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RESPONSE OF TOMATO (*LYCOPERSICUM ESCULENTUM*) PERFORMANCE TO DIFFERENT FRUIT-SETTING STIMULANTS IN GREENHOUSE

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ABSTRACT

The study was conducted in the Greenhouse, Department of Agricultural Technology, The Federal Polytechnic, Ado-Ekiti. Two fruit-setting stimulants, Fruit-setting Mix and Tecamin flower were applied at different concentrations on tomato flowers of the hybrid variety (Eva) grown under greenhouse condition. Tomato plants cultivar was raised in the nursery tray which was later transplanted to the Polythene bags filled with 5kg soil. The experiment was arranged in a complete randomized design (CRD) with seven (7) treatments and three (3) replicates. The stimulants were applied as foliar sprayings directly to the flower at the flowering stage. The water solutions at concentrations of 1, 2 and 3ml/L for each stimulant were prepared. Days to first fruiting, the number of fruits and fruit weight were determined at 40, 45, 50, 55 and 60 days after sowing. All stimulant concentration results were significantly higher than control but the highest values were observed at Tecamin Flower at 2ml/L concentration level.

***Keywords**: Tomato, Tecamin flower, Polythene, Fruit-setting, Solution.*

INTRODUCTION

Tomato (*Lycopersicum esculentum*) is a staple fruit vegetable worldwide (Saeed-Awan *et al*, 2012). Tomatoes are the second largest vegetable both in terms of production and consumption in the world (FAO, 2016). Tomatoes are currently an important food component globally. Reports from the United States show tomatoes as the second most-consumed fresh vegetable with 6 kg/person in 2017 (USDA, 2016). It is the second most important vegetable crop next to potatoes (Abdullahi *et al.*, 2010). Tomato is an important vegetable that play a major role in the provision of vitamins and minerals for humans, which are very necessary in the preparation of many local dishes and very diet of both rural and urban dwellers in Nigeria (Olayemi *et al.*,2010). Tomato fruits are consumed fresh in salads or cooked in sauces, soup and meat or fish dishes. They can be processed into purées, juices and ketchup. Canned and dried tomatoes are economically important processed product (Sardaro *et al.*, 2013). Self-compatibility and short lifespans (90-120 days) are alluring factors for thefarmers (Li *et al*, 2020).

Tomato cultivation can adapt to several climatic conditions. It could be done in the field, likewise under a controlled environment by using a screen house, greenhouse as well as fertigation to produce high-quality tomatoes (Oda and Saito, 2016). The transition of plants from the vegetative stage to the reproductive stage is a significant change in the life cycles where the production of offspring is the most

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important function of all living organisms. Flowering and fruit set are initiated and regulated by combined actions such as pollination and fertilization. After successful pollination and fertilization of the ovary. The functions of the flowering and development regulators are often conserved in the angiosperms, this makes Tomato an object of studying the mechanism of regulation especially in controlled environments where natural agents of pollination are absent such as wind and insects.

The European Council of Biostimulants Industry (EBIC) regarded biostimulants as natural substances or microorganisms that stimulate and enhance nutrient uptake, nutrient efficiency and tolerance to environmental stress. Yakhin *et al.* (2017) reported that biostimulants have the potential ability to solve some negative impacts of the changing climate on agriculture.

Tomato needs wind or insects especially bees to pollinate being an angiosperm plant. However, cultivating tomatoes inside controlled environments such as a greenhouse will need an artificial pollinator to perform better and also to increase the yield. Therefore, this research is looking into different fruit-setting stimulants and the best dosage for optimum performance. The objective of this study is to evaluate the effects of different fruit-settings and dosage rates.

Fruit setting mix and Tecamin flower are stimulants registered by Dizengoff W. A. Nigeria Ltd (Agro-allied company) and certified for organic farming and greenhouse usage for tomato production. It contains nutrients such as nitrogen and some micro-elements in addition to some plant extracts like algal.

Materials and Methods

The experiment was conducted in the Greenhouse at the Department of Agricultural Technology, The Federal Polytechnic, Ado-Ekiti from May, 2022 to September, 2022. The tomato plant (*L esculentum)* variety (Eva) was raised in the nursery tray and was transplanted 30days after sowing (DAS)into the Polythene bags filled with 5kg soil. The experiment was arranged in a complete randomized design (CRD) with 7 treatments and replicated thrice. The treatments are:

Treatment A – Control (No stimulant)

Treatment B – 1ml of Fruit-setting Mix in 1litre of water

Treatment C – 2ml of Fruit-setting Mix in 1litre of water

Treatment D – 3ml of Fruit-setting Mix in 1litre of water

Treatment E – 1ml of Tecamin flower in 1litre of water

Treatment F – 2ml of Tecamin flower in 1litre of water

Treatment G – 3ml of Tecamin flower in 1litre of water

The treatment solutions were applied at the flowering stage using a hand sprayer. The parameters were taken on days to first fruiting, number of fruits and weight of fruits(g). Data collected were analyzed using the Duncan Multiple Range Test (DMRT) at a 5% probability level.

RESULTS

Application of stimulants solution influenced the days to first fruiting of the tomato (Table.1). The flowers treated with Tecamin flower at 2ml/L concentration had

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the shortest day to first fruiting (49.15) and the longest day was observed in the control treatment (61.64). TF(2ml/L) was significantly difference from all other treatments with the highest value (Table.1)

Tecamin flower at 2ml/L concentration pollinated tomato flowers produced substantially the highest number of fruits per plant than the other treatments. The lowest value was produced from control tomato plants (Table 2). It was also observed that increase in the days recorded an increase in the number of fruits.

The same trend was observed in the average weight of the fruit (Table 3). Average fruit weight was significantly higher in the Tecamin Flower at 2ml/L concentration from 2.32, 4.61, 5.62, 6.33 and 8.06 for 40, 45, 50, 55 and 60 DAS respectively.

Table 1: Effect of Fruit-setting Stimulants on Tomato on days to first fruiting.

	DTF
Treatments	DAYS
FST (1m/L)	55.67b
FST(2m/L)	52.62b
FST(3ml/L)	54.9ab
TF(1ml/L)	52.43b
TF(2ml/L)	49.15a
TF(3ml/L)	52.61b
Control	61.64c
SE±	±3.02

Means with the same letter within a column are not significantly different at 5% level of probability.
FSM(1ml/L)=Fruit-setting Mix at 1ml/L concentration, FSM(2ml/L)= Fruit-setting mix at 2ml/L concentration, FSM(3ml/L)= Fruit-setting mix at 3ml/L concentration, TF(1ml/L)= Tecamin flowerat1ml/L concentration, TF(2ml/L)= Tecamin flower at 2ml/L concentration, TF(3ml/L)= Tecamin flower at 3ml/L concentration, Control= No stimulants application

Table 2: Response of Tomato to Different Fruit -setting Stimulants on Numbers of Fruits/ Plant

	Number of Fruit/Plant				
Treatments	40 DAS	45 DAS	50 DAS	55 DAS	60 DAS
FSM(1ml)	0.69a±0.33	2.01ab±0.82	3.60ab±0.93	4.00a±0.12	3.33b±0.61

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FSM(2ml)	1.04a±0.51	2.50b±0.63	3.86a±0.66	4.63ab±0.35	3.67b±0.31
FSM (3ml)	2.02ab±0.18	2.63b±0.51	4.02b±0.23	5.31b±0.11	4.00ab±0.11
TF(1ml)	2.33b±0.46	3.33c±0.33	5.01c±0.65	5.33b±0.64	6.03bc±0.25
TF(2ml)	2.35b±0.61	4.61d±0.22	5.62c±0.51	6.33c±0.18	8.06c±0.16
TF(3ml)	2.35b±0.42	3.01c±0.18	5.22c±0.51	5.41b±0.64	6.11±0.32
CONTROL	0.66±0.21	1.33a±0.35	2.0a±0.12	2.33±0.22	2.66a±0.12

Means in the same column with the same letter are not substantially different (P≤0.05)

FSM(1ml/L)=Fruit-setting Mix at 1ml/L concentration, FSM(2ml/L)= Fruit-setting mix at 2ml/L concentration, FSM(3ml/L)= Fruit-setting mix at 3ml/L concentration, TF(1ml/L)= Tecamin flower at1ml/L concentration, TF(2ml/L)= Tecamin flower at 2ml/L concentration, TF(3ml/L)= Tecamin flower at 3ml/L concentration, Control= No stimulants application

Table 3: Response of Tomato to Different Fruit -setting Stimulants on Weight of Fruit

	WEIGHT OF FRUITS (g)				
Treatments	40 DAS	45 DAS	50 DAS	55 DAS	60 DAS
FSM(1ml)	2.11a±0.3	3.13b±0.82	5.06b±0.91	7.46b±0.11	7.60b±0.62
FSM(2ml)	2.73ab±0.5	3.10b±0.61	5.66b±0.63	7.53b±0.24	8.80ab±0.83
FSM (3ml)	2.62ab±0.1	3.53b±0.52	5.98b±0.24	7.26c±0.13	7.02b±0.81
TF(1ml)	2.80ab±0.4	3.66b±0.3	5.93b±0.62	7.73b±0.21	8.73ab±0.33
TF(2ml)	3.53b±0.52	4.30c±0.62	6.20c±0.26	8.60c±0.25	10.00c±0.25
TF(3ml)	3.00b±0.11	4.10c±0.12	5.81b±0.11	8.36c±0.13	8.80b±0.32
CONTROL	1.80a±0.43	1.80a±0.41	3.53a±0.5	4.46a±0.11	4.73a±0.36

Means in the same column with the same letter are not substantially different (P≤0.05)
FSM(1ml/L)=Fruit-setting Mix at 1ml/L concentration, FSM(2ml/L)= Fruit-setting mix at 2ml/L concentration, FSM(3ml/L)= Fruit-setting mix at 3ml/L concentration, TF(1ml/L)= Tecamin flower at1ml/L concentration, TF(2ml/L)= Tecamin flower at 2ml/L concentration, TF(3ml/L)= Tecamin flower at 3ml/L concentration, Control= No stimulants application

DISCUSSION

The stimulants (Fruit-setting mix and Tecamin flower) contain some nutrients and extracts like nitrogen. Tomato days to first fruiting are different based on the dosage rate, the study showed that among the stimulants dosage rates, Tecamin flower at 2ml/L concentration had shown significant effects on all the parameters including the number of fruits and average fruit weight. The nutrient composition of the Tecamin flower contributed to the growth and development and also increased the reproductive structure, improving

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flowering efficiency and reducing flower abortion which transformed into fruits. This corroborates with the findings of Meyer *et al.* (2021) that some hormones in biostimulants promote the growth and development of tomatoes.

The stimulants across all the dosage rates performed better than the control in terms of the number of fruits, days to first fruiting and average weight of cluster fruits and also acted as means of mitigation for heat stress due to a less number of abortions and retention which agreed with Colla *et al*. (2017) which reported that biostimulants can serve as mitigator to climatic changes effects on tomato. The study also aligned with Petropoulos (2020) findings.

CONCLUSION

The biostimulant (Tecamin flower at 2ml/L concentration) increases the yield of tomato and likewise increases the weight of fruit more than thrice of control and double of other stimulants at different dosage rates. It is most cost-effective and recommended to be used as stimulants for better yield and climate change mitigation agents.

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