Effect of integrated nutrient management on growth and quality of bitter gourd (*Momordica charantia* L.)

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Abstract

The present investigation entitled effect of integrated nutrient management on growth and quality of bitter gourd (*Momordica charantia* L.) was carried out during kharif 2018 at College farm, College of Horticulture, S. D. Agricultural University, Jagudan, Dist. Mehsana, Gujarat. The experiment was laid out in Randomized Block Design with three replications with fourteen treatments under study. Treatment 75% RDN through vermicompost + 25% N through urea + *Azotobacter* @ 2.5 lit/ha + PSB @ 2.5 lit/ha (T11) was found significantly higher as compare other treatments. The growth parameters viz., maximum vine length (186.70 cm) at 45 DAS and (511.33 cm) at 90 DAS and number of branches per plant (12.87) at 90 DAS were recorded with treatment given by 75% RDN through vermicompost + 25% N through urea + *Azotobacter* @ 2.5 lit/ha + PSB @ 2.5 lit/ha (T11).

Keywords: Bitter gourd, INM, Urea, SSP, MOP, FYM, Neem cake, *Azotobacter*, PSB, Vermicompost, Growth and Quality

Introduction

Bitter gourd (*Momordica charantia* L.) also known as bitter melon belongs to family Cucurbitaceae is native to China or India. The vegetable *Momordica charantia* L., Cucurbitaceae, is known variously as bitter gourd, balsam pear, bitter melon, bitter cucumber and African cucumber (Heiser, 1979) [8]. Bitter gourd (*Momordica charantia* L.) is one of the commercially important cucurbitaceous vegetable crops extensively grown throughout the country for its nutritive value and medicinal properties. The fruits are prepared for consumption in many ways and are quite commonly used as fried, boiled and stuffed forms. It is highly cross pollinated crop and it is a climbing vine. (Behera et al. 2010) [4]. Although it has many culinary uses, especially in South India, South East and East Asia, it is also grown as an ornamental and is used extensively in folk medicine (Heiser, 1979) [8].

India is regarded as a horticultural paradise (Saravaiya and Patel, 2005) [19], with a vast array of vegetables being cultivated in our country. Bitter gourd is considered as one of the most popular and priced fruit vegetable among cucurbits. It is cultivated in many tropical countries as a source of both vegetable and medicine. It contains over 60 phytomedicines (Raman and Lau, 1996) [18] having medicinal properties and actions against nearly 30 human diseases, including cancer, diabetes and AIDS (Ng et al. 1992, Basch et al. 2003 and Kole et al. 2013) [14, 3, 11]. The bitterness of bitter gourd is due to the cucurbitacin-like alkaloid momordicine and tri terpene glycosides (Momordicoside K and L) (Jeffrey 1980, Okabe et al. 1982) [9, 15]. Bitter gourd fruits are a good source of carbohydrates, proteins, vitamins, and minerals and have the highest nutritive value among cucurbits (Desai and Musmade, 1998) [7]. The vitamin C content of Chinese bitter gourd varies significantly (440-780 mg/kg edible portion). Considerable variation in nutrients, including protein, carbohydrates, iron, zinc, calcium, magnesium, phosphorous and ascorbic acid has been observed in bitter gourd (Kale et al. 1991) [1]. Moreover, the crude protein content (11.4 - 20.9 g/kg) of bitter gourd fruits is higher than that of tomato and cucumber (Xiang et al. 2000) [24]. Integrated nutrient supply system has become an accepted strategy to bring about improvement in soil fertility and protecting the environment. It involves the integrated use of mineral
fertilizers in combination with organic manures and microbial inoculants to sustain optimum yield to maintain and to improve the soil fertility (Abrol and Katyal, 1990) [1]. Organic farming is the pathway that leads to achieve sustainability in horticultural production.

Farm yard manure (FYM) is the principle source of organic matter in our country and its application helps in proper supply of nutrition and maintaining soil health. It supplies all the essential plant nutrients, which improve the physical-chemical properties, increases water holding capacity and encourages the soil microbial activities.

Vermicompost is adopted as organic manure produced by use of Earthworm. It modifies soil physical, chemical and biochemical properties.

Neem cake is the by product obtained in the process of cold pressing of neem tree fruits and kernels and the solvent extraction process for neem oil cake. It is a potential source of organic manure. Neem cake also protects plant roots from nematodes, soil grubs and white ants probably due to its residual limonoid content. It also reduces alkalinity in soil, as it produces organic acids on decomposition. Being totally natural, it is compatible with soil microbes, improves rhizosphere micro flora and hence ensures fertility of soil. Neem cake improves the organic matter content of the soil, helping improve soil texture, water holding capacity, and soil aeration for better root development.

Biofertilizer is a substance which contains living microorganism which when applied to seeds, plant surface or soil, colonizes the rhizosphere or the interior of the plant and promotes growth by increasing the supply or availability of primary nutrients to the host plant. Chemical fertilizers directly increase soil fertility by adding nutrients. However, biofertilizer add nutrients through the natural processes of fixing atmospheric nitrogen, solubilizing phosphorus and stimulating plant growth through the synthesis of growth promoting substances.

Materials and Methods

Experiment was carried out in Kharif season 2018 under field condition at the College of Horticulture, S. D. Agricultural University, Jagudan, Dist. Mehsana, Gujarat.

Phule Green Gold is one of the high yielding variety. Its fruits are dark green in colour with tubercules and having average length about 25 to 30 cm. The pure seeds were obtained from MPKV, Rahuri.

The experiment was laid out in Randomized Block Design with three replications and fourteen treatments under study viz., T1: 100% RDF (100: 50: 50: NPK kg/ha), T2: 100% RDN through urea, T3: 75% RDN through FYM + 25% N through urea, T4: 50% RDN through FYM + 50% N through urea, T5: 75% RDN through vermicompost + 25% N through urea, T6: 50% RDN through vermicompost + 50% N through urea, T7: 75% RDN through neem cake + 25% N through urea, T8: 50% RDN through neem cake + 50% N through urea, T9: 75% RDN through FYM + 25% N through urea + Azotobacter @ 2.5 lit/ha + PSB @ 2.5 lit/ha (T11), whereas the minimum number of branches at 90 DAS (9.30) was recorded with the treatment 100% RDN through urea (T2). These might be due to organic manure and biofertilizer improves water holding capacity, availability of nutrient and micronutrients. These findings are in the accordance with the result of Thriveni et al. (2015) [23] in bitter gourd, Das et al. (2015) [6], Singh et al. (2017) [20] and Patle et al. (2018) [16] in bottle gourd, Singh et al. (2018) [21, 22] in cucumber and Nayak et al. (2016) [15] in pointed gourd.

Effect of integrated nutrient management on number of branches at 90 DAS

Data regarding to the effect of integrated nutrient management on number of branches at 90 DAS is presented in Table.

The experiment was laid out in Randomized Block Design with three replications and fourteen treatments under study viz., T1: 100% RDF (100: 50: 50: NPK kg/ha), T2: 100% RDN through urea, T3: 75% RDN through FYM + 25% N through urea, T4: 50% RDN through FYM + 50% N through urea, T5: 75% RDN through vermicompost + 25% N through urea, T6: 50% RDN through vermicompost + 50% N through urea, T7: 75% RDN through neem cake + 25% N through urea, T8: 50% RDN through neem cake + 50% N through urea, T9: 75% RDN through FYM + 25% N through urea + Azotobacter @ 2.5 lit/ha + PSB @ 2.5 lit/ha (T11), whereas the minimum number of branches at 90 DAS (9.30) was recorded with the treatment 100% RDN through urea (T2). These might be due to organic manure and biofertilizer improves water holding capacity, availability of nutrient and micronutrients. These findings are in the accordance with the result of Thriveni et al. (2015) [23] in bitter gourd, Das et al. (2015) [6], Singh et al. (2017) [20] and Singh et al. (2018) [21, 22] in bottle gourd, Anjanappa et al. (2012) [2] and Singh et al. (2018) [21, 22] in cucumber, Nayak et al. (2016) [13] in pointed gourd and Bindiya et al. (2012) [3] in gherkin.

Quality parameter

Effect of integrated nutrient management on fruit volume (cm³)

The effect of integrated nutrient management on fruit volume (cm³) is presented in Table. Data revealed that fruit volume was found significant.
Maximum fruit volume (125.56 cm³) was observed with treatment 75% RDN through vermicompost + 25% N through urea + \textit{Azotobacter} @ 2.5 lit/ha + PSB @ 2.5 lit/ha (T11), which was statistically at par with treatment T3 and T12, whereas the minimum fruit volume (106.72 cm³) was recorded with the treatment 100% RDN through urea (T2). This parameter positively increased with incremental use of inorganic use of vermicompost either alone or with biofertilizers. Similar observations were also noted by Mulani \textit{et al.} (2007)\cite{12} and Prasad \textit{et al.} (2009)\cite{17} in bitter gourd.

\begin{table}[h]
\centering
\caption{Effect of integrated nutrient management on growth and quality parameters} \label{tab:1}
\begin{tabular}{|c|c|c|c|c|}
\hline
Tr. No. & Treatments detail & Vine length at 45 DAS (cm) & Vine length at 90 DAS (cm) & Number of branches at 90 DAS & Fruit volume (cm³) \\
\hline
T1 & 100% RDF (100: 50: 50: NPK kg/ha) & 142.93 & 125.56 & 9.59 & 107.11 \\
T2 & 100% RDF through urea & 140.18 & 127.35 & 9.90 & 106.72 \\
T3 & 75% RDN through FYM + 25% N through urea & 144.87 & 129.01 & 9.67 & 108.69 \\
T4 & 50% RDN through FYM + 50% N through urea & 143.64 & 124.80 & 9.66 & 108.24 \\
T5 & 75% RDN through vermicompost + 25% N through urea & 173.50 & 443.82 & 10.13 & 119.93 \\
T6 & 50% RDN through vermicompost + 50% N through urea & 170.26 & 440.63 & 10.21 & 117.14 \\
T7 & 75% RDN through neem cake + 25% N through urea & 158.20 & 443.82 & 10.13 & 114.64 \\
T8 & 50% RDN through neem cake + 50% N through urea & 157.25 & 440.63 & 10.07 & 110.25 \\
T9 & 75% RDN through FYM + 25% N through urea + \textit{Azotobacter} @ 2.5 lit/ha + PSB @ 2.5 lit/ha (T11) & 154.24 & 428.52 & 10.06 & 109.83 \\
T10 & 50% RDN through FYM + 50% N through urea + \textit{Azotobacter} @ 2.5 lit/ha + PSB @ 2.5 lit/ha & 149.32 & 421.61 & 9.79 & 108.94 \\
T11 & 75% RDN through vermicompost + 25% N through urea + \textit{Azotobacter} @ 2.5 lit/ha + PSB @ 2.5 lit/ha & 186.70 & 511.33 & 12.87 & 125.56 \\
T12 & 50% RDN through vermicompost + 50% N through urea + \textit{Azotobacter} @ 2.5 lit/ha + PSB @ 2.5 lit/ha & 179.82 & 497.63 & 10.29 & 120.12 \\
T13 & 75% RDN through neem cake + 25% N through urea + \textit{Azotobacter} @ 2.5 lit/ha + PSB @ 2.5 lit/ha & 164.64 & 474.75 & 10.19 & 116.44 \\
T14 & 50% RDN through neem cake + 50% N through urea + \textit{Azotobacter} @ 2.5 lit/ha + PSB @ 2.5 lit/ha & 158.34 & 464.28 & 10.13 & 115.46 \\
\hline
S.Em. ± & & 7.45 & 19.79 & 0.48 & 2.79 \\
S.D. (P = 0.05) & & 21.64 & 57.52 & 1.41 & 8.10 \\
C.V. % & & 8.12 & 7.64 & 8.25 & 4.25 \\
\hline
\end{tabular}
\end{table}

**Conclusion**

From the foregoing discussion, it could be concluded that application of 75% RDN through vermicompost + 25% N through urea + \textit{Azotobacter} @ 2.5 lit/ha + PSB @ 2.5 lit/ha (T11) in \textit{Kharif} bitter gourd is beneficial for better growth, good quality and improvement of nutrient status of the soil.

**References**


