Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2020; 9(6): 620-622
Received: 14-09-2020
Accepted: 17-10-2020

DS Bharti
Department of Plant Pathology, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

SM Chapke
Department of Plant Pathology, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

GV Bhosale
Department of Plant Pathology, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

DN Dhutraj
Department of Plant Pathology, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Corresponding Author:
DS Bharti
Department of Plant Pathology, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

In vitro efficacy bioagents against bacterial blight of clusterbean caused by *Xanthomonas axonopodis* pv. *cyamopsidis*

DS Bharti, SM Chapke, GV Bhosale and DN Dhutraj

Abstract
The different bioagents were evaluated against *Xanthomonas axonopodis* pv. *cyamopsidis* causing bacterial blight of clusterbean under *in vitro* condition. Among all the eight bioagent *viz., Trichoderma viride, Trichoderma harzianum, Trichoderma hamatum, Bacillus subtillis, Trichoderma konigii, Azospirillum sp., Acetobacter sp.* and *Pseudomonas fluroscences* were evaluated *in vitro* against *Xanthomonas axonopodis* pv. *cyamopsidis*. All the treatments significantly inhibited bacterial growth of *Xanthomonas axonopodis* pv. *cyamopsidis* over untreated control. Among eight bioagent *Pseudomonas fluroscences, Bacillus subtilis and Acetobacter* sp. significantly inhibited the bacterial growth each at 81.26%, 78.95% and 76.72% respectively.

Keywords: *Xanthomonas axonopodis, Pseudomonas fluroscences, Bacillus subtilis*

Introduction
Cluster bean [*Cyamopsistetragonoloba* L. Taub.] (2n=14) is a drought tolerant leguminous vegetable belonging to *Leguminoceae* (*Fabaceae*) family and temperature tolerance commonly known as guar. It is also known by other names such as khutti, dararretic, guari etc. In India guar is known as poor mans crop and has been grown for years in arid and semi arid conditions in southern Asia as a kharif crop (Kumar, 2005) [13]. Primarily, guar is a drought hardy, deep rooted, summer annual legume, grown mainly in the dry habitat. This crop has a great industrial importance in recent years, mainly due to the presence of gum (galactomannan) in its endosperm, which constitutes about 30-32 per cent of the whole seed.Clusterbean seed is used as a concentrate for animals and for extraction of gum (Choudhary *et al.*, 2014) [6].

Clusterbean gum and its derivatives are used in various industries like textile, paper, cosmetics, mining, petroleum, pharmaceutical, food processing, oil drilling, explosives, well drilling (Rathore *et al.*, 2010) [15]. Clusterbean is commercially grown in India, Pakistan and U.S.A. and to a limited extent in Australia, Brazil and South Africa. Overall, India produces around 80% of global cluster bean production. It is cultivated on more than 4 m ha in India, Rajasthan alone accounts for around 80% of the area and production. Owing to its demand in the international market, it has been introduced in the non-traditional growing areas like Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra and Chhattisgarh. Further, its cultivation is also being taken up under irrigated conditions during summer (Bhatt, 2017) [3]. In India 2016-17clusterbean area, production and productivity is 42.6 lakh hecter, 24.2 thousand ton and 567 kg/ha respectively (Anonymous, 2017) [1]. In Maharashtra area, production and productivity is 21.6 lakh ha, 0.0063 thousand ton and 360 kg/ha respectively (Anonymous, 2017) [1]. The leaf blight pathogen *Xanthomonasaxonopodis* pv. *cyamopsidis* causes drastic reduction in plant stand and yield as high as 58% in cultivar. It is seed borne and can survive in seeds for up to one year. The disease appears both as leaf spot and blight simultaneously (Sain and Gour, 2009) [16]. The spots initially are intraveinal, round, water soaked or oily in appearance and well defined on the dorsal surface of leaf. The bacterial blight of guar is characterized by the appearance of V shaped lesions, which rapidly spread to the entire lamina giving it a totally blighted appearance.

Material and Methods
In vitro evaluation of bioagents
A total of eight bioagents (as detailed under treatments) were evaluated *in vitro* against *Xanthomonas axonopodis*, by inhibition zone assay method. A suspension of *Xanthomonas* the sterilized petriplates and allowed to solidify.

A loopful *axonopodis* pv. *Cyamopsidis* multiplied in nutrient broth (20 ml) was mixed with nutrient agar medium (1000 ml) contained in flask. Fifteen to twenty ml of seeded medium was poured into culture of the antagonistic organism was placed in the centre of petriplates containing the seeded medium. In case of fungal antagonists, mycelial discs of 5 mm (dia.) size taken from actively growing culture were placed in the centre of the plates. The inoculated plates were then incubated at 28˚C for 72 hours. The experimental details were as given below:

Experimental details
Design: CRD
Replications: Three
Treatments: Nine

Treatment details

Tr. No.	Treatments	Tr. No.	Treatments
T_1	*Trichoderma viride*	T_6	*Azospirilium sp.*
T_2	*Trichoderma harzianum*	T_7	*Acetobacter sp.*
T_3	*Trichoderma hamatum*	T_8	*Pseudomonas fluorescens*
T_4	*Bacillus subtilis*	T_9	Control (untreated)
T_5	*Trichoderma konigii*		

Observations were recorded for the production of inhibition zone around the antagonistic microorganisms around the growth of the pathogen and the results obtained were calculated and analyzed statistically.

Per cent inhibition of the test pathogen by the bioagents, over untreated control was calculated by applying following formula (Vincent, 1947).

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

Where,
I = Per cent inhibition
C = Diameter of pathogen colony in control
T = Diameter of pathogen colony in treatment

***In vitro* efficacy of bioagents**
Results (Table 5) revealed that all the bioagents evaluated exhibited fungistatic/antifungal activity against *Xanthomonas axonopodis* pv. *cyamopsidis* and inhibited its growth, over untreated control (Plate-V).
However, *T. viride* was found most effective with least mycelial growth (16.86 mm) and highest mycelial inhibition (81.26%), followed by *T. harzianum*(18.94 mm and 78.95%), *T. hamatum*(20.97 mm and 76.72%), *Aspergillusniger*(36.17 mm and 59.81%), *T. konigii* (39.16 mm and 56.48%), *Pseudomonas fluorescens* (47.50 mm and 47.42%) and *Bacillus subtilis* (50.17 mm and 44.25%).
The hyphae of *Trichoderma* wrap around the pathogen fungi and produce antibiotics and extracellular enzymes, which lyses the cell wall of these pathogens that damage them. The invading fungus eventually collapse and disintegrates.

Table 1: *In vitro* efficacy of bioagents against *Xanthomonas axonopodis* pv. *Cyamopsidis*

Tr. No.	Treatments	Mean Inhibition Zone (mm))*
T_1	*Trichoderma viride*	1.80 (3.42)*
T_2	*T. harzianum*	2.60 (8.90)
T_3	*T. hamatum*	3.39 (10.45)
T_4	*Bacillus subtilis*	11.50 (2.40)
T_5	*T. konigii*	2.40 (8.87)
T_6	*Azospirillum sp.*	5.76 (13.71)
T_7	*Acetobacter sp.*	8.90 (16.35)
T_8	*Pseudomonas fluorescens*	12.64 (20.97)
T_9	Control	0 (0.00)
	S. E. ±	0.04
	C.D. (P=0.01)	0.19

*Figures in Parenthesis are arcsine transformed values.

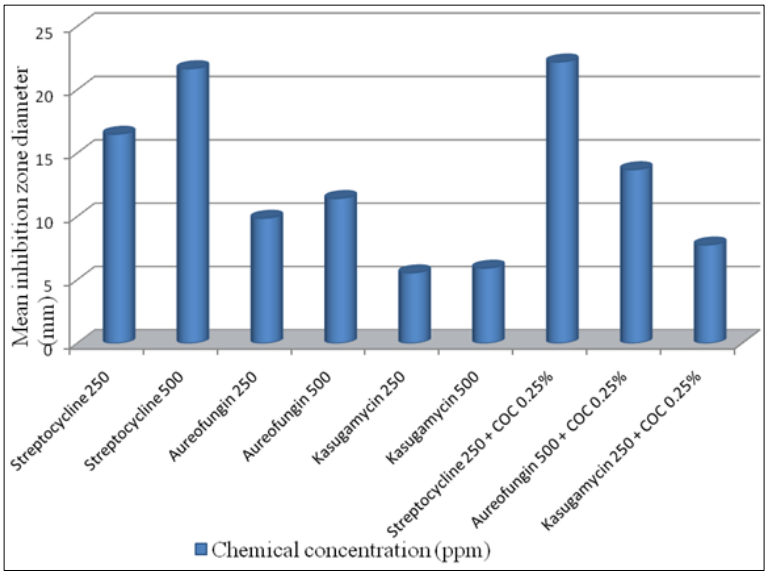

Fig 1: *In vitro* efficacy of bioagents against *Xanthomonas axonopodis* pv. *cyamopsidis*

Fig 2: *In vitro* efficacy of different bioagent on mycelial growth of *Xanthomonas axonopodis* pv. *cyamopsidis*

Conclusion and discussion

Considering the magnitude of the disease and its resultant losses, the investigation was undertaken to study the disease and pathogen thoroughly to bring out an appropriate management aspects to mitigate the problem effectively. Among the eight bioagents studied the *Pseudomonas fluorescens* was found most effective for inhibiting the growth of *Xanthomonas axonopodis* pv. *cyamopsidis* followed by *Bacillus subtilis*. These findings are similar to the results reported by Jindal *et al.* (1989) who tested the efficacy of *Bacillus spp*. to inhibit the growth of *Xanthomonas axonopodis* pv.*vignicola* and found that *Bacillus subtilis* was effective in controlling bacterial blight of cowpea.

Massomo *et al*. (2004) [14] also reported the inhibitory action of *Bacillus subtilis* against the bacterium *Xanthomonas axonopodis* pv.*vignicola* causing bacterial blight of cowpea which is similar to the observations recorded in the present study. Apet *et al*. (2018) [2] studied efficacy of different bioagent *viz*., *T. hamatum*, *B. subtilis*, *P. fluorescence*, *T. virens*, *T. Harzianum* and *T. viride* against *Xanthomonas axonopodis pv. punicae*. Maximum inhibition was observed due to the *Pseudomonas fluorescen* (12.82 mm), while minimum with *T. virens* (2.38mm).

References

1. Anonymous. Directorate of Economics and Statistics, Department of Agriculture, Cooperation and Farmers Welfare. Agricultural Statistics at a Glance, 2016, 227-228.
2. Apet KT, Agale RC, Thakur OS, Tambe MR. *In vivo* Evaluation of some Antibiotics and Bioagents against *Xanthomonas axonopodis* pv. *Punicae* causing Bacterial Blight of Pomegranate. Int. J Curr. Microbiol. App. Sci 2018;6:1900-1904.
3. Bhatt RK, Jukanti AK, Roy MM. Cluster bean [*Cyamopsis tetragonoloba* (L.) Taub.], an important industrial arid legume: A review. Legume Research 2017;40(2):207-214.
4. Bianca Obes Correa, Vanessa Nogueira Soares, Mauricio Sangiogo, Jose Rogerio de Oliveira, Andrea Bittencourt Moura. Interaction between bacterial biocontrol-agents and strains of *Xanthomonas axonopodis* pv. *phaseoli* effects on biocontrol efficacy of common blight in beans. Afr. J Microbiol. Res 2017;11(32):1294-1302.
5. Barnoczkine S. Possiblities to control *Fusarium* on onion. Zoldsegtermesztesi Kutato Intezet Bulletine 1986;19:33.
6. Choudhary RS, Yadav RS, Amin A. Productivity and economics of clusterbean (*Cyamopsis tetragonoloba*) as influenced by phosphorus fertilization and biofertilizers in western Rajasthan. Ann. Agril. Res. New Series 2014;35:62-64.
7. Davis GN, Reddy CS. A seedling blight stage of onion bulb rot. Phytopathology 1932;22:8.
8. Dennis C, Webster J. Antagonistic properties of species groups of Trichoderma. Trasactions of British Mycological Society 1971;57:25-39.
9. Gupta RC, Pandey NK, Bhonde SR. Evaluation of oil-cakes and bioefficacy of *Trichoderma viride* on soil borne fungal pathogens on onion and garlic. National symposium on the biotechnology in plant disease management for sustainable crop protection held at ARI, Pune on September 2008;39:17-18.
10. Jindal KK, Thind BS. Control of bacterial blight of cowpea (*Vigna unquiculata* (L.) Walp.), Trop. Pest Mangt 1990;36(3):211-213.
11. Jindal KK, Thind BS. Biological control of bacterial blight of cowpea (*Vignan unguiculata* L. Walp.). Phytopathol. Mediterr 1993;32(3):193-200.
12. Kumhar DR, Meena AK, Meena PN. Efficacy of different management modules against bacterial blight of clusterbean under epiphytotic conditions. J Pharm. & Phytochem 2018;7(3):1505-1509.
13. Mishra RK, Jaiswal RK, Kumar D, Saabale PR, Singh A. Management of major diseases and insect pests of onion and garlic: A comprehensive review. J Pl. Breeding and Crop Sci 2014;6(11):160-170.
14. Massomo SM, Mortensen CN, Mabagala RB, Newman MA, Hockenhull J. Biological control of black rot (*Xanthomonas campestris* pv. *campestris*) of cabbage in Tanzania with Bacillus strains, Phytopathology 2004;152:98-105.
15. Rathore BS. Efficacy of streptocycline and plant extracts against bacterial against bacterial leaf spot disease caused by *Xanthomonas axonopodid*pv. Vigna radiatae of greengram. Indian Phytopath 2010;63(4):384-386.
16. Sain SK, Gour HN. Pathological, Physiological and Biochemical Characterization of *Xanthomonas axonopodis* pv. *parthenii* Incitent of Leaf blight in Parthenium hysterophorus. J Myco. Pl. Pathol. 2008,38(3).
17. Singh RS. Diseases of vegetables crops. Vol. 3, Oxford and IBH Publication Co., New Delhi, India 1985,315-335.