International Journal of Agriculture Innovations and Research
Volume 1, Issue 6, ISSN (Online) 2319-1473

Effect of Fungal Metabolites of Wilt Complex Fungi on Mortality of Chickpea Seedlings

A.V. Zope, O.S. Rakhonde and G.K. Awadhiya
Department of Plant Pathology, Indira Gandhi Agricultural University, Raipur 492 006, Chhattisgarh, India.

Abstract **- The toxic effect of fungal metabolites of *Sclerotium rolfsii*, *Rhizoctonia solani* and *Fusarium oxyspo--rum* f.sp. *ciceri* alone and in combination with each other were studied on chickpea seedling mortality. Seedlings mortality was observed from 93.34 to 100 per cent due to fungal metabolites tested alone and in combination with each other. The infected seedlings showed poor growth, small, green to yellowish leaves. This might be due to presence of some phytotoxic chemicals which were responsible for wilting and drying of chickpea seedlings.**

Keywords **- Collar Rot, Fungal Metabolites, Root Rot, Wilt, Chickpea.**

I. Introduction

Seedling mortality in chickpea due to *S. rolfsii* is the main problem in most of the tropical regions. Similarly *R. bataticola, R. solani*, and *F. oxysporum* f.sp. *ciceri* also affects at different stages causing range losses in the standing crop. Chickpea production is severely curtailed by "Chickpea wilt complex" caused by *Fusarium oxyspo--rum* f. sp. *ciceris* (Padwick), *Sclerotium rolfsii* Sacc., *Rhizoctonia bataticola* (Taub.) Butler and *R. solani* Kuhn in most chickpea growing areas of the world. In spite of its importance, there are few quantitative assessments of the impact of "Chickpea wilt complex" on chickpea yields. Annual chickpea yield losses from "Chickpea wilt complex" vary from 10 to 15% (Trapero and Jiménez, 1985; Jalali and Chand, 1992; Dahiya, 2003).

Resistance in many plant-pathogen interactions is associated with multifaceted defense systems. The indivi--dual components of such systems include hypersensitive responses, chemical weapons like phytoalexins and hydrolytic enzymes, and structural barriers like lignin and hydroxyproline rich cell wall proteins (Dixon *et al*., 1994). Proper recognition and judicious regulation of defense responses is essential for host plants, as these responses often have small (but measurable) deleterious effects on plant growth and metabolism (Glazebrook, 2005). Fungal pathogens deploy different strategies to escape host surveillance and establish themselves within the host depending on their nutritional requirements. Therefore, the study was conducted to know the toxic effect of fungal metabolites of *Sclerotium rolfsii*, *Rhizoctonia solani* and *Fusarium oxysporum* f.sp. *ciceri* on chickpea seedlings and their mortality.

II. Materials and Methods

To study the effect of fungal metabolites on chickpea seedlings mortality, the 5 mm disc from 7 days old culture of *Sclerotium rolfsii, Rhizoctonia solani* and *Fusarium oxysporum* f.sp. *ciceri* was individually multiplied on 50 ml of sterilized Richard's broth solution in each 250 ml Erlenmeyer flask. After 15 days of incubation at 25 $\pm 2^0$C, the liquid of each flask was decanted and filtered through Whatman filter paper No. 42 aseptically. The fungal metabolites in the filter decant were diluted at 50 per cent concentration. Fifty ml of the diluted fungal metabolites of each fungus were tested for their effect, individually and also in combination with the other wilt fungi metabolites under study. Seven days old seedlings, previously grown in sterilized soil were used in experiment. Ten seedlings of the chickpea variety ICCV 2 were placed in each flask and each treatment replicated three times. Control was prepared with sterilized water instead of filtrate. All the flasks were kept at room temperature. Observation was recorded on mortality of seedling due to fungal metabolites after 7th days of the experiment.

Composition of the Richard's Broth used

Name of medium	Composition	Quantities
Richard's broth	Potassium nitrate	10 g
	Potassium dihydrogen phosphate	5 g
	Magnesium sulphate	2.5 g
	Ferric chloride	0.02 g
	Sucrose	50 g
	Water	1000 ml

II. Results and Discussion

Effect of Fungal Metabolites

The study was conducted to know the toxic effect of fungal metabolites of *Sclerotium rolfsii*, *Rhizoctonia solani* and *Fusarium oxysporum* f.sp. *ciceri* on chickpea seedlings and their mortality. It is evident from the data presented in Table 1 that metabolites of these fungi were toxic to the plants. The maximum toxic effect (100 %) was noted in the fungal metabolite of *S. rolfsii* alone and in combination with *R. solani*. Similar toxic effect was also noted in *R. solani* and *F. oxysporum* combination. In case of *R. solani*, *F. oxysporum* alone and in combination of *S. rolfsii* and *F. oxysporum*, the effect was moderate (96.67%). The combination of fungal metabolites of all three pathogen (93.34%) showed comparatively least mortality. In case of control (with Richard's broth) negligible mortality (6.67%) was observed.

Table 1. Effect of fungal metabolites on mortality of chickpea seedlings.

S. No.	Fungal filtrate at 50 per cent concentration	Number of total seedlings (8 days old)	Number of infected seedling after 7 days	Total mortality (%) after 7 days
1.	*Sclerotium rolfsii*	30	30	100.00
2.	*Rhizoctonia solani*	30	29	96.67
3.	*Fusarium oxysporum* f.sp. *ciceri*	30	29	96.67
4.	*S. rolfsii* + *R. solani*	30	30	100.00
5.	*S. rolfsii* + *F. o.* f.sp. *ciceri*	30	29	96.67
6.	*R. solani* + *F. o.* f.sp. *ciceri*	30	30	100.00
7.	*S. rolfsii* + *R. solani* + *F. o.* f.sp. *ciceri*	30	28	93.34
8.	Control (Richard's broth)	30	02	06.67

The infected seedling showed poor growth, small, green to yellowish leaves. These symptoms clearly indicated that the metabolites of these fungi contain some phytotoxic chemicals, which are responsible for wilting and drying of chickpea seedlings.

Similar findings also reported by Agrawal (1984) on lentil wilt complex. A toxin (phenyl acetic acid) was isolated from the culture filtrate of *R. solani* which inhibited the germination of seeds and also induced wilting symptoms on chickpea, mungbean, soybean, mustard, linseed, sunflower, lathyrus and onion (Lakpale *et al.*, 1996). Bajwa *et al.* (2000) screened 32 chickpea genotypes against *F. oxysporum* f.sp. *ciceri* by using spore free culture filtrate and reported 4 were tolerant and 27 were susceptible to highly susceptible.

REFERENCES

[1] Agrawal, R.K. 1984. Studies on Lentil wilt complex. *M.Sc. Thesis*, JNKVV, Jabalpur.

[2] Bajwa, K.M., Khan, I.A., Alam, S.S., Imtiaz, A. and Gill, M.A. 2000. Screening against phytotoxins for resistance to *Fusarium* wilt in chickpea. *Pakistan J. Phytopath.* 12(1): 62-65.

[3] Dahiya, B.S. 2003. Improved cultivars and agricultural practices for chickpea promotion in Punjab and Haryana. *In:* Proceedings and recommendations: Chickpea production and productivity contrants. ICAR, New Delhi. pp. 17-24.

[4] Dixon RA, Harrison MJ, Lamb CJ. 1994. Early events in the activation of plant defense responses. *Ann Rev Phytopathol*. 32:479–501.

[5] Glazebrook J. 2005. Contrasting mechanism of defense against biotrophic and necrotrophic pathogens. *Ann Rev Phytopathol*. 43:205–227.

[6] Jalali, B. L., and Chand, H. 1992. Chickpea wilt. *In*: Pl. Dis. of International Importance. Vol.1. Diseases of Cereals and Pulses. U.S.Singh, A.N. Mukhopadhayay, J. Kumar, and H. S. Chaube, eds. Prentice Hall, Englewood Cliffs, NJ. 1: 429-444.

[7] Lakpale, N., Rajiv, Kumar and Khare, N. 1996. Studies on toxin produced by *Rhizoctonia solani* causing sheath blight of rice. *J. Mycol. Pl. Pathol.* 26(3): 263-265.

[8] Trapero-Casas, A., and Jiménez-Díaz, R. M. 1985. Fungal wilt and root rot diseases of chickpea in southern Spain. *Phytopathology* 75:1146-1151.