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Response of nutrient management practices through organic substances on rice var. GR-11 in North Konkan Coastal zone of Maharashtra

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Abstract— *The management of soil organic matter is crucial to maintain a productive organic farming system. No one source of nutrient usually fulfills to maintain productivity and quality control in organic system.In addition, the inputs to supplement nutrient availability are often not uniform presenting additional challenges in meeting the nutrient requirements of crops in organic system.With this concept, a field experiment was conducted at the research farm of ASPEE Agricultural Research and Development Foundation, Tansa Farm, At Nare, Taluka Wada, Dist. Palghar, Maharashtra, during Kharif 2016-17 in rice.Different treatments comprising organic amendments such as Azotobacter, Banana Pseudostem sap 2%, Vermiwash 2% and Panchgavya 2% each applied alone or in all possible combinations were tried in organic crop production.These treatments were compared with absolute control (No biofertilizer+ No Spray). Recommended dose of chemical fertilizer 100:50:50 kg NPK ha^{-1}. A Rice variety 'GR-11' was taken.Results revealed a significant enhancement in grain yield of rice over absolute control due to the application of different organic amendments applied alone or in combinations. Rice grain yield increased by 35.5% over absolute control when organic amendments viz., Seedling deep in Azotobacter + Vermiwash 2% + Banana Pseudostem Sap 2% were applied together.The rice grain yield (5.7 t ha^{-1}) obtained under combined application of above three organic amendments was at par with the yield recorded under seedling deep in Azotobacter + Vermiwash 2% + Panchgavya 2%.An interesting observation recorded was that there was no serious attack of any insects pest or disease in organically grown crop.The study revealed that addition of four organic amendments viz. seedling deep in Azotobacter, vermiwash 2%, Panchgavya 2% and Banana Pseudostem Sap 2% could give the optimum yield of organic rice var. GR-11.*

Keywords— Azotobacter, Vermiwash, Noval fertilizer, Panchgavya.

I. INTRODUCTION

Organic farming production system aims at promoting and enhancing agro-ecosystem health, biodiversity, biological cycles and soil biological activities. The popularity of organic food and organic farming across the world has tempted rice producers in India to focus on the production of organic rice. Organic farming is an alternative agriculture which has been proposed as a solution to the problems associated with inputs of chemical fertilizers and pesticides. It is based on ecological approach to nutrient supply and crop protection rather than a chemical one. In organic farming, we constantly work to build the healthy soil that translates into healthy plants. Crop plants remove varying amounts of different nutrients from soil and to compensate the loss from the soil, organic amendments rich in nutrients must be added (Singh & Mandal, 2000). In organic farming, we feed to the soil micro and macro-organisms, which deliver a smorgasbord of minerals, vitamins and other nutrients to the crop at a metered pace.Through organic farming, incidences of diseases and insects may be reduced and soil and grain quality improved (Stockdale *et al.* 2001).With such background, an experiment was conducted to find out the feasibility of organic farming in riceand examine the impact of this on the yield and quality of grain.

II. MATERIALS AND METHODS

The experiment was conducted at ASPEE Agricultural Research and Development Foundation Farm, Village- Nare, Tauka- Wada, district- Palghar in *kharif* season during 2016-17 in Randomized Block Design (RBD) with three replications. The plot size was4.5 m x 2.5 m.The experimental site was located at 19.65^{0}N latitudes and 73.13^{0}E longitudes with average annual rainfall of 2600

mm.Fourteen treatments comprising different organic amendments such as seedling dip in Azotobacter, Vermiwash 2%, Panchgavya 2% and Banana Pseudostem Sap 2% each applied alone and in combination were tested inorganic crop production. Azotobacter are aerobic, free-living soil microbes which play an important role in the nitrogen cycle in nature, binding atmospheric nitrogen which is inaccessible to plants and releasing it in the form of ammonium ions into the soil (nitrogen fixation). In addition to being a model organism for studying diazotrophs, it is used by humans for the production of biofertilizers. The Liquid organic manure Panchagavya was freshely prepared at farm and vermiwash was colleted from vermicompost unit at farm. The noval fertilizer was brought from Navsari Agricultural University, Navsari. It was a sap extracted from banana pseudo-stem. This sap was rich source of major nutrients like nitrogen, phosphorus, potash and micro nutrients like iron, boron, molybdenum, magnesium, calcium, sulphur, zinc and copper. This sap was also worked as a growth promoters like gibbrelic acid and cytokinin.

Rice variety 'GR-11' was sown in first fortnight of June during 2016-17 after seed treatment with the fungicide thiram @ 3 g kg^{-1} seeds. Twenty five days old seedlings were transplanted at spacing of 20 cm x15 cm. The bed size was 4.5 m x 2.5 m. Nitrogen, phosphorus and pottassium were applied at the rate of 100:50:50 kg ha^{-1} in the form of urea, single super phosphate and muriate of potash, respectively. The entire quantity of P and K fertilizers along with 50 % N fertilizer was applied at the time of sowing. Remaining 50 % urea was applied in two equal splits one at tillering and another at panicle initiation stage as top dressing. Randomly five plants were selected from each plot for recorded regular biometric observations from 30 DAS till harvest. Data were compiled and analyzed using appropriate statistical methods.

III. RESULT AND DISCUSSION

Plant growth parameters

The plant growth parameters viz., plant height and number of tillers were markedly influenced by various organic amendments applied in rice. The maximum value of these parameters was recorded with treatment T_{12}seedling dip in Azotobacter + Vermiwash 2% + Banana Pseudostem Sap 2% which was at par with treatments T_{13} and T_{14}. The liquid organic manures contain small amount of essential nutrientsand growth boosters and these constituents are known to have positive effect on plant growth development and yield attributes of crop. This was the possible reason for increasing the growth and yield of rice under liquid manure treatments. To study the feasibility of foliar applied organic liquid manures on crops, several experiments were conducted by Venkataramana *et al.* (2010) with vermi wash and cow dung wash on mulberry at Vikarabad (AP) and Venkatalakshmi *et al.* (2009) with panchgavya on amaranthus at Coimbatore (TN). The results obtained are also under the study in conformity with the findings of Tharmaraj *et al.* (2011).

Yield parameters

Yield contributing parameters such as length of panicle, seeds per panicle, test weight, grain and straw yields were measured at harvest of the crop.The results in table 1 indicated that different treatments induced marked variations in length of panicle, seeds per panicle, test weight, grain and straw yields and harvest index. Highest values of all these parameters were found with seedling dip in Azotobacter + Vermiwash 2% + Banana Pseudostem Sap 2%.

The higher length of panicle (21.5 cm), seeds per panicle (131.4), test weight (21.4 g), grain (5956 kg) and straw (6208 kg) yields and harvest index (49%) were recorded in treatment T_{12}, seedling dip in Azotobacter + Vermiwash 2% + Banana Pseudostem Sap 2%) . In case of grain yield, treatment T_{12} was at par with treatment T_{13} and T_{14} while in case of straw yield, it was at par with treatment T_{13}. The results of experiment conducted at SWMRU, NAU, Navsari also proved that foliar application of banana sap @ 2% on mango increased the fruit retention and fruit yield (Anon., 2010). These results are also in conformity with the findings of Bokare (2013) in onion.

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Treatment Detail	**Plant height (cm)**	**No. of tillers**	**Lenght of panicle (cm)**	**Seed per panicle**	**Test weight (g)**	**Seed Yield (kg/ha)**	**Straw Yield (kg/ha)**	**Harvest Index (%)**
Control (No biofertilizer+ No Spray)	92.8	11.0	12.4	116.0	12.5	4230	4418	48.5
Banana Pseudostem sap 2%	102.9	15.1	17.6	124.5	17.0	5077	5253	49.2
Vermiwash 2%	103.0	15.5	18.0	125.4	17.7	5185	5374	49.1
Panchgavya 2%	101.6	14.7	17.2	124.0	16.4	4952	5151	49.0
Vermiwash 2% + Banana Pseudostem Sap 2%	100.8	14.2	16.6	123.2	15.8	4880	5107	48.9
Vermiwash 2% + Panchgavya 2%	99.7	13.3	16.0	122.0	15.2	4745	4920	49.6
Banana sap 2% + Panchgavya 2%	98.1	12.9	15.6	121.6	14.3	4500	4698	48.8
Seedling deep in Azotobacter	104.7	16.2	18.4	126.7	18.1	5214	5421	49.0
Seedling deep in Azotobacter + Banana Pseudostem sap 2%	108.0	16.7	19.3	127.9	19.1	5423	5683	48.7
Seedling deep in Azotobacter + Vermiwash 2%	110.2	17.2	19.7	128.5	19.6	5507	5741	49.0
Seedling deep in Azotobacter + Panchgavya 2%	105.4	16.4	18.8	127.3	18.6	5316	5562	48.9
Seedling deep in Azotobacter + Vermiwash 2% + Banana Pseudostem Sap 2%	118.5	19.7	21.5	131.4	21.4	5956	6208	49.0
Seedling deep in Azotobacter + Vermiwash 2% + Panchgavya 2%	115.4	18.5	20.8	129.6	20.6	5726	6016	48.3
Seedling deep in Azotobacter +Banana sap 2% + Panchgavya 2%	112.8	17.9	20.2	129.0	20.0	5624	5885	48.1
S.Em.	2.1	1.4	0.8	1.66	0.77	123.76	107.16	
C.D.	6.1	4.0	2.2	4.82	2.25	359.84	311.59	