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Efficacy of Different Medicinal Plant Extract on Incidence of Chickpea Wilt Complex Under Glass House Condition

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Abstract – **In the present investigation pot culture studies under glass house condition revealed that all the treatments were effective in reducing the total, pre- and post-emergence seedlings mortality due to collar rot, root rot and wilt diseases over control in sick pots. Seed soaking treatments also significantly reduced the incidence of collar rot, root rot and wilt diseases over soil application treatments. Seed soaking treatment with Ashwagandha leaf extract (500 µg ml^{-1}) found to be best for the control of collar rot, root rot and wilt pathogens by reducing 100 per cent pre- and post-emergence seedlings mortality. Among the soil application treatments of medicinal plants, Ashwagandha treatment (5%) showed minimum total incidence of collar rot (20.00%), root rot (23.33%) and wilt (16.67%) over control (100, 96.67 and 96.67%, respectively) with mean PDI 28.55, 26.67 and 23.57 per cent, respectively..**

Keywords – **Medicinal plant Extract, Ashwagandha, Wilt, Chickpea, Root Rot, Collar Rot.**

I. INTRODUCTION

Among pulse crops grown in India, chickpea occupies the premier position in terms of area as well as production. Chickpea is grown over an area of 10.6 m ha in the world and productivity with 820 kg ha-1. India accounts for about 5.77 m tonnes (66.62%) of world chickpea production and 68.77 per cent (7.29 m ha) area with productivity 792 kg ha-1 (USDA, 2004). During the past 10 years, India accounted for 60-70 per cent world chickpea production. One of the major constraints limiting agriculture production is the difficulty in managing diseases caused by pathogens specially of soil borne nature. This problem further compounds when the diseases is incited by more than one pathogen. "Chickpea wilt complex" is one of the best example of such diseases for which four pathogens accounts *viz*. *Sclerotium rolfsii* Sacc., *Rhizoctonia bataticola* (Taub.) Butler, *R. solani* Kuhn and *Fusarium oxysporum* f.sp. *ciceri* (Padwick) Snyder and Hansen. These pathogens cause significant loss in yield and primarily responsible for wide gap in the yield levels in farmers field as also reported earlier (Dahiya, 2003). Chickpea wilt complex pathogens belong to a group of ubiquitous and diverse plant pathogens that occur widely in India as a root pathogens on different crops and also could be isolated from different varieties of the same host species. Therefore, these pathogens differ in their cultural, morphological and pathogenic behavior.

For the management of this pathogen, number of chemical fungicides were used but frequent and indiscriminant use of synthetic fungicides posed a serious threat to the environment. Due to the aforementioned problems, the people are now moving towards the use of natural plant extracts as fungicides. Plants contain hundreds or thousands of metabolites. Many herbal plants are the gift of nature to human beings as they have some medicinal property and can be used to control various infections and diseases (Khalil *et al*., 2007). The use of natural products in disease prevention and control has received attention in recent years (Sati and Joshi, 2011; Kilani-Jaziri *et al*., 2011). The medicinal plants have been recognized for their antimicrobial activity for many years. Hence, the present study was undertaken to test whether the medicinal plant extracts are efficient in reducing the incidence of chickpea wilt complex fungi under *in vitro* condition.

II. MATERIALS AND METHODS

The study was conducted to find out the efficacy of medicinal plant species extracts/plant parts powder on wilt development under wilt sick conditions separately for each pathogen.

Treatments Were:

T_1 - Seed soaked in root extract of Kali haldi (500 µg ml^{-1}).

T_2 - Seed soaked in seed extract of Bawchi (500 µg ml^{-1}).

T_3 - Seed soaked in leaf extract of Ashwagandha (500 µ g ml^{-1}).

T_4 - Soil application of 5 per cent root powder of Kali haldi + seed soaked in sterilized water.

T_5 - Soil application of 5 per cent seed powder of Bawchi + seed soaked in sterilized water.

T_6 - Soil application of 5 per cent leaf powder of Ashwagandha + seed soaked in sterilized water.

T_7 - Control (Seed soaked in sterilized water).

For this purpose, disposable plastic cup (7.5 cm in diameter) were filled with infested soil for the respected fungus separately. Infested soil was prepared by adding the culture of respective fungus multiplied in soil maize medium at 25±2^{0}C for 3 weeks. Seed of susceptible chickpea cultivar ICCV 2 were sown at the rate of 5 seeds per pot. Three replications were maintained with the four pots for each replication separately for each of the pathogen and maintained in the glass house condition. The observation was recorded for pre-emergence mortality at 10 days after sowing (DAS) and post-emergence mortality was recorded at 30 DAS.

The soil maize medium with the 40: 40: 20 ratio of sand, soil and maize, were thoroughly mixed with 50 ml of water for every 200g and used for mass multiplication of t-

-he fungal pathogens.

III. Results and Discussion

Kali haldi (root), Bawchi (seed) and Ashwagandha (leaf) were evaluated either by seed soaking for 24 h in extract (500 µg ml^{-1}) or by 5 per cent soil application of powder against the incidence of collar rot, root rot and wilt diseases, separately.

Data presented in Table 1 revealed that, seed soaking treatments with medicinal plants part extract were significantly effective in reducing the incidence of collar rot, root rot and wilt diseases of chickpea in sick pots. All the treatments were effective in reducing the total, pre- and post-emergence seedlings mortality due to collar rot, root rot and wilt diseases over control. Seed soaking treatments also significantly reduced the incidence of collar rot, root rot and wilt diseases over soil application treatments. Seed soaking treatment with Ashwagandha leaf extract (500 µg ml^{-1}) found to be best for the control of collar rot, root rot and wilt pathogens by reducing total pre- and post-emergence seedlings mortality. This treatment showed no mortality due to chickpea wilt complex pathogens. Other than seed treatment with Ashwagandha, seed soaking treatment with Bawchi seed extract (500 µg ml^{-1}) also recorded minimum seedlings mortality per cent due to collar rot (0%), root rot (3.33%) and wilt (0%) disease. Among the soil application treatments, Ashwagandha treatment showed minimum total incidence of collar rot (20.00%), root rot (23.33%) and wilt (16.67%) over control (100.00, 96.67 and 96.67% respectively) with mean per cent disease incidence (PDI) 28.55, 26.67 and 23.57 per cent, respectively.

Ram and Tewari (1994) reported that, soil application of leaves of *Azadirachta indica*, rhizomes of *Curcuma amada* and resin of *Ferula fostida* at 5 per cent concentration reduced pre- and post-emergence mortality of chickpea caused by *S. rolfsii*. Similarly, leaf extract of *Tamarandus indica, Sopindus trifolia* and root extract of *Moringa oleifera* (Pani and Patra, 1997), *Pithecellobium dulce* and *Vitex negundo* (Meena and Muthusamy, 2002), stem extract of *Cactus deficiens* (Zapata *et al.*, 2003) significantly reduced the mycelial growth of *S. rolfsii* on PDA medium and 70 to 94 per cent reduction in disease incidence in sick pots. The bulb extract of garlic at 5 per cent concentration found promising in *in vitro*, in pot culture and field trails against *R. solani*. Sharma and Bohra (2003) reported that leaf extract of *Boerhavia diffusa* and *Salvadora persica* were recorded maximum inhibition of mycelial growth of *F. oxysporum* var *cumini* at all concentrations over control and reduced wilt incidence in cumin plant in pot experiment. These findings reported are partially in agreement with the present investigation as extract of different plant species had inhibitory character and reduced disease incidence.

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Table 1. Effect of medicinal plants as a seed/soil treatment on the per cent incidence of chickpea wilt complex (under glass house condition).

Medicinal plant	Treatment	Per cent Disease Incidence (PDI)									Average incidence of chickpea wilt complex (%)
		Collar rot			Root rot			Wilt			
		Pre-emergence	Post-emergence	Total	Pre-emergence	Post-emergence	Total	Pre-emergence	Post-emergence	Total	
Kali haldi	**Seed soaking**	03.33 (8.61)	03.33 (8.61)	06.67 (12.28)	0 (0.00)	03.33 (8.61)	03.33 (8.61)	03.33 (8.61)	0 (0.00)	03.33 (8.61)	04.44
Bawchi	**Seed soaking**	0 (0.00)	0 (0.00)	0 (0.00)	03.33 (8.61)	0 (0.00)	03.33 (8.61)	0 (0.00)	0 (0.00)	0 (0.00)	01.11
Ashwagandha	**Seed soaking**	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0.00
Kali haldi	**Soil application**	28.33 (32.13)	15.00 (22.59)	43.33 (41.12)	16.67 (24.04)	15.00 (22.59)	31.67 (34.17)	13.33 (21.33)	15.33 (22.59)	28.33 (32.13)	34.44
Bawchi	**Soil application**	18.33 (25.29)	11.67 (19.88)	30.00 (33.15)	16.67 (24.04)	11.67 (19.88)	28.33 (32.13)	11.67 (19.88)	08.53 (16.59)	20.00 (26.44)	26.11

Ashwagandha	**Soil application**	11.67 (19.88)	08.53 (16.59)	20.00 (26.44)	13.33 (21.33)	10.00 (16.59)	23.33 (28.77)	10.00 (18.04)	06.67 (14.75)	16.67 (24.04)	20.00
Water (Control)	**Seed soaking**	56.67 (48.84)	43.33 (41.12)	100.00 (89.39)	46.67 (43.06)	50.00 (41.12)	96.67 (81.16)	43.33 (41.14)	53.33 (46.90)	96.67 (81.16)	97.78
Mean (PDI)		16.90	11.67	28.55	13.81	12.86	26.67	11.67	11.90	23.57	
SEm ±		**2.0688**	**2.2715**	**2.7238**	**2.5828**	**2.2715**	**3.456**	**2.7716**	**1.6345**	**2.9695**	
CD (5%)		**6.28**	**6.89**	**8.26**	**7.83**	**6.89**	**10.48**	**8.41**	**4.96**	**9.01**	

Figures in parenthesis are Arcsine transformed values