INFLUENCE OF ORGANIC NUTRIENTS ON PHYSIOLOGICAL AND FLOWERING CHARACTERS OF BITTERGOURD (*MOMORDICA CHARANTIA*.L) ECOTYPE MITHIPAGAL

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ABSTRACT

An investigation on effect of organic nutrients on physiological and flowering characters of bittergourd (*Momordica charantia* L.) ecotype "Mithipagal" through organic nutrient management practices was carried out at the Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar during 2016-17.The experiment comprised of 13 treatments replicated thrice was executed following the principles of Randomized Block Design. Results of the experiment revealed that the application of vermicompost @ 5t ha^{-1} and sea weed extract 3% along with *Azospirillum* @ 2 kg ha^{-1} improved the growth, yield and quality performance of bitter gourd ecotype "Mithipagal". Among the treatments, T_5 (vermicompost 5t + sea weed extract 3% + *azospirillum* 2kg ha^{-1}) selected the highest in physiological characters *viz.*, leaf area index ,chlorophyll content, photosynthetic rate and dry matter production. It was closely followed by T_2(vermicompost 5t + humic acid 2% + *Azospirillum* 2 kg ha^{-1}). Regarding with flowering characters *viz.*, days taken to first female flowering and number of female flowers, the best values are found with application of T_5 .which was followed by T_2 and the least values are found in control.

Key words:Bittergourd,leaf area,humic acid,Azospirillum

INTRODUCTION

India has made significant progress on the vegetable map of the world and accounts about 12% share in the world total vegetable production They are rich and comparatively cheaper source of vitamins and minerals which constitute an important part in human nutrition. So, they are also called as Protective food. Besides the nutritional value of vegetables, increased interest is being bestowed on the functional and therapeutic benefits. (Satish Sing Baghal *et al*., 2017).Bitter gourd (*Momordica charantia* L.) is one of the most important popular vegetable crops grown in south east Asia. The genus name Momordica is derived from Latin word 'Mordeo' indicating jagged seeds and belongs to the family Cucurbitaceae. Cultivation area of Bitter gourd in India is 211.23 ha and total production is 1030 Mt. Fruits are considered as a rich source of vitamins and minerals and rich in Vitamin 'C' (88 mg/100g) .It is a leading vegetable crop of India and the higher yield and maximum returns make it the most preferred vegetable crop of Indian farmers The fruits, leaves and even the roots of *Momordica charantia* have been used in Ayurveda for the cure of a number of diseases such as a bitter stomachic, laxative and anathematic. It is used as ahypoglycaemic and anti diabetic agent because it posses hypoglycaemic (blood sugar lowering) properties (Parmar *et al.*, 2011) Bitter gourd has been found highly beneficial in lowering the blood and urine sugar level .The leaf extract of Bitter gourd is also having a very good mosquitocidal effect (Muralee *et al*., 2008).

Based on the different location, bitter gourd is also known as bitter melon, karella (or) balsam pear. Apart from the small fruits, which is called as 'Mithipagal' and it is cultivated in almost all the parts of the India including Tamilnadu. 'Mithipagal' which does not trained in pandal system which is allowed to grow in the ground itself. The leaves of this bitter gourd is smaller than the bigger sized bitter gourd plant leaves. It is a trailing climber annual, branching freely, and semi angled monoecious crop with duration of 100-120 days (Sureshkumar *et al.,* 2015). During last four decades indiscriminate use of inorganic fertilizers, pesticides and fungicides caused environmental pollution, especially into the soil thereby affecting its fertility on long term basis (Das *et al*., 2015). To avert this situation, reduced use of fertilizers without compromising on yield and quality can be achieved if the nutrient supply through organic manures, are used Again it can better address the important threats of food security such as soil degradation, climate change and pest problems.

Compare with inorganic nutrients organic nutrients plays a key role in achieve sustainability on agricultural production because it possesses many desirable properties such as high water holding capacity, cations exchange capacity, beneficial effect on the physical, chemical and biological characteristics of soil. It also adds organic matter to the soil which may improve soil structure, aeration, soil moisture holding capacity and water infiltration (Sundararasu, 2017).The organic farming practice need to be standardized for many crops so also for bitter gourd keeping all the above factors, an experiment conducted to assess the productivity enhancement of bitter gourd ecotype 'mithipagal' through organic nutrient management practices.

MATERIALS AND METHODS

The experiment was conducted in the department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalainagar .The seeds were sown with the spacing of 1m between plants and 0.75 m between rows. The design adopted was RBD with three replication. The seeds were subjected to 13 treatments.

TREATMENT DETAILS

T_1 - Press mud @ 3.5 + humic acid @ 2% + *azospirillum* @ 2kg ha^{-1}
T_2 - Vermicompost @ 5t + humic acid @ 2% + a*zospirillum* @ 2kg ha^{-1}
T_3 - Poultry manure @ 2.5t + humic acid @ 2% + a*zospirillum* @ 2kg ha^{-1}
T_4 - Press mud @ 3.5t + sea weed extract @ 3% + a*zospirillum* @ 2kg ha^{-1}
T_5 - Vermicompost @ 5t + sea weed extract @ 3% + a*zospirillum* 2kg ha^{-1}
T_6 - Poultry manure @ 2.5t + sea weed extract @ 3% + a*zospirillum* @ 2kg ha^{-1}
T_7 - Press mud @ 3.5 t + humic acid @ 2% + phosphobacteria @ 2.5 kg ha^{-1}
T_8 - Vermicompost @ 5t + humic acid @ 2% + phosphobacteria @ 2.5 kg ha^{-1}
T_9 - Poultry manure @ 2.5t + humic acid @ 2% + phosphobacteria @ 2.5kg ha^{-1}
T_{10} - Press mud @ 5.3t + sea weed extract @ 3% + phosphobacteria @ 2.5 kg ha^{-1}
T_{11} - Vermicompost @ 5t + Sea weed extract @ 3% + phosphobacteria @ 2.5kg ha^{-1}
T_{12} - Poultry manure @ 2.5t + Sea weed extract @ 3% + phosphobacteria @ 2.5kg ha^{-1}
T_{13} - Control

RDF: 75% NPK (60:30:20 kg ha^{-1})

The experiment was laid out in Randomised Block Design with three replications. Pits were taken at a spacing of 1 X 0.75 m. In each pit, four seeds were sown. The cultural and management practices were adopted according to the management practices recommended by Tamilnadu Agricultural University. Three plants were tagged randomly in each treatment for recording the observations on the physiological characters *viz.,* leaf area index ,chlorophyll content, photosynthetic rate and dry matter production and flowering characters like days taken to first female flowering and number female flowers.

RESULT AND DISCUSSION

The data on the influence of organic nutrients on the physiological characters *viz.,* leaf area index ,chlorophyll content, photosynthetic rate and dry matter production of bitter gourd is presented in Table 1.

Among the treatments maximum leaf area index was observed in T_5 (1.37) While, the minimum was observed in control T_{13} (0.88) which was significantly differed from all other treatments. Data presented in table.1 on total chlorophyll content reflected significant difference among the treatments. Among the treatments the highest total chlorophyll content was observed in T_5 (0.42) which was followed by T_2 (0.39) whereas, the lowest total chlorophyll content was observed in control T_{13} (0.36). Also, in Table 1, the maximum values in photosynthetic rate(10.69 µ mol Co_2 m^{-2} s^{-1}) and DMP (154.23 g $plant^{-1}$) was observed under T_5.The combined application of vermicompost @ + sea weed extract + *Azospirilum* registered the highest values in all physiological characters. The increase in chlorophyll content by the application of vermicompost and sea weed extract was due to the availability of micronutrient such as magnesium and zinc in traces in the organic manures and increases the uptake of nitrogen. Higher chlorophyll content might be due to the better process utilization of nitrogen for protein synthesis, which would have indirectly influenced the photosynthetic activities resulting in better process of assimilation. Magnesium as nucleolus as nitrogen atoms as basic bricks of chlorophyll molecules, ultimately increase the photosynthetic activities which are associated with major photosynthetic process of plants (Gouda *et al*. 2001). Sea weed extract improves leaf quality and leaf content of micro nutrients. Similar result were observed by Gaikwad *et al*., (2012), Anburani *et al*. (2010) in gherkin, Sharma *et al*. (2012) in cucumber .

The data on flowering characters like days taken to first female flowering and number of female flowers was recorded in table 2. It reflects the significant difference among the treatments. T_5 treated with combination of vermicompost @ 5t + seaweed extract @ 3% + *azospirillum* 2k ha^{-1} produced maximum number of female flowers per plant (36.08) followed by T_2 (35.36) and minimum was recorded in control (34.63). The minimum number of days taken to first female flowering(32.88 days) was observed with application of T_5 which was followed by T_2 (33.28 days) and the maximum was recorded in control(37.23). Investigation on flowering characters were studied and the plant supplied with organic nutrients *viz.*, vermicompost 5t + sea weed extract 3% + *Azospirilum* 2kg ha^{-1} showed early flowering and higher flower production. This might be due to the better nutritional status of the plant, which was favored by this treatment. Further due to greater photosynthetic effect, flowering was induced, thus affecting early ignition of flower bud formation. Application of vermicompost resulted in earlier flowering and higher flower production, which may be due to better aeration and creation of favorable soil environment for deeper penetration of root and higher nutrient extraction from the soil. The results of the present study are in accordance with the findings of Kameshwari *et al*. (2010) in Ridge gourd, , Thriveni *et al*. (2015) in bitter gourd,

Table. 1. Effect of organic nutrients leaf area index, total chlorophyll content,photosynthetic rate and dry matter production of bitter gourd (*Momordica charantia* L.) ecotype 'mithipagal'

Treatment	Leaf area index	Total chlorophyll content (mg g^{-1})	Photosynthetic rate (µ mol Co_2 m^{-2} s^{-1})	Dry matter production (g $plant^{-1}$)
T_1 -Press mud @ 3.5 + humic acid @ 2% + *azospirillum* @ 2kg ha^{-1}	1.16	0.30	8.44	136.17
T_2 -Vermicompost @ 5t + humic acid @ 2% + a*zospirillum* @ 2kg ha^{-1}	1.32	0.39	10.26	149.94
T_3 -Poultry manure @ 2.5t + humic acid @ 2% + a*zospirillum* @ 2kg ha^{-1}	0.96	0.16	6.66	117.8
T_4 -Press mud @ 3.5t + sea weed extract @ 3% + a*zospirillum* @ 2kg ha^{-1}	1.22	0.33	8.87	140.43
T_5 -Vermicompost @ 5t + sea weed extract @ 3% + a*zospirillum* 2kg ha^{-1}	1.37	0.42	10.69	154.23

T_6 -Poultry manure @ 2.5t + sea weed extract @ 3% + *azospirillum* @ 2kg ha^{-1}	0.92	0.13	6.23	113.57
T_7 -Press mud @ 3.5 t + humic acid @ 2% + phosphobacteria @ 2.5 kg ha^{-1}	1.05	0.21	7.53	126.30
T_8 -Vermicompost @ 5t + humic acid @ 2% + phosphobacteria @ 2.5 kg ha^{-1}	1.28	0.36	9.39	145.70
T_9 -Poultry manure @ 2.5t + humic acid @ 2% + phosphobacteria @ 2.5kg ha^{-1}	1.11	0.25	8.02	131.93
T_{10} -Press mud @ 3.5t + sea weed extract @ 3% + phosphobacteria @ 2.5 kg ha^{-1}	1.01	0.18	7.09	122.06
T_{11} -Vermicompost @ 5t + Sea weed extract @ 3% + phosphobacteria @ 2.5kg ha^{-1}	1.23	0.34	8.95	141.45
T_{12} -Poultry manure @ 2.5t + Sea weed extract @ 3% + phosphobacteria @ 2.5kg ha^{-1}	1.07	0.22	7.58	127.68
T_{13} -Control	0.88	0.11	6.01	107.69
SED	**0.015**	**0.01**	**0.10**	**2.01**
CD (p = 0.05)	**0.03**	**0.02**	**0.20**	**4.03**

Table 2. Effect of organic nutrients on days taken to first female flowering and number of female flowers of bitter gourd (*Momordica charantia* L.) ecotype 'mithipagal'

Treatments	Days taken to first female flowering	Number of female flowers
T_1 - Press mud @ 3.5 + humic acid @ 2% + *azospirillum* @ 2kg ha^{-1}	34.58	32.98
T_2 - Vermicompost @ 5t + humic acid @ 2% + *azospirillum* @ 2kg ha^{-1}	33.28	35.36
T_3 - Poultry manure @ 2.5t + humic acid @ 2% + *azospirillum* @ 2kg ha^{-1}	36.36	29.83
T_4 - Press mud @ 3.5t + sea weed extract @ 3% + *azospirillum* @ 2kg ha^{-1}	34.18	33.70
T_5 - Vermicompost @ 5t + sea weed extract @ 3% + *azospirillum* 2kg ha^{-1}	32.88	36.08
T_6 - Poultry manure @ 2.5t + sea weed extract @ 3% + *azospirillum* @ 2kg ha^{-1}	36.77	29.12
T_7 - Press mud @ 3.5 t + humic acid @ 2% + phosphobacteria @ 2.5 kg ha^{-1}	35.56	31.29
T_8 - Vermicompost @ 5t + humic acid @ 2% + phosphobacteria @ 2.5 kg ha^{-1}	33.67	34.63

T_9 - Poultry manure @ 2.5t + humic acid @ 2% + phosphobacteria @ 2.5kg ha^{-1}	34.99	32.24
T_{10} - Press mud @ 3.5t + sea weed extract @ 3% + phosphobacteria @ 2.5 kg ha^{-1}	35.97	30.57
T_{11} - Vermicompost @ 5t + Sea weed extract @ 3% + phosphobacteria @ 2.5kg ha^{-1}	34.07	33.91
T_{12} - Poultry manure @ 2.5t + Sea weed extract @ 3% + phosphobacteria @ 2.5kg ha^{-1}	35.40	31.51
T_{13} - Control	37.23	28.21
SED	**0.09**	**0.25**
CD (p = 0.05)	**0.19**	**0.51**

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