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Efficacy of bioagents and plant extract against *Alternaria porri* causing purple blotch of onion

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ABSTRACT

The bioagent *T.harzarium* was found most effective in controlling the pathogen. Lowest disease severity (37.67%) was recorded in the spray treatment of *T.harzarium*.It was followed *by T. viride and P. fluorescens, B. subtilis*. Among the plant extract 5 per cent neem seed kernel extract gave maximum control of pathogen *i.e.* 44.24 per cent over control, followed by Followed by *Mentha arvensis, Allium sativum, Zingiber officinale, Vitex negundo.*The fungicide Mancozeb was at found at par with extract of NSK and *Mentha arvensis*.

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INTRODUCTION

The onion (*Allium cepa* L.) (Latin 'cepa' = onion), also known as the bulb onion or common onion, is used as a vegetable and is the most widely cultivated species of the genus *Allium*. Onion rightly called as "Queen of kitchen" is one of the oldest known and an important vegetable crop grown in India. Onion rightly called as "Queen of kitchen" is one of the oldest known and an important vegetable crop grown in India.

Crop is attacked by 66 diseases, of which 10 bacterial, 38 fungal, 6 nematodes, three viral, one phytoplasmal, one phanerogamic plant parasite and seven miscellaneous diseases and disorder. The major bacterial diseases are: Bacterial flower stalk and leaf necrosis (*Pantoeaagg lomerans*) fungal diseases are: Purple blotch (*Alternaria porri* (Ellis) Cif) and *Stemphylium* leaf blight (*Stemphylium vesicarium*) viral diseases are: Yellow dwarf (Yellow dwarf virus) and nematode diseases are: Stem and bulb nematode (*Ditylenchus dipsaci*) and root knot nematode (*Meloidogyne incognita*). Among these diseases the Purple blotch (*Alternaria porri*) is one of the major constrains in onion cultivation. The pathogen is polyphagus infecting crop like onion, Garlic, Shallot and other *Allium* crops. High relative humidity (80 to 90%) and optimum temperature (24 ± 1^0C) are needed for further development of Purple blotch disease symptoms causing considerable yield losses and is seed borne pathogen causing up to 20-60 per cent loss in bulb yield and extent of loss depend on time of infection and stage of crop growth (Sandhu *et al.*, 1981).

MATERIAL AND METHODS

Harmful effect of fungicide the present study was undertaken.Four bioagent and five plant extract were tested for their efficiency aginst the pathogen along with fungicide mancozeb.

Biocontrol agents :

Biocontrol agents like *T. viride, P. fluorescens, B. subtilis, T. harzianum* were obtained from BNF scheme College of Agriculture, Pune and Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani.

Plant extracts/Botanicals :

Plant species reported to exhibit antifungal and therapeutic properties (Alice, 1984) against fungal pathogens and available locally were collected from the farms of Oilseeds Research Station and College of Agriculture, Latur, and adjoining fields. Following locally available plant species were used for *in vivo* studies. Plant species Neem (*Azadirachta indica*) was used for study. The seed part of Neem is used against this pathogen.The plant parts /species of *zingiber officinale, mentha arvensis, Allium sativum, nirgudi* are collected from market and different fields. Plant part used neem (seed), zinger (rhizome), mint (leaves), garlic (clove), Nirgudi (leaves). Five plant extract were selected to estimate the antifungal behaviour against *A.porri* of of onion through poision food technique (Nene and Thapliyal, 1979). The plant species and part used with their conc.10 per cent. The fresh leaves and other parts of healthy plants were collected and were thoroughly washed with tap water and were air dried. Ten grams of plant tissue were ground using pestel and mortar by adding equal amount (10ml) of sterilized distilled water (1:1 w/v). The extract was filtered standard through muslin cloth. The supernatant was taken as standard plant extrac solution (100%). Further,the extract was diluted by adding sterilized water to get 10 per cent concentration. Besides, plant extracts at 10 per cent were also tested *in vitro* in pot culture.

The extract were tested both under pot as well as field condition. The crop was grown either in pots or fields and the first spray was given. Three sprayings of all the treatments were undertaken at an interval of 15 days, starting first spraying at 60 days after transplanting of the crops. When first symptoms of disease appeared. One plot/replication was maintained as unsprayed control without receiving any fungicide, botanical and bioagent. Observation on disease incidence and severity were recorded before each spray treatment and lastly 15 days after last spraying.

The experiment was laid in Completely Randomized Block Design. The variety was N-53 and Phule Baswant-780. The field trial was laid in RBD with three replication during *Kharif* season by using variety. Observation on disease incidence were recorded by counting treatment wise the number of plants affected with purple blotch disease and per cent disease incidence was calculated by applying the formula :

$$\text{Incidence (\%)} = \frac{\text{No. of plants showing disease symptoms}}{\text{Total no. of plants/plot}} \times 100$$

PDI = Total sum of numerical ratings /Total number of leaves observed x 100/y (y is the maximum category value in score chart.The PDI calculated by using Mckinney (1923) formula.

Ten plants per treatment per replication were selected randomly and tagged, and five leaves /plant were selected for recording purple blotch intensity. The purple blotch disease intensity was recorded applying 0-9 point disease rating scale (Table A).

Table A : Observation by using 0-9 point as (Mayee and Datar, 1986)

Scale	Symptom
0	No symptoms on the leaf.
1	Small brown spots scattered on the lesions 1 % or less of the area
3	Lesions small, scattered, brown to black with concentric rings covering 1-10 % of the leaf area.
5	Lesions small, scattered, brown to black with concentric rings covering 11-25 % of the leaf area.
7	Lesions enlarging and coalescing, lesions have concentric rings shot hole symptoms covers 26-50 % of the leaf area.
9	Big, irregular concentric lesions brown to black colour covering 51 % or more leaf area. Shot hole symptoms common. Collapse of seedling

RESULTS AND DISCUSSION

In *in vitro* Results obtained in respect of efficacy of the plant extract and bioagents against purple blotch disease and their effects on bulb yield of onion indicated that all the treatments were significantly superior over

control and there by reduced the disease severity, incidence and intensity and increased the bulb yield. Among the bioagents, *T. harzianum* recorded intensity (33.22%), followed by *T. viride, P. fluoresencese, B. substilius* over mean reduction over control.Among the Plant extract NSK recorded intensity (29.73%) mean reduction over contol. Mancozeb recorded also less intensity of disease (29.07%) over control (Wanggikar *et al.*, 2014; Ansar and Dabbas, 2012).

In *in vivo* results obtained in respect of efficacy of the plant extract and bioagents against purple blotch disease and their effects on bulb yield of onion indicated that all the treatments were significantly superior over control and there by reduced the disease severity, incidence and intensity and increased the bulb yield. Among the bioagents, *T. harzianum* recorded less intensity (34.46%), followed by *T. viride, P. fluoresencese, B. substilius* over mean reduction over control.Among the Plant extract NSK recorded intensity (29.01%) mean reduction over control (Deshmukh *et al.*, 2008; Ambresh and Gowda, 2013).

Thus, all the bioagents and plant extract evaluated under field conditions against purple blotch of onion were found most effective in reducing Purple blotch disease of incidence and intensity in onion cv. N-53 and thereby increased the bulb yield over unsprayed control. Among the bioagents *T. harzanium* was the most effective than others several workers have reported at effectiveness of *T. harzianum* in control of disease caused by *Alternaria* (Tyagi *et al*., 1990; Casida and Lukezic, 1992; Kale and Ajjappalavara, 2014, Kareem *et al*., 2012a; Sastrahidayat, 1995; Mathivanan *et al.*, 2000; Rao, 2006;

Table1 : *In vitro* effect of plant extract and bioagents on purple blotch disease severity in onion cv. N-53. during *Kharif* (pot)

Treatments	Per cent Disease sevirity		Mean (%)	Mean Reduction over control (%)
	After 1st spray	After 3rd spray		
T_1 : *P. fluorescens*	41.32(24.40)	43.26(25.63)	42.29(25.02)	20.68
T_2 : *T. viride*	40.31(23.77)	39.10(23.01)	39.71(23.39)	25.52
T_3 : *T. Harzianum*	34.41(20.12)	32.02(18.67)	33.22(19.40)	37.50
T_4 : *B.subtilis*	45.12(26.83)	43.11(25.53)	44.12(26.18)	17.25
T_5 : *NSK*	30.35(17.67)	29.11(16.92)	29.73(17.30)	44.24
T_6 : *Mentha arvensis*	36.62(21.48)	23.13(13.37)	29.88(17.43)	43.96
T_7 : *Allium sativum*	35.91(21.04)	25.22(14.61)	30.57(17.83)	42.66
T_8 : *Zingiber officinale*	37.42(21.97)	32.18(18.77)	34.8(20.37)	34.73
T_9 : *Vitex negundo*	40.42(23.83)	39.39(23.19)	39.91(23.51)	25.15
T_{10} : *Mancozeb*	2.10(16.91)	29.03(16.87)	29.07(16.89)	43.55
T_{11} : Control	53.31(32.22)	57.32(34.97)	55.32(33.60)	45.88
S.E. $\pm$	1.06	0.8		
C.D. (P=0.05)	3.13	2.4		

Table 2 : *In vivo* effect of plant extract and bioagents on purple blotch disease intensity in onion cv. N-53. during *Kharif*

Treatments	Mean disease incidence (%)	Mean disease severity (%)	Mean PDI (%)	Yield (q/ ha)	% Increase in yield over control
T_1 : *P. fluorescens*	43.36(25.80)*	46.08(24.45)	40.30(23.80)*	242.63	15.50
T_2 : *T.viride*	37.57(22.15)	40.32(23.8)	35.92(21.18)	302.06	32.12
T_3 : *T.harzianum*	31.67(22.15)	34.48(20.3o)	34.46(21.18)	315.08	34.93
T_4 : *B. sbstilis*	49.17(29.49)	46.96(28.01)	47.12(28.12)	236.42	13.28
T_5 : *NSK*	33.3(19.95)	29.13(16.87)	29.09(17.20)	394.27	48.00
T_6 : *Mentha arvensis*	38.73(22.86)	30.43(17.93)	30.39(17.91)	326.56	37.22
T_7 : *Aillium sativum*	41.4(24.49)	35.95(21.19)	35.19(21.19)	309.56	33.84
T_8 : *Zingiber officinale*	41.40(24.49)	36.34(21.38)	38.49(26.73)	284.70	27.99
T_9 : *Vitex negundo*	45.63(27.16)	38.51(23.19)	44.79(26.61)	234.37	12.52
T_{10} : Mancozeb	45.65(24.28)	38.11(19.36)	43.88(26.06)	284.02	27.81
T_{11} : Control	69.08(46.67)	54.87(36.38)	54.88(33.12)	205.01	00

Vadivel and Ebenzae, 2006; Shahanaz *et al.*, 2007; Hussein *et al.*, 2007; Kumar and Palkashappa, 2008; Mishra and Gupta, 2012; Kareem *et al.*, 2012b; Chethana *et al.*, 2012; Shahnaz *et al.*, 2013).

Conclusion:

In summary, spraying of *T. harzanium* was the most effective bioagent followed by *T.viride, P. fluorescens, B. substilius* and in the Plant Extract spraying of NSK was the most effective plant extract for control Purple blotch of Onion caused by *Alternaria porri* (Ellis)cif. However the extract should be used on appropriate concentration that is non-toxic to host plant.

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