Int.J.Curr.Microbiol.App.Sci (2020) *9*(5): 1988-2001

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 9 Number 5 (2020)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2020.905.225

Performance of Round Melon [*Praecitrullus fistulosus* (Stocks) Pangalo] Varieties under Different Nutrient Level during *Kharif* Season

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A B S T R A C T

Ten treatment combinations comprising of two varieties (V_1- Akra Tinda and V_2-Tinda Ludhiana) and five nutrient levels (N_1-0:0:0 NPK kg/ha+15t FYM q/ha, N_2- 30:20:15 NPK kg/ha+15t FYM q/ha, N_3-40:30:25 NPK kg/ha+15t FYM q/ha, N_4- 60:40:35 NPK kg/ha+15t FYM q/ha, N_5-80:50:45 NPK kg/ha+15t FYM q/ha) were evaluated in factorial randomized block design with three replications at vegetable research farm, College of Horticulture, Mandsaur during Kharif season 2018-19. The findings of the present study revealed that among the varieties of round melon, V_2 (Tinda Ludhiana) recorded superior performance for growth and yield attributes as well as yield and gross income, net income and B:C ratio. There was significant effect of nutrient levels on growth and yield parameters as well as NPK content in plant and fruit. Application of N_4 (60-40-35 NPK kg/ha +15t FYM q/ha) showed highest growth attributes, earliest female flower appearance and fruit picking as well as yield attributes and yield in round melon. Economic evaluation of different nutrient levels revealed highest gross income, net income and B:C ratio with application of N_4 (NPK-60-40-35 kg/ha+15t FYM q/ha). Besides, highest NPK content in plant and fruit was recorded with application of N_4 (60-40-35 NPK kg/ha +15t FYM q/ha). Post-harvest analysis of NPK in soil revealed significant effect of varieties and nutrient levels on available NPK content in soil. Highest available NPK in soil were determined with variety V_1 (Arka Tinda). Post-harvest available NPK in soil were estimated highest with N_5 (80:50:45 NPK kg/ha+15t FYM q/ha) which was significantly superior over all other nutrient levels.

Keywords

Round melon, Varieties, Nutrient levels, Yield, Economics

Article Info

Accepted:
15 April 2020
Available Online:
10 May 2020

Introduction

Round melon [*Praecitrullus fistulosus* (Stocks) Pangalo] is a warm season, monoecious, annual vine belongs to family cucurbitaceae. It is also known as tinda or Indian round gourd or apple gourd or Indian squash or Indian baby pumpkin or squash melon. It is a squash like cucurbit grown for its immature fruit. The fruit has light green skin with soft hair and spherical in shape (Nath and Swamy, 2016).

The immature tender fruits of tinda are used as a vegetable, canned, rayata or curry preparation and its seeds are roasted and

consumed. This short duration crop is becoming very popular in north India due to its high nutritional value, good taste and keeping quality as well as high remunerative price (Samadia, 2007). Round melon fruit contains protein (1.4 g), fat (0.2 g), minerals (0.5 g), fibre (1.5 g), carbohydrate (3.4 g), energy (21 k-cal), calcium (25 mg), phosphorus (24 mg), iron (0.9 mg), carotene (13 µg), thiamine (0.04 mg), riboflavin (0.08 mg), niacin (0.3 mg) and vitamin-C (18 mg) per 100 g of edible portion (Gopalan *et al.*, 1982). It is very useful for those suffering from dry cough and defects in the circulation of blood. It is used alone as vegetable or cooked together with some pulses as lentil, moong and gram. It is made into preserves or pickles also (Shendge, 1995).

The origin of round melon is probably north-western India. It is widely grown in north-western states of India such as Punjab, Haryana, Rajasthan, Delhi, western part of U.P. and at smaller scale in MP, Bihar, Gujarat and Maharashtra. Round melon is grown in spring-summer as well as in rainy season.

Nutrition plays a very important role in the performance of a plant. Amongst nutrients, inorganic nitrogenous fertilizers are commonly used by most of the farmers because of quick availability of nitrogen to the plants. Application of fertilizer, especially nitrogen is considered to be the most important factor for vegetable production. It imparts dark green colour to plants and promotes overall growth and finely governs the yield. Nitrogen fertilization favours the development of the aerial parts over roots and consequently the promotion of flowering and fruiting of many crops. Moreover, nitrogen promotes vegetative growth, flowering, fruit set, improve fruit quality, fruit size and number of fruits per plant. Next to nitrogen, phosphorus is the second important nutrient required by plants. Phosphorus is of paramount importance for energy transfer in living cells by mean of high energy phosphate bonds of ATP. It also affects protein content, quality and yield. Phosphorus is necessary for cellular preparation and in the metabolism of starch, protein and fats. One of the most important effects of phosphorus on plants is the stimulation of early root formation and growth. Phosphorus is necessary for cellular preparation and in the metabolism of starch, protein and fats. One of the most important effects of phosphorus on plants is the stimulation of early root formation and growth. Low available phosphorus content in soil means delay in maturity and poor plant growth (Meena *et al*., 20017). Potassium is an important element in plant metabolism, promoting carbohydrates synthesis (El-Gengaihi *et al*., 2007). It has the strongest influence on plant growth, yield and quality attributes that determine fruit marketability (Dwivedi and Kumar 2018).

Very less work has been carried out on nutrition of round melon in India. Shendge (1995) reported that for obtaining better fruit yield of tinda var. Ludhiana Tinda, the crop should be fertilized with 80 kg N and 50 kg P_2O_5 per hectare. Seshadri and Parthasarathy (2002) had reported that application of 56 kg N, 28 kg P and 28 kg K is most profitable for round melon. Natchathra *et al.,* (2016) reported that more number of fruits (14.41), highest single fruit weight (50.68 g) and highest yield per plant (722.69 g) were obtained with treatments comprising 75 per cent recommended dose of fertilizers (recommended dose of inorganic fertilizers @ 50:20:20 kg NPK ha^{-1}) coupled with vermicompost @ 2 t ha^{-1} along with *Azospirillum* and phosphobacteria @ 2 kg ha^{-1}. An application of 40 kg N, 60 kg P and 40 kg K /ha has been advocated by Nath and Swamy (2016). Looking to these varied recommendations of nutrients for round

melon, a study was carried out to assess the performance of round melon varieties under different nutrient levels during kharif season with the objectives: 1. To determine the effect of nutrient levels on growth and yield of round melon, 2. To study the performance of round melon varieties during kharif season.

Materials and Methods

The experiment was conducted at Vegetable Research Field, College of Horticulture, Mandsaur, (M.P.), during Kharif season 2018-19. Mandsaur is situated at 23.45° to 24.13°North latitude and 74.44° to 75.18° east longitudes at an elevation of 435.02 meters above mean sea level in Malwa plateau of Madhya Pradesh. Mandsaur is located under sub-tropical and semi-arid climatic conditions. The soil was light alluvial having sandy loam texture. Ten treatment combinations comprising of two varieties (V_1-Akra Tinda and V_2-Tinda Ludhiana) and five nutrient levels (N_1-0:0:0 NPK kg/ha+15t FYM q/ha, N_2- 30:20:15 NPK kg/ha+15t FYM q/ha, N_3-40:30:25 NPK kg/ha+15t FYM q/ha, N_4- 60:40:35 NPK kg/ha+15t FYM q/ha, N_5-80:50:45 NPK kg/ha+15t FYM q/ha) were evaluated in factorial randomized block design with three replications.

Seed was sown at spacing 120 cm row to row and 50 cm plant to plant. The source of nutrients were DAP (Diammonim phosphate) + Urea for nitrogen, DAP for phosphorus) and MOP (muriate of potash) for potash. A half dose of nitrogen along with full dose of P and K was applied as basal dose at the time of sowing. The remaining half dose of nitrogen was applied after 30 days of sowing. The vines were trained on polypropylene thread tied on bamboo poles like trellis system of training. Observations were recorded on various growth and yield parameters as well as post-harvest NPK content in plant and fruit and available NPK in soil.

The vine length was measured at 30, 45 days after sowing (DAS) and last harvesting in five-tagged plants from ground level to the tip of the vine by meter scale. The number of branches per plant was counted at 30, 45 DAS and at last harvesting in five tagged plant. The number of leaves per plant was counted at 30, 45 DAS and at last harvesting in five selected plant. Chlorophyll content in fully opened leave from the top was estimated by using SPAD chlorophyll meter (SPAD meter 502) in five labeled plants around 10 to 11.30 am by simple clamping the meter over leaf tissue at 30, 45 and 60 DAS.

The fresh weight of plant was taken from three tagged plant in each plot at last harvesting and average weight was recorded. After taking fresh weight plants were put in hot air oven at 65±2°C temperature for drying till constant weight. After that final weight was noted and average weight was recorded as dry weight of plant. For determination of dry matter content in fruit, first fresh weight of fruit was taken thereafter 100g sample was put in hot air oven at 65±2°C temperature for drying till constant weight. After that final weight was noted and average weight was recorded as dry matter content (%) in fruit. Days to first male flower appearance were recorded by counting the number of days from sowing of seed to first male flower opening in five selected plant.

Days to first female flower appearance were noted by counting the number of days from sowing of seed to first female flower opening in five selected plant. Days to first fruit picking were recorded by counting the number of days from sowing of seed to the first fruit picking in five selected plant. For determination of number of fruits per plant, total fruits harvested from each five tagged plant from each plot were counted and their average was worked out. Diameter (horizontal fruit size) of five randomly selected fruits

from each plot was measured by using Digital Caliper (Mitutoyo Digmatic Caliper model No.CD-6"ASX) in millimeter and average diameter (horizontal fruit size) of fruit was calculated. Fruit weight of five randomly selected fruits from each plot was weighed with help of electronic balance and their average weight was recorded. Weight of tender fruits of five tagged plants was recorded in gram and averaged for estimation of fruit yield per plant.

Yield per plant in gram was converted into quintal per hectare by multiplying it with number of plant in a hectare and divided by 10000. Economics of different treatments was worked out on the basis of prevailing market prices of different inputs and output in the local market at the time of experiment. The NPK content in plant and fruit were estimated in laboratory. Nitrogen was determined by Kjeldahl method, P with ammonium molybdate (Chapman and Pratt, 1961) and K with flame photometer (Holiday and Preedy, 1953) method. Available nitrogen in soil was estimated with volumetric method (Walkley and Black method, 1934), available phosphorus with Olsen's method, (1954) and available potassium in soil with Holiday and Preedy (1953). The data recorded were subjected to statistical analysis as per standard procedure (Panse and Sukhatme, 1984).

Results and Discussion

Growth parameters

Growth parameters of round melon viz., vine length, number of leaves per plant, number of branches per plant, SPAD value, fresh weight of plant, dry weight of plant and dry matter content of fruit (%) were recorded during the present investigation. There was significant influence of varieties and nutrient levels on all these growth parameters. Whereas, combined effect of varieties and nutrient levels was found non-significant in case of all growth parameters. There was increase in vine length with advancement of growth period. The results showed that increase in vine length between 30 and 45 DAS was rapid as compared to later stages. Among varieties V_2 (Tinda Ludhiana) recorded more vine length as compared to V_1 (Arka Tinda) at 30, 45 and at last harvest. Significant difference in vine length indicated the wide variation among the genotypes under study.

These findings are in agreement with those reported by Dahiya *et al.,* (2001), Samadia (2007) and Mandal and Mohanta (2018). Highest number of branches per plant was observed with variety V_2 (Tinda Ludhiana) at all the stages under study. It was found significantly higher than variety V_1 (Arka Tinda). Genetic variation might have resulted in differences for number of branches per plant. These findings are in agreement with those reported by Dahiya *et al.,* (2001), Samadia (2007) and (Mandal and Mohanta, 2018). Findings indicated significant influence of varieties on number of leaves in round melon. Variety V_2 (Tinda Ludhiana) had recorded maximum number of leaves per plant which was significantly superior over V_1 (Arka Tinda).

Similar results were reported by Shahid *et al.,* (2018). There was significant difference among varieties for SPAD value in leaves. Variety V_2 (Tinda Ludhiana) recorded highest SPAD value in leaves at 30, 45 and 60 DAS. Higher number of leaves and SPAD value enhanced photosynthesis and more accumulation of food material which reflected with significant influence on fresh and dry weight of plant among the varieties. Highest fresh as well as dry weight of plant was recorded with variety V_2 (Tinda Ludhiana) at last harvest. Dry matter content in fruit indicated significant difference among varieties.

Variety V_2 (Tinda Ludhiana) had recorded maximum dry matter content in fruit at harvest stage which was significantly superior over V_1. These results are in line with the findings of Dahiya *et al.,* (2001) and Shahid *et al.,* (2018).

Nutrient levels had significant effect on vine length. Maximum vine length was observed with nutrient level N_4 (NPK 60-40-35 kg/ha+15t FYM q/ha) followed by $N_5 > N_3 > N_2$ in descending order at all the stages under study. The increase in vine length at higher levels of nutrients might be due to higher availability of nitrogen. There shall be increased auxins, gibberellins, cytokinins and ethylene with increase in carbohydrates and amino acids due to increase in nitrogen levels. Similar results have been reported by Natchathra *et al.,* (2017) and Birbal *et al.,* (2019). Dwivedi and Kumar (2018) reported that length of main shoot of kheksa was increased significantly by increasing K levels. Number of branches was affected significantly with nutrient levels. Maximum number of branches per plant was observed with application of N_4 (NPK-60-40-35 kg/ha+15t FYM q/ha) at 30, 45 DAS and last harvest. It was followed by $N_5 > N_3 > N_2 > N_1$in descending order at all the stages under study. These findings could be supported with the results of Eifediyi and Remison (2010) and Nagar *et al.,* (2017). There was increase in number of leaves with increasing nutrient levels up to N_4. Further increase in nutrient levels did not show any remarkable influence on number of leaves at 30 DAS as well as at last harvest stage.

Though, it was significant at 45 DAS. Maximum number of leaves per plant were recorded with nutrient level N_4 (NPK-60-40-35 kg/ha+15t FYM q/ha). It was followed by $N_5 > N_3 > N_2 > N_1$ in descending order. Nitrogen is well known for the enhancement of vegetative growth of plants. It takes place in synthesis of different amino acids and proteins. It is also necessary for the formation of chlorophyll. Generally, nitrogen application to the plants enhances the synthesis of amino acids, proteins, chlorophyll and enzymes. Thereby, it enhances the other physiological activities like photosynthesis in the plants. As a result, vegetative growth of the plant is enhanced. Similar results have been reported by Shendge (1995) and Eifediyi and Remison (2010).

SPAD value in leaves was significantly affected with nutrient levels. Application of nutrient level N_4 (NPK-60-40-35 kg/ha+15t FYM q/ha) recorded maximum SPAD value in leaves followed by $N_5 > N_3 > N_2 > N_1$ in descending order at 30, 45 and 60 DAS. Nitrogen being the constituent of chlorophyll and its continued synthesis would have enhanced the photosynthetic activity of the plant (Meenakshi *et al.,* 2008). Naorem and Sureshkumar (2015) reported increase in the rate of total chlorophyll due the increased application of phosphorus.

Application of nutrient levels imposed significant effect on fresh and dry weight of plant. Nutrient level N_4 (NPK-60-40-35 kg/ha+15t FYM q/ha) registered maximum fresh and dry weight of plant which was followed by $N_5 > N_3 > N_2 > N_1$ in descending order. The highest dry matter production might be due to increased nutrient availability and assimilation by plant.

These findings could be supported with the results of Meenakshi *et al.,* (2008), Hilli *et al.,* (2009) and Naorem and Sureshkumar (2015). Dry matter content in fruit had showed significant effect of nutrient levels. There was increase in dry matter content with increasing nutrient levels up to N_4 (NPK-60-40-35 kg/ha+15t FYM q/ha) which was followed by $N_5 > N_3 > N_2$ in descending order.

Minimum dry matter content of fruit was found with N_1 (NPK-0-0-0 kg/ha+15t FYM q/ha). Similar findings were reported by Thriveni *et al.,* (2015).

Phenological parameters

The findings (Table 2) showed that there was non-significant influence of varieties on number of node to first male flower appearance, number of node to first female flower appearance, days to first male flower appearance, female flower appearance which lead to non-significant differences in days to first fruit picking in this study. These findings are contrary to the observations of Samadia (2007), Mandal and Mohanta (2018) who found significant differences among genotypes for days to female flower appearance.

The findings revealed that there was non-significant influence of nutrient levels, on days to first male flower appearance. Though, nutrient levels imposed significant influence on days to first female flower appearance. Application of nutrient level N_4 had recorded minimum days to first female flower appearance. It was followed by $N_5>N_3>N_2$. Though the difference between N_5, N_4 and N_3 was non-significant. Maximum days to first female flower appearance was taken in case of nutrient level N_1.

Data showed that lesser number of days required for the initiation of first female flower under optimum fertilizers application. The early appearance of female flower due to the optimum levels of nutrients application may be attributed to fast growth of vine which favoured flower formation hormones like Gibberelic acid. These results are similar to those previously reported by Umamaheswarappa *et al.,* (2005), Meena and Bhati (2017), Meena *et al.,* (2017) and Meragal *et al.,* (2018).

Nutrient levels imposed significant influence on days to first fruit picking. Application of nutrient level N_4 recorded earliest first fruit picking. It was followed by $N_5>N_3>N_2$ in ascending order. Though the difference between N_5, N_4 and N_3 was non-significant. Maximum days to first fruit picking was taken in case of nutrient level N_1. Similar results were also reported by earlier workers (Umamaheswarappa *et al.,* 2005, Meena and Bhati, 2017 and Meena *et al.,* 2017).

Application of nutrient levels imposed significant influence on number of node to first male flower appearance. Nutrient level N_4 had recorded lowest number of node to first male flower appearance which was at par to N_5 and N_3 but significantly higher than N_2. Highest number of node to first male flower appearance was observed in case of nutrient level N_1.

Nutrient levels also imparted significant influence on number of node to first female flower appearance. Application of N_4 had recorded minimum number of node to first female flower appearance. It was at par to N_5 and N_3 but significantly higher than N_2. Maximum number of node to first female flower appearance was noted in case of nutrient level N_1 (NPK-0-0-0 kg/ha+15t FYM q/ha). Phosphorus application exerted significant effect on node number at which first female flower appeared (Meena and Bhati 2017). These results corroborated with the findings of Meena *et al.,* (2017).

Yield parameters and yield

Yield parameters of round melon indicated significant influence of varieties and nutrient levels in the present investigation. Interactive effect of varieties and nutrient levels was found non-significant on all yield parameters. The data (Table 3) revealed significant influence of varieties on number of fruit per

plant in round melon. Variety V_2 (Tinda Ludhiana) had recorded maximum number of fruit per plant which was significantly superior over V_1 (Arka Tinda). Number of fruits/vine is one of the major factors for determining the yield of the crop. The variation in number of fruits per vine might have been due to sex ratio, fruit set percentage, genetic nature and their response to varying environmental conditions. These findings are in agreement with those reported by Dahiya *et al.,* (2001), Samadia (2007) and Mandal and Mohanta (2018).

The findings had showed significant influence of varieties on average fruit size and fruit weight of round melon. Variety V_2 (Tinda Ludhiana) recorded highest fruit size and weight as compared to variety V_1 (Arka Tinda). Highly significant difference was found for fruit size as well as fruit weight indicating a wide variation among the varieties under study. These findings are in agreement with those reported by Dahiya *et al.,* (2001), Samadia (2007), Garg (2017) and Mandal and Mohanta (2018).

Variety V_2 (Tinda Ludhiana) recorded higher fruit yield per plant which resulted in significantly higher fruit yield hectare over V_1 (Arka Tinda). These findings denoted significant difference among the varieties under study. These results are in agreement with those reported by Dahiya *et al.,* (2001), Samadia (2007) and Mandal and Mohanta (2018). Economic evaluation of both the varieties indicated that highest gross income, net income and B:C ratio was realised with variety V_2 (Tinda Ludhiana) because of higher yield.

Nutrient levels denoted significant effect on number of fruits per plant. There was increase in number of fruits per vine with increasing levels of nutrients up to N_4. Further increase in nutrients did not enhance number of fruits per plant. Application of nutrient level N_4 (NPK-60-40-35 kg/ha+15t FYM q/ha) had recorded highest number of fruit per plant which was followed by $N_5 > N_3 > N_2$. Minimum number of fruits per plant was found with N_1 (NPK-0-0-0 kg/ha+15t FYM q/ha). Increased availability of nutrients under higher nutrient level application enhanced the growth, accumulation of food material which could have resulted in more fruit set and fruits per plant. These results are in conformity with the findings of Natchathra *et al.,* (2016), Meena and Bhati (2017), Siva *et al.,* (2018) and Birbal *et al.,* (2019).

Application of nutrient levels exhibited positive effect on average fruit size. Largest fruit was observed under the nutrient level N_4 (NPK-60-40-35 kg/ha+15t FYM q/ha) which was at par to N_5 but significantly superior over N_3 and N_2. Smallest fruit was measured under nutrient level N_1 (NPK-0-0-0 kg/ha+15t FYM q/ha). More availability of nutrients with application of higher nutrient levels enhanced the growth, accumulation of food material which could have resulted in larger size of fruits. Similar findings were reported by Meena and Bhati (2017) and Siva *et al.,* (2018).

Nutrient levels had significant effect on average fruit weight. Highest average fruit weight was noted with the nutrient level N_4 (NPK-60-40-35 kg/ha+15t FYM q/ha) which was followed by N_5, N_3 and N_2 application. Minimum average fruit weight was recorded under nutrient level N_1 (NPK-0-0-0 kg/ha+15t FYM q/ha).

These results might be due to availability of balanced amount of nutrients and higher rate of assimilation and ultimately more production of carbohydrates and their translocation to the storage organs like fruits. These findings also indicated that the efficiency of nitrogen increased considerably

by a simultaneous application of phosphorus and potassium. Similar findings have been reported by Natchathra *et al.,* (2016), Meena *et al.,* (2017), Siva *et al.,* (2018) and Birbal *et al.,* (2019).

Nutrient levels registered remarkable effect on fruit yield per plant and per hectare. Highest fruit yield per plant and per hectare was noted under the nutrient level N_4 (NPK-60-40-35 kg/ha+15t FYM q/ha) which was followed by $N_5 > N_3 > N_2$. Lowest fruit yield per plant and per hectare was found with nutrient level N_1 (NPK-0-0-0 kg/ha+15t FYM q/ha). The reason of more number and heavy fruits per plant as well as higher yield per hectare, might be due to increase in the number of leaves, number of branches, chlorophyll content in plants raised at higher dose of nitrogen, which is responsible for higher rate of photosynthesis, amino acid and protein synthesis which were translocated to the fruits with the help of potassium and consequently responsible for growth and yield. These results also indicated that the efficiency of nitrogen increased considerably by a simultaneous application of phosphorus and potassium. Improvement of vegetative growth and fruiting could be due to combined application of nitrogen, phosphorus and potassium. These findings are corroborated with those reported by Nath *et al.,* (2007), Natchrathra *et al.,* (2016), Meena and Bhati (2017), Meena *et al.,* (2017), Siva *et al.,* (2018) and Birbal *et al.,* (2019). Economic evaluation of different nutrient levels revealed highest gross income, net income and B:C ratio with application of N_4 (NPK-60-40-35 kg/ha+15t FYM q/ha) which was followed by $N_5 > N_3 > N_2 > N_1$.

Post-harvest analysis of N, P and K in plant and fruit

Post-harvest analysis of nutrients (N, P and K) in plant and fruit (Table 4) indicated non-significant influence of varieties and combined effect of varieties and nutrient levels.

Application of nutrients exhibited significant effect on NPK content in plant. Maximum post-harvest NPK content in plant was recorded with nutrient level N_4 (NPK-60-40-35 kg/ha+15t FYM q/ha) which was significantly superior over all other nutrient levels. It was followed by $N_5 > N_3 > N_2$. Whereas application of nutrient level N_1 (NPK-0-0-0 kg/ha+15t FYM q/ha) resulted in minimum post-harvest NPK content in plant. Optimum level of nutrients application (N_4) might have enhanced the availability and absorption of nutrients by the plant thereby increased the N, P and K content. These results are similar to those reported by Thriveni *et al.,* (2015) in bitter gourd.

Highest post-harvest NPK content in fruit was recorded with application of nutrient level N_4 (NPK-60-40-35 kg/ha+15t FYM q/ha) which was significantly superior over all other nutrient levels. It was followed by $N_5 > N_3 > N_2$ in descending order. Lowest post-harvest NPK content in fruit was observed under nutrient level N_1 (NPK-0-0-0 kg/ha+15t FYM q/ha). The higher N, P and K content of fruit appeared to be due to improvement in nutritional environment.

The adequate supply of NPK increased the availability of nutrient in the root zone coupled with increased metabolic activity at the cellular level probably might have increased the nutrient uptake and accumulation in the vegetative parts of the plant and fruit. Higher NPK content in fruit under N_4 over N_5 may be due to excess dose of nutrients under N_5 which obstructed the proper absorption and thereby lesser NPK content in plant and fruit. These findings are corroborated with those of Thriveni *et al.,* (2015), Nagar *et al.,* (2017) and Meragal *et al.,* (2018).

Table.1 Effect of nutrient levels on growth parameters in round melon varieties

Treatment	Vine length(cm)			Number of branches per plant			Number of leaves per plant			SPAD value in leaves			Fresh weight of plant (g) at last harvest	Dry weight of plant (g) at last harvest	Dry matter content (%)
	30 DAS	45 DAS	At last harvest	30 DAS	45 DAS	At last harvest	30 DAS	45 DAS	At last harvest	30 DAS	45 DAS	At last harvest			
Varieties(V)															
V_1	52.27	126.38	148.18	2.45	3.12	4.09	22.51	48.17	58.76	46.55	51.38	55.48	159.17	70.27	5.79
V_2	59.27	134.49	157.78	2.92	4.09	4.85	24.06	57.39	65.43	52.10	56.12	60.84	174.27	78.20	6.43
S.Em±	**1.97**	**1.77**	**2.67**	**0.07**	**0.16**	**0.18**	**0.48**	**1.20**	**1.52**	**1.64**	**1.40**	**1.74**	**3.12**	**1.46**	**0.18**
CD at 5%	**5.85**	**5.25**	**7.94**	**0.20**	**0.48**	**0.52**	**1.44**	**3.56**	**4.51**	**4.87**	**4.15**	**5.18**	**9.27**	**4.33**	**0.39**
Nutrient levels (N)															
N_1	44.03	80.37	119.07	1.38	2.28	3.25	17.79	34.93	39.93	42.24	47.74	51.91	124.25	46.75	46.75
N_2	50.37	131.27	142.33	2.00	3.35	3.87	20.88	45.75	56.97	47.24	51.48	55.82	145.50	60.83	60.83
N_3	54.27	135.70	153.00	2.87	3.42	4.33	23.43	52.35	63.12	48.53	53.67	57.41	163.83	83.50	83.50
N_4	68.73	157.33	179.97	3.95	5.08	5.82	27.75	69.58	77.83	55.63	59.05	63.72	215.33	94.83	94.83
N_5	61.43	147.50	170.53	3.23	3.90	5.08	26.38	61.30	72.62	52.98	56.81	61.93	184.67	85.25	85.25
S.Em±	**3.11**	**2.79**	**4.22**	**0.10**	**0.25**	**0.28**	**0.77**	**1.90**	**2.40**	**2.59**	**2.21**	**2.76**	**4.93**	**2.31**	**2.31**
CD at 5%	**9.24**	**8.30**	**12.55**	**0.31**	**0.76**	**0.83**	**2.28**	**5.63**	**7.13**	**7.70**	**6.56**	**8.19**	**14.66**	**6.85**	**6.85**

Table.2 Effect of nutrient levels on phenological parameters in round melon varieties

Treatment	Days to first female flower appearance	No. of node to 1st male flower appearance	No. of node to 1st female flower appearance	Days to 1st fruit picking
Varieties(V)				
V_1	28.02	**2.55**	6.74	44.13
V_2	27.79	**2.45**	6.57	43.29
S.Em±	**0.35**	0.07	**0.17**	0.56
CD at 5%	**NS**	NS	**NS**	NS
Nutrient levels (N)				
N_1	29.60	2.83	7.45	45.85
N_2	28.45	2.62	6.95	44.47
N_3	27.70	2.40	6.58	43.58
N_4	26.65	2.30	6.00	41.65
N_5	27.13	2.35	6.28	43.02
S.Em±	**0.60**	**0.11**	**0.27**	**0.89**
CD at 5%	**1.78**	**0.34**	**0.81**	**2.65**

Table.3 Effect of nutrient levels on yield parameters, yield and economics of round melon varieties

Treatment	No. of fruit per plant	Average fruit size (mm)	Average fruit weight (g)	Fruit yield per plant	Fruit yield (q/ha)	Total expenditure (Rs.)	Gross income (Rs.)	Net income (Rs.)	B:C ratio
Varieties(V)									
V_1	9.49	47.54	40.33	307.42	102.48	65897.47	153726.00	87828.60	1.32
V_2	10.15	49.91	44.94	349.73	110.49	65897.47	165740.00	99842.60	1.50
S.Em±	**0.19**	**0.65**	**0.82**	**6.79**	**2.62**	**-**	**3922.27**	**3922.27**	**0.06**
CD at 5%	**0.57**	**1.92**	**2.43**	**20.16**	**7.77**	**-**	**11653.67**	**11653.67**	**0.18**
Nutrient levels (N)									
N_1	7.42	44.91	35.21	170.62	73.79	63205	110692.50	47487.50	0.75
N_2	8.65	45.96	39.62	239.95	92.09	65071.28	138140.00	73069.00	1.12
N_3	9.82	49.21	44.25	319.11	107.08	66012.58	160612.50	94599.50	1.43
N_4	12.29	52.63	48.69	512.21	138.82	67070.31	208227.50	141157.50	2.10
N_5	10.91	50.93	45.39	400.99	120.66	68128.2	180992.50	112864.50	1.65
S.Em±	**0.33**	**1.02**	**1.29**	**10.73**	**4.13**	**-**	**6201.66**	**6201.66**	**0.09**
CD at 5%	**0.99**	**3.04**	**3.85**	**31.88**	**12.29**	**-**	**18426.07**	**18426.07**	**0.28**

Table.4 Effect of nutrient levels and round melon varieties on post harvest NPK content in plant and fruit and available NPK content in soil

Treatment	Post-harvest NPK content in plant (%) at last harvesting			Post-harvest NPK content in fruit (%) at last harvesting			Post-harvest NPK content in soil (kg/ha) after harvesting		
	Nitrogen	Phosphorus	Potassium	Nitrogen	Phosphorus	Potassium	Nitrogen	Phosphorus	Potassium
Varieties(V)									
V_1	1.46	0.61	2.78	2.56	0.42	2.48	185.24	18.64	373.37
V_2	1.51	0.63	2.89	2.61	0.43	2.55	181.74	18.06	365.85
S.Em±	**0.02**	**0.01**	**0.05**	**0.02**	**0.01**	**0.02**	**1.09**	**0.14**	**2.32**
$CDat_{5\%}$	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**3.25**	**0.42**	**6.88**
Nutrient levels (N)									
N_1	1.31	0.47	2.60	2.41	0.27	2.30	171.79	17.43	357.37
N_2	1.36	0.56	2.71	2.46	0.36	2.41	178.32	18.06	361.20
N_3	1.50	0.66	2.84	2.60	0.46	2.54	182.41	18.26	368.33
N_4	1.68	0.72	3.12	2.78	0.52	2.71	189.82	18.58	373.08
N_5	1.59	.0.70	2.91	2.68	0.50	2.64	195.11	19.44	388.07
S.Em±	**0.03**	**0.01**	**0.08**	**0.03**	**0.01**	**0.04**	**1.73**	**0.23**	**3.66**
$CDat_{5\%}$	**0.09**	**0.03**	**0.22**	**0.09**	**0.03**	**0.11**	**5.14**	**0.67**	**10.88**

Post-harvest analysis of N, P and K in soil

Post-harvest analysis of NPK in soil (Table 4) revealed significant effect of varieties and nutrient levels on available NPK content in soil. There was significant effect of varieties on available NPK content in soil. Highest available NPK in soil were estimated with variety V_1 (Arka Tinda). It was significantly superior over V_2 (Tinda Ludhiana). Higher growth and yield in case of variety V_2 might have resulted in more absorption of nutrients thereby caused higher depletion of nutrients from the soil. Application of nutrient levels imposed positive effect on post-harvest NPK content in soil. Maximum post-harvest available NPK in soil were recorded with nutrient level N_5 which was significantly higher over all other nutrient levels. It was followed by $N_4 > N_3 > N_2$ in descending in order. While minimum post-harvest NPK in soil were observed under nutrient level N_1 (NPK-0-0-0 kg/ha+15t FYM q/ha). Application of higher dose of nutrients might have enhanced the available NPK in soil.

It may be concluded from the findings of the present study that among the different varieties of round melon, variety V_2 (Tinda Ludhiana) recorded superior performance for growth and yield attributes as well as yield and economics. Among the nutrient levels, application of N_4 (60-40-35 NPK kg/ha +15t FYM q/ha) showed highest growth attributes, earliest female flower appearance and fruit picking as well as yield attributes and yield in round melon. It has also resulted in highest gross income, net income and B:C ratio. Besides, highest NPK content in plant and fruit was recorded with application of N_4.

Acknowledgement

Authors are thankful to the authorities of RVSKVV, Gwalior for providing necessary permission and funds as well as facilities to conduct this research work.

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How to cite this article:

Lakhan, S. S. Kushwah, R. K. Sharma and Gallani, R. 2020. Performance of Round Melon [*Praecitrullus Fistulosus* (Stocks) Pangalo] Varieties under Different Nutrient Level during Kharif Season. *Int.J.Curr.Microbiol.App.Sci.* 9(05): 1988-2001.
doi: https://doi.org/10.20546/ijcmas.2020.905.225