EFFECT OF FUNGICIDES ON SPORE GERMINATION INHIBITION OF *Cercospora arachidicola* AND *Phaeoisariopsis personata*

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ABSTRACT

A field experiment was carried out to know the effect of fungicides on spore germination inhibition. Early and late leaf spot are major foliar diseases of groundnut. Selection of fungicide based on spore germination inhibition after application of fungicides in field condition was one of best way of disease management. The seven fungicidal treatments viz., mancozeb 75% WP (0.2%), carbendazim 50% WP (0.025%), pyraclostrobin 20% WG (0.05%), hexaconazole 5% SC (0.005%), carbendazim 12% + mancozeb 63% WP (0.15%), azoxystrobin 11% + tebuconazole 18.3 % SC (0.015%), zineb 68% + hexaconazole 4% WP (0.15%) were applied in field condition. The spore germination inhibition in vitro was carried out after two days of first spraying for early leaf spot and after two days of second spraying for late leaf spot in field. Maximum spore germination inhibition Cercospora arachidicola (83.25 %) and Phaeoisariopsis pesonata (81.17 %) were recorded in plot treated with carbendazim 12 % + mancozeb 63% WP (0.15%) closely followed by plot treated with hexaconazole 5% SC (0.005%).

KEY WORDS: Cercospora arachidicola, Early leaf spot, Groundnut, Late leaf spot, Phaeoisariopsis pesonata, Spore germination inhibition

INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is an important food legume and oilseed crop. Total area under groundnut cultivation in India is 41.52 lakh ha which account for total production of 70.77 lakh tones with productivity of 1704 kg/ha. Among the major groundnut growing states, Gujarat alone accounted for 39.1 per cent of the national acreage. Groundnut was grown nearly about 16.25 lakh hectares with 30.54 lakh tones production and productivity of 1,879 kg/ha (Anon., 2018). Productivity of groundnut was far low because the biotic and abiotic stresses limits production during the rainy season (Smith *et al*., 1992). Large numbers of biotic stresses lower down the yield. More than 50 diseases have been reported in groundnut. Among them, the two leaf spots together are popularly known as "Tikka" disease in India caused significant effect on production. Both early and late leaf spot are commonly present wherever groundnut is grown. However, the incidence and severity of each disease varies between locality and seasons. Problems related to leaf spot diseases cause nearly complete

defoliation and yield losses of up to 50 per cent or more (Gibbons, 1980).

Management of early and late leaf spot by proper use of fungicide is necessary (Bhaskar, 2006). Germination is the initial stage in the development of a fungus mycelium from its spore. So, spore germination on host is one of most important stage of disease progress (Alderman and Beute, 1986). The field efficacy of fungicides on spore germination considered as most suitable strategy for management.

MATERIALS AND METHODS

A field experiment was carried out to know the effect of fungicides on spore germination inhibition at Department of Plant Pathology, College of Agriculture, Junagadh Agricultural University, Junagadh during *Kharif* 2017. Groundnut variety GG-20 was sown in 5.0 × 3.0 m gross and 4.0 × 1.8 m net plot size with 60 × 10 cm spacing on June 29, 2017. Fungicide evaluation was carried out with eight treatments *viz.*, mancozeb 75% WP (0.2%), carbendazim 50% WP (0.025%), pyraclostrobin 20% WG (0.05%), hexaconazole 5% SC (0.005%), carbendazim 12% + mancozeb 63% WP (0.15%), azoxystrobin 11% + tebuconazole 18.3 % SC (0.015%), zineb 68% + hexaconazole 4% WP (0.15%) and control. The experiment was conducted in randomized block design with three replications. The sprays were carried out at two times, first after early leaf spot initiation and second after appearance of late leaf spot infection.

The spore germination inhibition *in vitro* was carried out after two days of first spraying for early leaf spot and after two days of second spraying for late leaf spot in field. Spores were collected from each treatments and control in distill sterilized water from disease infected leaves using sterilized brush. Spore suspension was prepare in distill water to check spore germination inhibition. One drop of spore suspension from each treatment was put on cavity slide with three repetitions and observed under light microscope with 40x objective lens. Same methodology was used for spore germination inhibition by Khunt (2016). Observations were recorded and per cent inhibition of spore germination worked out as per the formula given by Vincent (1947).

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

Where,

I = Per cent inhibition

C = Number of germinated spores in control.

T = Number of germinated spores in treatment

RESULTS AND DISCUSSION

The first event in the formation of a new fungus colony is the germination of a spore. The infection in plant by a parasitic fungus and the resulting production of disease is initiated in most instances by a spore germinating within or near the potential host plant and experiment was conducted for checking efficacy of various fungicides on spore germination inhibition *in vitro* after two days of spraying fungicide in field.

The results (Table 1, Plate 1 and Figure 1) revealed that different fungicide have different ability to inhibit spore germination in field condition. In early leaf spot, effect of fungicides on spore germination inhibition ranged from 31.17 (pyraclostrobin) to 83.25 (carbendazim + mancozeb) per cent. Spore germination inhibition was significantly higher (83.25 %) in carbendazim + mancozeb (0.15%) closely followed (at par) by hexaconazole (0.005%) with 78.95 per cent spore germination inhibition. Mancozeb (0.2%), carbendazim (0.025%) and azoxystrobin + tebuconazole (0.15%) were found moderately effective

with 44.73, 42.84 and 41.90 per cent spore germination inhibition, respectively and were statistically at par. The least effective treatments were zineb + hexaconazole (0.15%) and pyraclostrobin (0.15%), which gave 35.00 and 31.17 per cent spore germination inhibition of spore of *C. arachidicola*.

In case of late leaf spot, spore germination inhibition was recorded two days after second spraying of fungicides, which was sprayed after the late leaf spot appearance. Spore germination inhibition ranged from 30.57 (pyraclostrobin) to 81.17 (carbendazim + mancozeb) per cent. Significantly the maximum spore germination inhibition (81.17%) was recorded in treatment carbendazim + mancozeb (0.15%), which was at par with hexaconazole (0.005%) with 78.89 per cent spore germination inhibition. Mancozeb (0.2%) and azoxystrobin + tebuconazole (0.015%) were moderately effective in per cent spore germination inhibition with 43.77 and 42.36 per cent inhibition, respectively and also remained statically at par. Carbendazim 50% WP (0.025%) 38.77% gave spore germination inhibition which was remained significantly higher than control. Zineb 68% + hexaconazole 4% WP (0.15 %) and pyraclostrobin 2% WG (0.015 %) were inferior in spore germination inhibition of *P. personasta* with 33.64 and 30.57 per cent, respectively (Table 1, Plate 1 and Figure 1).

Similar experiment was conducted by Kalaskar *et al.* (2013) on *Puccinia arachidis* of groundnut and recorded maximum inhibition of uredospore germination with treatment of difenconazole @ 0.1% (100%) followed by propiconazole @ 0.1% (95.2%) and hexaconazole @ 0.1% (90.74%). According to Librinos and Nutter (1993) recorded that chlorothalonil (1.25 kg a.i /ha) and tebuconazole (0.42 kg a. i. /ha) reduced spore germination up to 60 to 97 per cent, respectively of *C. personatum*in in groundnut.

CONCLUSION

From the above study, it can be concluded that spore germination is one of most important phenomenon of pathogen survival and disease development. Maximum spore germination inhibition was recorded in treatment carbendazim 12 % + mancozeb 63% (0.15%) closely followed by hexaconazol (0.005%) in both early and late leaf spot of groundnut. So these both fungicides are suitable for early and late leaf spot management.

REFERENCES

Alderman, S. C. and Beute, M. K. (1986). Influence of temperature and moisture on germination and germination and germ tube elongation of *Cercospora arachidicola. Phytopatho.,* **6**: 715-719.

Anonymous (2018). Directorate of Economics and Statistics, Government of India. New Delhi. www.eands.dacnet.nic.in. Accessed on March 24, 2018.

Bhaskar, A. V. (2006). Investigation on early and late leaf spots of groundnut (*Arachi hypogaea* l.). Ph. D. Thesis (Unpublished) Submitted to Junagadh Agricultural University, Junagadh.

Gibbons, R. W. (1980). Groundnut Improvement, Research Technology for the Semi-Arid Tropics. *Proceedings of the Protection International Symposium. Development Transfer of Technology for Rainfed Agriculture and the SAT Farmer*, 28th August-1st September, 1979. pp. 27-37.

Kalaskar, R. R.; Parate, R. L.; Mane, P. A. and Lomate, C. B. (2013). Effect of fungicides, plant extracts and bioagents on inhibition of uredospore

germination of *Puccinia arachidis*speg..*Internat. J. Plant Prot*., **6**(2): 436-439.

Khunt, A. R. (2016). Powdery mildew (*Erysiphe polygony* DC) of cumin and its management. M. Sc. (Agri.) Thesis (Unpublished) Submitted to Junagadh Agricultural University, Junagadh.

Librinos, J. L. and Nutter, F. W. (1993). Effect of a protectant *versus* a systemic fungicide on disease component of peanut late leaf spot. *Pl. Dis*., **77**: 837-845.

Smith, D. H.; Pauer, G. D. C. and Shokes, F. M. (1992). *Cercosporidium* and *cercospora* leaf spots of peanut. In: *Plant Diseases of International, Importance Diseases of Vegetables and Oilseed Crops* (Eds. Chaube, H. S.; Singh, U.S. and Mukhopadhyay, A.N.), Prentice Hall, New Jersey, pp. 285-304.

Vincent, J. M. (1947). Distortion of fungal hyphae in the presence of certain inhibitors. *Nature*, **159**: 850-852.

Table 1: Efficacy of fungicides on *C. arachidicola* and *P. personata* spore germination inhibition after first and second spray in field

No.	Treatments	Concentration (%)	Early[@] Leaf Spot	Late[@] Leaf Spot
T_1	Mancozeb 75% WP	0.20	41.97 (44.73)*	41.05 (43.77)
T_2	Carbendazim 50% WP	0.025	40.88 (42.84)	38.50 (38.77)
T_3	Pyraclostrobin 20% WG	0.05	33.92 (31.17)	33.57 (30.57)
T_4	Hexaconazole 5% SC	0.005	62.71 (78.95)	62.65 (78.89)
T_5	Carbendazim 12% + Mancozeb 63% WP	0.15	65.93 (83.25)	64.29 (81.17)
T_6	Azoxystrobin 11% + Tebuconazole 18.3 % SC	0.015	40.32 (41.90)	40.60 (42.36)
T_7	Zineb 68% + Hexaconazole 4% WP	0.15	36.27 (35.00)	35.44 (33.64)
T_8	Control	-		
S.Em ±			1.19	0.83
CD at 5%			3.60	2.54
CV %			4.48	3.22

[@]Mean of three replications

**Numerals in parenthesis are arcsine re-transformed value*

C. arachidicola

P. personata

Plate 1: Spore germination of C. arachidicola and P. personatacausing leaf spot in groundnut

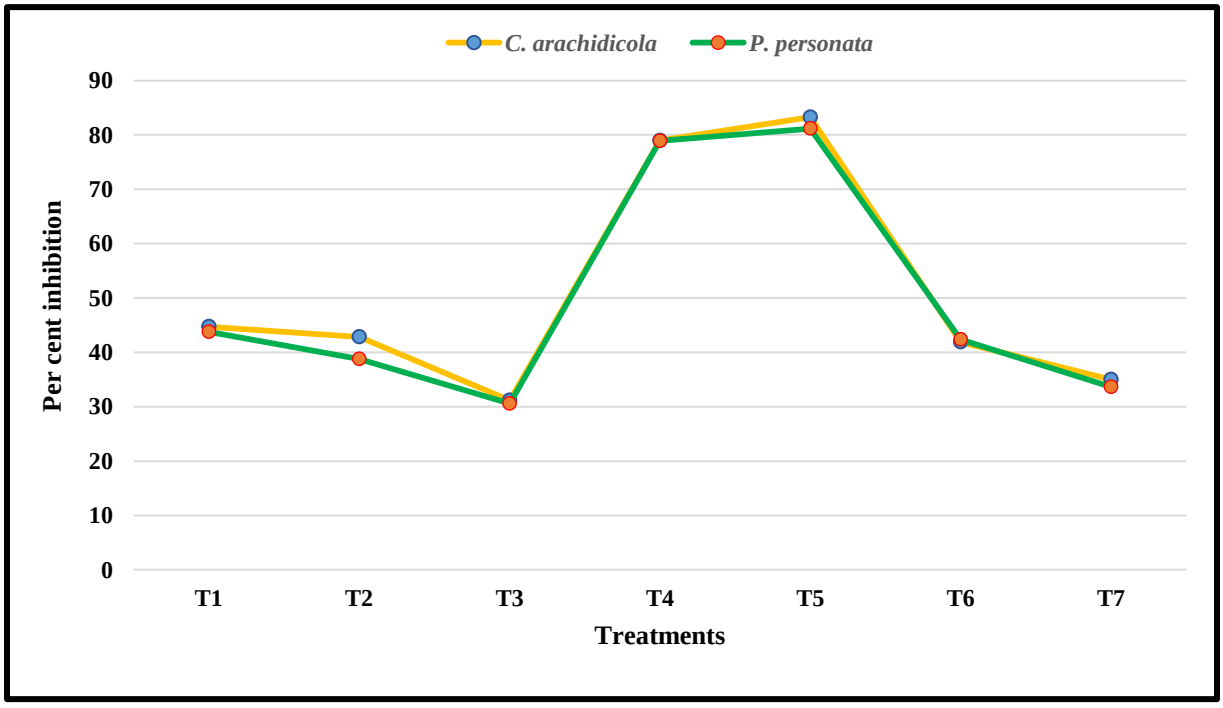

Fig. 1: Per cent spore germination inhibition of C. arachidicola and P. personatacausing leaf spot in groundnut

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