

## Effect of bio-K and inorganic fertilizers on growth and yield parameters of tomato (*Lycopersicon esculantum* Mill.)

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### ABSTRACT

The present study was conducted at Department of Horticulture, Marathwada Agricultural University Parbhani (M.S.) during the year 2004-05. Treatment of Bio-K 1ml/l of water + RDF of NP and 50% of K produced best results in terms of height of plant, number of leaves per plant, number of flowers per plant, days of 50% flowering, average weight of fruit, number of fruits per plant and plot, also yield parameters like marketable yield of fruits, percentage of marketable fruits and total yield per plant and per hectare as compared to treatment control and rest of the treatments under study.

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**Key words :** Bio-K, RDF, Tomato

### INTRODUCTION

Tomato (*Lycopersicon esculantum* Mill.) is one of the most protective food both because of its special nutritive value and also because of its wide spread production. The role of inorganic fertilizers in increasing growth and yield of the plant is well known. Biofertilizers not only played an important role in maintaining good health of the plant but also served as natural source of plant nutrients to increase productivity. The combination of inorganic fertilizers and biofertilizers on tomato has been studied using biofertilizers like *Azotobacter*, phosphate solubilizing bacteria, *Azospirillum* by many workers. In the present study, use of bio-k an potassium uptake activator has been used to study the combination use of various levels of inorganic fertilizers with different levels of bio-k to know its correct combination for obtaining good growth and yield of tomato crop.

### MATERIALS AND METHODS

The present experiment was laid out in Randomized Block Design. There were thirteen treatments and three replications. The treatment details are given below: T<sub>1</sub> - Bio-K 1ml/l of water + RDF of NP and K, T<sub>2</sub> - Bio-K 1ml/l of water + RDF of NP and 75% of K, T<sub>3</sub> - Bio-K 1ml/l of water + RDF of NP and 50% of K, T<sub>4</sub> - Bio-K 1ml/l of water + RDF of NP and 25% of K, T<sub>5</sub> - Bio-K

2ml/l of water + RDF of NP and K, T<sub>6</sub> - Bio-K 1ml/l of water + RDF of NP and 75% of K, T<sub>7</sub> - Bio-K 2ml/l of water + RDF of NP and 50% of K, T<sub>8</sub> - Bio-K 2ml/l of water + RDF of NP and 25% of K, T<sub>9</sub> - Bio-K 3ml/l of water + RDF of NP and K, T<sub>10</sub> - Bio-K 3ml/l of water + RDF of NP and 75% of K, T<sub>11</sub> - Bio-K 3ml/l of water + RDF of NP and 50% of K, T<sub>12</sub> - Bio-K 3ml/l of water + RDF of NP and 25% of K and T<sub>13</sub> - Recommended dose of NP and K (Control).

The plot size was 3 x 2.4m<sup>2</sup> and spacing was 60 x 60 cm. The variety used was 'Parbhani Yashashri'. The recommended dose of fertilizer 100:50:50 kg NPK ha<sup>-1</sup> was considered as RDF. In this for NPK, the urea, single super phosphate and murate of potash were used, respectively. Potassium was used at four levels *i.e.* at 100, 75, 50 and 25 per cent of recommended dose of potassium and applied one day before transplanting with half dose of nitrogen and full dose of phosphorus. Amrut-Akash (Bio-K) is a homeopathic formulation by using *Adathoda vasakas* 1ml (0.01%), *Officinalis* 1ml (0.01%) *Bnbeffin ribens* 1ml (0.01%) and aqua solvenent (99.97%). Bio-K was sprayed at three levels *i.e.* 1ml/l of water, 2ml/l of water and 3ml/l of water. It was applied at 15, 30 and 45 DAT.

The biometric observations on height of plant, and number of primary branches were taken at 15 days interval commencing from 30 days after transplanting

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(DAT) upto 90 DAT, days to 50 per cent flowering, yield per plant and yield per hectare were recorded. The observational data were subjected to statistical analysis.

## RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been presented under following heads :

### Growth parameters:

#### Height of plant:

The data presented in Table 1 indicated that the maximum height of plant (103.05cm) at 90 DAT was recorded in treatment T<sub>3</sub> where 50% of K and 1ml of Bio-k/l of water was given. The next best treatment in this regard was T<sub>4</sub> where 25% of K and 1ml of bio-k/ l of water was applied. Sendurkumar *et al.* (1998) found that application of FYM + NPK 100: 50 kg/ ha + *Azospirillum* + phosphate solubilising bacteria increased height of plant

in tomato.

#### Number of primary branches:

At 90 DAT the treatment of application of Bio-k 1ml/l of water + RDF of NP and 25% of K was given significantly more number of branches as compared to other treatments under study except treatment T<sub>10</sub> which was at par with it.

#### Number of leaves per plant:

The results obtained in the present investigation show that treatment T<sub>3</sub>-Bio-k 1 ml/l. of water + RDF of NP and 50 per cent of K found effective in producing more number of leaves per plant (107.06) than other treatments and control. Due to application of bio-k there might have been more nutrition absorbed by the plant and shown more height, more number of branches as well as more leaves per plant. Zeenat *et al.* (1994) found better effect of biofertilizers (the fresh algae) on vegetative growth *i.e.*

**Table 1: Effect of Bio-k and inorganic fertilizer on growth flowering and fruiting of tomato**

Tr. No.	Treatments	Height of plant	Number of primary branches	Number of leaves/plant	Number of flowers/plant	Days req. for 50% flowering	Avg. wt of fruit(g)
T <sub>1</sub>	Bio-K 1ml/lit. of water + RDF of NP and K	93.67	8.02	97.17	82.40	43.33	33.96
T <sub>2</sub>	Bio-K 1ml/lit. of water + RDF of NP and 75% of K	95.83	8.52	97.20	82.67	44.00	36.04
T <sub>3</sub>	Bio-K 1ml/lit. of water + RDF of NP and 50% of K	103.05	8.64	107.06	91.52	40.00	7.43
T <sub>4</sub>	Bio-K 1ml/lit. of water + RDF of NP and 25% of K	99.93	9.45	105.86	89.26	41.00	46.06
T <sub>5</sub>	Bio-K 2ml/lit. of water + RDF of NP and K	96.06	8.93	100.60	85.61	45.00	40.84
T <sub>6</sub>	Bio-K 1ml/lit. of water + RDF of NP and 75% of K	93.93	7.96	95.56	81.82	43.00	32.65
T <sub>7</sub>	Bio-K 2ml/lit. of water + RDF of NP and 50% of K	92.28	7.75	92.99	81.34	44.00	30.87
T <sub>8</sub>	Bio-K 2ml/lit. of water + RDF of NP and 25% of K	99.31	9.10	105.18	89.26	43.00	45.63
T <sub>9</sub>	Bio-K 3ml/lit. of water + RDF of NP and K	97.79	8.96	100.99	86.07	44.00	42.85
T <sub>10</sub>	Bio-K 3ml/lit. of water + RDF of NP and 75% of K	98.65	9.06	103.76	88.67	42.00	44.46
T <sub>11</sub>	Bio-K 3ml/lit. of water + RDF of NP and 50% of K	94.33	8.64	99.57	83.55	42.00	38.00
T <sub>12</sub>	Bio-K 3ml/lit. of water + RDF of NP and 25% of K	92.43	9.66	91.22	81.44	43.00	30.13
T <sub>13</sub>	Recommended dose of NP and K	91.21	7.08	89.90	87.36	44.00	27.35
S.E. ±		2.227	0.320	2.435	1.993	0.71	1.123
C.D. (P=0.05)		6.492	0.933	7.098	5.810	2.069	3.274

plant height and leaf number of tomato than control.

Number of flowers per plant:

Table 1 revealed that more number of flowers (91.52) were produced by the T<sub>3</sub>-Bio-k1ml/l of water + RDF of NP and 50 per cent of K which was statistically similar with treatments T<sub>4</sub>, T<sub>8</sub>, T<sub>9</sub> and T<sub>10</sub>. The finding is in line with the finding of Nathankumar and Veeragavathatham (1999) who found that number of flowers per plant was increased due to combined application of organic and biofertilizers in briajal.

Day to 50 per cent flowering:

From Table 1 it can be observed that, treatment T<sub>5</sub> (Bio-k-2ml/l of water + RDF of NP and K) required maximum number of days (45.00) for 50 per cent flowering as compared to other treatment which was at par with T<sub>2</sub>, T<sub>7</sub>, T<sub>13</sub>, T<sub>1</sub>, T<sub>6</sub>, T<sub>8</sub> and T<sub>12</sub>. Treatment T<sub>3</sub> required minimum number of days (40.00) for 50 per cent flowering as compared to all other treatments. Brown *et*

*al.* (1968) reported in tomato seedling treatment with culture of *Azospirillum chroococcum* caused earlier flowering of fruiting.

Weight of fruit:

It is observed from the observation recorded in respect of weight of fruit that there was variation amongst the different treatments of biofertilizers and inorganic fertilizers with various level. The treatment T<sub>3</sub> (Bio-k 1ml/l of water + RDF of NP and 50 per cent K) produced highest average weight of fruit (47.43 g) which was at par with the treatments T<sub>4</sub>, T<sub>8</sub>, T<sub>9</sub> and T<sub>10</sub>. Similar results were obtained by Hossain and Mohanty (1999) who recorded the highest fruit weight (58.09 g) in cv. PUNJAB CHUHARA with the application of 90 kg N/ha and 40 kg. K/ha. The higher fruit weight in T<sub>3</sub> treatment might have been due to accelerated mobility of photosynthates from the source to the sink as influenced by the growth hormone, released or synthesized due to the inorganic and biological source of fertilizers.

**Table 2: Effect of Bio-k and inorganic fertilizer on yield and yield parameters of tomato**

Tr. No.	Treatments	Number of fruits/plant	Number of fruit/plot	Marketable yield plant	Marketable yield% to total yield	Total yield per plant (kg)	Total yield per ha. (q)
T <sub>1</sub>	Bio-K 1ml/lit. of water + RDF of NP and K	40.19	803.87	1095.80	84.48	1.29	360.09
T <sub>2</sub>	Bio-K 1ml/lit. of water + RDF of NP and 75% of K	40.68	813.40	1177.70	88.88	1.32	368.24
T <sub>3</sub>	Bio-K 1ml/lit. of water + RDF of NP and 50% of K	45.15	903.00	1307.20	89.35	1.46	406.38
T <sub>4</sub>	Bio-K 1ml/lit. of water + RDF of NP and 25% of K	39.99	799.80	1267.00	88.04	1.43	399.72
T <sub>5</sub>	Bio-K 2ml/lit. of water + RDF of NP and K	38.78	815.60	1201.60	86.71	1.38	384.90
T <sub>6</sub>	Bio-K 1ml/lit. of water + RDF of NP and 75% of K	37.48	749.60	1086.00	84.97	1.23	355.18
T <sub>7</sub>	Bio-K 2ml/lit. of water + RDF of NP and 50% of K	37.17	743.40	1067.20	84.95	1.25	348.89
T <sub>8</sub>	Bio-K 2ml/lit. of water + RDF of NP and 25% of K	36.78	735.60	1242.30	86.99	1.42	396.66
T <sub>9</sub>	Bio-K 3ml/lit. of water + RDF of NP and K	37.25	745.07	1221.40	87.05	1.40	389.72
T <sub>10</sub>	Bio-K 3ml/lit. of water + RDF of NP and 75% of K	35.35	707.00	1237.20	88.8	1.41	393.05
T <sub>11</sub>	Bio-K 3ml/lit. of water + RDF of NP and 50% of K	32.22	644.00	1198.80	84.72	1.36	378.33
T <sub>12</sub>	Bio-K 3ml/lit. of water + RDF of NP and 25% of K	33.48	666.60	1046.60	85.29	1.22	340.83
T <sub>13</sub>	Recommended dose of NP and K	35.58	711.60	886.00	81.96	1.08	300.27
S.E. ±		1.280	28.98	51.787	-	0.052	16.53
C.D. (P=0.05)		3.730	84.87	150.93	-	0.152	48.19

**Yield parameters:**

Number of the fruits per plant:

It is observed from Table 2 that treatment T<sub>3</sub> (Bio-K 1ml/l of water + RDF of NP and 50 per cent K) produced more number of fruits (45.15) per plant. The minimum number of fruits was recorded by T<sub>11</sub>. Felipe and Lasanova (2000) studied the effect of K (0,90,180 and 270 kg/ha.) on the yield and number of fruits per plant and noted that the best treatment was 180 kg K/ha. The increased number of fruits per plant may be due to more number of flowers and higher per cent fruit set as well as earliness in the production of fruits.

Number of fruits per plot:

It is observed from Table 2 that treatment T<sub>3</sub> (Bio-K 1ml/l of water + RDF of NP and 50 per cent K) produced more number of fruits (903.00) per plot. The minimum number of fruits per plot (644.00) were produced by treatment T<sub>11</sub>. Number of the fruits per plant in T<sub>3</sub> treatment was the highest and due to this reason the number of fruits per plot was highest in this treatments.

Marketable yield per plant:

Table 2 revealed that highest marketable yield per plant (1307.2 g) was observed in treatment T<sub>3</sub> (Bio-K 1ml/l of water + RDF of NP and 50 per cent K). Where as lowest marketable yield per plant (886.0g) was recorded in treatment T<sub>13</sub> (Control). Singh and Kohali (1999) obtained highest overall marketable yield (560.7 q/ha.) by cv. MENKA when supplied 110 kg K/ha in tomato.

Marketable yield per cent to total yield:

Table 2 revealed that highest marketable yield percentage to total yield was recorded by treatment T<sub>3</sub> (89.75%). This may be due to highest marketable yield per plant was obtained by T<sub>3</sub> treatment.

Total yield per plant:

The data recorded in respect of total yield per plant clearly indicated that there were significant differences among different treatments of biofertilizers and inorganic fertilizers with various levels. The treatment T<sub>3</sub> (Bio-K 1ml/l of water + RDF of NP and 50 per cent K) emerged significantly superior in production of more yield (1.46 kg) per plant over all other treatments. This was because of fact that treatment T<sub>3</sub> resulted in more plant height

and more number of leaves which ultimately resulted in higher plant yield.

Total yield per hectare:

Data given in Table 2 clearly indicated that significantly highest yield hectare (406.78g) was recorded when bio-K 1ml/l of water + RDF of NP and 50 per cent K was applied and it was statistically superior over all other treatments. Yield of the tomato depends on the indirect component *i.e.* more vegetative growth which comprises height of plant, branches and number of leaves followed by direct yield contributing factors *viz.*, number of flower per plant, number of fruits per plant and average weight of fruit. In the present investigation all components contributing directly and indirectly towards yield were superior in the treatments T<sub>3</sub>. Therefore, significantly higher yield per plant and per hectare was obtained in this treatment.

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