International Journal of Agricultural Sciences ☞ DOI:10.15740/HAS/IJAS/17-AAEBSSD/273-276
Volume 17 | AAEBSSD | 2021 | 273-276 ■ ISSN : 0973-130X Visit us : www.researchjournal.co.in

RESEARCH PAPER

Evaluation of IAA and GA_3 producing yeast isolates on growth of tomato crop by spraying under green house

M. Yallappa*, B.C. Mallesha, K.R. Rekha **and** M. Swathi
Department of Agricultural Microbiology, College of Agriculture (UAS), Bheemarayanagudi (Karnataka) India
(Email: ambyallappam@gmail.com)

Abstract : A green house experiment was carried out at Department of Agricultural Microbiology, GKVK, Bengaluru by use of IAA (MZL -8 and TCL -1) and GA_3 (CAL – 1 and ACL- 3) producing yeast isolates on growth of tomato crop by spraying method with 8 treatments and 3 replication. The highest plant height, number of leaves per plant, number of branches per plant, root length, fresh shoot biomass, dry shoot biomass, fresh root biomass, dry root biomass, IAA and GA_3 content, 44.73 cm, 80, 11.40, 14.70 cm, 24.00 g/plant, 11.75 g/plant, 7.98 g/plant, 3.91 g/plant, 1.205 µg/g of leaf and 0.550 µg/g of leaf, respectively by the yeast isolate TCL -1.The least plant height, number of leaves per plant, number of branches per plant, root length, fresh shoot biomass, dry shoot biomass, fresh root biomass, dry root biomass, IAA and GA_3 content, 22.20 cm, 55.70, 8.00,9.00 cm, 11.00 g/plant, 6.23 g/plant, 3.67 g/plant, 2.07 g/plant, 0.384 µg/g of leaf and 0.200 µg/g of leaf, respectively was recorded by control (T_1) treatment at 50 DAT.

Key Words : Indole -3-acetic acid (IAA), Gibberellins (GA_3), *Manilkara zapota* leaf isolate (MZL), *Coffea robusta* leaf isolate (CAL), *Theobroma cocoa* leaf isolate (TCL)

View Point Article : Yallappa, M., Mallesha, B.C., Rekha, K. R. and Swathi, M. (2021). Evaluation of IAA and GA_3 producing yeast isolates on growth of tomato crop by spraying under green house. *Internat. J. agric. Sci.*, **17** (AAEBSSD) : 273-276, **DOI:10.15740/HAS/IJAS/17-AAEBSSD/273-276.**

Article History : Received : 01.08.2021; **Accepted :** 03.08.2021

INTRODUCTION

Yeasts are group of fungi in which unicellular form are predominant in environment. Yeasts are generally of three types a) Ascomycetous b) Basidiomycetous and c) Deuteromycetous. Most of the yeasts are represented in Sub Division Ascomycotina and Basidiomycotina of the kingdom Mycota. Dimorphic yeasts are also present which become filamentous under certain environmental conditions. They play their role in the dynamics of biological and chemical turnover in soil, plants, animals and water. They are generally present in the natural resources leaf surface, fruit surface soil, animal surfaces and in the intestinal tracts of warm-blooded animals (Rose and Harrison, 1987).

Plant hormones regulate the cellular and physiological processes such as cell division, cell enlargement, bud dormancy, flowering, fruit ripening, seed dormancy, seed germination and leaf abscission. Auxin, one of the plant hormones stimulates differentiation of phloem and xylem, root initiation on stem cutting and also the development of branch roots. Auxin mediates the tropism (bending), response to gravity and light. Indole

***Author for correspondence:**
Department of Agricultural Microbiology, University of Agricultural Sciences, GKVK Bengaluru (Karnataka) India

-3-acetic acid (IAA) is the common natural auxin that shows all auxin do actions and extensively affects plants physiology.

The indole-3-acetic acid (IAA) stimulates rapid and long-term responses in plants and has been identified in plant-associated bacteria, molds and yeasts. The role of microbial IAA in plant-microbe interactions has recently received increased attention. Therefore IAA-producing microbes have been suggested as sources of biofertilizer. The IAA is a signaling molecule in certain micro-organisms and modifies gene expression. Therefore, IAA might act as a reciprocal signaling molecule in microbe-plant interactions (Pei *et al.,* 2014).

Gibberellins are an important group of isoprenoid phytohormones that occur in small amounts in higher plants. They are involved in the development and regulation of different growth processes throughout the life-cycle of plants. Numerous reports have shown gibberellins (GA_3) play a role in the growth, development and sexual differentiation processes of different plant species.

MATERIAL AND METHODS

Experiments were conducted by collected yeast isolates from the Department of Agricultural Microbiology, University of Agricultural Sciences, GKVK, Bengaluru to study the effect of yeast isolates on tomato crop under green house condition.

Green house evaluation of efficient yeast isolates for plant growth promotion in tomato crop :

Pot culture experiment:

The Abhinava hybrid seedlings were transplanted to sterilized soil filled in bags and mentioned for experiment under green house condition.

Method of application of yeast isolates:

Root dip:

The yeast isolates were grown in YM broth with constant shaking at 150 rpm for 48 hr at room temperature. Tomato seedling roots were dipped (10 minutes) in different yeast cultures grown in broth and transplanted to the bags.

Treatments:

T_1- Control, T_2- MZL -8, T_3- TCL- 1, T_4- CAL- 1, T_5- ACL- 3, T_6- IAA (1 ppm), GA_3 (1 ppm) and T_8- YM Broth.

Observations recorded:

The Plant height (cm), Number of branchesand Number of leaves were recorded at 25 and 50 days after transplanting.

Total biomass content:

The fresh and dry weight of shoot and root (g) were recorded at 50 days after transplanting and expressed in grams per plant.

Plant analysis:

Estimation of IAA and GA in tomato leaf sample Leaf sample extraction:

The extraction and purification was made following the method of Kettner and Doerffling (1995).

Estimation of indole-3-acetic acid (IAA):

Ethyl acetate (15 ml) fraction was taken and 4 ml of Salper's reagent was added and incubated in darkness for 1 hr at 28°C (Gordon and Weber, 1951). The intensity of the pink colour developed was read in spectrophotometer at 535 nm. By referring to a standard graph prepared with chemical grade indole-3-acetic acid, the quantity of IAA in the sample was determined.

Estimation of gibberellic acid (GA):

Ethyl acetate (15ml) fraction was taken and 2 ml of zinc acetate solution was added (Paleg, 1965). After 2 min, 2 ml of Potassium ferrocyanide solution was added and the mixture was centrifuged at 10,000 rpm for 10 min. Five ml of supernatant was added to 5 ml of 30 % hydrochloric acid (HCl) and the mixture was incubated at 20 °C for 75 min. The blank was prepared with 5 % HCl. The absorbance was measured at 254 nm in a spectrophotometer. By referring to a standard graph prepared with chemical grade of GA_3, the quantity of GA_3 in the sample was determined.

RESULTS AND DISCUSSION

The data pertaining to plant height, number of leaves and number of branches at 25 and 50 DAT is given in the Table 1. At 25 DAT significantly higher plant height, number of leaves and number of branches were recorded by the treatment T_3 (TCL – 1) 24.50 cm, 53.30 and 8.90, respectively and lowest was recorded by treatment T_1 (control) 16.40 cm, 40.30, and 6.70, respectively. At 50 significantly higher plant height, number of leaves and number of branches were recorded by the treatment T_3

(TCL – 1) 44.73 cm, 80.00 and 11.40 respectively and lowest was recorded by treatment T_1 (control) 22.20 cm, 55.70, and 8.00, respectively.

Such enhancement effect of yeast isolates Root dip might be attributed to the favorable influence on metabolism and biological activity and their stimulatory effect on photosynthetic pigments, leaf area, cell turgor and enzyme activity which helped for vegetative growth of plants (Mady, 2009, Abou and Mady, 2012).

These results are were also conformation with findings of Mona *et al.* (2013) They have reported that application of yeast extract increased the The Plant height (cm), Number of branches and Number of leaves in soybean plants (Mekki, and Amal, 2005). Similer results were obtained by Abdel *et al.* (2012) in Snap bean crop.

The data pertaining to root length, fresh shoot,root and dry shoot, root biomass at 50 DAT is given in the Table 2.The treatment T_3 (TCL-1) was recorded maximum root length, fresh shoot biomass, dry shoot biomass, fresh root biomass and dry root biomass, 14.70 cm, 24.00 g/plant, 11.75 g/plant, 7.98 g/plant and 3.91 g/ plant respectively, the lowest were recorded by control treatment (T_1) 9.00 cm, 11.00 g/plant, 6.23 g/plant, 3.67 g/plant and 2.07 g/plant, respectively at 50 DAT.

The significant increase in root length, fresh shoot, root and dry shoot, root biomass at 50 DAT was observed due to inoculation of yeast isolates to tomato crop at 50 DAT. These results are in conformation with the findings

Table 1: Effect of IAA and GA_3 producing yeast isolates on tomato crop plant height, number of leaves and number of branches under pot condition at 25 and 50 DAT by root dip method

Treatments	Plant height (Cm)		Number of leaves at 25 DAT		Number of branches at 25 DAT	
	25 DAT	50 DAT	25 DAT	25 DAT	25 DAT	25 DAT
T_1- Control	16.40	22.20	40.30	55.70	6.70	8.00
T_2- MZL – 8	23.50	43.20	52.30	74.70	8.70	10.70
T_3- TCL- 1	24.50	44.73	53.30	80.00	8.90	11.40
T_4- CAL – 1	22.30	40.50	47.30	68.00	7.90	9.70
T_5- ACL – 3	21.30	38.27	46.00	66.00	7.70	9.40
T_6- IAA (1 ppm)	22.10	41.25	49.00	71.70	8.20	10.20
T_7- GA_3 (1 ppm)	22.50	42.28	50.30	72.30	8.40	10.30
T_8- YM Broth	19.50	24.20	41.00	62.70	6.80	9.00
Sem ±	1.15	2.25	3.78	3.25	1.10	1.32
CD @ 5%	4.76	6.10	8.95	8.62	2.86	3.21

Note: MZL – 8 = *Manilkara zapota* leaf isolate – 8, TCL – 1= *Theobroma cocoa* leaf isolate – 1
CAL – 1 = *Coffea robusta* leaf isolate – 1, ACL – 3 = *Averrhoa carambola* leaf isolate - 3
IAA = Indole acetic acid ,GA_3= Gibberellic acid,YM Broth = Yeast Extract Malt Extract Broth

Table 2: Effect of IAA and GA_3 producing yeast isolates on tomato crop root length, fresh Shoot biomass, dry shoot biomass, fresh root biomass and dry root biomass under pot condition at 50 DAT by root dip method

Treatments	Root length (cm)	Fresh shoot biomass (g/plant)	Dry shoot biomass (g/plant)	Fresh root biomass (g/plant)	Dry root biomass (g/plant)
T_1- Control	9.00	11.00	6.23	3.67	2.07
T_2- MZL – 8	12.30	23.98	11.51	7.75	3.62
T_3- TCL- 1	14.70	24.00	11.75	7.98	3.91
T_4- CAL – 1	10.30	23.00	11.00	7.62	3.67
T_5- ACL – 3	12.00	22.75	10.25	7.58	3.42
T_6- IAA (1 ppm)	12.70	16.75	10.50	5.58	3.50
T_7- GA_3 (1 ppm)	11.70	23.25	10.98	7.48	3.31
T_8- YM Broth	9.70	11.50	6.50	3.83	2.17
Sem ±	0.86	2.21	2.24	0.94	0.56
CD @ 5%	2.56	6.10	6.23	2.56	1.64

Note: MZL – 8 = *Manilkara zapota* leaf isolate – 8, TCL – 1= *Theobroma cocoa* leaf isolate – 1
CAL – 1 = *Coffea robusta* leaf isolate – 1, ACL – 3 = *Averrhoa carambola* leaf isolate - 3
IAA = Indole acetic acid ,GA_3= Gibberellic acid,YM Broth = Yeast Extract Malt Extract Broth

of Ramadan *et al.* (2013). They reported that application of yeast as a biofertilizer increased the root length fresh shoot, root and dry shoot, root biomass at 50 DAT in Sugar beet.

The data pertaining to IAA and GA_3 content at 50 DAT is given in the Table 3.The significantly maximum IAA content in tomato leaf sample was recorded in plants roots dipped with the yeast isolate TCL – 1 (1.205 µg/g of leaf) followed by plants roots dipped with MZL-8 (1.123 µg/g of leaf). The minimum IAA content in tomato leaf sample was recorded in control plants (0.384 µg/g of leaf).

Significantly higher GA_3 content in tomato leaf was noticed in plants inoculated with the yeast isolates compared to control plants. The plants roots dipped with the yeast isolate TCL – 1 was showed significantly higher GA_3 content (0.550 µg/g of leaf) in tomato leaf which was on par with plants roots dipped with MZL-8. Significantly lower GA_3 content (0.200 µg/g of leaf) in tomato leaf sample was recorded in control plants.

This may be due to the production of IAA and GA_3 by inoculated yeast isolates which may promote various physiological activities in plant which are considered to be indispensable for proper growth and development of plants which is in close agreement with the findings of Salwa (2013) who reported that application of yeast increased IAA and GA_3 content in the shoot of field bean.

Table 3 : Effect of IAA and GA_3 producing yeast isolates on tomato crop leaf IAA and GA_3 content in leaf under pot condition at 50 DAT by root dip method

Treatments	IAA content (µg/g of leaf)	GA_3 content (µg/g of leaf)
T_1- Control	0.384	0.200
T_2- MZL – 8	1.123[c]	0.500
T_3- TCL- 1	1.205	0.550
T_4- CAL – 1	0.984	0.320
T_5- ACL – 3	0.783	0.450
T_6- IAA (1 ppm)	0.834	0.420
T_7- GA_3 (1 ppm)	0.543	0.480
T_8- YM Broth	0.432	0.250
T_1- Control	0.384	0.200
Sem ±	0.242	0.452
CD @ 5%	0.620	1.602

Note: MZL – 8 = *Manilkara zapota* leaf isolate – 8, TCL – 1= *Theobroma cocoa* leaf isolate – 1
CAL – 1 = *Coffea robusta* leaf isolate – 1, ACL – 3 = *Averrhoa carambola* leaf isolate - 3
IAA = Indole acetic acid ,GA_3= Gibberellic acid,YM Broth = Yeast Extract Malt Extract Broth

REFERENCES

Abdel, R. M., Tawaha, A. and Faisal, A. (2012). Effects of Site and Exogenous Application of Yeast Extract on the Growth and Chemical Composition of Soybean. *Int. Conf. Agric. Environ. Biol. Sci.,* pp. 52-54.

Abou, A. E. Y. and Mady, M. A. (2012). Effect of boron and yeast extract foliar application on Growth, Pod Setting and both Green Pod and Seed Yield of Broad Bean (*Vicia faba* L). *J. Amer. Sci.* **8**(4) : 517-533.

Gordon, S. A. and Weber, R. P. (1951). Colorimetric estimation of indole-acetic acid. *Plant Physiol.,* **26**: 192-195.

Kettner, J. and Doerffling, K. (1995). Biosynthesis and metabolisim of abscisic acid in tomato leaves infected with *Botrytis cinerea*. *Plant,* **196** : 627-634.

Mady, M. A. (2009). Effect of foliar application with yeast extract and zinc on fruit setting and yield of Faba bean (*Vicia faba* L). *J. Biol. Chem. Environ. Sci.,* **4** (2): 109-127.

Mekki, B. B. and Amal, G. A. (2005). Growth, yield and seed quality of Soybean (*Glycine max* L.) as affected by organic, biofertilizer and yeast application. *Res. J. Agri. Biol. Sci.,* **1**(4): 320-324.

Mona, G. D., Safaa, R.E. and Mervat, S.S. (2013). Role of methanol and yeast in improving growth, yield, nutritive value and antioxidants of Soybean. *World Appl. Sci. J.,* **26**(1): 06-14.

Paleg, L. G. (1965). Physiological effects of gibberellins. *Ann. Res. Plant Physiol.,* **16** : 134-138.

Pei, F. S., Wei, T. F., LI, Y. S., Jyuan, Y. W., Shih, F. F. and Jui, Y. C. (2014). Indole-3-Acetic Acid-Producing Yeasts in the Phyllosphere of the Carnivorous Plant *Drosera indica* L. *J. Pone.* pp. 1-22.

Ramadan, A., Mohamed, S. and Saad, A. (2013). Effect of soil amendment with yeasts as bio-fertilizers on the growth and productivity of sugar beet. *African J. Agric. Res.,* **8**(1) 46-56.

Rose, A.H. and Harrison, J. S. (1987). *The Yeasts*: Vol. **1-5**: Academic Press, London.

Salwa, M. A. (2013). The influence of biostimulants on the growth and on the biochemical composition of *Vicia faba* CV. Giza 3 beans. *Romanian Biotechnol. Lett.,* **18** (2): 8061-8068.