The Pharma Innovation Journal 2021; 10(4): 81-84

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; 10(4): 81-84

www.thepharmajournal.com
Received: 05-02-2021
Accepted: 18-03-2021

K Hariprasad
Department of Plant Pathology, College of Agriculture, University of Agricultural Sciences, Dharwad, Karnataka, India

MG Palakshappa
Department of Plant Pathology, College of Agriculture, University of Agricultural Sciences, Dharwad, Karnataka, India

K Dinesh
Department of Plant Pathology, College of Agriculture, University of Agricultural Sciences, Dharwad, Karnataka, India

Krishnananda S Iliger
Department of Plant Pathology, College of Agriculture, University of Agricultural Sciences, Dharwad, Karnataka, India

Corresponding Author:
K Hariprasad
Department of Plant Pathology, College of Agriculture, University of Agricultural Sciences, Dharwad, Karnataka, India

Efficacy of bio control agents under *in vitro* against *Alternaria porri* (Ellis) Cifferi. Causing purple blotch in onion

K Hariprasad, MG Palakshappa, K Dinesh and Krishnananda S Iliger

DOI: https://doi.org/10.22271/tpi.2021.v10.i4b.5925

Abstract
Purple blotch of onion caused by *Alternaria porri* (Ellis) Cif. is most devastating disease of onion in India has it causes huge loss under field conditions. In the recent days bio control agents are playing an important role in controlling the incidence of purple leaf blotch disease. Hence the study was undertaken to check the efficacy of nine fungal and eight bacterial antagonists under laboratory conditions by employing dual culture techniques. From the study it was clear that fungal bioagents takes upper hand in inhibiting the pathogen growth when compared to bacterial antagonists. Among nine fungal antagonists under study the highest mycelial inhibition was recorded in the isolate *Trichoderma viride*-1 with the per cent inhibition of 94.50 per cent. Followed by isolate *Trichoderma harzianum*-1 showing the inhibition per cent (90.19%). However the least inhibition of the mycelia growth 33.72 was noticed in *Bacillus subtilis* -3 isolate.

Keywords: Bio control agents, *In vitro*, *Alternaria porri***,** purple blotch, onion

Introduction

Onion (*Allium cepa* L.) is the oldest known important vegetable crop of the family Alliaceae which is been globally cultivated, in 175 countries for around 5000 years (Mehta, 2017) [7]. The primary center of origin is believed to be central Asia. Whereas, near East and Mediterranean are the secondary centers of origin (Vavilov, 1951) [15]. Onion is regarded as “Queen of kitchen” due to its highly valued flavor, aroma, unique taste, making the crop an important ingredient in all types of dishes. They are mostly fried, stewed or baked before consumption; however, it can be also eaten as raw, in the form of salads and condiment especially sweet onions having mild taste. There is a lot of demand for Indian onion in the world, Apart from meeting the domestic requirements of the country 15.00-18.00 lakh tonnes is being exported to the neighboring countries (Anon., 2018) [1]. However, in spite of the increase in area planted, the production is estimated to be 4.5 per cent lower as compared to the previous years (Anon., 2018) [1]. Poor yielding short day genotypes, susceptibility of genotypes to major pests and diseases, improper and inadequate use of production technologies continues to affect the production. Several biotic factors which lower the productivity of onion in India have been identified among all purple blotch, (*Alternaria porri* (Ellis) Ciferri.) alone is responsible for 30-100 per cent crop loss under congenial weather conditions Shahanaz *et al.* (2007) [12]. With the rise in per capita vegetable consumption from 95 to 175 grams and also with the emphasis laid on export of vegetables, there is a great need to increase the production of vegetables in India So by considering, the economic importance of onion and reduction in its production due to purple blotch disease and ever increasing demand for safe, healthy food in these days. Hence the present study was undertaken using biological control agents as they seems to be ecologically conscious cost effective and serves as alternative strategy in the organic farming system.

Material and Methods

In vitro evaluation was carried out with selected bio agents listed in table 1 employing dual culture technique. Twenty ml of sterilized and cooled potato dextrose agar was poured into sterile Petri plates. Fungal antagonists were evaluated by inoculating the pathogen at one side of the plate and the antagonist on the opposite side of the same plate by leaving 3-4 cm gap. Bacterial antagonist was streaked in the corner of the plate after which a fungal disc was placed. Each treatment was replicated three times.

After 8 days of incubation period the growth of pathogen was measured. Per cent inhibition over control was worked out according to the equation of Vincent (1947) [17].

$$I = \frac{C - T}{C} \times 100$$

Where,
I = Per cent inhibition of the mycelium
C = Growth of the mycelium in control
T = Growth of the mycelium in treatment

Table 1: List of Bio agents used for *in vitro* evaluation against *Alternaria porri*

Bio agent	Source	Location
Trichoderma harzianum -1	Biocontrol laboratory	ICAR-NBAIR, Bengaluru
Trichoderma harzianum -2	Plant Pathology laboratory	UAS, GKVK, Bengaluru
Trichoderma asperellum	Microbiology laboratory	UAS, GKVK, Bengaluru
Trichoderma koningii	Microbiology laboratory	UAS, GKVK, Bengaluru
Trichoderma harzianum -3	Microbiology laboratory	UAS, Raichur
Trichoderma harzianum -4	Native isolate	MARS, UAS, Dharwad
Trichoderma harzianum -5	Institute of organic farming (IOF)	UAS, Dharwad
Trichoderma viride -1	Commercial formulation (Kalpavruksha)	Karnataka Agrochemicals, Dharwad
Trichoderma viride -2	Commercial formulation (Multiplex Nisarga)	Multiplex product wholesalers, Hubbali
Bacillus subtilis-1	Native isolate	MARS, UAS, Dharwad
Bacillus subtilis-2	Microbiology laboratory	UAS, Raichur
Bacillus subtilis-3	Institute of organic farming (IOF)	UAS, Dharwad
Bacillus amyloliquefaciens	Plant Pathology laboratory	TNAU, Coimbatore
Pseudomonas fluorescens-1	Native isolate	MARS, UAS, Dharwad
Pseudomonas fluorescens-2	Microbiology laboratory	UAS, Raichur
Pseudomonas fluorescens-3	Institute of organic farming (IOF)	UAS, Dharwad
Pseudomonas fluorescens-4	Commercial formulation (Multiplex Sparsha)	Multiplex product wholesalers, Hubbali

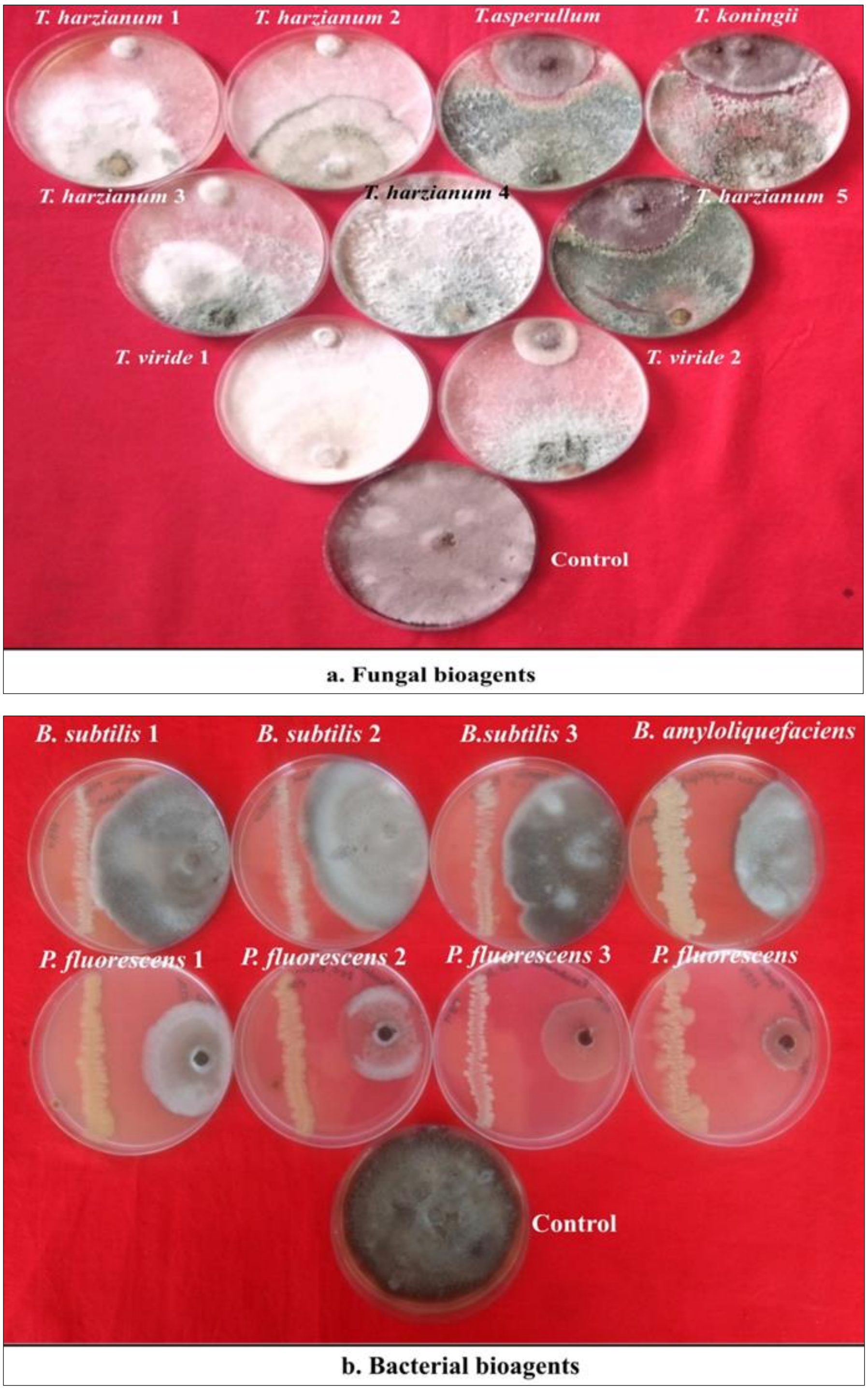
Results and Discussions

In vitro evaluation of bio agents by dual culture revealed significant difference in per cent inhibition of mycelial growth of *A. porri* and the tested bioagents. Maximum mycelial inhibition of (94.50%) was noticed in *T.viride*-1 *i.e.* Kalpavruksha (commercial formulation) followed by *T. harzianum*- 2, 3 and 1 which were found to be on par with each other with a inhibition per cent of (90.58, 90.58 and 90.19) respectively. While, the minimum mycelial inhibition (66.66%) was noticed in *T. koningii* (Table 2 and Plate 1). Similar findings were observed by (Kumari *et al*., 2006) [6] (Pramodkumar, 2007) [10], (Kareem, 2008) [5], (Mishra and Gupta; Wanggikar, 2012) [8] and Rahman *et al.* (2015) [11] who reported that *T. viride* as effective under *in vitro* in inhibiting the maximum mycelial growth of the fungus.

Among the bacterial bioagents, *Pseudomonas fluorescens*-4 *i.e.* Multiplex sparsha (commercial formulation) showed maximum inhibition of mycelial growth (72.15%). Whereas, *Pseudomonas fluorescens*-3 (57.64%) was found to be on par with *B. amyloliquefaciens* (56.47%). While, the least inhibition of mycelial growth was observed in *B.subtilis*-1 (26.66%) (Table 2 and Plate 1). The obtained results were in line with the earlier reports of (Prakasam, 2010) [9] and (Wanggikar, 2012b) [18].

Table 2: *In vitro* evaluation of fungal and bacterial bio agents against *Alternaria porri*

Sl. No.	Bio agents	Per cent inhibition
1.	*Trichoderma harzianum*-1	90.19 (71.75)
2.	*Trichoderma harzianum*-2	90.58 (72.15)
3.	*Trichoderma asperullum*	74.51(59.68)
4.	*Trichoderma koningii*	66.66 (54.73)
5.	*Trichoderma harzianum* -3	90.58 (72.15)
6.	*Trichoderma harzianum* -4	89.80 (71.38)
7.	*Trichoderma harzianum* -5	59.21 (50.30)
8.	*Trichoderma viride*-1	94.50 (76.46)
9.	*Trichoderma viride*-2	83.52 (66.06)
10.	*Bacillus subtilis* -1	26.66 (31.08)
11.	*Bacillus subtilis* -2	34.11 (35.73)
12.	*Bacillus amyloliquefaciens*	56.47 (48.71)
13.	*Bacillus subtilis* -3	33.72 (35.49)
14.	*Pseudomonas fluorescens* -1	52.94 (46.68)
15.	*Pseudomonas fluorescens* -2	50.98 (45.56)
16.	*Pseudomonas fluorescens* -3	57.64 (49.39)
17.	*Pseudomonas fluorescens* -4	72.15 (58.15)
S.Em. ±		0.51
C.D. at 1%		1.99



a. Fungal bioagents

b. Bacterial bioagents

Plate 1: *In vitro* efficacy of Fungal and Bacterial bio agents against *A. porri*

In the present study *Trichoderma* species had more mycelial inhibition compared to bacterial antagonists. This may be due to higher competitive ability of *Trichoderma* spp. either by mycoparasitism, antibiosis or siderophore production and also due to possibilities of existence of microbial interactions *viz*., stimulation, inhibition, mutual intermingling of growth of antagonistic isolate over test pathogen. Ghaffar (1969) [3]. Fuji *et al.* (1978) [2] and Vinale *et al.* (2008) [16] reported that *Trichoderma* spp. produced secondary metabolites such as antibiotics (6-pentyl-alpha-pyrone (6pp), iso-cyanide derivatives), acids (heptelidic and koningic acid), peptaibols and cell wall degrading enzymes (CDWE) which are implicated in the growth inhibition of many phytopathogenic fungi. Similarly, the mechanism of inhibition of bacterial isolate *Pseudomonas* spp. against *A. porri* presumably is due to the activity of secondary metabolites including antibiotics, siderophores and hydrogen cyanide (Sullivan and Gara, 1992) [14]. While, *Bacillus* spp. produces a variety of antibiotics such as zwittermycin-A (He *et al.*, 1994) [4] kanamycin and lipopeptida of iturin, surfatin and fengycin (Stabb *et al.*, 1994) [13] that are effective against many fungi.

References

1. Anonymous. Monthly report on Onion, Horticultural statistics division, Department of Agriculture co-operation and farmers welfare, Ministry of Agriculture and Farmers Welfare, New Delhi (India) 2018.
2. Fuji K, Fujita E, Takaishi Y, Fujita T, Arita I, Komatsu M *et al*., New antibiotics, trichopolyns A and B: isolation and biological activity. *Experientia* 1978;34(2):237-239.

3. Ghaffar A. Biological control of white rot of onion, interaction effect of soil microorganisms with *Sclerotium cepivorum* Berk. J Mycol. Plant Pathol 1969;38(1):101-111.
4. He H, Silo-Suh LA, Handelsman J, Clardy J. Zwittermicin A: An antifungal and plant protection agent from *Bacillus cereus*. Tetrahedron letters 1994;35(6):2499-2502.
5. Kareem AM. Factors influencing the disease development of purple blotch of onion and effect of certain plant extracts, fungicides and bio control agents on the causal organism of the disease. M. Sc. (Agri.) Thesis, Acharya N. G Ranga Agriculture Univ., Hyderabad (India) 2008.
6. Kumari L, Shekhawat KS, Rai PK. Efficacy of fungicides and plant extracts against *Alternaria* blight of periwinkle. J Mycol. Plant Pathol 2006;36(2):134-137.
7. Mehta I. Origin and history of onions. J Humanities Sci 2017;22(9):7-10.
8. Mishra RK, Gupta RP. *In vitro* evaluation of plant fungicides against purple blotch and stemphylium blight of onion. J Medicinal Plant. Res 2012;6(4):5658-5661.
9. Prakasam T. Characterization and management of *Alternaria porri* incitant of purple blotch of onion, Ph. D Thesis, Indian Agricultural Research Institute, New Delhi, India 2010.
10. Pramodkumar T. Biological management of *Alternaria* blight of onion. M. Sc. (Agri.) Thesis, Univ. Agric. Sci. Dharwad, Karnataka (India) 2007.
11. Rahman SM, Maniruzzaman SM, Nusrat S, Khair A. *In vitro* evaluation of botanical extracts, bio agents and fungicides against purple blotch diseases of bunch onion in Bangladesh. Adv. Zool. Bot 2015;3(4):179-183.
12. Shahanaz E, Razdan VK, Raina PK. Survival, dispersal and management of foliar blight pathogen of onion. J Mycol. Plant Pathol 2007;37(2):213-214.
13. Stabb EV, Jacobson LM, Handelsman JO. Zwittermicin A-producing strains of *Bacillus cereus* from diverse soils. Appl. Environ. Microbiol 1994;60(12):4404-4412.
14. Sullivan O, Gara O. Traits of *Flouroscent Pseudomonas* spp. involved in suppression of plant root pathogens. Microbiol. Rev 1992;56(1):662-676.
15. Vavilov. The origin, variation, immunity and breeding of cultivated plants. *Chronica Botanica*, Mass (USA) 1951, 89-95.
16. Vinale F, Sivasithamparam K, Ghisalberti EL, Marra R, Woo SL, Lorito M. *Trichoderma* Plant-Pathogen interactions. Soil Biol Biochem 2008;40(1):1-10.
17. Vincent JM. Distortion of fungal hyphae in the presence of certain inhibitor. Nature 1947;159(1):800-801.
18. Wanggikar AA. Studies on purple blotch of onion incited by Alternaria porri (Ellis) Cif. M.Sc. (Agri.) Thesis, Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra 2012.