length and test weight of 1000 grains were higher in treatment T_{13}. These results are in akin with findings of Roy and Singh (2006) in barley.

The seed and straw yields were also found significant. The higher grain (2100 kg ha^{-1}) and straw (3235 kg ha^{-1}) yields were observed in treatment T_{13} also. Whereas it was lower in treatment receiving organic manures individually. These results are in accordance with Kale *et al*., 1994 in groundnut and Patil and Bhilare (2000) in wheat. The higher yield may be due to the fact that these organic manures supply direct available nutrients such as nitrogen to the plants and improve the proportion of water stable aggregates of the soil. This was attributed to cementing action of polysacchrides and other organic compounds released during the decomposition of organic matters, thus leading to taller plants, increased number of tillers, number of ear head and inturn the final yield. (Hendrix *et al*., 1994 and Martens *et al*.1992)

IV. CONCLUSION

FYM @ 10 t ha^{-1} + vermicompost @ 2.5 t ha^{-1} + spraying of Noval fertilizer @ 1% at 30 and 60 DAS remarkably reduced the demand of chemical fertilizer and alternative for chemical fertilizer in wheat. The same treatment proved its superiority in increasing all yield attributing factors along with grain and straw yields of wheat indicating the most effective organic application practice for wheat in North Konkan Coastal Zone of Maharashtra.

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Table 1: Effect of different organic products on plant growth and yield of Wheat

Sr. No.	Treatments	Plant height (cm)	Number of tillers (plant^{-1})	No. of ear head m^{-2}	Ear head length (cm)	Test weight (g)	Yield, kg ha^{-1}	
							Grain	Straw
T_1	FYM @ 10 t ha^{-1}	44.76	6.00	228.41	7.56	36.27	1535	2670
T_2	Vermicompost @ 5 t ha^{-1}	44.37	5.74	218.39	7.34	36.17	1467	2603
T_3	FYM @ 5 t ha^{-1} + vermicompost @ 2.5 t ha^{-1}	48.93	6.62	251.77	8.18	39.10	1693	2828
T_4	Noval fertilizer @ 1% spray	48.81	6.46	245.88	8.13	38.60	1653	2789
T_5	Vermiwash @ 2% spray	48.14	6.24	237.61	7.95	38.00	1597	2733
T_6	Panchgavya @ 2% spray	45.29	6.12	232.86	7.83	37.37	1565	2700
T_7	FYM @ 10 t ha^{-1} + Noval fertilizer @ 1% spray	54.08	7.63	289.91	8.54	49.47	1951	3086
T_8	FYM @ 10 t ha^{-1} + Vermiwash @ 2% spray	52.29	7.26	276.16	8.41	46.43	1858	2993
T_9	FYM @ 10 t ha^{-1} + Panchgavya @ 2% spray	53.49	7.43	282.37	8.43	48.03	1900	3035
T_{10}	Vermicompost @ 5 t ha^{-1} + Noval fertilizer @ 1% spray	51.29	7.08	269.03	8.39	44.67	1809	2945
T_{11}	Vermicompost @ 5 t ha^{-1} + Vermiwash @ 2% spray	49.67	6.75	256.73	8.23	42.10	1726	2862
T_{12}	Vermicompost @ 5 t ha^{-1} + Panchgavya @ 2% spray	51.01	7.02	266.86	8.29	43.13	1795	2930
T_{13}	FYM @ 10 t ha^{-1} + vermicompost@2.5 t ha^{-1}+Noval fertilizer@ 1% spray	55.81	8.21	311.93	8.76	59.13	2100	3235
T_{14}	FYM @ 10 t ha^{-1} + vermicompost @ 2.5 t ha^{-1} + Vermiwash @ 2% spray	54.27	7.75	294.56	8.60	55.33	1982	3118
T_{15}	FYM @ 10 t ha^{-1} + vermicompost @ 2.5 t ha^{-1} + Panchgavya @ 2% spray	55.40	8.01	304.38	8.71	56.80	2049	3184
T_{16}	100% RDF @ 120:60:40 NPK ha^{-1}	43.07	5.64	214.56	6.51	20.83	1441	2577
S.Em.±		2.12	0.37	6.89	0.40	0.63	84.95	120.49
C.D. (P=0.05)		6.13	1.06	19.88	1.14	1.83	245.33	347.95
C.V. %		7.4	9.3	4.6	8.4	5.5	8.4	7.2

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