Integrated crop management (ICM) practices to enhance watermelon yield and farm income

K SUNDHARAIYA, N SRIRAM, R BASKARAN, K NATARAJAN and K BHARATHIKUMAR

ICAR – Krishi Vigyan Kendra, TNAU, Vridhachalam, Cuddalore 606001 Tamil Nadu, India
Email for correspondence: aiya_hort@rediffmail.com

 Received: 18.05.2022/Accepted: 17.06.2022

ABSTRACT

Field demonstrations on integrated crop management (ICM) practices on watermelon (*Citrullus lanatus* L) to increase the yield and farm income were conducted in Cuddalore district of Tamil Nadu by Krishi Vigyan Kendra, Tamil Nadu Agricultural University, Vridhachalam, Cuddlaore district, Tamil Nadu. In total, ten farmers were selected in three blocks viz Kattumannarkoil, Vridhachalam and Panruti of Cuddalore district. Critical inputs viz *Azospirillum,* phosphobacteria*, Pseudomonos flurescense* and ethrel were distributed to the farmers along with seeds of watermelon variety Arka Muthu. The biofertlizers and bio-inoculant were applied in the soil @ 25 g per plant. Foliar application of ethrel @ 200 ppm was done at 15 days after sowing and repeated three times at weekly interval. It was observed that ICM practices viz high yielding variety Arka Muthu, soil application of biofertilizers *Azospirillum* and phosphobacteria and bio-inoculant *P flurescense* each @ 25 g per plant and foliar application of ethrel @ 200 ppm registered higher values for number of fruits per plant (3.80), fruit weight (3.40 kg) and fruit yield (398.71 q/ha). The demonstration plots registered higher net income of Rs 1,99,104.28 compared to check which registered a net income of Rs 1,40,455.55 and higher B-C ratio of 2.55 as compared to 1.89 in local check.

Keywords: Watermelon; ICM practices; yield; BCR

INTRODUCTION

Watermelon (*Citrullus lanatus* L) is an important fruit vegetable belonging to the family Cucurbitaceae and is extensively grown worldwide. It is a refreshing fruit rich in water (92%) soaked with important nutrients viz vitamins A, C and B6 and lots of lycopene, antioxidants and amino acids. Lycopene is a phytonutrient which is a naturally occurring compound in fruits and vegetables that reacts with the human body to trigger healthy reactions. Watermelon contains high level of lycopene that is linked with heart and bone health and prostate cancer prevention. It is also a powerful antioxidant thought to have anti-inflammatory properties. It is also rich in potassium and magnesium which help in reducing high blood pressure (Nascimento et al 2017, Mainga et al 2018). In India, watermelon is extensively grown for its refreshing fruit. India is the second largest producer of watermelon among the Asian countries accounting for 2.48 million tonnes from 1.01 lakh hectares with productivity of 24.58 tonnes/ha (Anon 2017a). In Tamil Nadu, the production is 2.16 lakh tonnes from an area of 9,095 ha with the average productivity of 23.78 tonnes/ha (Anon 2017b). However, the productivity of watermelon is low. It might be due to low fertility, improper management practices, lack of knowledge on integrated crop management (ICM) practices, unawareness about improved high yielding watermelon varieties etc. Biofertilizers are microbial preparations containing living microorganisms which play beneficial role in famishing a proper rhizosphere for plant growth. Thus it causes minerals solubilizing and facilitates minerals (especially N) uptake. Biofertilizers improve soil texture; are eco-friendly and cost-effective; protect the environment from pollutants; destroy many harmful substances present in the soil that can cause plant diseases and are effective even under semi-arid conditions. The effects of external application of ethrel on plant growth and development have been known for many years and many responses to ethylene are strikingly similar to auxin responses. Enhanced flowering by ethylene in cucurbits is well documented and ethylene-releasing compounds have been applied

to enhance female flower in cucurbitaceous plants (Abeles et al 1992). With this view, ICM practices in watermelon were applied at farmers' fields of Cuddalore district of Tamil Nadu to increase the yield and farm income.

MATERIAL and METHODS

The frontline demonstrations on ICM practices in watermelon were conducted at farmers' fields in Cuddalore district by Krishi Vigyan Kendra, Vridhachalam, Cuddalore district, Tamil Nadu (Table 1). In total, ten farmers with four hectares of land from three blocks viz Kattumannarkoil, Vridhachalam and Panruti were selected to conduct the demonstrations. Critical inputs viz *Azospirillum*, phosphobacteria, *Pseudomonos flurescense* and ethrel were distributed to the farmers along with seeds of watermelon variety Arka Muthu. The biofertlizers and bio-inoculants were applied in the soil @ 25 g per plant. Foliar application of ethrel @ 200 ppm was done at 15 days after sowing and repeated three times at weekly interval. Other horticultural practices were followed as per crop production guide. The demonstrations were continuously monitored by the scientists of Krishi Vigyan Kendra from seed sowing to harvest and marketing. Biometrical observations on number of fruits, individual fruit weight, yield per hectare and economic parameters viz gross income, net income and benefit-cost ratio were calculated.

RESULTS and DISCUSSION

The results (Table 2) reveal that under ICM practices improved high yielding variety Arka Muthu, soil application of biofertilizers *Azospirillum* and phosphobacteria and bio-inoculant *Pseudomonos flurescense* each @ 25 g per plant and foliar application of ethrel @ 200 ppm registered higher values for all the yield parameters viz number of fruits per plant (3.80), fruit weight (3.40 kg/plant) and fruit yield (398.71 q/ha), whereas, farmers' practice registered lower values for number of fruits per plant (3.30), fruit weight (3.03 kg/plant) and yield per hectare (308.56 q/ha). Isfahani and Besharati (2012) indicated that the use of biological fertilizers increased yield and yield contributing parameters of cucumber. Qun et al (2015) reported that organic fertilizers improve soil enzyme activities, adjust soil microbial community structure and improve soil quality and fertility conditions thus resulting in increased yield. Jyoti et al (2019) concluded that the application of inorganic nitrogen in combination with *Azotobacter* + PSB bio-fertilizers resulted in healthy and maximum yield in bitter gourd. Saeed et al (2015) stated that a combined application of biofertilizers and chemical fertilizers had significant effect on yield and growth characters of cucumber. *Azospirillum* is an associative symbiotic nitrogen fixing bacterium having high potential for nitrogen fixation and produces growth hormones. *Azospirillum* inoculation is known to increase the yield of crops by 5 to 20 per cent (Dart 1986). The results showed that combined application of microbial inoculants and inorganic fertilizers significantly increased the yield and yield attributing traits in watermelon. *P fluorescens* belongs to plant growth promoting bacteria, the group of bacteria that play a major role in plant growth promotion, inducing systemic resistance, biological control of pathogens etc.

Data on yield and income of watermelon before and after ICM practices are presented in Table 3. ICM practice plots registered 29.22 per cent increase in yield over farmers' practice. This might be due to the application of biofertilizers, bio-inoculant, ethrel and improved high yielding variety. The results are similar to findings of Tamilselvan et al (2017) who reported that ICM practice plots registered 20 per cent yield enhancement as compared to local check. Hemalatha et al (2017) reported that the ICM increased the yield up to 20 per cent in chilli. The ICM plots registered higher net income of Rs 1,99,104.28 compared to check which registered a net income of Rs 1,40,455.55. The demonstration plots also registered higher B-C ratio of 2.55, whereas, it was 1.89 in local check. Desai et al (2018) reported that B-C ratio before FLDs was 2.12 which increased to 2.97 after FLDs. The same trend was noticed by Prabhu et al (2016) who stated that demonstration plots registered the higher B-C ratio of 2.86 and 19.2 per cent increased yield over the local check in brinjal in Vellore district. Rameshkumar et al (2018) reported that demonstration plots registered the higher B-C ratio of 2.57, whereas, local check registered the lower ratio of 2.23 in cashew.

From the results it was concluded that the integrated crop management practices which included high yielding variety, soil application of *Azospirillum*, phosphobacteria, *Pseudomonas* and foliar application of ethrel increased the yield by increasing number of fruits per plant and fruit weight. Watermelon growing farmers of Cuddalore district, Tamil Nadu realized the importance of ICM practices to increase the yield and their farm income. They got awareness about high

Table 1. Integrated crop management technology used in watermelon

Component	Number of villages	Number of trials	Area (ha)	Technology used
Improved variety	3	10	4	Arka Muthu
Soil application of biofertilizers	3	10	4	*Azospirillum* @ 25 g/pit phospobacteria @ 25 g/pit
Soil application of bio-inoculant	3	10	4	*Pseudomonas flurescense* @ 25 g/pit
Foliar application of growth regulator	3	10	4	Ethrel @ 200 ppm

Table 2. Effect of conventional and ICM practices on watermelon yield

Component	Control	ICM practice
Number of fruits/plant	3.30	3.80
Individual fruit weight (kg)	3.03	3.40
Yield (q/ha)	308.56	398.71
Gross income (Rs)	2,14,455.55	2,77,104.28
Net income (Rs)	1,40,455.55	1,99,104.28
BCR	1.89	2.55

Table 3. Yield and income of watermelon before and after ICM practices

Component	Check	ICM	Per cent increase
Estimated yield/ha (q)	308.55	398.71	29.22
Net income (Rs)	1,40,455.55	1,99,104.28	41.76
BCR	1.89	2.55	

yielding varieties in watermelon and significance of biofertilizers, bio-inoculant and growth regulator in watermelon. After the frontline demonstrations, most of the framers were ready to follow the ICM practices in watermelon. The ICM practices also got spread to other farmers and they started following the use of new high yielding variety, seed treatment with bio-inoculants, soil application of biofertlizers and foliar spraying of ethrel.

REFERENCES

Abeles FB, Morgan PW and Saltveit ME Jr 1992. Ethylene in plant biology. 2nd edn, Academic Press Inc, San Diego, California, USA.

Anonymous 2017a. Horticultural statistics at a glance 2017. Horticulture Statistics Division, Department of Agriculture, Cooperation and Farmers Welfare, Ministry of Agriculture and Farmers' Welfare, Government of India.

Anonymous 2017b. Statistical handbook of Tamil Nadu 2017. Department of Economics and Statistics. Government of Tamil Nadu, India.

Dart PJ 1986. Nitrogen fixation associated with non-legumes in agriculture. Plant and Soil **90(1-3):** 303- 304.

Desai N, Patil C and Mamatha B 2018. Effect of integrated crop management on brinjal yield and economics through frontline demonstration at farmers field. International Journal of Agricultural Sciences **14(1):** 154-159.

Hemalatha KJ, Anandkumar V, Yenjerappa ST and Ravishankar G 2017. Integrated crop management in chilli. Paper Presented in 2nd KVK Symposium on Frontline Extension Programmes for Realizing Higher Productivity and Profitability in Farming, 7-8 March 2017, Coimbatore, Tamil Nadu, India.

Isfahani FM and Besharati H 2012. Effect of bio-fertilizers on yield and yield components of cucumber. Journal of Biology and Earth Sciences **2:** 83-92.

Jyoti, Singh L and Singh J 2019. Use of different types of fertilizers in Cucurbitaceae family. International Journal of Current Microbiology and Applied Sciences **8(6):** 1877-1885.

Mainga B, Saha HM and Mwololo JK 2018. Use of cattle manure, calcium ammonium nitrate and diammonium

phosphate in watermelon [*Citrullus lanatus* (Thunb) Matsum. & Nakai] production increases fruit quality and maximizes small holder farmers net returns and profits. Horticulture International Journal **2(5):** 244-251.

Nascimento JAMD, Souto JS, Cavalcante LF and Pereira WE 2017. Watermelon (*Citrullus lanatus* Thunb) production as affected by soil potassium fertilizer and livestock manure. Agrociencia Uruguay **21(2):** 7-14.

Prabhu T, Pandiyan M and Sridhar P 2016. High yielding spiny brinjal and its impact in Vellore district. Paper Presented in 1st KVK Symposium on Technology Delivery Mechanisms of KVKs for Higher Productivity and Profitability in Agriculture, 21-22 January 2016, Dharwad, Karnataka, India.

Qun C, WenJuan D, LanFeng Z, XiaoFeng L, Ying L, HuaXing L 2015. Effects of biological organic fertilizer on wax gourd wilt disease, microorganism and enzyme activities in soil. Journal of South China Agricultural University **36(2):** 36-42.

Rameshkumar A, Sharavanan PT, Porkodi G and Kannan S 2018. Demonstration of crop management practices to increase yield in cashew. Paper Presented in International Conference on Invigorating Transformation of Farm Extension towards Sustainable Development: Futuristic Challenges and Prospects (INTFES-18), 9-10 March 2017, Coimbatore, Tamil Nadu, India.

Saeed KS, Ahmed SA, Hassan IA and Ahmed PH 2015. Effect of biofertilizer and chemical fertilizer on growth and yield in cucumber (*Cucumis sativus* L) in green house condition. Pakistan Journal of Biological Sciences **18(3):** 129-134.

Shafeek MR, Shaheen AM, El-Samad EHA, Rizk FA and El-Al FSA 2015. Response of growth, yield and fruit quality of cantaloupe plants (*Cucumis melo* L) to organic and mineral fertilization. Middle East Journal of Applied Sciences **5(1):** 76-82.

Tamilselvan M, Ravi R and Anuratha A 2017. Effect of micronutrient mixtures for increasing the yield and productivity in brinjal. Paper presented in 2nd KVK Symposium on Frontline Extension Programmes for Realizing Higher Productivity and Profitability in Farming, 7-8 March 2017, Coimbatore, Tamil Nadu, India.