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**JP Sajitha**
Department of vegetable crops, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

**RM Vijayakumar**
Department of medicinal and aromatic crop, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

**C Kannan**
Department of Plant Pathology, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu, India

**S Senthil Murugan**
Department of Plant Pathology, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu, India

**Correspondence**
**JP Sajitha**
Department of vegetable crops, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

# Efficacy of different levels of nutrients through fertigation on microbial population in watermelon rhizosphere soil

**JP Sajitha, RM Vijayakumar, C Kannan and S Senthil Murugan**

**Abstract**
Watermelon (*Citrullus lanatus* (Thumb) is the only fruit vegetable that is consumed as fresh fruit. It has risen from its relative obscurity to the present status mainly because of its pleasant flavour, sweet taste and refreshing effect that is well utilized during hot summer months. Soil constitutes the habitat of vast majority of microscopic forms of life distributed throughout the soil. These micro organisms bring about the decomposition of plant and animal residues to inorganic compounds that are essential for the maintenance of soil fertility and enhanced nutrient uptake capacity.An investigation was carried out to study the efficacy of different levels of nutrients through fertigation on microbial population in watermelon rhizosphere soil. Among the different levels of treatments in two seasons, the highest microbial population was recorded in the treatment $T_7$ at 30$^{th}$, 45$^{th}$, 60$^{th}$ and 75$^{th}$ DAS respectively). The soil application of 100 per cent recommended dose of nutrients had lesser impact on the microbial populations.

**Keywords:** watermelon, fertigation and rhizosphere microflora.

## Introduction
Watermelon is a common man's fruit relished by both rich and poor alike. The flesh of the fruit is also consumed after adding a pinch of salt and black pepper. The juice is delicious and nourishing and exerts a cooling effect in hot summer months. The unripe fruit is also cooked as a vegetable and its seeds are fried and eaten in some parts of India (Vigneshwara Varmudy, 2012) [2]. Among the curcurbitaceous crops, watermelon is the only fruit vegetable that is consumed as fresh fruit. It is truly native to sandy dry areas of South Africa chiefly Kalahari desert. It has risen from its relative obscurity to the present status mainly because of its pleasant flavour, sweet taste and refreshing effect that is well utilized during hot summer months. (Silva-matos. *et al*., 2012) [3]. Micro organisms decomposes the plant and animal residues to inorganic compounds that are essential for the maintenance of soil fertility. and enhanced nutrient uptake capacity Kajal *et al.* (2008) [4]. The present study was carried out to study the efficacy of different levels of nutrients through fertigation on microbial population in watermelon rhizosphere soil**.**

## Material and methods
### Crop and variety
The watermelon hybrid 'Kiran' of known You Seed India Pvt. Ltd. was used for the study. It is an early maturing and vigorous hybrid with elongated dark green fruit.

### Treatments
$T_1$ - 75% RDF through fertigation using water soluble fertilizers
$T_2$ - 100% RDF through fertigation using water soluble fertilizers
$T_3$ - 125% RDF through fertigation using water soluble fertilizers.
$T_4$ - 150% RDF through fertigation using water soluble fertilizers
$T_5$ - 75% RDF through fertigation using water soluble fertilizers+Azophosmet + humic acid
$T_6$ - 100% RDF through fertigation using water soluble fertilizers+Azophosmet + humic acid
$T_7$ - 125% RDF through fertigation using water soluble fertilizers +Azophosmet + humic acid
$T_8$ - 150% RDF through fertigation using water soluble fertilizers +Azophosmet + humic acid
$T_9$ - 100% RDF through soil application (control)
(RDF-Recommended Dose of Fertilizers -200:100:100 kg of N, $P_2O_5$, $K_2O$ per ha, respectively)

### Fertilizer form
The following are the forms of fertilizers used for the study.

**Straight fertilizers:** Urea (46 % N), Single super phosphate (SP – 16% $P_2O_5$) and Muriate of potash (MOP – 60 % $K_2O$)
**Water soluble fertilizers:** Proprietary water soluble form of N, P and K fertilizers *Viz.*, 19:19:19- (Polyfeed), 12:61:00 (Mono ammonium phosphate), 13:00:45(Multi 'K').

**Scheduling of Nutrients**
**Fertilizer schedule**

| Time of Application | Number of application* | N % | P% | K% |
|---|---|---|---|---|
| From 21st day onwards and up to 49th day | 4 | 50 | 100 | 25 |
| From 49th day to 62nd day | 2 | 30 | - | 25 |
| From 62nd day to 77th day | 2 | 20 | - | 50 |
| Total | | 100 | 100 | 100 |

*Frequency of application: 7 days.

**Enumeration of Rhizosphere Soil Microbial Population**
The rhizosphere soil sample from watermelon crop was analysed for bacteria, fungi and actinomycetes.

**Serial dilution of soil sample**
Ten grams of rhizosphere soil sample was transferred to 90 ml of sterile distilled water to get $10^{-1}$dilution. After thorough mixing, one ml of this dilution was transferred to 9 ml water blank to get $10^{-2}$ dilution. Likewise, sample was diluted serially with 9 ml water blank till appropriate dilution was obtained (Parkinson *et al*., 1971) [1].

**Bacteria (No. of colonies per g of soil)**
The total bacterial population was enumerated by planting one ml of $10^{-6}$ dilution in sterile petri plates using soil extract medium. The bacterial colonies appearing on the plates after 48 hours of incubation at 30°C were counted and expressed in g of dry weight of the soil.

**Fungi (No. of colonies per g of soil)**
For the determination of fungal population, one ml of $10^{-4}$ dilution of the soil sample was plated in sterile plate with potato dextrose agar medium. After 72 h of incubation, the fungal colonies were counted and expressed in g of dry weight of soil.

**Actinomycetes (No of colonies per g of soil)**
The total actinomycetes population was determined by plating 1 ml of $10^{-3}$ dilution with starch casein nitrate agar medium. The powdery colonies of actinomycetes appearing after 5 days were counted and expressed per g of dry weight of soil
Result and discussion

**Influence of different of nutrient levels on rhizosphere microbial changes**
**Bacteria**
The results from the experiment showed that the bacterial population was the highest in fertigation treatment $T_7$ (125 per cent recommended dose of nutrients along with Azophosmet and humic acid) which recorded 10.59 and 10.64 cfu $g^{-1}$ at 45th DAS during seasons I and II respectively. The lowest value was noticed in soil application of recommended dose of fertilizer which recorded 8.74 and 8.02 cfu $g^{-1}$ (Table 1).

**Fungi**
Among the different levels of treatments in two seasons, the highest fungi population was recorded in the treatment $T_7$ (3.602, 4.602, 4.561 and 4.397 cfu $g^{-1}$ in season I and 3.716, 4.851, 4.756 and 4.672 cfu $g^{-1}$ in season II at 30th, 45th, 60th and 75th DAS respectively). The soil application of 100 per cent recommended dose of nutrients had lesser impact on the fungal populations with the lowest values of 2.583, 3.595, 3.508 and 3.254 cfu $g^{-1}$ in season I and in season II 3.005, 3.608, 3.938 and 3.764 cfu $g^{-1}$ at 30th, 45th, 60th and 75th DAS respectively (Table 2).

**Actinomycetes**
The data on actinomycetes population as influenced by different levels of fertigation are presented in table 3. In general, the acinomycetes populations increased with the increasing in nutrients levels. The highest actinomycetes population was observed in $T_7$ with 5.459, 5.634 cfu $g^{-1}$ and 5.653, 5.734 cfu $g^{-1}$ during seasons I and II respectively at 60th and 75th DAS. The lowest value was noticed in the control ($T_9$) with 4.293 and 4.521 cfu $g^{-1}$ in seasons I and II at 75th DAS.
Soil constitutes the habitat of vast majority of microscopic forms of life distributed throughout the soil. It was revealed from the data that application of liquid Azophosmet and humic acid through drip irrigation showed a greater chance for multiplication of beneficial microorganism in the rhizosphere region. The results of present study indicated that drip fertigation at 125 per cent recommended dose of nutrients as water soluble fertilizer along with Azophosmet and humic acid resulted in a higher population of bacteria, fungi and actinomycetes than without using of Azophosmet and humic acid treatments at flowering stage. These micro organisms bring about the decomposition of plant and animal residues to inorganic compounds that are essential for the maintenance of soil fertility. Kajal *et al.* (2008) [4] reported that application of water soluble fertilizers along with Azophosmet and humic acid improved the microbial population of soil and enhanced nutrient uptake capacity of bhendi crop.
Nguyen (2003) [5] reported that high above-ground biomass yield is obviously accompanied by an active root system, which releases an array of organic compounds into the rhizosphere. Plant roots release about 17 per cent of the photosynthate captured, most of which is available to soil organisms. These compounds support the growth of the microbial community and result in dense population in drip fertigation plot over the control plot at harvesting stage.

**Table 1:** Influence of different levels of nutrients on bacteria population at different growth stages in watermelon hybrid Kiran

| Treatments | Bacteria (CFU g-1) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 30th day | | 45th day | | 60th day | | 75th day | |
| | Season I | Season II | Season I | Season II | Season I | Season II | Season I | Season II |
| T1 | 7.46 | 7.01 | 9.20 | 8.60 | 9.06 | 7.84 | 8.37 | 8.67 |
| T2 | 7.55 | 7.12 | 9.30 | 8.656 | 9.13 | 8.45 | 8.42 | 8.72 |
| T3 | 7.71 | 7.62 | 9.86 | 9.35 | 9.56 | 9.09 | 9.05 | 9.25 |
| T4 | 8.01 | 8.18 | 10.36 | 10.04 | 10.07 | 9.69 | 9.52 | 9.76 |
| T5 | 7.85 | 7.18 | 9.34 | 8.689 | 9.14 | 8.49 | 8.54 | 8.75 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| T6 | 8.18 | 7.77 | 9.90 | 9.47 | 9.69 | 9.16 | 9.12 | 9.28 |
| T7 | 8.43 | 8.68 | 10.59 | 10.64 | 10.18 | 10.27 | 9.83 | 9.91 |
| T8 | 8.32 | 8.57 | 10.47 | 10.56 | 10.11 | 10.18 | 9.76 | 9.82 |
| T9 | 6.54 | 6.63 | 8.74 | 8.02 | 8.67 | 7.76 | 7.96 | 8.20 |

**Table 2:** Influence of different levels of nutrients on fungi population at different growth stages in watermelon hybrid Kiran

| Fungi ( CFU $g^{-1}$) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Treatments** | **30th day** | | **45th day** | | **60th day** | | **75th day** | |
| | **Season I** | **Season II** | **Season I** | **Season II** | **Season I** | **Season II** | **Season I** | **Season II** |
| $T_1$ | 2.671 | 3.198 | 3.796 | 3.705 | 3.765 | 4.095 | 3.286 | 3.938 |
| $T_2$ | 2.889 | 3.213 | 3.824 | 3.913 | 3.892 | 4.102 | 3.488 | 4.065 |
| $T_3$ | 3.174 | 3.461 | 4.102 | 4.268 | 4.192 | 4.299 | 3.816 | 4.272 |
| $T_4$ | 3.406 | 3.641 | 4.348 | 4.523 | 4.453 | 4.498 | 4.109 | 4.491 |
| $T_5$ | 2.921 | 3.234 | 3.855 | 3.991 | 3.916 | 4.106 | 3.514 | 4.124 |
| $T_6$ | 3.178 | 3.479 | 4.113 | 4.338 | 4.208 | 4.317 | 3.853 | 4.349 |
| $T_7$ | 3.602 | 3.716 | 4.602 | 4.851 | 4.561 | 4.756 | 4.397 | 4.672 |
| $T_8$ | 3.591 | 3.678 | 4.551 | 4.693 | 4.515 | 4.663 | 4.322 | 4.597 |
| $T_9$ | 2.583 | 3.005 | 3.595 | 3.608 | 3.508 | 3.938 | 3.254 | 3.764 |

**Table 3:** Influence of different levels of nutrients on actinomycetes population at different growth stages in watermelon hybrid Kiran

| Actinomycetes (CFU $g^{-1}$) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Treatments** | **30th day** | | **45th day** | | **60th day** | | **75th day** | |
| | **Season I** | **Season II** | **Season I** | **Season II** | **Season I** | **Season II** | **Season I** | **Season II** |
| $T_1$ | 2.545 | 2.941 | 4.141 | 4.469 | 4.543 | 4.290 | 4.346 | 4.769 |
| $T_2$ | 2.594 | 3.020 | 4.207 | 4.665 | 4.587 | 4.600 | 4.614 | 4.965 |
| $T_3$ | 2.783 | 3.213 | 4.503 | 5.013 | 4.896 | 4.980 | 5.007 | 5.291 |
| $T_4$ | 3.051 | 3.373 | 4.792 | 5.362 | 5.191 | 5.324 | 5.307 | 5.623 |
| $T_5$ | 2.602 | 3.049 | 4.211 | 4.741 | 4.593 | 4.620 | 4.670 | 5.011 |
| $T_6$ | 2.852 | 3.220 | 4.512 | 5.102 | 4.921 | 5.016 | 5.027 | 5.382 |
| $T_7$ | 3.219 | 3.431 | 5.045 | 5.532 | 5.428 | 5.622 | 5.566 | 5.675 |
| $T_8$ | 3.230 | 3.477 | 5.127 | 5.553 | 5.459 | 5.653 | 5.634 | 5.734 |
| $T_9$ | 2.353 | 2.762 | 3.862 | 4.209 | 4.258 | 4.235 | 4.293 | 4.521 |

## References


1. Parkinson D, Gray JRG, Williams ST. Methods for studying the ecology of soil microorganisms. Oxford Blackwell Scientific Publications, 1971, 116.
2. Vigneshwara Varmudy. Market survey, 2012. www.ffymag.com/admin/issuepdf/Watermelon
3. Silva-matos RRS, Cavalcante IHL, Albano FG. Foliar spray of humic substances on seedlings production of watermelon cv. Crimson sweet. J Agron. 2012; 11(2):60-64.
4. Kajal A, AS Jadhav, Patil DS, Waghdhare DS. Influence of integrated plant fertigation on field grown tomato. Indian J Agric. Sci. 2008; 75(6):329-332.
5. Nguyen C. Rhizo deposition of organic C by plant mechanism and control. *Agron.* 2003; 23:375- 396