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To study the effect of integrated nutrient management on growth and yield attributes of muskmelon (*Cucumis melo* L.)

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Abstract
A field investigation on the "Study of integrated nutrient management on growth, yield and quality of muskmelon (*Cucumis melo* L.) was carried out in randomized block design with seven treatments and three replications during *summer* 2021 at PG research block, College of Horticulture, Rajendranagar, Hyderabad (Southern Telangana Zone). The treatments comprising of integrated nutrient management *viz.*, T_1: RDF (200:100:100) kg/ha, T_2: 75% RDF + 25% RDN through FYM @ 5 t/ha + AMC @ 12.5 kg/ha, T_3: 75% RDF + 25% RDN through vermicompost @ 2.5 t/ha + AMC @ 12.5 kg/ha, T_4: 75% RDF + 25% RDN through neem cake @ 2.5 t/ha + AMC @ 12.5 kg/ha, T_5: 50% RDF + 50% RDN through FYM @ 10 t/ha + AMC @ 12.5 kg/ha, T_6: 50% RDF + 50% RDN through vermicompost @ 5 t/ha + AMC @ 12.5 kg/ha, T_7: 50% RDF + 50% RDN through neem cake @ 5 t/ha + AMC @ 12.5 kg/ha of treatment were evaluated in randomized block design concept with three replications.

Keywords: FYM, vermicompost, AMC, RDF, RDN, neem cake

Introduction
Muskmelon (*Cucumis melo* L.) is a popular and an important vegetable crop, grown as "Dessert Crop" throughout the warmer region of the world which is now grown in temperate regions also. In India, it is popular in Northern states such as Uttar Pradesh, Punjab, Rajasthan and Madya Pradesh. Muskmelon (2n=24) belongs to the family Cucurbitaceae, commonly known as cucurbits (Schaefer *et al*., 2009) [14]. Muskmelon is said to be native of Tropical Africa with secondary centres of origin Central Asia comprising some parts of Southern Russia, Iran, Afghanistan and North-West India (Whitaker and Davis, 1962) [17]. Muskmelon is a good source of vitamins and minerals. Apart from this for every 100 g edible portion, melon provides 26-41 calory energy, 0.6-1.0 g protein, 5-10 mg calcium, 0.2-0.4 mg iron, 8.17 mg magnesium and 7.39 mg Phosphorus (Howard *et al*., 1962) [6].
Organic manures and bio fertilizers are the important components of integrated nutrient management. There is a need to seek alternative nutrient sources which could be cheap and eco-friendly so that farmers may be able to reduce the investment on chemical fertilizers along with maintaining good soil environment conditions leading to ecological sustainable farming.

Material and Methods
Organic manures *viz*., well decomposed farmyard manure, vermicompost and neem cake were incorporated in to the respective experimental plots uniformly, before sowing as basal application. Similarly N, P and K @ 200:100:100 kg ha^{-1} were applied in the form of urea, single super phosphate and muriate of potash respectively. Urea was applied in two splits, the first dose as basal application and another dose at 30 days after sowing. The entire dose of single super phosphate and muriate of potash were applied at the time of sowing as basal dose. The bio fertilizer AMC (Arka Microbial Consortium) was applied as soil application. The crop was harvested at 75 days after sowing, when the fruits are still tender and it is harvested after ripening at half-slip and full slip stage. One day before harvesting, a light irrigation was given. Harvesting done when netting was visible and colour changes from green to brown. Before taking the observations, fruits were cleaned with fresh water to remove the adhering soil particles.

Growth characters

Vine length (cm)

The vine length was measured with a measuring tape from the first cotyledonary node to the tip of the vine. It was measured at the time of final harvest and expressed in centimeters.

Number of leaves per plant

Number of leaves per plant was counted at harvesting stage and average was expressed in number.

Leaf length and Leaf width (cm)

The leaf from middle of the vine was selected and measured at harvesting stage and average length and width was expressed in centimeters.

Yield Characters

Days taken to first flowering

Number of days taken from the date of sowing to first flower opening was counted and expressed in days.

Days taken to 50% flowering

Number of days taken from the date of sowing till 50 percent plants started flowering in each replication was counted and expressed in days.

Days taken from flowering to fruit formation

Number of days taken from the date of first flower opening till first fruit formation in each replication was counted and expressed in days.

Number of fruits per plant

Total number of fruits harvested from selected/tagged five plants in each replication were counted and averaged to get the number of fruits per plant.

Fruit length and Fruit width (cm)

Ten fruits were chosen randomly from each plot and the length was measured from apex of fruit to the base of the fruit and fruit width at a point of maximum width. The average fruit length and width was expressed in centimeters.

Fruit weight (kg)

Ten random fruits were weighed and the average weight was calculated and expressed in kilo grams.

Fruit yield per plant (kg plant^{-1}), Fruit yield per plot (kg plot^{-1}) and Fruit yield per hectare (q ha^{-1})

The fruits of each plant were harvested separately and weighed with the help of electronic balance and mean value was expressed in kilo grams.

Results

The vine length of muskmelon plant as influenced by different treatments is given in Table 1. Significant difference with respect to vine length was observed due to the different treatments application on the effect of integrated nutrient management in muskmelon at harvest. Regarding vine length, highest vine length (202 cm) was recorded in T_6 (50% RDF + 50% RDN through vermicompost @ 5 t/ha + AMC @ 12.5 Kg/ha) followed by the treatment T_5 (50% RDF + 50% RDN through FYM @ 10 t/ha + AMC @ 12.5 t/ha), T_7 (50% RDF + 50% RDN through neem cake @ 5 t/ha + AMC @ 12.5 kg/ha), T_3 (75% RDF + 25% RDN through vermicompost @ 2.5 t/ha + AMC @ 12.5 kg/ha), T_2 (75% RDF + 25% RDN through FYM @ 5 t/ha + AMC @ 12.5 kg/ha) and T_4 (75% RDF + 25% RDN through neem cake @ 5 t/ha + AMC @ 12.5 kg/ha) while lowest vine length (166 cm) was recorded in T_1 (100% RDF).

The number of leaves per plant in muskmelon as influenced by different treatments is given in Table 2. Significant difference was observed by the application of integrated nutrient management in muskmelon at harvest with respect to number of leaves per plant. Data regarding number of leaves per plant revealed that significantly maximum number of leaves per plant (97.12) was produced with the treatment T_6 (50% RDF + 50% RDN through vermicompost @ 5 t/ha + AMC @ 12.5 Kg/ha) followed by T_5 (50% RDF + 50% RDN through FYM @ 10 t/ha + AMC @ 12.5 t/ha), T_7 (50% RDF + 50% neem cake @ 5 t/ha + AMC @ 12.5 kg/ha), T_3 (75% RDF + 25% RDN through vermicompost @ 2.5 t/ha + AMC @ 12.5 kg/ha), T_2 (75% RDF + 25% RDN through FYM @ 5 t/ha + AMC @ 12.5 kg/ha), T_4 (75% RDF + 25% RDN through neem cake @ 2.5 t/ha + AMC @ 12.5 kg/ha) and less of number of leaves (83.80) per plant was reported in T_1 (100% RDF).

The leaf length and width of muskmelon plant as influenced by different treatments is given in Table 3 and 4. Significant difference was observed by the application of effect of integrated nutrient management in muskmelon at harvest for leaf length and width. Maximum leaf length (16.20 cm) from middle of the vine was recorded in treatment T_6 (50% RDF + 50% RDN through vermicompost @ 5 t/ha) through followed by the treatment T_5 (50% RDF + 50% RDN through FYM @ 10 t/ha), T_7 (50% RDF + 50% RDN through neem cake @ 5 t/ha), T_3 (75% RDF + 25% RDN through vermicompost @ 2.5 t/ha), T_2 (75% RDF + 25% RDN through FYM @ 5 t/ha), T_4 (75% RDF + 25% RDN through neem cake @ 2.5 t/ha) and least leaf length (12.91 cm) was observed in T_1 (100% RDF) under study.

Significantly maximum leaf width (15.77 cm) from middle of the vine was recorded with T_6 (50% RDF + 50% RDN through vermicompost @ 5 t/ha + AMC @ 12.5 kg/ha) followed by the treatment T_5 (50% RDF + 50% RDN through FYM @ 10 t/ha + AMC @ 2.5 kg/ha), T_7 (50% RDF + 50% RDN through neem cake @ 5 t/ha), T_3 (75% RDF + 25% RDN through vermicompost @ 2.5 t/ha + AMC @ 12.5 kg/ha), T_2 (75% RDF + 25% RDN through FYM @ 5 t/ha + AMC @ 12.5 kg/ha), T_4 (75% RDF + 25% RDN through neem cake @ 2.5 t/ha + AMC @ 12.5 kg/ha) which were at on par with each other while minimum leaf width (11.50 cm) was recorded in T_1 (100% RDF).

The number of days taken to 1st flowering of muskmelon plant as influenced by integrated nutrient management is given in Table 5. Significant difference was observed by with the application of integrated nutrient management practices in muskmelon regarding to days taken to 1st flowering. Significantly minimum number of days taken to 1st flowering (29.14) was recorded in treatment T_6 (50% RDF + 50% RDN through vermicompost @ 5 t/ha + AMC @ 12.5 kg/ha) under the study. It was followed by the treatment T_5 (50% RDF + 50% RDN through FYM @ 10 t/ha + AMC @ 12.5 kg/ha), T_7 (50% RDF + 50% RDN through neem cake @ 5 t/ha + AMC @ 12.5 kg/ha) and T_3 (75% RDF + 25% RDN through vermicompost @ 2.5 t/ha + AMC @ 12.5 kg/ha), T_2 (75% RDF + 25% RDN through FYM @ 5 t/ha + AMC @ 12.5kg/ha), T_4 (75% RDF + 25% RDN through neem cake @

2.5 t/ha + AMC 12.5 kg/ha) which were on par with one another while maximum days taken to first flowering (33.36) was recorded in treatment T_1 (100% RDF).

Number of days taken to 50% flowering was recorded and presented in Table 5. Significant difference was observed by the application of integrated nutrient management practices in muskmelon regarding to days taken to 50% flowering. The data showed that significantly minimum days (34.04) taken to 50% flowering was recorded in T_6 (50% RDF + 50% RDN through vermicompost @ 5 t/ha + AMC @ 12.5 kg/ha) followed by treatment T_5 (50% RDF + 50% RDN through FYM @ 10 t/ha + AMC @ 12.5 kg/ha), T_7 (50% RDF + 50% RDN through neem cake @ 5 t/ha + AMC @ 12.5 kg/ha) and the treatment T_3 (75% RDF + 25% RDN through vermicompost @ 2.5 t/ha + AMC @ 12.5 kg/ha, T_2 (75% RDF + 25% RDN through FYM @ 5 t/ha + AMC @ 12.5 kg/ha) and T_4 (75% RDF + 25% RDN through neem cake @ 2.5 t/ha + AMC @ 12.5 kg/ha) showed intermediate results, while maximum number of days (38.23) taken to 50% flowering was recorded in T_1 (100% RDF).

The number of days taken from flowering to fruiting as Influenced by integrated nutrient management is given in Table 5. Significant difference was observed with by the application of integrated nutrient management treatments in muskmelon for days taken from flowering to fruiting. The treatment T_6 (50% RDF + 50% RDN through vermicompost @ 5 t/ha + AMC @ 12.5 kg/ha) recorded significantly minimum number of days (13.44) taken from flowering to fruiting followed by T_5 (50% RDF + 50% RDN through FYM @ 10 t/ha + AMC @ 12.5 kg/ha) which was on par with T_7 (50% RDF + 50% RDN through neem cake + AMC @ 12.5 kg/ha) followed by T_3 (75% RDF + 25% RDN through vermicompost @ 2.5 t/ha + AMC @ 12.5 kg/ha), T_2 (75% RDF + 25% RDN through FYM @ 5 t/ha) and T_4 (75% RDF + 25% RDN through neem cake @ 2.5 t/ha + AMC @ 12.5 kg/ha)which were on par with one another while maximum number of days (16.96) taken from flowering to fruiting was noticed in T_1 (100% RDF) where recommended dose of fertilizers were applied.

The number of fruits was recorded at harvest as influenced by integrated nutrient management is given in Table 6. Significant difference was observed by the application of integrated nutrient management in muskmelon at harvest for number of fruits per plant. Data regarding number of fruits per plant (4.14) recorded significantly maximum in treatment T_6 (50% RDF + 50% RDN through vermicompost @ 5 t/ha + AMC @ 12.5 kg/ha) which was on par with T_5 (50% RDF + 50% RDN through FYM @ 10 t/ha + AMC @ 12.5 kg/ha), T_7 (50% RDF + 50% RDN through neem cake @ 5 t/ha + AMC @ 12.5 kg/ha) then followed by T_3 (75% RDF + 25% RDN through vermicompost @ 2.5 t/ha + AMC @ 12.5 kg/ha) and T_2 (75% RDF + 25% RDN through FYM @ 5 t/ha + AMC @ 12.5 kg/ha), T_4 (75% RDF + 25% RDN through neem cake @ 2.5 t/ha + AMC @ 12.5 kg/ha)and T_1 (100% RDF)which were on par with one another while lower number of fruits (2.75) per plant was noted in T_1 (100% RDF).

The fruit length and width of muskmelon plant as influenced by integrated nutrient management is given in the Table 7 and 8. Significant difference was observed by the application of integrated nutrient management practices in muskmelon for fruit length and fruit width. Data regarding fruit length revealed that significantly maximum (11.80 cm) was raved in treatment T_6 (50% RDF + 50% RDN through vermicompost @ 5 t/ha + AMC @ 12.5 kg/ha) which was on par with treatment T_5 (50% RDF + 50% RDN through FYM @ 10 t/ha + AMC @ 12.5 kg/ha) followed by the treatments T_7 (50% RDF + 50% RDN through neem cake @ 5 t/ha + AMC @ 12.5 kg/ha), T_3 (75% RDF + 25% RDN through vermicompost @ 2.5 t/ha + AMC @ 12.5 kg/ha), T_2 (75% RDF + 25% RDN through FYM @ 5 t/ha + AMC @ 12.5 kg/ha), T_4 (75% RDF + 25% RDN through neem cake @ 2.5 t/ha + AMC @ 12.5 kg/ha) and finally (8.32 cm) in T_1 (100% RDF).

Maximum fruit width (8.84 cm) was recorded in T_6 (50% RDF + 50% RDN through vermicompost @ 5 t/ha + AMC @ 12.5 kg/ha) followed by treatment T_5 (50% RDF + 50% RDN through FYM @ 10 t/ha + AMC @ 12.5 kg/ha) which was on par with T_7 (50% RDF + 50% RDN through neem cake @ 5 t/ha + AMC @ 12.5 kg/ha) and T_3 (75% RDF + 25% RDN through vermicompost @ 2.5 t/ha + AMC @ 12.5 kg/ha) then followed by T_2 (75% RDF + 25% RDN through FYM @ 5 t/ha + AMC @ 12.5 kg/ha) on par with T_4 (75% RDF + 25% RDN through neem cake @ 2.5 t/ha + AMC @ 12.5 kg/ha) while minimum fruit width (5.85 cm) was recorded in treatment T_1 (100% RDF) where recommended dose of fertilizers were applied.

The data with respect to the study of INM on fruit weight content are presented in Table 9. Significant difference was observed by the application of integrated nutrient management in muskmelon at harvest with fruit weight. It was evident from the data that all the nutrient application strategies influenced the fruit weight, maximum (0.75 Kgs) was recorded in T_6 (50% RDF + 50% RDN through vermicompost @ 5 t/ha + AMC @ 12.5 kg/ha) the treatments T_5 (50% RDF + 50% RDN through FYM @ 10 t/ha + AMC @ 12.5 kg/ha), T_7 (50% RDF + 50% RDN through neem cake @ 5 t/ha + AMC @ 12.5 kg/ha), T_3 (75% RDF + 25% RDN through vermicompost @ 2.5 t/ha + AMC @ 12.5 kg/ha), T_2 (75% RDF + 25% RDN through FYM @ 5t/ha + AMC @ 12.5 kg/ha), T_4 (75% RDF + 25% RDN through neem cake @ 2.5 t/ha + AMC @ 12.5 kg/ha) have intermediate effects, while minimum fruit weight (0.41 Kgs) was recorded in T_1 (100% RDF).

The data with respect to fruit yield per plant, per plot and per hectare from the study of INM are presented in Table 10. Significant difference was observed by the application of integrated nutrient management in muskmelon at harvest on fruit yield per plant, per plot and per hectare. Significantly maximum fruit yield per plant (1.36 Kg) was recorded in T_6 (50% RDF + 50% RDN through vermicompost @ 5 t/ha + AMC @ 12.5 kg/ha) which was at on par with T_5 (50% RDF + 50% RDN through FYM @ 10 t/ha + AMC @ 12.5 kg/ha). Treatments T_7 (50% RDF + 50% RDN through neem cake @ 5 t/ha + AMC @ 12.5 kg/ha), T_3 (75% RDF + 25% RDN through vermicompost @ 2.5 t/ha + AMC @ 12.5 kg/ha), T_2 (75% RDF + 25% RDN through FYM @ 5 t/ha + AMC @ 12.5 kg/ha) and T_4 (75% RDF + 25% RDN through neem cake @ 2.5 t/ha + AMC @ 12.5 kg/ha) have intermediate effects. While, minimum fruit yield per plant (0.93 Kg) was recorded in T_1 (100% RDF) where recommended dose of fertilizers were applied. The maximum fruit yield per plot (9.90 Kgs) was recorded in T_6 (50% RDF + 50% RDN through vermicompost @ 5 t/ha + AMC @ 12.5 kg/ha) followed by treatments T_5 (50% RDF + 50% RDN through FYM @ 10 t/ha + AMC @ 12.5 kg/ha), T_7 (50% RDF + 50% RDN through neem cake @ 5 t/ha + AMC @ 12.5 kg/ha), T_3

(75% RDF + 25% RDN through vermicompost @ 2.5 t/ha + AMC @ 12.5 kg/ha), T_2 (75% RDF + 25% RDN through FYM @ 5 t/ha + AMC @ 12.5 kg/ha), T_4 (75% RDF + 25% RDN through neem cake @ 2.5 t/ha + AMC @ 12.5 kg/ha) while minimum fruit yield per plot (7.21 Kgs) was recorded in T_1 (100% RDF) where recommended dose of fertilizers were applied.

The maximum fruit yield per hectare (151.62 q/ha) was recorded in T_6 (50% RDF + 50% RDN through vermicompost @ 5 t/ha + AMC @ 12.5 kg/ha) followed by treatments T_5 (50% RDF + 50% RDN through FYM @ 10 t/ha + AMC @ 12.5 kg/ha), T_7 (50% RDF + 50% RDN through neem cake @ 5 t/ha + AMC @ 12.5 kg/ha), T_3 (75% RDF + 25% RDN through vermicompost @ 2.5 t/ha + AMC @ 12.5 kg/ha), T_2 (75% RDF + 25% RDN through FYM @ 5 t/ha + AMC @ 12.5 kg/ha), T_4 (75% RDF + 25% RDN through neem cake @ 2.5 t/ha + AMC @ 12.5 kg/ha) while minimum fruit yield per plot (131.80 q/ha) was recorded in T_1 (100% RDF) where recommended dose of fertilizers were applied.

Discussion

Growth characters

Vine length (cm)

The increased vine length may be due to the increased dosage and beneficiary effect of vermicompost along with inorganic fertilizers increased the absorption of nutrients especially nitrogen which enhanced the cell division, cell elongation and increased vine length. These findings were in agreement with the findings of Thriveni *et al.* (2015) [16] in bitter gourd supported integrated nutrient management including application of optimum organic manures increased vine length, Ghosh *et al.* (2016) [5] in watermelon reported that application of increasing levels of vermicompost and inorganic fertilizers significantly increased the vine length and Jagraj Singh *et al.* (2020) [7] in cucumber identified vine length was significantly affected by the various INM doses of organic manure and fertilizers during the crop growth period.

Number of leaves per plant

The maximum number of leaves per plant may be due to the increased nutrient application resulted better root development and increased translocation of carbohydrates from source to growing points. This might be due to influence of nutrient, the chief constituent of protein which is essential for the formation of protoplasm leading to meristematic activity, cell division and development of leaf. These findings are comparable with Audi *et al*. (2013) [2] in watermelon found that using soil amendment's using organic manures and inorganic fertilizers reported to improve soil conditions and enhance vegetative growth, Jagraj *et al*. (2020) [7] noticed number of leaves per plant were significantly affected by various INM doses of organic manure and fertilizers during the crop growth period in cucumber and Matthew *et al.* (2020) [8] in muskmelon observed application of inorganic fertilizers along with organic manures increased number of leaves per plant.

Leaf length and Leaf width (cm)

Maximum leaf length might be due to the nutrients (N.P.K.) which was starting material for biological synthesis. It also play an important role in plant metabolism and being an essential constituent of diverse type metabolically active compounds like purines, pyrimidine's, enzymes, co-enzymes and alkaloids. Thus, the increased availability of photosynthesis, which consequently led to desirable C:N ratio as carbohydrate supply might be helping in larger storage in the leaf. Maximum leaf width might be due to the role of nitrogen in promoting vegetative growth and enhancing cell division and cell elongation as well as greater chlorophyll synthesis. Phosphorus is easily mobilized in the plant and translocated to the meristematic zone and increase the activity of leaf formation. Potassium activates many enzymes involved in respiration and photosynthesis. The added organic manures would have improved the physical, chemical and biological properties of the soil which helps better nutrient absorption and utilization by the plant resulting better growth.

Similar observations were made by Satish *et al*. (2018) [18] in bottle gourd. Combined application of inorganic fertilizers and organic manures increased the leaf width and Jagraj *et al*. (2020) [7] in cucumber reported the leaf width was significantly affected by the various INM doses of organic manure and fertilizers during the crop growth period.

Yield characters

Days taken to 1st flowering, days taken 50% flowering and Days taken from flowering to fruiting

Minimum number of days taken to first flowering may due to the balanced nutrient levels with organic manures. Phosphorus is an important element and is essential for initiation of flowering, organic manures along with NPK known to increase the availability of phosphorus resulted in early flowering. This result was in conformity with the findings of Prabhu *et al*. (2006) [11] found the application of vermicompost along with inorganic fertilizers induced less number of days taken to first flowering and Anjanappa *et al*. (2012) [1] in cucumber recorded combination of organic and inorganic fertilizers helped in enhanced uptake of nutrients which promoted less number of days taken to first flowering.

In the present study, minimum number of days taken to 50% flowering might be due to the judicious integration of organic manures with inorganic fertilizers are capable of supplying optimum level of required nutrients along with the growing media. The result complies with the findings given by Sudeshna *et al*. (2019) [15] in cucumber, observed the judicious integration of organic manures along with inorganic fertilizers capable of supplying optimum level of nutrients which induced less number of days taken to 50% flowering.

In the present study minimum number of days taken from flowering to fruiting might be due to the integrated approach of nutrient application has improved early fruiting as compared to treatment where recommended dose of fertilizers were applied. These findings are in line with report of Sudeshna *et al.* (2019) [15] in cucumber observed the judicious integration of organic manures along with inorganic fertilizers capable of supplying optimum level of nutrients which induced less number of days taken from flowering to fruiting. Jagraj *et al.* (2020) [7] in cucumber found the earliness from flowering to fruiting due to better translocation of nutrients to the aerial parts of the plant and enhancement in reproductive phase due to the treatment of relevant combinations of organic and inorganic sources of nutrients.

Number of fruits per plant

Maximum number of fruits per plant might be due to the application of various levels of organic manures, inorganic fertilizers. The increased nutrient availability from vermicompost, organic phosphorus have increased the various endogenous hormonal levels in the plant tissue, which was responsible for enhanced pollen germination and tube growth, which ultimately increased the number of fruits per plant. The highest number of fruits per plant may also be due to higher percentage of productive flowers. Similar findings were reported by Prabhu *et al*. (2006) [11], recorded maximum number of fruits per plant in the treatment combination of vermicompost along with recommended dose of inorganic fertilizers, Anjanappa *et al*. (2012) [1] in cucumber found the plants which were provided with the combinations of inorganic and organic manures which influence the increased number of fruits per plant. Sankhala *et al*. (2019) [12] reported organic manures contained all the essential nutrients and their application with inorganic fertilizers definitely enhances nutrient availability which helps the muskmelon crop to produce more number of fruits per plant.

Fruit length and Fruit width (cm): Maximum fruit length recorded due to the synergistic interaction between organic manures and biofertilizers, soil improved the plant growth by producing plant hormones which are involved in apical dominance, cell division and cell enlargement. The present results getting support from Anjanappa *et al*. (2012) [1] noticed when plants are provided with combinations of inorganic and organic manures which influence the increased fruit length in cucumber and Nayak *et al*. (2016) [9] in pointed gourd observed maximum fruit length in the treatment which received vermicompost and full recommended dose of NPK. A synergistic interaction between organic manures and inorganic fertilizers resulted in enhanced fruit length.
Maximum fruit width was recorded due to higher dose of nutrients resulted in improving the soil physical, chemical and biological properties resulted in increase in the fruit width. These findings corroborate with the findings of Patle *et al.* (2018) [10] in bottle gourd and Satish *et al.* (2018) [18] and Sankhala *et al*. (2019) [12] in muskmelon.

Fruit weight (Kgs)
The favourable effect of organic manure and inorganic fertilizer is supplying all essential nutrients in balanced ratio improved the fertility status of the soil, resulted in greater fruit weight of muskmelon. The findings were in congruence with the findings of Dauda *et al.* (2008) [3] in watermelon observed that increased in fruit weight could be attributed to the ability of organic manures to promote increase in the fruit weight due to increase in N application. Sankhala *et al*. (2019) [12] in muskmelon recorded that organic manures application with inorganic fertilizers enhances the nutrient availability which helps the muskmelon crop to produce maximum fruit weight. Similarly Matthew *et al*. (2020) [8] in muskmelon noticed that growing muskmelon under the rainfed condition with adequate fertilizer application influences fruit weight.

Fruit yield per plant (Kg/plant), Fruit yield per plot (kg/plot), Fruit yield per hectare (q/ha): Maximum fruit yield per plant might be due to the fertigation of experimental plot with integrated nutrient approach may be attributed to offer suitable growing media providing better aeration with ample amount of organic matter in the soil creating perfect microclimatic condition for growth of crop to develop effective crop stand at reproductive stage resulted in more fruit yield per plant. These findings were in resemblance with Sankhala *et al.* (2019) [12] in muskmelon, recorded that organic manures application with inorganic fertilizers enhances the nutrient availability which helps the muskmelon to produce maximum fruit yield per plant. Sudeshna *et al.* (2019) [15] in cucumber found quick release of available nutrient from the inorganic fertilizers coupled with micronutrients and vitamins from organic manures like vermicompost produced maximum fruit yield per plant.
The higher yield per plot in the present study might be due to influence of luxurious supply of nitrogen, phosphorus, potash and their effect. Absorption in which the various physiological and metabolic processes translocated these nutrients to fruiting nodes resulted in higher fruiting and ultimately yield. The investigation was in line with other reports of Sudeshna *et al*. (2019) [15] in cucumber reported that integration of inorganic fertilizers with vermicompost and other organic manures has provided the impeccable growing media with favourable soil environment produced more fruit yield per plot. Jagraj *et al*. (2020) [7] in cucumber discovered maximum fruit yield per plot significantly increased with incremental uses of inorganic nutrients along with integrated uses of FYM, vermicompost and other organic manures. Daudhat *et al.* (2020) [4] in bitter gourd observed luxurious supply of nitrogen, phosphorus, potash, FYM and biofertilizers enhanced maximum nutrient absorption by various physiological and metabolic process especially protein metabolism. Translocation of these nutrients to the fruiting nodes results in higher fruiting, fruit development and ultimately yield.
The maximum increased fruit yield could be attributed to lowest number of days taken for male and female flower appearance, production of more female flowers, number of fruits and fruit weight which were positively contributed towards fruit yield. Increased fruit yield was also related to balanced nutrition, better uptake of nutrients by plants which helped for better fruit set and fruit yield. The results were in conformation with the findings of Anjanappa *et al*. (2012) [1] in cucumber noticed influence of organic manures in combination with NPK enhanced more yield, Ghosh *et al*. (2016) [5] in watermelon recorded increased yield using different organic manures in combination with NPK fertilizers. Satish *et al*. (2018) [18] in bottle gourd recorded maximum fruit yield per plot increased with application of organics with RDF and Jagraj *et al*. (2020) [7] in cucumber discovered maximum fruit yield per plot significantly increased with incremental uses of inorganic nutrients along with integrated uses of FYM, vermicompost and other organic manures.

Table 1: Vine length (cm)

Treatment	Details	Vine length (cm)
T_1	RDF (200:100:100) NPK/ha	166.00[g]
T_2	75% RDF + 25% RDN through FYM (5 t/ha) + AMC (12.5 kg/ha)	178.00[e]
T_3	75% RDF + 25% RDN through vermicompost (2.5 t/ha) + AMC (12.5 kg/ha)	181.00[d]
T_4	75% RDF + 25% RDN through neem cake (2.5 t/ha) + AMC (12.5 kg/ha)	173.00[f]
T_5	50% RDF + 50% RDN through FYM (10 t/ha) + AMC (12.5 kg/ha)	195.00[b]
T_6	50% RDF + 50% RDN through vermicompost (5 t/ha) + AMC (12.5 kg/ha)	202.00[a]
T_7	50% RDF + 50% RDN through neem cake (5 t/ha) + AMC (12.5 kg/ha)	187.00[c]
	CD @ 5%	0.57
	S.Em ±	0.18
	CV %	6.32

Table 2: Number of leaves per plant

Treatment	Details	Number of leaves per plant
T_1	RDF (200:100:100) NPK/ha	83.80[g]
T_2	75% RDF + 25% RDN through FYM (5 t/ha) + AMC (12.5 kg/ha)	88.78[e]
T_3	75% RDF + 25% RDN through vermicompost (2.5 t/ha) + AMC (12.5 kg/ha)	91.46[d]
T_4	75% RDF + 25% RDN through neem cake (2.5 t/ha) + AMC (12.5 kg/ha)	86.10[f]
T_5	50% RDF + 50% RDN through FYM (10 t/ha) + AMC (12.5 kg/ha)	94.20[b]
T_6	50% RDF + 50% RDN through vermicompost (5 t/ha) + AMC (12.5 kg/ha)	97.12[a]
T_7	50% RDF + 50% RDN through neem cake (5 t/ha) + AMC (12.5 kg/ha)	93.00[c]
	CD @ 5%	0.72
	S.Em ±	0.23
	CV %	4.78

Table 3: Leaf length (cm)

Treatment	Details	Leaf length (cm)
T_1	RDF (200:100:100) NPK/ha	12.91[g]
T_2	75% RDF + 25% RDN through FYM (5 t/ha) + AMC (12.5 kg/ha)	13.94[e]
T_3	75% RDF + 25% RDN through vermicompost (2.5 t/ha) + AMC (12.5 kg/ha)	14.56[d]
T_4	75% RDF + 25% RDN through neem cake (2.5 t/ha) + AMC (12.5 kg/ha)	13.68[f]
T_5	50% RDF + 50% RDN through FYM (10 t/ha) + AMC (12.5 kg/ha)	15.82[b]
T_6	50% RDF + 50% RDN through vermicompost (5 t/ha) + AMC (12.5 kg/ha)	16.20[a]
T_7	50% RDF + 50% RDN through neem cake (5 t/ha) + AMC (12.5 kg/ha)	15.65[c]
	CD @ 5%	0.09
	S.Em ±	0.03
	CV %	7.82

Table 4: Leaf width (cm)

Treatment	Details	Leaf width (cm)
T_1	RDF (200:100:100) NPK/ha	11.50[f]
T_2	75% RDF + 25% RDN through FYM (5 t/ha) + AMC (12.5 kg/ha)	12.30[e]
T_3	75% RDF + 25% RDN through vermicompost (2.5 t/ha) + AMC (12.5 kg/ha)	13.19[d]
T_4	75% RDF + 25% RDN through neem cake (2.5 t/ha) + AMC (12.5 kg/ha)	12.21[e]
T_5	50% RDF + 50% RDN through FYM (10 t/ha) + AMC (12.5 kg/ha)	15.06[b]
T_6	50% RDF + 50% RDN through vermicompost (5 t/ha) + AMC (12.5 kg/ha)	15.77[a]
T_7	50% RDF + 50% RDN through neem cake (5 t/ha) + AMC (12.5 kg/ha)	14.42[c]
	CD @ 5%	0.34
	S.Em ±	0.11
	CV %	11.07

Table 5: Number of days taken to 1st flowering, days taken 50% flowering and days taken from flowering to fruiting

Treatment details	Days taken to 1st flowering	Days taken to 50% flowering	Days taken from flowering to fruiting
RDF (200:100:100) NPK/ha	33.36[a]	38.23[a]	16.96[a]
75% RDF + 25% RDN through FYM (5 t/ha) + AMC (12.5 kg/ha)	32.33[b]	37.31[bc]	15.87[b]
75% RDF + 25% RDN through vermicompost (2.5 t/ha) + AMC (12.5 kg/ha)	31.93[b]	36.79[cd]	15.81[b]
75% RDF + 25% RDN through neem cake (2.5 t/ha) + AMC (12.5 kg/ha)	32.46[b]	37.84[ab]	16.05[b]
50% RDF + 50% RDN through FYM (10 t/ha) + AMC (12.5 kg/ha)	30.20[d]	35.29[e]	14.88[c]
50% RDF + 50% RDN through vermicompost (5 t/ha) + AMC (12.5 kg/ha)	29.14[e]	34.04[f]	13.44[d]
50% RDF + 50% RDN through neem cake (5 t/ha) + AMC (12.5 kg/ha)	31.27[c]	36.26[d]	14.92[c]
CD @ 5%	0.65	0.75	0.32
S.Em ±	0.21	0.24	0.10
CV %	4.25	3.74	6.75

Table 6: Number of fruits per plant

Treatment	Details	Number of fruits per plant
T_1	RDF (200:100:100) NPK/ha	2.75[c]
T_2	75% RDF + 25% RDN through FYM (5 t/ha) + AMC (12.5 kg/ha)	2.93[c]
T_3	75% RDF + 25% RDN through vermicompost (2.5 t/ha) + AMC (12.5 kg/ha)	3.66[b]
T_4	75% RDF + 25% RDN through neem cake (2.5 t/ha) + AMC (12.5 kg/ha)	2.82[c]
T_5	50% RDF + 50% RDN through FYM (10t/ha) + AMC (12.5 kg/ha)	4.10[a]
T_6	50% RDF + 50% RDN through vermicompost (5 t/ha) + AMC (12.5 kg/ha)	4.14[a]
T_7	50% RDF + 50% RDN through neem cake (5 t/ha) + AMC (12.5 kg/ha)	3.96[a]
	CD @ 5%	0.29
	S.Em ±	0.09
	CV %	16.67

Table 7: Fruit length (cm)

Treatment	Details	Fruit length (cm)
T_1	RDF (200:100:100) NPK/ha	8.32[f]
T_2	75% RDF + 25% RDN through FYM (5 t/ha) + AMC (12.5 kg/ha)	9.04[d]
T_3	75% RDF + 25% RDN through vermicompost (2.5 t/ha) + AMC (12.5 kg/ha)	10.56[c]
T_4	75% RDF + 25% RDN through neem cake (2.5 t/ha) + AMC (12.5 kg/ha)	8.68[e]
T_5	50% RDF + 50% RDN through FYM (10 t/ha) + AMC (12.5 kg/ha)	11.77[a]
T_6	50% RDF + 50% RDN through vermicompost (5 t/ha) + AMC (12.5 kg/ha)	11.80[a]
T_7	50% RDF + 50% RDN through neem cake (5 t/ha) + AMC (12.5 kg/ha)	10.95[b]
	CD @ 5%	0.27
	S.Em ±	0.09
	CV %	13.36

Table 8: Fruit width (cm)

Treatment	Details	Fruit width (cm)
T_1	RDF (200:100:100) NPK/ha	5.85[d]
T_2	75% RDF + 25% RDN through FYM (5 t/ha) + AMC (12.5 kg/ha)	6.83[c]
T_3	75% RDF + 25% RDN through vermicompost (2.5 t/ha) + AMC (12.5 kg/ha)	7.64[b]
T_4	75% RDF + 25% RDN through neem cake (2.5 t/ha) + AMC (12.5 kg/ha)	6.72[c]
T_5	50% RDF + 50% RDN through FYM (10 t/ha) + AMC (12.5 kg/ha)	8.17[b]
T_6	50% RDF + 50% RDN through vermicompost (5 t/ha) + AMC (12.5 kg/ha)	8.84[a]
T_7	50% RDF + 50% RDN through neem cake (5 t/ha) + AMC (12.5 kg/ha)	7.96[b]
	CD @ 5%	0.61
	S.Em ±	0.20
	CV %	12.69

Table 9: Fruit weight (Kgs)

Treatment	Details	Fruit weight (kg)
T_1	RDF (200:100:100) NPK/ha	0.41[e]
T_2	75% RDF + 25% RDN through FYM (5 t/ha) + AMC (12.5 kg/ha)	0.53[d]
T_3	75% RDF + 25% RDN through vermicompost (2.5 t/ha) + AMC (12.5 kg/ha)	0.62[c]
T_4	75% RDF + 25% RDN through neem cake (2.5 t/ha) + AMC (12.5kg/ha)	0.50[d]
T_5	50% RDF + 50% RDN through FYM (10 t/ha) + AMC (12.5 kg/ha)	0.71[ab]
T_6	50% RDF + 50% RDN through vermicompost (5 t/ha) + AMC (12.5 kg/ha)	0.75[a]
T_7	50% RDF + 50% RDN through neem cake (5 t/ha) + AMC (12.5 kg/ha)	0.68[bc]
	CD @ 5%	0.06
	S.Em ±	0.02
	CV %	19.15

Table 10: Fruit yield per plant (kg/plant), Fruit yield per plot (kg/plot) and Fruit yield per hectare (q/ha)

Treatment details	Fruit yield per plant (kg/plant)	Fruit yield per plot (kg/plot)	Fruit yield per hectare (q/ha)
RDF (200:100:100) NPK/ha	0.93[e]	7.21[f]	131.80[g]
75% RDF + 25% RDN through FYM (5 t/ha) + AMC (12.5 kg/ha)	1.14[cd]	8.52[d]	138.29[e]
75% RDF + 25% RDN through vermicompost (2.5 t/ha) + AMC (12.5 kg/ha)	1.19[bc]	8.94[c]	141.14[d]
75% RDF + 25% RDN through neem cake (2.5 t/ha) + AMC (12.5 kg/ha)	1.04[de]	7.60[e]	135.38[f]
50% RDF + 50% RDN through FYM (10 t/ha) + AMC (12.5 kg/ha)	1.28[ab]	9.38[b]	148.86[b]
50% RDF + 50% RDN through vermicompost (5 t/ha) + AMC (12.5 kg/ha)	1.36[a]	9.90[a]	151.62[a]
50% RDF + 50% RDN through neem cake (5 t/ha) + AMC (12.5 kg/ha)	1.22[bc]	9.06[c]	144.50[c]
CD@5%	0.12	0.13	0.23
S.Em ±	0.04	0.04	0.07
CV %	11.53	10.27	4.68

Conclusion

The various treatments of integrated nutrient management had significant influence on growth parameters *viz.*, vine length, number of leaves per plant, leaf length and leaf width. Yield parameters *viz.*, fruit weight, fruit yield per plant, fruit yield per plot and fruit yield per hectare were influenced by INM. The maximum value of all the growth and yield parameters were observed under T_6: 50% RDF + 50% RDN through vermicompost (5 t/ha) + AMC (12.5 Kg/ha). It could be concluded from the present investigation that the Integrated Nutrient Management significantly influenced the growth and yield attributes in muskmelon. Among the different levels of integrated nutrient management optimum growth and yield was obtained from 50% RDF + 50% RDN through vermicompost (5 t/ha) + AMC (12.5 Kg/ha).

References

1. Anjanappa M, Venkatesh J, Suresh B. Influence of organic, inorganic and biofertilizers on flowering, yield and yield attributes of cucumber (cv. Hassan Local) in open field condition. Karnataka Journal of Agricultural Sciences. 2012;25(4):493-497.
2. Audi W, Aguyog JN, Qiong L. Yield and quality of watermelon as affected by Organic and inorganic nitrogen sources, 2013. (ISSN: 2321-1571).
3. Dauda SN, Ajayi FA, Ndor E. Growth and yield of watermelon (*Citrullus lanatus*) as affected by poultry manure application. Journal of Agricultural and Social Sciences, 2008. ISSN 1814-960X.
4. Daudhat MA, Patel KD. Evaluation of integrated nutrient management on the performance of quality and yield attributes of hybrid bitter gourd VNR 22 (*Momordica charantia* L.). Journal of Pharmacognosy and Phytochemistry. 2020;9(2):1643-1645.
5. Ghosh C, Sangeet C, Rana DK, Mahato B, Chakraborty A, Bhattacharya MK. Response of organic and inorganic nutrient sources on growth and yield of watermelon. International Journal of Biosource, Environment and Agricultural Sciences. 2016;2(3):387-390.
6. Howard FD, Macgillivray JH, Yamaguchi M. Bull. no. 788. California Agric.Exp.sm. Univ. of California, Berkeley, 1962.
7. Jagraj S, Manoj KS, Mukesh K, Vipin K, Pratap KS, Abdul QO. Effect of Integrated nutrient management on growth, flowering and yield attributes of cucumber (*Cucumis sativus* L.). International journal of chemical studies. 2020;6(4):567-572.
8. Matthew A. Sowing dates and fertilizer application on growth and yield of Muskmelon (*Cucumis melo* L.) at Ado-Ekiti. Asian Journal of Agricultural and Horticultural Research. 2020;5(3):11-21.
9. Nayak DA, Pradhan M, Mohanty S, Parida AK, Mahapatra P. Effect of integrated nutrient management on productivity and profitability of pointed gourd. Journal of Crop and Weed. 2016;12(1):25-31.
10. Patle BJ, Wagh AP, Umbarkar PS, Bondre SV. Integrated nutrient management studies in bottle gourd. Journal of Pharmacognosy and Phytochemistry. 2018;7(5):1383-1385.
11. Prabhu M, Natarajan S, Srinivasan K, Pugalendhi L. Integrated nutrient management in cucumber. Indian Journal of Agricultural Research. 2006;40(2):123-126.
12. Sankhala GK, Piyush V, Nandre BM, Vadodaria JR, Joshi PC, Patel VP. Effect of organic nutrient management on yield and quality of muskmelon (*Cucumis melo* L.) cv. GMM 3, 2019. ISSN 2277-7601.
13. Satish SB, Bose US, Singh SS. Impact of different organic and inorganic fertilizers on sustainable production of bottle gourd. International Journal of Pure and Applied Bioscience. 2017;5(2):1089-1094.
14. Schaefer H, Heibl C, Renner SS. Gourds afloat: A dated phylogeny reveals an Asian origin of the gourd family (Cucurbitaceae) and numerous overseas dispersal events. Proceedings of Royal Society of London Biological Research. 2009;276:843-851.
15. Sudeshna K, Pranabjyoti S, Warade SD, Debnath P, Wangchu L, Amit KS, *et al*. Effect of integrated nutrient management on growth and yield Attributes of cucumber (*Cucumis sativus* L.) under protected condition. International Journal of Current Microbiology and Applied Sciences. 2019;8(8):1862-1871.
16. Thriveni V, Mishra HN, Pattanayak SK, Maji A. Effect of integrated nutrient management on nutrient uptake and recovery of bitter gourd (*Momordica charantia* L.). An International Quarterly Journal of Environmental Sciences. 2015;8:85-89.
17. Whitaker TW, Davis GN. Cucurbits. New York, NY: Interscience, 1962.
18. Osowiecki WT, Ye X, Satish P, Bustillo KC, Clark EL, Alivisatos AP. Tailoring morphology of Cu–Ag nanocrescents and core-shell nanocrystals guided by a thermodynamic model. Journal of the American Chemical Society. 2018 Jun 17;140(27):8569-77.