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Influence of Organic Amendments and Fertigation on Growth, Yield, Quality of Watermelon (*Citrulluslanatus*Thunb.) and Available Nutrient Status in *Theri* Land (Red Sand Dune) of Southern Tamil Nadu

Paramasivan M[1*] and Jothimani S [2]

[1*]ICAR – KVK, TNAU, Virinjipuram, Vellore – 632 104, Tamil Nadu

[2]Department of Soil Science and Agrl. Chemistry, Agricultural College and Research Institute, Killikulam

Author Email: paramusoil@gmail.com

ABSTRACT

The present investigation was carried out at Thirumaraiyur village, Sattankulamtaluk, Thoothukudi district, to study the effect of organic amendments with the recommended dose of fertilizers on the growth and yield of watermelon in *Ther i*soil (red sand dunes) during the year 2017 and 2018. The experiment was laid out in Randomized Block Design with Factorial concept (FRBD). There were three factors as organic amendments with 6 treatment combinations for each factor, which were assigned at random in each plot with three replications. The recommended dose of fertilizers in treatments was two levels 75 and 100 percent. Among the treatment combinations, the tank silt application @ 100 t ha^{-1} with 100 per cent recommended fertilizer as 200:100:100 kg of NPK ha^{-1} through Fertigation at 7 days interval (A1N5) produced the maximum number of branches (10.67), longest vine (362.0 cm), number of fruits $plant^{-1}$ (2.57), the weight of fruit (5.27 kg), fruit yield (68.77 t ha^{-1}), total soluble solid (TSS) 10.94%), ascorbic acid (8.08 (mg $100g^{-1}$), gross return (₹4,09,320/ha), B:C ratio (2.45), uptake of NPK 41.51, 3.93 and 31.94 kg ha^{-1}, respectively) compared to other treatments. Significant built-up of organic carbon (0.52%), available N (253.47 kg ha^{-1}), P (16.40 kg ha^{-1}) and K (218.40 kg ha^{-1}) were registered with the application of tank silt application @ 100 t ha^{-1} with 100 per cent recommended fertilizer as 200:100:100 kg of NPK ha^{-1} through Fertigation at 7 days interval (A1N5).

Keywords: *Organic amendments; Fertigation; Yield; Watermelon;Theri land*

INTRODUCTION

Watermelon (*Citrulluslanatus*Thunb.) is one of the important vegetable crops grown extensively in India. It is a major tropical crop in the south Indian states of Karnataka, Andhra Pradesh, and Tamil Nadu. India is the second largest producer of watermelon fruit among the Asian countries accounting 2.48 million tonnes from 1.01 lakh hectare with the productivity of 24.58 t ha^{-1} (HSD, 2017. In Tamil Nadu, the production is 1.63 lakh tonnes from an area of 6930 ha with an average productivity of 23.52 t ha (DES, 2017).

The *Theri* lands (red sand dunes) are one of the significant wastelands in Tirunelveli and Thoothukudi districts of Tamil Nadu. These *theries* are located (77° 49' 44" to 78° 28' 22" E and from 8° 15'13" to 9° 11' 0" N)

to an extent of 20,171 ha (Jawahar*et al.,* 1999). The soils have low nutrient status, low water holding capacity, low organic carbon content, and are susceptible to high wind erosion (Manikandan and Subramanian, 2010). The mean annual rainfall of the study area is between 610 and 700 mm.

A soil amendment is any material added to soil to improve its physical properties, such as water retention, permeability, water infiltration, drainage, aeration and structure. In *theri* soils (red sand dune), organic amendments like tank silt, FYM, composted coir pith (CCP), etc., improve soil's physic-chemical properties. Many organic amendments contain plant nutrients and act as organic fertilizers. Monitoring soil and plant nutrient status is essential to ensure maximum crop productivity. It is well known that organic amendments and inorganic fertilizers are essential to increase the productivity of crops and fertility of soils.

The Fertigation technologyis the possible way to improve the crop production and soil productivity for profitable farming in constrained *Theri* soil. Fertigation within the rhizosphere matches with the physiological needs of the crop viz. root development, vegetative growth, flower and fruit development. Scientific information on Fertigation in theri land (red sand dune), especially in watermelon, is very scanty. The soil management in *theri*was an important concept for cultivation of crops. Study of the role of organic amendments on yield of watermelon and soil physico-chemical properties was the main objective in this field experiment. Hence, the present field experiment was conducted to determine influence of organic amendments combined with inorganic fertilizers through Fertigation on growth, fruit yield of watermelon and soil fertility of *Theri* land.

MATERIAL AND METHODS

The experiment was conducted during kharif – winter seasons of 2016-2017 and 2017-2018 at Thirumaraiyur village, Sattankulamtaluk, Thoothukudi district, Tamil Nadu. The sand dune ecosystem formed in *isomegathermic* and *ustic* regime from geogenic sand deposits under a semi arid climate. Soil at the experimental site was red sandy, with organic carbon 0.12%, electrical conductivity 0.13 dS/m, neutral pH (6.26), low available N (93.7 kg ha^{-1}), low available P (8.2 kg ha^{-1}) and low available K (88.5 kg ha^{-1}). Seeds of watermelon F1 hybrid Suprit were sown in rows of 2m width, with 60 cm plant-to-plant spacing, during the first week of November in both years. The experiment was laid out in Factorial Randomized Block Design (FRBD) with six treatments and three replications. Factor as three organic amendments viz., tank silt @ 100 t ha^{-1}, composted coir pith @ 12.5 t $ha^{-1,}$ and farm yard manure @ 20 t ha^{-1} were applied as basal doses before sowing. The treatments were T_1- 75 % recommended dose of fertilizers (RDF) (150:75:75 kg of NPK ha^{-1}) through soil application; T_2- 100 % recommended dose of fertilizers (RDF) (200:100:100 kg of NPK ha^{-1}) through soil application; T_3- 75 % recommended dose of fertilizers (RDF) (150:75:75 kg of NPK ha^{-1}) through Fertigation at 7 days interval; T_4- 75 % recommended dose of fertilizers (RDF) (150:75:75 kg of NPK ha^{-1}) through Fertigation at 15 days interval; T_5- 100 % recommended dose of fertilizers (RDF) (200:100:100 kg of NPK ha^{-1}) through Fertigation at 7 days interval; T_6- 100 % recommended dose of fertilizers (RDF) (200:100:100 kg of NPK ha^{-1}) through Fertigation at 15 days interval. Studies on the role of organic amendments with Fertigation on growth and yield of watermelon, soil fertility status, and economics were the main objectives in the experiment.

The nutrient composition of organic amendments *viz.,* tank silt, composted coir pith and farm yard manure analysed. The available nitrogen, phosphorus and potassium were as 312.5, 18.3 and 222.6 kg ha^{-1}. The content of nitrogen, phosphorus and potassium were as 0.78, 0.38 and 0.92 per cent in composted coir pith. The farm yard manure contained 1.08, 0.27 and 1.02 per cent, respectively of nitrogen, phosphorus and potassium.

Conventional fertilizers used in the experiment were urea, single super phosphate, di-ammonium phosphate and muriate of potash; whereas, 19 each of N, P_2O_5, K_2O and KNO_3 used as the source of water-soluble fertilizer. Fertilizer was applied at 7 and 15 days intervals through fertigation treatments. Soil treatments received the entire P_2O_5 and K_2O at sowing and N in two splits as basal during sowing and at 30 DAS. Irrigation was given through drippers to all the treatments. Growth observations were taken 60 days after sowing. All agronomic and plant protection measures were adopted as per the guide lines of crop production guide for Tamil Nadu (CPG, TNAU, 2015). The crop was harvested at 90 to 100 days after sowing, at fruit maturity as indicated by a dull sound of the fruit, or, when the fruit tendril turned to straw colour or when the fruit base turned creamy-yellow in colour. Plant nutrient content and uptake wereanalyzed through prescribed laboratory procedures. Soil samples were analysed for organic carbon following Walkley and Black 1934, alkaline permanganate oxidizable N as described by Subbiah and Asija, 1956, 0.5 M $NaHCO_3$- extractable P (Olsen et al., 1954 and available potassium by flame photometry with extracting 1 N NH_4OAc (Schollenberger and Simon, 1945). Observations on crop growth, yield, yield parameters, and quality were recorded and statistically analyzed as per Gomez and Gomez (1984). Economics of water melon cultivation as influenced by chemical fertilizer, drip fertigation and management practices were calculated by considering the prevailing market price of fruit and inputs used.

RESULTS AND DISCUSSION

Growth and yield

Effect of amendments

The growth and yield attributing characters such as the number of branches, number of fruits plant^{-1} and fruit yield were significantly influenced by various amendments (Figures 1-4).

Among the three amendments, the application of tank silt at the rate of 100 t ha^{-1} significantly registered more number of branches (8.72), more fruits (2.22), and higher fruit yield (55.49 t ha^{-1}) followed by composted coir pith applied at the rate of 12.5 t ha^{-1}, which registered a higher number of branches (8.22), number of fruits (2.10) and fruit yield (50.43 t ha^{-1}). Tank silt contains all nutrients which is responsible for the enhanced growth and yield attributes in watermelon. Annaduraiet *al.*(2005) noticed similar results that tank silt amendment enhanced the productivity of crops like sunflower, groundnut, cotton, sugarcane, soybean, gingili, tomato, cotton, onion, brinjal, turnip, cucumber, chilli etc.

Effect of nutrients

The growth and yield attributes of watermelon *viz.,* number of branches, vine length, number of fruits and fruit weight were significantly influenced by the application of a recommended dose of NPK as 200:100:100 kg ha^{-1} through Fertigation at 7 days interval (N5) (Figures 1 - 4) significantly registered maximum number of branches (10.0), longest vine (347.89 cm), the highest number of fruits plant^{-1} (2.38), more weight of fruit (5.33 kg) and higher fruit yield (63.32 t/ha) followed by the application of 75 per cent NPK through Fertigation at 7 days interval (N3) with the number of fruit (9.00), long vine (339.22 cm), more number of fruits plant^{-1} (2.28), weight of fruit (5.04 kg) and higher fruit yield (58.38 t ha^{-1}). However, among the two levels of NPK without Fertigation, the minimum number of branches (6.78), shortest vein length (268.44 cm), minimum number of fruits per plant (1.75), lowest fruit weight (4.29 kg) and minimum fruit yield (38.36 t ha^{-1}) were found in treatment applied with 75 per cent NPK ha^{-1} through soil application (T_1)**.** The present finding was supported by Kadam*et al.,* 2009.The levels of tank

silt at the rate of 20 t ha^{-1} recorded a higher number of pods, pod yield, haulm yield and shelling percentage in case of groundnut crop (Binitha, 2006).

Combined effect of amendment and nutrients

The interaction of amendments with fertilizers played an important role in increasing the production of watermelon. Though the interaction effect was non significant for all except fruit yield more number of branches (10.67), longer vine (362 cm), maximum number of fruits $plant^{-1}$ (2.57), heavy weight of fruit (5.27 kg) and maximum fruit yield (68.77 t/ha) were registered by the application of tank silt @ 100 t ha^{-1} along with 100 per cent NPK as 200:100:100 kg ha^{-1} through Fertigation at 7 days interval (A1N5) followed by the application of composted coir pith @ 12.5 t ha^{-1} with 100 per cent NPK through Fertigation at 7 days interval (A2N5) which recorded 10.33 number of branches, 350 cm longer vine, 2.33 number of fruits $plant^{-1}$, 5.29 kg of fruit and 61.73 t ha^{-1} of fruit yield. Among the two levels of NPK without Fertigation the less number of branches (6.33), short vein length (259.33 cm), low number of fruits $plant^{-1}$ (1.67), low fruit weight (4.26 kg) and minimum fruit yield (36.11 t ha^{-1}) were found in treatment applied with FYM @ 20 t ha^{-1} with 75 per cent NPK ha^{-1} through soil application (A3N1). The result clearly indicated that only inorganic nutrients can not alone maintain instant flow of nutrients in increasing crop yield. There is a need to use organic and chemical fertilizers in combination with drip fertigation so as to increase crop productivity. The increase in the fruit yield might be due to the application of organic amendments in combination with inorganic fertilizers. This result is supported by the earlier findings of Ramesh (2001, (20), Umamaheshwarappa*et al.,* 2005 and Castellanos*et al.,* 2009.

Nutrient uptake

Effect of amendments

The uptake of N and K in watermelon was also significantly influenced by the organic amendments. The highest values of N and K uptake (32.90, and 24.09 kg ha^{-1}, respectively) by watermelon were recorded with the application of tank silt @ 100 t ha^{-1}(A1) followed by the treatment applied with composted coir pith @ 12.5 t ha^{-1} (A2) which recorded the values of 31.69 and 21.88 kg ha^{-1}, where as the highest phosphorus uptake (3.17 kg ha^{-1}) was recorded in treatment applied with composted coir pith @ 12.5 t ha^{-1}(A2) followed by the treatment with tank silt @100 t ha^{-1} (A1) by recording the value of 2.96 kg ha^{-1}. The minimum uptake of N, P and K (26.32, 2.78 and 19.49 kg ha^{-1}, respectively) were recorded in the treatment applied with FYM @ 20 t ha^{-1}(A3). The organic amendments contain all macro and micronutrients, which enhanced the steadily supply of nutrient at all critical stages of the crop resulted more nutrient uptake by the crop. The result confirms the findings of Vasantha Kumar *et al.,* 2012 and Battilani and Solimando, 2006.

Effect of nutrients

N, P and K uptake in watermelon were also significantly influenced by various nutrient level and application methods. The highest values of N, P and K uptake (39.79, 4.04, and 30.49 kg ha^{-1}, respectively) by watermelon were recorded with the application of 100 per cent NPK as 200:100:100 kg ha^{-1} through Fertigation at 7 days interval (N5) followed by 75 per cent NPK through Fertigation at 7 days interval (N3) with the N, P and K uptake values of 36.68, 3.71 and 28.30 kg ha^{-1}, respectively. The lowest uptake of N, P and K (20.13, 1.86 and 11.97 kg ha^{-1}, respectively) were observed in the treatment with soil application of 75 % recommended dose of NPK (N1). This could be ascribed to the increase in the available N, P and K contents in soil resulting from the increasing availability of nutrients which ultimately increased nutrient content in the plant tissue and also greater biomass

production at higher rate of fertilizer application. Since the uptake of nutrient is a function of dry matter and nutrient content, the increased growth and yield attributes together with higher NPK content resulted in greater uptake of these elements. The result confirm the findings of Shyamaa*et al.,*(2009)andSajitha*et al.,*(2016).

Combined effect of amendments and nutrients

The interaction of organic amendments with fertilizers played an important role in increasing the nutrient uptake of watermelon. Significantly maximum uptake of N and K (41.51 and 31.94 kg ha^{-1}) were recorded in treatment applied with tank silt @ 100 t ha^{-1} with 100 per cent NPK as 200:100:100 kg ha^{-1} through Fertigation at 7 days interval (A1N5) where as the maximum P uptake (4.27 kg ha^{-1}) and higher uptake of N and K (40.37 and 30.00 kg ha^{-1}) were registered for the treatment applied with composted coir pith @ 12.5 t ha^{-1} with 100 per cent NPK through Fertigation at 7 days interval (A2N5). The minimum values of N, P and K uptake (18.35, 1.92 and 9.65 kg ha^{-1}) were recorded in the treatment applied with FYM @ 20 t ha^{-1} with 75 per cent NPK ha^{-1} through soil application (A3N1). The increased uptake of nutrients might be attributed to good growth and fruit yield of watermelon and may be due to application of tank silt with inorganic fertilizers, which help in improved plant growth and accumulation of greater biomass resulting in increased nutrient uptake. The increased uptake of N, P and K in watermelon may be ascribed to more availability of these nutrients from the added tank silt, fertilizer sources and the solubility action of organic acids produced during the decomposition of organic materials. Similar results were also reported by Ganeshappa (2000) and Tanwar*et al.*(2003).

Fertility status

Effect of amendments

The data presented in Figure 3 & 4 revealed that the highest organic carbon (0.38 %), available N, P and K (196.07, 13.41 and 193.17 kg ha^{-1}, respectively) were obtained by the application of tank silt @ 100 t ha^{-1} (A1) followed by the treatment applied with composted coir pith @ 12.5 t ha^{-1} (A2) which recorded the 0.27 % of organic carbon with available N, P and K (188.79,12.98 and 174.30 kg ha^{-1}, respectively). The tank silt and composted coir pith contain high level of organic carbon and all nutrients, which helped in sustaining the organic carbon and available N, P and K in the soil. Similar findings has been reported earlier by Ramesh, 2001andGonsalves*et al.*(2011).

Effect of Nutrients

Different levels and methods of nutrient application significantly influenced the soil organic carbon and available NPK. The highest organic carbon (0.39 %), available N, P and K (242.23, 16.48 and 203.55 kg ha^{-1}, respectively) were obtained by the application of 100 per cent NPK through Fertigation at 7 days interval (N5). The next superior values of organic carbon (0.34%), available N, P and K (216.62, 14.27 and 186.53 kg ha^{-1}, respectively) were recorded for the treatment which received 75 per cent NPK as 150:75:75 kg ha^{-1} through Fertigation at 7 days interval (N3). The lowest values of organic carbon (0.24%) and available N, P and K (139.71, 9.71 and 149.50 kg ha^{-1}, respectively) were noticed in the treatment received 75 per cent NPK as 150:75:75 kg ha^{-1} through soil application (N1) (Table 2). The decline in the available N status of the soil might be attributed to the utilization of N, P and K for growth of watermelon. These results are in agreement with the findings of Kadam and Karthikeyan, 2006 and Kacha*et al.,* (2017).

Combined effect of amendments and nutrients

It was observed from the data presented in table 2 that the combined application of amendments with fertilizers was significantly influenced the organic carbon and available nutrients. The highest organic carbon (0.52 %), available N, P and K (253.47, 16.40 and 218.40 kg ha^{-1}, respectively) were obtained from the treatment applied with tank silt @ 100 t ha^{-1} with 100 per cent NPK as 200:100:100 kg ha^{-1} through Fertigation at 7 days interval (A1N5) followed by the treatment treatment applied with composted coir pith @ 12.5 t ha^{-1} with 100 per cent NPK through Fertigation at 7 days interval (A2N5), which recorded the next highest content of organic carbon (0.35%) and available N, P and K (242.73, 17.37 and 202.63 kg ha^{-1}, respectively). The higher content of organic carbon in soil might be due highly fertile tank silt and composted coir pith combined with inorganic nutrients is responsible for needed nutrient transformation besides providing favourable physico-chemical properties which help in the mineralization of soil nutrients leading to higher availability of N, P and K in soil. These results are in agreement with the findings of Kadam and Karthikeyan, 2006 and Kacha*et al.,* 2017. The lowest organic carbon content (0.21%) and available N, P and K (132.27, 9.23 and 140.6 kg ha^{-1}, respectively)were observed for the treatment applied with FYM @ 20 t ha^{-1} with 75 per cent NPK ha^{-1} through soil application (A3N1). The decline in the available N status of the soil might be attributed to the utilization of N, P and K for growth of watermelon. These results are in agreement with the findings of Krishnappa*et al.*(1998) and Ramesh, (2001).

Economics

Details on economics and benefit:cost ratio in watermelon F1 hybrid Suprit in relation to various organic amendments with inorganic fertilizers with and without fertigation treatments tested are presented in Table 2.

Effect of amendments

The application of tank silt at the rate of 100 t ha^{-1}(A1) significantly influenced economics of watermelon with the return (₹1,98,795) and benefit:cost ratio (1.88) followed by application of FYM @ 20 t ha^{-1} (A3) which recorded the higher net return (₹1,55,355) and benefit:cost ratio (2.33).this might be due the cheap cost of manures reduced the cost of cultivation and increased the net return.

Effect of nutrients

The highest net return (₹2,48,090) with the benefit:cost ratio (2.61) were obtained by the application of 100 per cent NPK through Fertigation at 7 days interval (N5). The next highest net return (₹2,25,860) with the benefit:cost ratio (2.52) were recorded for the treatment which received 75 per cent NPK as 150:75:75 kg ha^{-1} through Fertigation at 7 days interval (N3). The lowest net return (₹68,493) with the benefit:cost ratio (1.52) were recorded in the treatment received 75 per cent NPK as 150:75:75 kg ha^{-1} through soil application (N1).

Combined effect of amendments and nutrients

The application of tank silt @ 100 t ha^{-1} with 100 per cent NPK as 200:100:100 kg ha^{-1} through Fertigation at 7 days interval (A1N5) fetched significantly the highest net returns (₹2,90,570 and benefit : cost ratio (2.45) over the rest of the treatments. The better treatment was application of tank silt @ 100 t/ha with 75 per cent NPK as 150:75:75 kg ha^{-1} through Fertigation at 15 days interval (A1N3), which fetched a net return of ₹ 2,60, 560 and benefit : cost ratio of 2.31. The application of CCP@ 12.5 t ha^{-1} with 100 per cent NPK as 200:100:100 kg ha^{-1} through fertigation at 7days interval (A2N5) recorded the net return of ₹2,30, 790 and benefit : cost ratio of 2.66 which was higher than the application of FYM @ 20 t ha^{-1} with 100 per cent NPK as 200:100:100 kg ha^{-1} through fertigation at 7 days interval (A3N5) by fetching the net return of ₹2,22, 910 and benefit : cost ratio of 2.73. This might be due to increased higher productivity and lower cost of cultivation. The

variation in the cost of cultivation under different treatments were recorded due to variable costs of fertilizers. Fruit yield was the major factor, which caused differences in net return. These results are in close conformity with the findings of Kumar *et al.,*(2007) and Sajitha, (2013).

From the above data It can be concluded that application of tank silt @ 100 t ha^{-1} with 100 per cent NPK as 200:100:100 kg ha^{-1} through fertigation at 7 days interval (A1N5) could be recommended for increasing the fruit yield of hybrid watermelon, better net return and sustaining soil fertility in *Theri* land (Red sand dune) of Thoothukudi district of Tamil Nadu.

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Ethics statement

No specific permits were required for the described field studies because no human or animal subjects were involved in this research.

Originality and plagiarism

We ensure that we have written and submitted only entirely original works, and if we have used the work and/or words of others, that has been appropriately cited.

Consent for publication

All the authors agreed to publish the content.

Competing interests

There were no conflict of interest in the publication of this content

Data availability

All the data of this manuscript are included in the MS.

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Table 1. Effect of organic amendment with inorganic fertilizers on nutrient uptake of hybrid watermelon and soil fertility (Pooled data)

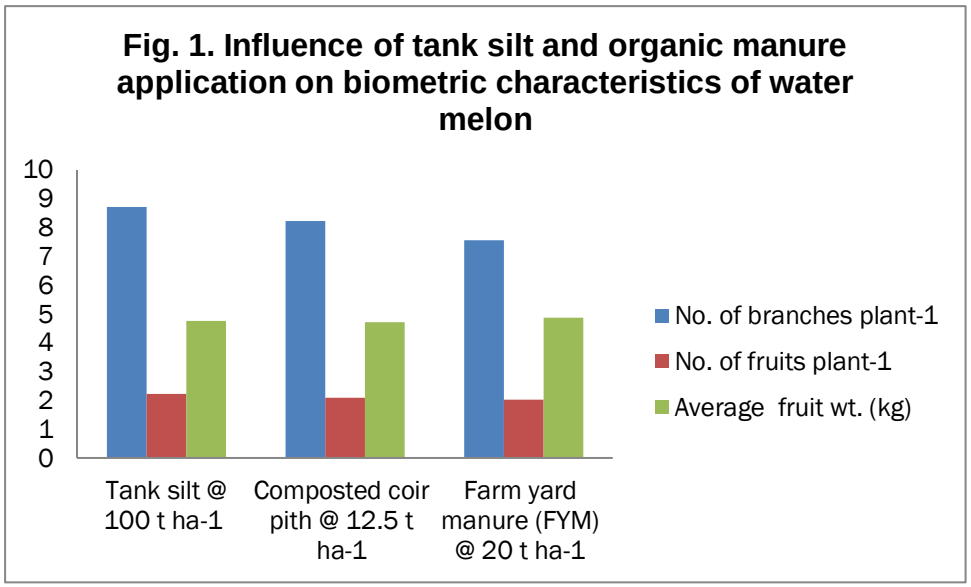
Treatments	Nutrient uptake (kg/ha)			Organic carbon (%)	Available nutrients (kg/ha)		
	N	P	K		N	P	K
	Main factor (Amendments)						
(A_1) Tank silt @ 100 t ha^{-1}	32.90	2.96	24.09	0.38	196.07	13.41	193.17
(A_2) Composted coir pith @ 12.5 t ha^{-1}	31.69	3.17	21.88	0.27	188.79	12.98	174.30
(A_3) Farm yard manure (FYM) @ 20 t ha^{-1}	26.32	2.78	19.49	0.25	178.59	12.52	165.35
Mean	30.47	2.97	21.82	0.30	187.82	12.97	177.61
SEd	0.150	0.128	0.072	0.001	0.397	0.047	0.104
CD (P=0.05)	0.417	NS	0.201	0.004	1.103	0.131	0.289
Main factor (Nutrients)							
N_1- 75 % RDF (Soil application)	20.13	1.86	11.97	0.24	139.71	9.71	149.50

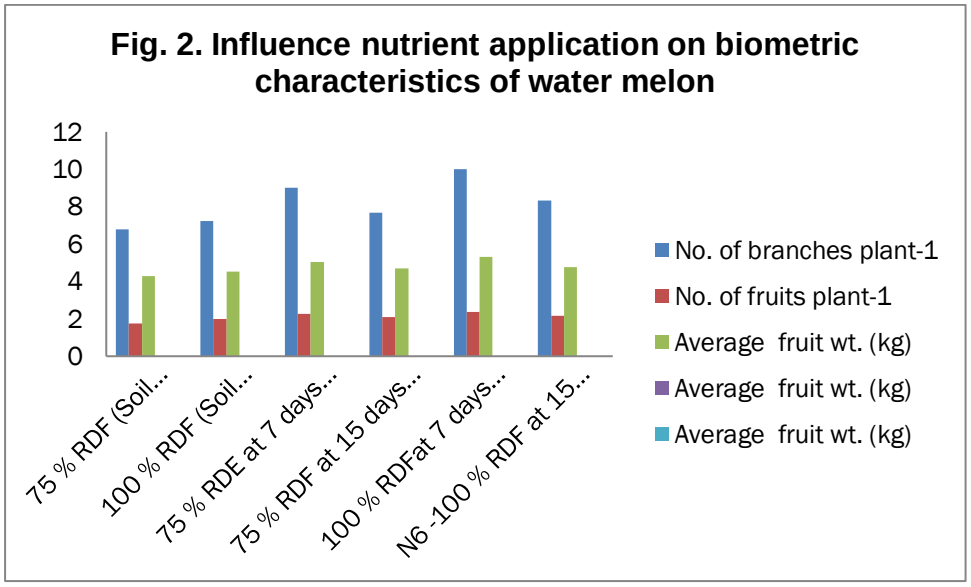
N_2-100 % RDF (Soil application)	25.61	2.58	17.63	0.26	158.04	12.03	169.80
N_3-75 % RDE at 7 days interval (Fertigation)	36.68	3.71	28.30	0.34	216.62	14.27	186.53
N_4-75 % RDF at 15 days interval (Fertigation)	28.54	2.67	20.59	0.29	182.51	12.47	175.79
N_5-100 % RDFat 7 days interval (Fertigation)	39.79	4.04	30.49	0.39	242.23	16.48	203.55
N_6-100 % RDF at 15 days interval (Fertigation)	32.08	2.97	21.94	0.27	187.79	12.85	180.47
Mean	30.47	2.97	21.82	0.30	187.82	12.97	177.61
SEd	0.204	0.078	0.099	0.002	0.668	0.084	0.110
CD (P=0.05)	0.416	0.160	0.201	0.004	1.364	0.173	0.227
	Interaction						
A_1N_1	22.58	1.52	15.34	0.29	146.43	10.53	165.40
A_1N_2	27.34	2.77	20.61	0.32	175.20	12.63	182.47
A_1N_3	39.30	3.79	29.88	0.43	209.23	14.80	202.53
A_1N_4	31.47	2.88	23.55	0.36	198.70	12.53	193.77
A_1N_5	41.51	3.93	31.94	0.52	253.47	16.40	218.40
A_1N_6	35.21	2.91	23.22	0.34	193.37	13.57	196.47
A_2N_1	19.45	2.14	10.94	0.22	140.43	9.37	142.50
A_2N_2	26.22	2.71	17.63	0.24	155.47	11.90	168.43
A_2N_3	38.32	3.88	29.30	0.32	222.33	14.30	183.63
A_2N_4	30.22	2.84	19.99	0.24	183.47	12.50	172.03
A_2N_5	40.37	4.27	30.00	0.35	242.73	17.37	202.63
A_2N_6	35.58	3.17	23.43	0.23	188.33	12.43	176.37
A_3N_1	18.35	1.92	9.65	0.21	132.27	9.23	140.60
A_3N_2	23.29	2.26	14.67	0.23	143.47	11.57	158.50
A_3N_3	32.43	3.48	25.71	0.28	218.30	13.70	173.43
A_3N_4	23.92	2.29	18.24	0.26	165.37	12.37	161.57
A_3N_5	37.47	3.91	29.52	0.30	230.50	15.70	189.63
A_3N_6	25.46	2.85	19.18	0.24	181.67	12.57	168.37
Mean	30.47	2.97	21.82	0.30	187.82	12.97	177.61
A@N							
SEd	0.356	0.179	0.172	0.003	1.128	0.142	0.204
CD (P=0.05)	0.773	0.433	0.373	0.008	2.407	0.301	0.456
N@A							
SEd	0.353	0.135	0.171	0.003	1.157	0.146	0.192
CD (P=0.05)	0.721	0.277	0.349	0.007	2.363	0.299	0.392

Table 2. Effect of organic amendment with inorganic fertilizers on economics of hybrid watermelon (Pooled data)

Treatments	Cost of cultivation (₹/ha)	Gross return (₹/ha)	Net return (₹/ha)	Benefit: cost ratio
	Main factor (Amendments)			
(A_1) Tank silt @ 100 t ha^{-1}	1,01,729	3,00,417	1,98,795	1.88
(A_2) Composted coir pith @ 12.5 t ha^{-1}	1,21,618	2,74,307	1,52,688	2.20
(A_3) Farm yard manure (FYM) @ 20 t ha^{-1}	1,11,618	2,66,973	1,55,355	2.33
Mean	1,11,655	2,80,565	1,68,946	2.14
SEd	90.72	10.88	8.16	0.004
CD (P=0.05)	251.88	30.23	22.67	0.010
Main factor (Nutrients)				
N_1- 75 % RDF (Soil application)	82,820	1,51,300	68,493	1.52
N_2-100 % RDF (Soil application)	93,972	1,81,053	87,303	1.62
N_3-75 % RDE at 7 days interval (Fertigation)	1,22,820	3,48,680	2,25,860	2.52
N_4 -75 % RDF at 15 days interval (Fertigation)	1,17,820	3,02,760	1,84,940	2.26
N_5-100 % RDFat 7 days interval (Fertigation)	1,28,750	3,76,860	2,48,090	2.61
N_6-100 % RDF at 15 days interval (Fertigation)	1,23,750	3,22,740	1,98,990	2.29
Mean	1,11,655	2,80,565	1,68,946	2.14
SEd	128.30	11.41	11.55	0.003
CD (P=0.05)	262.04	23.32	23.58	0.006
Interaction				
A_1N_1	72,820	1,62,640	89,820	1.23
A_1N_2	83,750	1,88,560	1,04,810	1.25
A_1N_3	1,12,820	3,73,380	2,60,560	2.31
A_1N_4	1,07,820	3,22,440	2,14,620	1.99
A_1N_5	1,18,750	4,09,320	2,90,570	2.45
A_1N_6	1,13,750	3,46,080	2,32,330	2.04
A_2N_1	92,820	1,48,200	55,380	1.60
A_2N_2	1,03,750	1,79,200	75,450	1.73
A_2N_3	1,32,820	3,41,580	2,08,760	2.57
A_2N_4	1,27,820	2,95,140	1,67,320	2.31
A_2N_5	1,38,750	3,69,540	2,30,790	2.66
A_2N_6	1,33,750	3,12,180	1,78,430	2.33
A_3N_1	82,820	1,43,040	60,220	1.73
A_3N_2	93,750	1,75,400	81,650	1.87
A_3N_3	1,22,820	3,31,080	2,08,260	2.69
A_3N_4	1,17,820	2,90,700	1,72,880	2.47
A_3N_5	1,28,750	3,51,660	2,22,910	2.73
A_3N_6	1,23,750	3,09,960	1,86,210	2.50
Mean	1,11,655	2,80,565	2,80,565	2.14
A@N				
SEd	222.22	21.08	20.00	0.006
CD (P=0.05)	NS	47.18	43.29	0.014
N@A				

SEd	222.00	19.78	20.00	0.005
CD (P=0.05)	NS	40.39	40.84	0.010





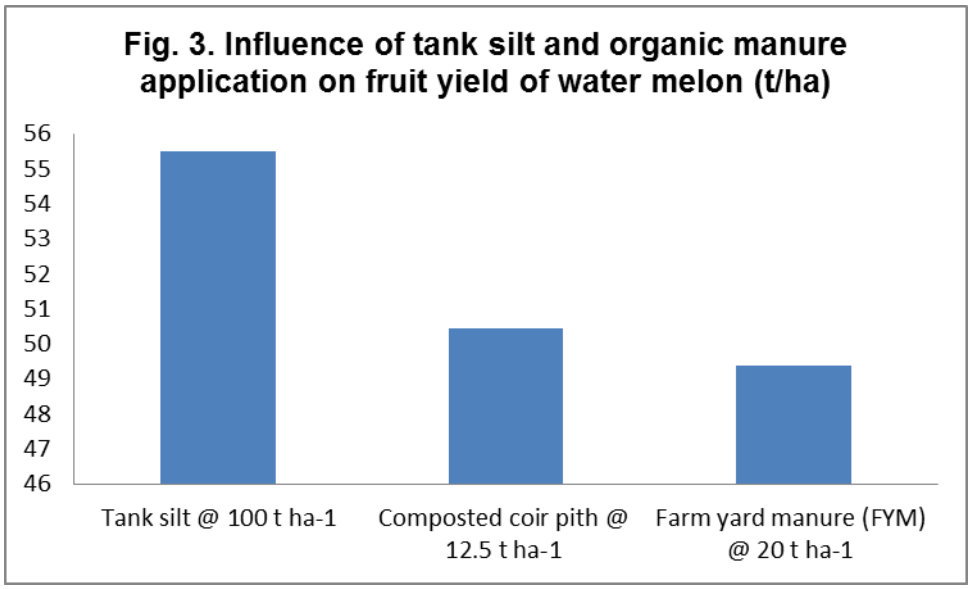


Fig. 3. Influence of tank silt and organic manure application on fruit yield of water melon (t/ha)
56
55
54
53
52
51
50
49
48
47
46
Tank silt @ 100 t ha-1
Composted coir pith @ 12.5 t ha-1
Farm yard manure (FYM) @ 20 t ha-1

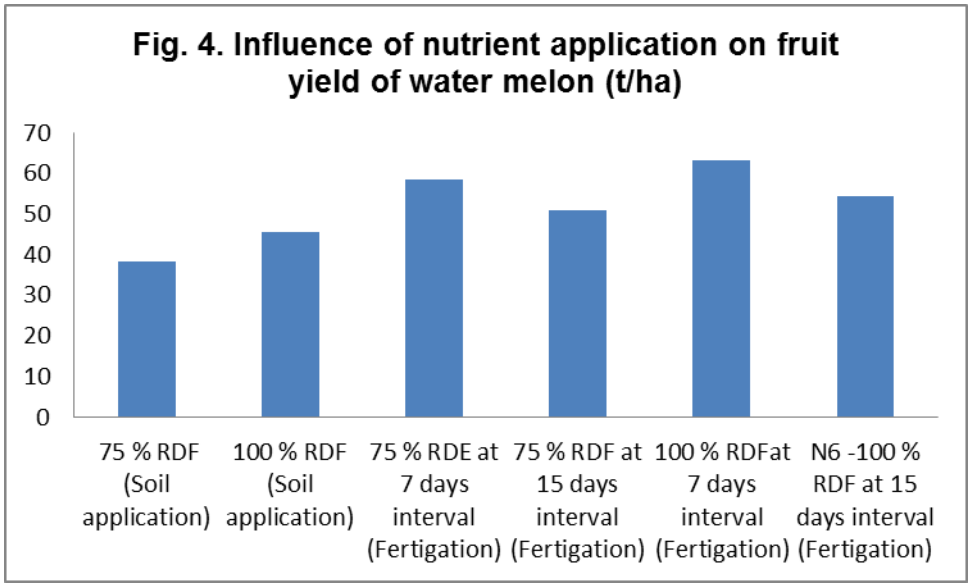


Fig. 4. Influence of nutrient application on fruit yield of water melon (t/ha)
70
60
50
40
30
20
10
0
75 % RDF (Soil application)
100 % RDF (Soil application)
75 % RDE at 7 days interval (Fertigation)
75 % RDF at 15 days interval (Fertigation)
100 % RDFat 7 days interval (Fertigation)
N6 -100 % RDF at 15 days interval (Fertigation)