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B Kannan
Ph.D. Scholar, Department of Soil Science and Agricultural Chemistry, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

K Arulmozhiselvan
Professor of Soil Science and Agricultural Chemistry and Project Director, Centre of Excellence in sustaining Soil Health, Anbil Dharmalingam Agricultural College and Research Institute, Trichy, Tamil Nadu India

Corresponding Author:
B Kannan
Ph.D. Scholar, Department of Soil Science and Agricultural Chemistry, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Effect of growing media and method of fertilization on growth, yield and quality of watermelon grown under matric suction irrigation

B Kannan and K Arulmozhiselvan

Abstract
In a plain open field wasteland area a pot experiment was conducted during *Rabi* season in the year 2017-18, with different growing media composed with varying substrates such as cocopeat, vermicompost, fly ash, biocompost and pressmud for standardizing suitable composition for enhancing the growth and yield of watermelon (*Citrullus lanatus* (Thumb) Matsum and Nakai) under matric suction irrigation. Watermelon variety NS-295 was grown in pots filled with media and water was supplied to media from the tubs placed beneath the pots. The water raised from bottom to top into the growing media by the phenomenon of matric suction. All tubs were interconnected by tubes through which constant supply of water was made. This set up maintained moisture in growing media throughout the crop period without a drying phase. The growing media were composed by mixing equal proportion of substrates on dry weight basis. The experimental pots were arranged in 6 x 3 factorial completely randomized design. The results indicated that the growth, yield and quality parameters of watermelon were highest in the growing media containing Cocopeat: Vermicompost: Fly ash fertilized by fertilizer solution, which consequently resulted in the highest fruit yield (21.12 kg pot^{-1}). Comparatively high fruit yield (19.45 kg pot^{-1}) was recorded in Cocopeat: Vermicompost media fertilized by fertilizer solution. Conventional pot mixture of Soil: Sand: FYM with fertilizer solution gave moderate yield (17.12 kg pot^{-1}) which was at par with Cocopeat: Vermicompost: Fly ash with Fertilizer Pellet Pack placement (16.82 kg pot^{-1}). Besides standardizing growing media, the promising effect of matric suction irrigation has been brought out in the present study as an alternative means for surface irrigation. It is concluded that crop production by matric suction irrigation using the growing media may suit well for terrace garden as well as in leveled wastelands where water availability is limited.

Keywords: Growing media, fertilizer solution, fertilizer pellet pack, watermelon, matric suction

Introduction
Due to prevalence of diversified agroclimatic conditions, India is able to produce variable fruit crops which contribute to substantial national income by way of supplementing horticultural production and export market. Fruits are widely recommended for human consumption as they can play a vital role in solving problems of deficiencies of minerals, vitamins and also in malnutrition. Cultivation, preservation, value addition and marketing of fruit crops generate greater employment potential in rural areas, besides help in achieving food security of the country.

Watermelon (*Citrullus lanatus* (Thumb) Matsum and Nakai) is a fruit, which belong to the family Curcubitacea. It is widely cultivated mainly in the warmer region of the continent which is referred to as a warm season fruit vegetable. It is cultivated largely for its fruits pulp which serves as a desert or be used in salad. It is also an important crop that are rich in water which help in preventing dehydration during drought period and also aid digestion of food (Sabo *et al*., 2013) [27]. It is highly nutritious and contains thiamine water soluble B vitamin that helps the body cells that converts carbohydrate into energy. It is also essential for the functioning of the heart muscles and nervous system. Fruits are generally low in energy, fat and sodium and have many medicinal properties. It is often fed to people with kidney disorders. Watermelon juice is used as antiseptic in typhus fever (Chauhan 1972) [5]

Open field agriculture with beds, bunds and channels is difficult as it involves large space, lot of labour and large volume of water. In most urban and industrial areas, soil is less available for crop growing, or in some areas, there is scarcity of fertile cultivable arable lands due to their unfavorable geographical and topographical conditions. Other serious problem experienced is to hire labour at regular times for conventional open field agriculture. Soilless culture in which plants are raised without soil is becoming more relevant in the present scenario especially for vegetable crops (Joseph and Muthuchamy 2014) [11].

It is reported that about 600 million tonnes of wastes have been generated in India from agricultural sources alone. Through recycling they can become an organic source for agriculture. This waste can be effectively used to prepare growing media for plants. A good growing medium have to provide anchorage to the plant, serve as store house for nutrients and water, allow oxygen diffusion to the roots and permit gaseous exchange among roots, media and atmosphere.

Irrigation by matric suction is a new technique in which moisture is continuously supplied to growbag media without break from bottom to top. Water is circulated in pipes at the bottom of pots where growing media is placed. There is no drainage/ leaching leading to prevention of water loss as well as nutrients. Always moisture is kept at optimum range in growbag media from sowing to harvest. Fertilization is possible at right concentration by placing fertilizer pellet pack in the growing media. Fertilization by fertilizer pellet pack has also been standardized recently as a new method for steady nutrient supply to crops (Tamilselvi and Arulmozhiselvan, 2018) [32]. In order to evaluate the effect of different growing media and method of fertilization on growth, yield and quality of watermelon the present study was conducted under matric suction irrigation in open field condition.

Materials and Methods

Watermelon crop was raised in pots in open field with a set up to provide water to the pots by matric suction irrigation. In each pot as per the treatments and replications growing media were filled and the crop was raised.

Components for matric suction irrigation

Matric suction arises due to interaction of water with the surface of solid particles of media. With the increase in water content of media, matric suction decreases and water is more prone to free movement in the system. In matic suction movement, moisture moves from wet region to dry region only by surface contact of media particles and not by capillary flow. In unsaturated media, water moves from a region of low matric suction to a region of high matric suction.

The matric suction irrigation system consists of components such as water tank, water level maintaining plastic tray with ball valve assembly, series of plastic base tubs interconnected through the 20 mm drip tubes (Figure 1). The base tubs are linked with water level maintaining tray through pipe to ensure the uniform flow in all the base tubs due to gravitational force. Each base tub contains one plastic growing media container having five holes (8 mm) at the bottom and admit the water from the tub to media.

In each growing media container, a nylon mesh (No.4) with an area of 18 square inch was placed at the bottom and filled with sand as base media to a height of 4 inch. Base media is partly submerged in water maintained in base tub, which is located at bottom of each container. Above the sand media, again a nylon mesh with an area of 18 square inch was placed to check the downward particle movement of growing media and above the nylon mesh growing media was filled to a height of 9 inch. Through matric and capillary suction, the base media gets moistened first by contact with water, later maintains almost saturated moisture content (Figure 2). Successively the growing media gets moistened by the virtue of only matric suction.

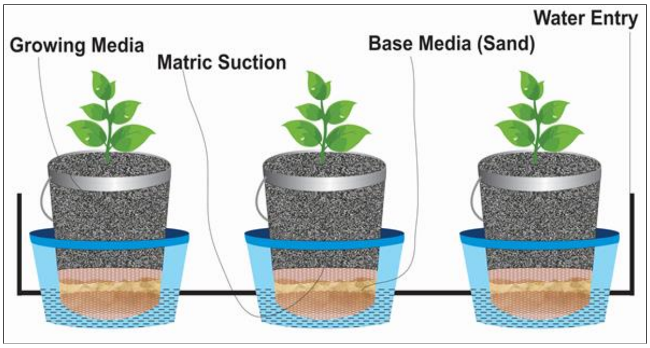

Fig 1: Diagrammatic representation of matric suction irrigation in pots

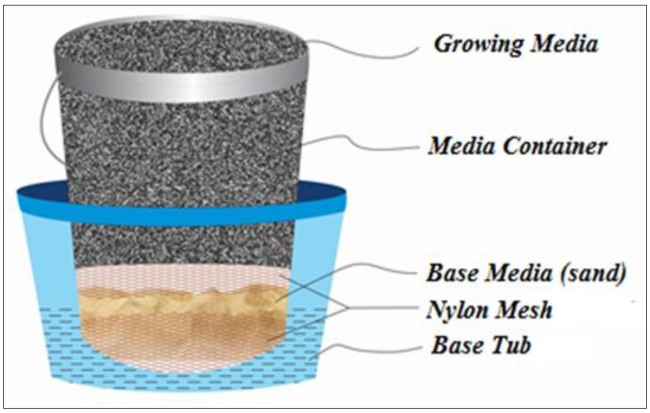

Fig 2: Components of growing media container

Fertilization by Fertilizer Pellet Pack placement

The composition of fertilizer pellet was worked out according to the blanket recommended fertilizer dose of watermelon of 55:55:55 kg N, P_2O_5 and K_2O ha^{-1}. The recommended dose of each primary nutrient was divided by the plant population per hectare and per plant requirement was found out. In the fertilizer pellet used for watermelon, urea, diammonium phosphate and muriate of potash were mixed to contribute 6200:6200:6200 mg of N, P_2O_5 and K_2O, Then the mixture was pelleted in to 33 g pellets. These pellets were then encapsulated in the polymer coated paper pouch and sealed. The encapsulated fertilizer pellet is called as Fertilizer Pellet Pack (FPP). Two fertilizer pellet packs were placed at the bottom layer of growing media in the respective treatments.

Fertilization by fertilizer solution addition

The composition of fertilizer solution was worked out according to the fertigation recommended fertilizer dose for watermelon crop (200:25:100 kg N, P_2O_5 and K_2O ha^{-1}). Total dosage was divided by the plant population per hectare and per plant requirement was found out. Accordingly, the calculated quantity of water soluble fertilizers viz., 19:19:19, monoammonium phosphate (MAP), potassium nitrate and urea were mixed to contribute 45:5.6:22.5 g of N, P_2O_5 and K_2O per plant, which was applied in 12 split doses. Each dose was dissolved in one liter of water and applied around the root zone of the crop in the respective fertilizer solution treatments, starting from 30 days after sowing (DAS) at weekly interval.

Experimental set up and treatments

The wasteland open field area selected for the experiment was located in the premises of Tamil Nadu State Agricultural Marketing Board Training Centre, Salem. The experiment was conducted during *rabi* season in the year 2017-18. The experimental site lies between the latitude of 11^{0}36.500' North and longitude of 78^{0}5.634' East with an altitude of 253 meters above the mean sea level. The growing media containers were placed in 6 x 3 factorial completely randomized design with 3 replications (Figure 3). The watermelon variety NS-295 was sown on 31 December 2017 and final harvest was done on 3 May 2018.

Fig 3: Experimental set up of growing media containers under matric suction irrigation

Treatments (Growing media and Method of fertilization)

Factor1 : Growing Media	M_1 – Commercial Pot Mixture – Soil : Sand : FYM (1:1:1)
	M_2 – Cocopeat : Vermicompost (1:1)
	M_3 – Cocopeat : Biocompost (1:1)
	M_4 – Cocopeat : Vermicompost : Fly ash (1:1:1)
	M_5 – Cocopeat : Biocompost : Fly ash (1:1:1)
	M_6 – Cocopeat : Vermicompost : Pressmud (1:1:1)
Factor 2: Method of Fertilization :	F_1 – Control
	F_2 – Fertilizer Pellet Pack Placement
	F_3 – Fertilizer Solution

Lay out of matric suction irrigation in open experimental field

In the demarked experimental area, according to treatments and replications, 54 platforms were laid by using fly ash bricks in 9 x 6 rows with spacing of 3 m on either side. The fly ash brick platforms were constructed in such a way that all the platforms are in same alignment having uniform level by adopting tube level method. On the platforms, tubs were positioned and interconnected to ensure the water flow due to gravitational force. The growbag containers were placed over the base tubs according to randomization order.

The results of analysis of growing media and method of fertilization on plant growth and yield parameters of crops and quality attributes of fruits were subjected to analysis of variance to find out the performance of watermelon crop (Panse and Sukhatme 1985) [21].

Results

Initial characteristics of experimental media

The different growbag media for the experiment were collected from different places and its physico-chemical properties viz., pH, electrical conductivity (EC), organic carbon (OC), total N, P and K were analyzed (Table 1).

Plant growth parameters

Growth parameters such as primary vine length, number of braches per primary vine, number of nodes per primary vine and root length per pot were observed after final harvest (Table 2). Among the growing media, the highest primary vein length (320.0 cm), number of branches per primary vine (10.44) and number of nodes per primary vine (74.22) were recorded with the plants raised in the media consisting of Cocopeat : Vermicompost : Fly ash. The lowest primary vine length (230.1 cm), number of branches per primary vine (6.67) and number of nodes per primary vine (53.56) were registered for the growing media having the composition of Cocopeat : Biocompost : Fly ash and which was at par with Cocopeat : Biocompost.

Among the method of fertilization application, fertilizer solution was more effective than FPP. The highest primary vein length (346.6 cm), number of branches per primary vine (11.67) and number of nodes per primary vine (81.33) were recorded in plants raised in Cocopeat : Vermicompost : Fly ash, under fertilizer solution method. A similar trend was observed for root length of watermelon, which ranged from 62.80 to 71.57 cm.

Yield Parameters

The results clearly indicated that the yield attributes of watermelon (Table 3 and 4) significantly differed among the various growing media and method of fertilization experimented. Among the growing media tested, the media containing Cocopeat: Vermicompost: Fly ash recorded the highest values in yield parameters and yield.

Application of nutrients through fertilizer solution recorded the higher values in yield parameters and yield than placement of nutrients as Fertilizer Pellet Pack. The total fruit yield ranged from 5.88 to 21.12 kg pot^{-1}. The growing media having the composition of Cocopeat: Vermicompost: Fly ash receiving fertilization as fertilizer solution (M_4 F_3) gave the highest fruit yield of 21.12 kg pot^{-1}. In the case of growing media having Cocopeat: Vermicompost applied with fertilizer solution (M_2 F_3) registered moderately high yield (19.45 kg pot^{-1}). The lowest yield (5.88 kg pot^{-1}) was observed with growing media containing Cocopeat: Biocompost: Fly ash with no fertilization (M_5 F_1). Obliviously, a similar trend was also observed in total fruit dry matter which ranged between 322.9 and 1128.0 g pot^{-1}.

Fruit quality parameters

Fruit quality parameters (Table 5 and 6) viz., pulp weight, juice content, crude protein, ascorbic acid, total soluble solids, acidity, reducing sugar, non-reducing sugar and total sugar contents of watermelon fruit varied significantly owing to various growing media and method of fertilization. It was observed that the fruit of plants raised with growing media comprising of Cocopeat : Vermicompost : Fly ash registered significantly the highest pulp weight (2569 g fruit^{-1}), juice content (89.53%), crude protein (12.29%), ascorbic acid (6.21 mg 100 g^{-1}), total soluble solids (9.16%), reducing sugar (1.75%), non-reducing sugar (3.58%), total sugar (5.33) and minimum acidity (0.34%). In the media having Cocopeat: Vermicompost recorded moderate fruit quality parameters. The fruits of plants applied with fertilizer solution recorded the high pulp weight (2521 g fruit^{-1}), juice content (87.35%), crude protein (11.89%), ascorbic acid (6.10 mg 100g^{-1}), total soluble solids (9.09%), reducing sugar (1.70%), non-reducing sugar (3.53%), total sugar (5.23) and minimum acidity (0.37%), when compared to Fertilizer Pellet Pack.

Discussion

The experiment set up with pots was arranged in the unproductive open field purposefully to utilize a wasteland space for crop production. In the study conducted the effect of different growing media and method of fertilization on watermelon under matric suction irrigation showed promising results for the media containing Cocopeat: Vermicompost: Fly ash. Application of fertilizers as solution was superior to Fertilizer Pellet Pack. The media was in equal proportion on dry weight basis for practical purpose for accurate mix of media. Volume base mixing may cause non-uniformity as substrate bulk density are variable. In the growing media wherever Cocopeat and vermicompost were used, there was enhancement in growth. In addition to cocopeat and vermicompost when fly ash was combined there was exceptionally high growth and yield. This supportive performance of fly ash might be due to the presence of substantial essential plant nutrients such as N, P, K, Ca, Mg, S and micronutrients, besides having high water holding capacity (58.2%) due to its fine texture and high surface area. Fly ash has already been recognized as a potential source for increasing the availability of mineral nutrients for plant growth (Mittra *et al.* 2005; Lee *et al.*2007; Pandey and Singh 2010) [17, 14, 20]. Sikka and Kansal (2000) [30], Lee *et al.* (2005) [15] and Jala and Goel (2006) [10] reported that in combination with various organic manures, Fly ash can enhance soil microbial activities, nutrient availability and plant productivity.

With application of fertilizers as solution increase in growth was observed, which could be attributed to continuous supply of nutrients incrementally at weekly intervals, throughout the crop period to meet the full nutritional requirement of watermelon. In a study, Thriveni *et al.* (2015) [33] recorded the highest vine length and number of branches per vine of bitter gourd when grown with 100 per cent NPK integrated with vermicompost and bio fertilizers. In Fertilizer Pellet Pack placement also, substantial growth was observed in the early growth and flowering stages, but at maturity phase yield parameters were lower than fertilization by solution. Possibly this might have happened because nutrients supplied by Fertilizer Pellet Pack was lower than the solution method.

The results on the fruit yield of watermelon distinctly indicated the importance of combining right fertilization with right composition of growing media for getting an enhanced production. All the growing media fertilized with fertilizer solution treatments significantly increased the yield of fruits over control. The yield recorded was highest in the media having the combination of Cocopeat : Vermicompost : Fly ash with fertilizer solution, as this media would have provided good anchorage and supply of most of the inherently bound macronutrients and micronutrients. Further, the incremental application of fertilizer solution would have in addition provided readily available forms of N, P, and K nutrients.

In general, in similar studies, integration of fly ash with inorganic fertilizer and FYM produced considerably higher grain and straw yield in rice than all other treatment combination as reported by Yeledhalli *et al*. (2008) [34] and Reddy *et al*. (2010) [25]. Bhople *et al*. (2011) [4] also observed that application of fly ash at increasing level in combination with N, P and K increased the grain and straw yield of rice.

Matte and Kene (1995) [16], Selvakumari *et al*. (2000) [29] and Yeledhalli *et al*. (2008) [34] reported increase in yield due to addition of fly ash in several crops. Selvakumari *et al*. (2000) [29] also reported the highest grain yield in rice when fly ash was applied in combination with compost, fertilizer and *Azospirillum*. The supply of nutrients, conducive physical condition leading to better aeration, increase in soil moisture holding capacity, root activity would have resulted due to complementary effect of fly ash when combining with FYM, which would have increased straw and grain yield of rice.

The superior influence of application of fertilizer solution on growth and yield attributes finally has enhanced fruit yield of watermelon in the present study. Increase in yield due to application of solution form of water soluble fertilizer might have instantly supplied available N, P and K in the root zone, which would have facilitated direct absorption and translocation by plants more quickly, thereby resulted in higher photosynthetic activity. In a similar study, application of water soluble fertilizers through fertigation to watermelon resulting in significant increase in plant growth parameters, yield parameters and quality parameters of fruits was observed by Rolbiecki *et al.* (2011) [26], Hazarika *et al.,* (2012) [9] and Prabhakar *et al.* (2013) [23].

Irrespective of all the varying composition of growing media experimented, fertilization by Fertilizer Pellet Pack placement recorded considerable increase in yield of watermelon over no fertilization. Yield parameters such as number of harvests, fruit length, fruit girth, number of fruits and single fruit weight were found influenced by Fertilizer Pellet Pack placement. This might be due to slow release of nutrients spread over the cropping period promoting continuous growth of crop leading to comparatively high increased in yield. Previously in different studies, increase in yield due to deep placement of fertilizer N, P and K in the form of Nutriseed Pack / Fertilizer Pellet Pack in the root zone was reported by Surabhi Hota and Arulmozhiselvan (2016) [31] in tomato, Raja Rajeshwaran and Arulmozhiselvan (2018) [24] in sugarcane and Tamilselvi and Arulmozhiselvan (2018) [32] in tomato.

Orozco *et al*. (1996) [19] reported that growing media containing vermicompost provided nutrients for the growth of crop adequately as vermicompost contains most plant nutrients in available forms such as nitrates, phosphates, exchangeable calcium and soluble potassium. Arancon *et al*. (1996) found out that there was occurrence of marked decrease in total N in soils where no application of vermicompost was made when compared to soil with vermicompost application. In vermicompost treated soils, the presence of large amount of total C and N in vermicompost could have provided enough N for mineralization, thereby increased N stabilization. Sangeeta Shree *et al*. (2018) [28] observed that combined application of vermicompost and inorganic fertilizers increased fruit weight and yield of bitter gourd. Similar findings were reported by Anuja and Poovizhi (2009) [1] in cucumber and Kameswari *et al*. (2011) [12] in sponge gourd.

Apart from providing mineral nutrients, vermicompost also contributes to the biological fertility by adding beneficial microbes to soil. Mucus, excreted through the digestive canal of earthworm, stimulates antagonism and competition between diverse microbial population resulting in the production of some antibiotics and hormones boosting plant growth (Edwards and Bohlen 1996) [6]. In addition, mucus accelerates and enhances decomposition of organic matter composing stabilized humic substances, which embody water-soluble phytohormonal elements (Edwards and Arancon 2004) [7] and plant available nutrients at high levels (Atiyeh *et al*., 2000) [3].

There was a significant difference in quality parameters of fruits among the media. The results on quality parameters clearly indicated the highest content of pulp, juice, crude protein, ascorbic acid, total soluble solids, reducing sugar, non-reducing sugar, total sugar and minimum acidity in the fruits of watermelon grown in media consisting Cocopeat: Vermicompost : Fly ash fertilized with fertilizer solution. This might be due to the continuous supply of readily available nutrients by periodical application of fertilizer solution, synergistically interacting with vermicompost and fly ash. Several studies indicated that application of organic manures along with inorganic fertilizers enhanced quality aspects of fruit. This quality improvement might be due to quick metabolic transformation of soluble compounds and more conversion of metabolites into amino acids and sugar (Gawande *et al.*, 1998; Kumar *et al.*, 2016 and Phookan *et al.*, 2016) [8, 13].

Mohan Kumar *et al.* (2017) [18] observed that the highest value of ascorbic acid and total soluble solids were observed with application of 100% N through vermicompost along with panchagavya (3%) in snake gourd. The lower content of quality aspects has resulted in the fruits of plants raised in the growing media having the composition of Cocopeat: Biocompost: Fly ash which could be attributed to inadequate supply of nutrients due to antagonistic effect between biocompost and Fly ash, since biocompost of sugarcane industry is having higher concentration of soluble salts.

The promising effect of matric suction irrigation has been identified in the present study as an alternative means for surface irrigation. Matric suction irrigation reduces the labour cost and suits for easy maintenance, as one-time installation of the set up provides water to crop year-round. Water is circulated in pipes at the bottom of pots all the time where growing media container is placed. There is no drainage/ leaching leading to prevention of water loss as well as nutrients. Always moisture is kept at optimum range in growing media. There is no drying cycle from sowing to harvest. Based on these advantages, it is concluded that crop production by matric suction irrigation using the growing media identified in the present study may suit well for terrace garden as well as in leveled wastelands utilizing limited irrigation water.

Table 1: Characteristics of substrates and growing media

S. No.	Growing media materials	pH	EC (dS m^{-1})	OC (%)	Total Nutrients (%)			C/N Ratio
					N	P_2O_5	K_2O	
1.	Farmyard manure	7.61	0.62	13.54	0.58	0.26	0.67	23
2.	Vermicompost	7.14	0.81	15.45	1.56	0.83	1.30	10
3.	Cocopeat	6.72	0.75	28.76	0.25	0.05	1.38	115
4.	Fly ash	5.85	0.12	1.72	0.07	0.28	0.60	25
5.	Pressmud	6.64	2.81	19.51	1.36	2.88	1.46	14
6.	Biocompost	7.44	3.52	23.87	1.72	2.11	1.78	14
7.	(M_1) Soil: Sand: FYM	7.62	0.73	3.30	0.49	0.20	0.57	7
8.	(M_2) CP : VC	7.11	0.72	20.82	0.68	0.51	1.35	31
9.	(M_3) CP : BC	7.51	2.86	21.93	1.23	0.82	1.55	18
10.	(M_4) CP : VC : FA	6.85	0.64	12.28	0.58	0.41	1.16	21
11.	(M_5) CP : BC : FA	6.86	2.51	12.48	0.66	0.48	1.29	19
12.	(M_6) CP : VC : PM	6.72	1.82	19.36	0.96	1.28	1.38	20

CP	Cocopeat	PM	Pressmud	FYM	Farmyard Manure
VC	Vermicompost	BC	Bio compost	M_1 to M_6	Growing media
FA	Fly ash				

Table 2: Effect of growing media and fertilization on growth parameters of watermelon (*Rabi* 2017-18)

Media	Fertilization		Growth Parameters			
			Primary vein length (Cm.)	No. of branches primary vein^{-1}	No. of nodes primary vein^{-1}	Root length pot^{-1} (Cm.)
Soil: Sand: FYM (M_1)	F_1	Control	232.6	6.33	54.67	64.43
	F_2	FPP	266.4	8.33	62.33	65.87
	F_3	FS	292.6	9.67	67.67	67.50
Mean			263.9	8.11	61.56	65.93
CP : VC (M_2)	F_1	Control	265.7	8.33	60.33	66.03
	F_2	FPP	301.4	9.67	70.00	67.90
	F_3	FS	328.8	11.00	76.67	69.33
Mean			298.6	9.67	69.00	67.76
CP : BC (M_3)	F_1	Control	208.2	5.67	48.67	62.83
	F_2	FPP	236.6	7.33	55.33	64.33
	F_3	FS	257.3	7.67	61.33	65.43
Mean			234.0	6.89	55.11	64.20
CP : VC : FA (M_4)	F_1	Control	288.8	8.67	65.67	68.20
	F_2	FPP	324.5	11.00	75.67	69.93
	F_3	FS	346.6	11.67	81.33	71.57
Mean			320.0	10.44	74.22	69.90
CP : BC : FA (M_5)	F_1	Control	205.2	5.33	48.33	62.80
	F_2	FPP	234.5	7.00	55.00	64.07
	F_3	FS	250.6	7.67	57.33	65.27
Mean			230.1	6.67	53.56	64.04
CP : VC : PM (M_6)	F_1	Control	224.5	6.33	57.67	63.27
	F_2	FPP	253.6	7.67	59.67	64.73

	F3	FS	278.2	8.67	65.67	66.30
			252.1	7.56	61.00	64.77
Fertilization Mean	F1	Control	237.5	6.78	55.89	64.59
	F2	FPP	269.5	8.50	63.00	66.14
	F3	FS	292.4	9.39	68.33	67.57

CD (P=0.05)	SEd	CD	SEd	CD	SEd	CD	SEd	CD
Media (M)	3.83	7.77	0.25	0.50	0.74	1.50	0.85	1.73
Fertilization (F)	2.71	5.50	0.18	0.36	0.52	1.06	0.60	1.23
M X F	6.64	NS	0.43	NS	1.28	2.60	1.48	NS

CP Cocopeat **PM** Pressmud **FPP** Fertilizer Pellet Pack **VC** Vermicompost **BC** Biocompost **FS** Fertilizer Solution **FA** Fly ash **FYM** Farmyard Manure

Table 3: Effect of growing media and fertilization on yield parameters of watermelon (*Rabi* 2017-18)

Media	Fertilization		Yield Parameters			
			Days to first harvest	No. of harvests	Fruit length (Cm.)	Fruit girth (Cm.)
Soil: Sand: FYM (M_1)	F_1	Control	83.67	2.33	29.27	46.50
	F_2	FPP	81.67	2.67	31.37	47.23
	F_3	FS	80.67	3.00	32.57	47.83
Mean			82.00	2.67	31.07	47.19
CP : VC (M_2)	F_1	Control	84.33	2.67	30.40	46.70
	F_2	FPP	81.33	3.00	32.53	47.67
	F_3	FS	78.67	3.33	33.40	48.27
Mean			81.44	3.00	32.11	47.54
CP : BC (M_3)	F_1	Control	96.33	2.00	27.33	45.27
	F_2	FPP	93.67	2.33	29.53	46.37
	F_3	FS	89.00	2.67	30.70	46.93
Mean			93.00	2.33	29.19	46.19
CP : VC : FA (M_4)	F_1	Control	83.33	2.67	31.27	47.10
	F_2	FPP	80.67	3.00	33.20	48.07
	F_3	FS	78.33	3.33	34.23	48.67
Mean			80.78	3.00	32.90	47.94
CP : BC : FA (M_5)	F_1	Control	97.33	2.00	28.60	44.60
	F_2	FPP	93.67	2.33	29.73	45.80
	F_3	FS	90.33	2.67	30.23	46.47
Mean			93.78	2.33	29.52	45.62
CP : VC : PM (M_6)	F_1	Control	87.33	2.33	28.60	45.83
	F_2	FPP	85.67	2.67	30.50	46.83
	F_3	FS	83.33	3.00	31.63	47.43
Mean			85.44	2.67	30.24	46.70
Fertilization Mean	F_1	Control	88.72	2.33	29.52	46.00
	F_2	FPP	86.11	2.67	30.96	46.99
	F_3	FS	83.39	3.00	32.04	47.60

CD (P=0.05)	SEd	CD	SEd	CD	SEd	CD	SEd	CD
Media (M)	1.00	2.02	0.22	0.45	0.71	1.44	0.50	1.02
Fertilization (F)	0.71	1.43	0.16	0.32	0.50	1.02	0.35	0.72
M X F	1.73	NS	0.38	NS	1.23	NS	0.87	NS

CP Cocopeat **PM** Pressmud **FPP** Fertilizer Pellet Pack **VC** Vermicompost **BC** Biocompost **FS** Fertilizer Solution **FA** Fly ash **FYM** Farmyard Manure

Table 4: Effect of growing media and fertilization on yield parameters of watermelon (*Rabi* 2017-18)

Media	Fertilization		Yield Parameters			
			No. of fruits pot^{-1}	Single fruit weight (g.)	Yield (kg pot^{-1})	Fruit dry matter (g pot^{-1})
Soil: Sand: FYM (M_1)	F_1	Control	3.00	2.93	9.89	539.1
	F_2	FPP	4.00	3.42	13.27	686.7
	F_3	FS	4.33	3.95	17.12	912.8
Mean			3.78	3.43	13.43	712.9
CP : VC (M_2)	F_1	Control	3.67	3.13	11.50	623.1
	F_2	FPP	4.33	3.55	15.38	807.3
	F_3	FS	4.67	4.16	19.45	1040
Mean			4.22	3.61	15.44	823.6
CP : BC (M_3)	F_1	Control	3.00	2.41	7.22	395.6
	F_2	FPP	3.67	2.85	10.47	558.1
	F_3	FS	4.00	3.29	13.15	705.2
Mean			3.56	2.85	10.28	552.9
CP : VC : FA (M_4)	F_1	Control	4.00	3.18	12.71	687.1
	F_2	FPP	4.67	3.60	16.82	876.2
	F_3	FS	5.00	4.22	21.12	1128

Mean			4.56	3.67	16.88	897.0
CP : BC : FA (M_5)	F_1	Control	2.67	2.20	5.88	322.9
	F_2	FPP	3.33	2.75	9.16	476.1
	F_3	FS	3.67	3.11	11.44	610.9
Mean			3.22	2.69	8.83	470.0
CP : VC : PM (M_6)	F_1	Control	3.33	2.80	9.33	507.2
	F_2	FPP	4.00	3.25	12.98	682.3
	F_3	FS	4.33	3.59	15.53	829.3
Mean			3.89	3.21	12.61	673.0
Fertilization Mean	F_1	Control	3.28	2.78	9.42	512.5
	F_2	FPP	4.00	3.24	13.01	681.1
	F_3	FS	4.33	3.72	16.30	871.1

CD (P=0.05)	SEd	CD	SEd	CD	SEd	CD	SEd	CD
Media (M)	0.21	0.43	0.05	0.10	0.18	0.36	9.09	18.45
Fertilization (F)	0.15	0.31	0.03	0.07	0.13	0.25	6.43	13.04
M X F	0.37	NS	0.08	NS	0.31	0.62	15.75	31.95

CP Cocopeat **PM** Pressmud **FPP** Fertilizer Pellet Pack **VC** Vermicompost **BC** Biocompost **FS** Fertilizer Solution **FA** Fly ash **FYM** Farmyard Manure

Table 5: Effect of growing media and fertilization on quality parameters of watermelon (*Rabi* 2017-18)

Media	Fertilization		Quality Parameters			
			Pulp weight (g fruit^{-1})	Juice content (%)	Crude Protein (%)	Ascorbic acid (mg 100g^{-1})
Soil: Sand: FYM (M_1)	F_1	Control	1913	85.41	10.13	5.64
	F_2	FPP	2266	86.82	11.31	5.96
	F_3	FS	2649	88.17	12.19	6.19
Mean			2276	86.80	11.21	5.93
CP : VC (M_2)	F_1	Control	2130	87.49	10.19	5.87
	F_2	FPP	2447	88.25	11.69	6.11
	F_3	FS	2894	89.58	12.75	6.35
Mean			2490	88.44	11.54	6.11
CP : BC (M_3)	F_1	Control	1541	82.65	9.13	5.36
	F_2	FPP	1832	84.17	9.88	5.57
	F_3	FS	2186	85.46	10.81	5.83
Mean			1853	84.10	9.94	5.59
CP : VC : FA (M_4)	F_1	Control	2189	88.13	11.19	5.93
	F_2	FPP	2528	89.64	12.38	6.24
	F_3	FS	2989	90.81	13.31	6.46
Mean			2569	89.53	12.29	6.21
CP : BC : FA (M_5)	F_1	Control	1445	80.72	9.06	5.25
	F_2	FPP	1768	82.11	9.75	5.54
	F_3	FS	2028	83.35	10.88	5.76
Mean			1747	82.06	9.89	5.52
CP : VC : PM (M_6)	F_1	Control	1819	84.36	9.50	5.42
	F_2	FPP	2120	85.60	10.56	5.75
	F_3	FS	2381	86.74	11.38	5.98
Mean			2106	85.57	10.48	5.72
Fertilization Mean	F_1	Control	1839	84.79	9.87	5.58
	F_2	FPP	2160	86.10	10.93	5.86
	F_3	FS	2521	87.35	11.89	6.10

CD (P=0.05)	SEd	CD	SEd	CD	SEd	CD	SEd	CD
Media (M)	26.08	52.89	1.02	2.06	0.15	0.29	0.07	0.13
Fertilization (F)	18.44	37.40	0.72	1.46	0.10	0.21	0.05	0.09
M X F	45.17	91.61	1.76	NS	0.25	NS	0.11	NS

CP Cocopeat **PM** Pressmud **FPP** Fertilizer Pellet Pack **VC** Vermicompost **BC** Biocompost **FS** Fertilizer Solution **FA** Fly ash **FYM** Farmyard Manure

Table 6: Effect of growing media and fertilization on nutrients content of watermelon (*Rabi* 2017-18)

Media	Fertilization		Quality parameters (%)				
			TSS	Acidity	RS	NRS	TS
Soil: Sand: FYM (M_1)	F_1	Control	8.95	0.39	1.58	3.35	4.93
	F_2	FPP	9.07	0.37	1.65	3.48	5.13
	F_3	FS	9.14	0.37	1.74	3.56	5.30
			9.05	0.38	1.66	3.46	5.12
CP : VC (M_2)	F_1	Control	9.03	0.37	1.60	3.42	5.02
	F_2	FPP	9.10	0.35	1.69	3.54	5.23
	F_3	FS	9.18	0.34	1.77	3.61	5.38
Mean			9.10	0.35	1.69	3.52	5.21
CP : BC (M_3)	F_1	Control	8.68	0.42	1.41	3.16	4.57
	F_2	FPP	8.82	0.40	1.50	3.29	4.79
	F_3	FS	8.96	0.39	1.62	3.44	5.06
Mean			8.82	0.40	1.51	3.30	4.81
CP : VC : FA (M_4)	F_1	Control	9.08	0.36	1.67	3.48	5.15
	F_2	FPP	9.16	0.34	1.75	3.59	5.34
	F_3	FS	9.25	0.33	1.82	3.67	5.49
Mean			9.16	0.34	1.75	3.58	5.33
CP : BC : FA (M_5)	F_1	Control	8.65	0.43	1.37	3.11	4.48
	F_2	FPP	8.80	0.41	1.47	3.25	4.72
	F_3	FS	8.93	0.40	1.58	3.38	4.96
Mean			8.79	0.41	1.47	3.24	4.72
CP : VC : PM (M_6)	F_1	Control	8.85	0.40	1.50	3.26	4.76
	F_2	FPP	8.94	0.38	1.58	3.38	4.96
	F_3	FS	9.07	0.37	1.69	3.52	5.21
Mean			8.95	0.39	1.59	3.39	4.98
Fertilization Mean	F_1	Control	8.87	0.39	1.52	3.30	4.82
	F_2	FPP	8.98	0.38	1.61	3.42	5.03
	F_3	FS	9.09	0.37	1.70	3.53	5.23

CD (P=0.05)	TSS		Acidity		RS		NRS		TS	
	SEd	CD	SEd	CD	SEd	CD	SEd	CD	SEd	CD
Media (M)	0.090	0.183	0.005	0.011	0.019	0.039	0.044	0.089	0.064	0.131
Fertilization (F)	0.064	0.129	0.004	0.008	0.014	0.028	0.031	0.063	0.046	0.092
M X F	0.156	NS	0.009	NS	0.034	NS	0.076	NS	0.112	NS

CP Cocopeat **PM** Pressmud **FPP** Fertilizer Pellet Pack **VC** Vermicompost **BC** Biocompost **FS** Fertilizer Solution **FA** Fly ash **FYM** Farmyard Manure

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