RESEARCH ARTICLE

EFFICACY OF PGPR AND *TRICHODERMA* ON GROWTH AND YIELD PARAMETERS OF BELL PEPPER (*CAPSICUM ANNUUM* L.)

Sujata Kumari* Narender K. Bharat[1] and D.S. Chauhan[2]

Regional Office, National Seeds Corporation Ltd, Mohali- 160062 Punjab.
[1]Department of Seed Science and Technology, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan-173230 H P.
[2]Regional Office, National Seeds Corporation Ltd, Mohali- 160062 Punjab.
Email: sujatasst1990@gmail.com

Received-06.09.2019, Revised-25.09.2019

Abstract: A field experiment was carried out during (2016-17) at experimental farm of Department of Seed Science and Technology, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan-273230 (HP). Plant growth promoting rhizobacteria (PGPR) and biocontrol agent (BCA) were applied to crop as seedling root dip as well as soil application singly and in various combinations. Among different treatments, a combination of PGPR (seedling root dip) + *Trichoderma harzianum* (soil application) performed best w.r.t. various plant growth and yield parameters viz. maximum plant height (70.42 cm), minimum days to 50% flowering (51.00 days), maximum number of fruits/plant (9.50), maximum average fruit weight (44.01g), fruit length (6.68 cm), fruit width (6.18 cm), fruit size (42.05 cm) , minimum days to first picking (82.27), maximum harvest duration (58.33 days), maximum number of fruit pickings (7.93), highest fruit yield/plant (922.33 g), fruit yield/plot (13.83 kg) and fruit yield/ha (403.17 q) were recorded maximum with treatment T_5 PGPR (seedling root dip) + *Trichoderma harzianum* (soil application).

Keywords: Bell pepper, PGPR, BCA, *Trichoderma*

REFERENCES

Sreedhara, D.S., Kerutagi, M.G., Basabaraja, H., Kunnal, L.B. and Dodamani, M.T. (2013). Economics of capsicum production under protected conditions in northern Karnataka. *Karnataka Journal of Agriculture Science* 26(2): 217-219.

N.H.B. (2014-15). National Horticulture Board Statistical database. New Delhi.

N.H.B. (2013-14). National Horticulture Board Statistical database. New Delhi.

Sharma, A., Shankhdhar, D. and Shankhdhar, S.C. (2013). Enhancing grain iron content of rice by the application of plant growth promoting rhizobacteria. *Plant Soil and Environment* 59(2):89-94.

Chet, I. (1987). *Trichoderma* application, mode of action, and potential as biocontrol agent of soilborne plant pathogenic fungi. *In*: Chet I (ed). Innovative Approaches to Plant Disease Control. John Wiley, New York, pp 137-160.

Harman, G.E. and Bjorkman, T. (1998). Potential and existing uses of *Trichoderma* and *Gliocladium* for plant disease control and plant growth enhancement. *In*: Kubicek CP, Harman GE (eds). *Trichoderma* and *Gliocladium* Vol. 2. Taylor and Francis, London, pp 229-265.

Gomez, K.A. and Gomez, A. (1984). Statistical Procedure for Agricultural Research-Hand Book. John Wiley & Sons, New York.

Gupta, S., Kaushal, R., Kaundal, K., Chauhan, A. and Spehia, R.S. (2015). Efficacy of indigenous plant growth promoting rhizobacteria on capsicum yield and soil health. *Research on Crops*, 16(1): 123-132.

Mandyal, P., Kaushal, R., Sharma, K. and Kaushal, M. (2012). Evaluation of native PGPR isolates in bell pepper for enhanced growth, yield and fruit quality. *International Journal of Farm Sciences* 2(2): 28-35.

Ryu, C.M., Reddy, M.S., Zhang, S., Murphy, J.F. and Kloepper, J.W. (2003). Plant growth promotion of tomato by a biological preparation (LS 213) and evaluation for protection against cucumber mosaic virus. *Phytopathology*, 89: 87-95.

Bhagat, S. (2016). Exploration of microbial resources for plant disease management. *Indian Phytopathology*, 69(2): 107-113.

Sajan, K.M., Gowda, K.K., Kumar, S.N. and Sreeramu, B.S. (2002). Effect of biofertilizers on growth and yield of chilli (*Capsicum annuum* L.) cv. Byadagi Dabba at different levels of nitrogen and phosphorus. *Journal of Spices and Aromatic Crops*, 11(1): 58-61.

Basavaraju, O., Rao, A.R.M. and Shankarappa, T.H. (2002). Effect of *Azotobacter* inoculation and nitrogen levels on growth and yield of radish (*Raphanus sativus* L.). *Biotechnology of Microbes and Sustainable Utilization*, pp.155-160.

Kanchana, D., Jayanthi, M., Usharani, G., Saranraj, P. and Sujitha, D. (2014). Interaction effect of combined inoculation of plant growth promoting rhizobacteria on growth and yield parameters of chilli variety K1 (*Capsicum annuum* L.). *International Journal of Microbiological Research*, 5(3): 144-151.

*Corresponding Author

Datta, M., Palit, R., Sengupta, C., Pandit, M.K. and Banerjee, S. (2011). Plant growth promoting rhizobacteria enhance growth and yield of chilli (*Capsicum annuum* L.) under field conditions. *Australian Journal of Crop Science*, 5(5): 531-536.

Handelsman, J. and Stabb, E.V. (1996). Biocontrol of soil-borne plant pathogens. *The Plant Cell* 8: 1855-1869.

Nehl, D.B., Allen, S.J. and Brown, J.F. (1996). Deleterious rhizosphere bacteria: an integrating perspective. *Applied Soil Ecology*, 5: 1-20.

Cartieaux, F.P., Nussaume, L. and Robaglia, C. (2003). Tales from the underground: molecular plant rhizobacteria interactions. *Plant Cell and Environment* 26: 189-199.

Weller, D.M. and Cook, R.J. (1986). Increased growth of wheat by seed treatments with fluorescent pseudomonads, and implications of *Pythium* control. *Canadian Journal of Plant Pathology*, 8: 328-334.

Dunne, C., Crowley, J.J., Loccoz, Y.M., Dowling, D.N., de-Bruijn, F. and Gara, O.F. (1993). Biological control of *Pythium ultimum* by *Stenotrophomonas maltophilia* 111W81 is mediated by an extracellular proteolytic activity. *Microbiology* 143: 3921-3931.

Kloepper, J.W., Hume, D.J., Scher, F.M., Singleton, C., Tipping, B., Laliberte, M., Frauley, K., Kutchaw, T., Simonson, C., Lifshitz, R., Zaleska, I. and Lee, L. (1988). Plant growth promoting rhizobacteria on canola (rapeseed). *Plant Disease*, 72: 42-45.

Liu, L., Kloepper, J.W. and Tuzun, S. (1995). Induction of systemic resistance in cucumber against bacterial angular leaf spot by plant growth promoting rhizobacteria. *Phytopathology* 85: 843-847.

Glick, B.R., Patten, C.L., Holguin, G. and Penrose, G.M. (1999). Biochemical and genetic mechanisms used by plant growth promoting bacteria. Imperial College Press, London.

Herman, M.A.B., Naultb, B.A. and Smart, C.D. (2008). Effects of plant growth-promoting rhizobacteria on bell pepper production and green peach aphid infestations in New York. *Crop Protection*, 27: 996-1002.

Minorsky, P.V. (2008). Pyrroloquinoline Quinone: A new plant growth promotion factor. *American Society of Plant Biologists*, 146: 323-324.

Lugtenberg, B. and Kamilova, F. (2009). Plant growth promoting rhizobacteria. *Annual Review of Microbiology* 63(1): 541-556.

Couillerot, O., Prigent-Combaret, C., Caballero-Mellado, J. and Moenne-Loccoz, Y. (2009). *Pseudomonas fluorescens* and closely-related fluorescent pseudomonads as biocontrol agents of soil-borne phytopathogens. *Letters in Applied Microbiology*, 48(5): 505-512.

Ali, Q., Elahi, M., Ahsan, M., Tahir, M.H.N. and Basra, S.M.A. (2011). Genetic evaluation of maize (*Zea mays* L.) genotypes at seedling stage under moisture stress. *International Journal for Agro Veterinary and Medical Sciences*, 5(2): 184-193.