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MANAGEMENT OF *CERCOSPORA* LEAF SPOT OF GROUNDNUT (*CERCOSPORA ARACHIDICOLA* & *CERCOSPORIDIUM PERSONATUM*) THROUGH THE USE OF SYSTEMIC FUNGICIDES

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ABSTRACT. Various fungal diseases reduce groundnut yield but *Cercospora* leaf spot commonly called, Tikka disease is most detrimental one. A field experiment was conducted to evaluate the efficacy of different fungicides and their doses on *Cercospora* leaf spot of groundnut. Five different fungicides (Chlorothalonil, Propineb, Mancozeb, Nativo and Triazole) having three different doses (prescribed, half & prescribed+half) were used to control *Cercospora* leaf spot of groundnut. Groundnut variety (YH-14) highly susceptible to *Cercospora* leaf spot was used. The experiment was laid down in RCBD design. The data were analyzed statistically by Fisher's analysis of variance technique. Results showed that maximum disease control with high pod yield was observed with Nativo and Triazole treatments. Efficacy of Chlorothalonil was also better than Mancozeb and Propineb. Maximum disease control and pod yield was observed when Nativo was used @ 0.97g/L of water, followed by @ 0.65g/L and 0.32 g/L, respectively. Propineb was the least effective in controlling *Cercospora* leaf spot of groundnut as well as having minimum pod yield.

Key words: *Cercospora*; Leaf spot; Fungicide; Groundnut; Disease development; Yield.
CLS = *Cercospora* leaf spot

INTRODUCTION

Groundnut (*Arachis hypogaea* L.) belongs to genus *Arachis* in the subtribe *Stylosanthinae* of tribe *Aeschynomeneae* of the family *Leguminosae* having origin from South America (Naidu *et al.,* 2006). It is the most important summer season cash crop as well as oil seed crop in the world (Mensah and Obadoni, 2007).

Groundnut seed has high protein (25-28%) and oil content (43-55%) (Naeem *et al.,* 2009). Groundnut is

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produced nearly in 100 countries, the semiarid tropical and subtropical regions of the world between 40ºN and 40ºS. 1st commercial planting of groundnut in Pakistan started in 1949 in Rawalpindi with 400 hectare area (Ahmad, 1990). In Pakistan, during 2008-2009, groundnut was grown on an area of 928 hundreds hectare with a production of 85,500 tones and yield of 921 kg/ha.

In Pakistan, groundnut is mostly cultivated in Pothowar, region of Punjab, and some areas of NWFP and Sindh. Punjab contribute about 85% of the total area under groundnut crop while 10% in KPK and 5% in Sindh (Agri. Statistics of Pakistan, 2008). The main groundnut producing areas in Pakistan are Chakwal, Attock, Jhelum, Rawalpindi, Karak, Swabi, Sanghar (Khan, 2005). Integrated factors affect the groundnut yield in Pakistan i.e. *Cercospora* leaf spot attributable to *Cercospora arachidicola* S. Hori (Early leaf spot) and *Cercosporidium personatum* (Late leaf spot). These wide spread and most drastic foliar diseases cause severe losses in crop (Ijaz *et al.,* 2008). CLS infect groundnut crop directly and indirectly and causes huge losses up to 25-43% as defoliation of the leaves due to photosynthesis process is disrupted and plant produce pods lesser and inferior in quality (Waliyar *et al.,* 2000). Losses are even more when crop is unsprayed (Anonymus, 2000).

Symptoms caused by CLS are easily distinguishable on the leaf surface. CLS is characterized by light brown spots surrounded by yellow halo, while spots of late CLS are black and usually without yellow halo (Ouzounov, 1988; Subrahmanyam *et al.,* 1995). Mostly Infection and disease development starts from irregular rains during flowering to pods formation. The maximum and minimum temperature ranges for CLS is 31^0C- to 35^0C and 18^0C- to 23^0C, respectively (Pande *et al.,* 2000).

Use of chemicals for the control of CLS has been practiced for a long time having varying degree of success (Backman *et al.,* 1977). In Pakistan chemical control of CLS of groundnut is not widely practiced due to high costs of chemicals and farmers unawareness to chemicals. According to modern research (Mohammed, 2004), control of CLS through systemic fungicides can lead to the increased yield and high haulm quality. The lack of resistant varieties to *Cercospora* leaf spot still makes the use of chemicals for controlling CLS. This study was carried out to evaluate the most effective fungicide and its dose to control CLS of groundnut.

MATERIAL AND METHODS

The experiment was carried out in the research area of Plant Pathology at Barani Agricultural Research Institute, Chakwal, during the summer season in 2011. Groundnut variety (YH-14) having a vegetative cycle of 90 days and highly susceptible to *Cercospora* leaf spot was used to check the efficacy of different fungicides on groundnut. Five fungicides (Chlorothalonil, Propineb, Mancozeb, Nativo and Triazole) with three different

doses (prescribed, half & prescribed+half) were used. The experiment was conducted in RCBD design having three replicates with a plot size of 2.7 m^2. *Cercospora* leaf spot infected leaves collected from the previous crop were added in the soil as primary inoculum before sowing of the experiment. Leaves showing yellow hollow symptoms of *Cercospora* leaf spot were obtained from the farmer's field, preserved and were brought to the lab for isolation of CLS. Fungal isolations was done by means of scheduled isolation trials (Riker and Riker, 1936). The diseases portion of leaves were cut into small pieces of 1-2 mm and was surface sterilized with 0.1% mercuric chloride solution for 1-2 minutes. These small pieces were rinsed twice in sterilized water and were transferred to sterilized blotter paper in Petri dishes for drying. Plating of these dried pieces was done on Petri plates containing potato dextrose agar (PDA) medium in a laminar hood. These Petri plates were then incubated at $27^oC \pm 2^oC$ for 57 days to allow the fungi to grow. After five days the margins of the developed mycelium were sub-cultured on potato dextrose agar (PDA) at 25 C^0 for seven days to get the pure culture of CLS. Single spore method was used for the identification of the CLS. Identification of CLS was done on the basis of morphological characters. Mycelial growth of CLS in Petri plates was blended in sterilized distilled water in a blender. No. of spores were counted by haemo-cytometer and were diluted by sterile distilled water to reach 3.3×10^5 CFU ml^{-1}. These spores were used as inoculum and were sprayed on all the treatments except control. To provide favorable environment for disease development misting of water was carried out from time to time (Ijaz, 2011). Disease severity data were recorded according to Florida leaf spot 1-10 scale (Chiteka *et al.,* 1988) before each spray and 10 days after spraying. Yield data was recorded after the harvesting of crop.

Statistical analysis

For statistical analysis of data, Fishers analysis of variance technique was used (Steel *et al.,* 1997). All the means of treatments were compared by using Least Significance Difference (LSD) test at 5% probability level using (M. Stat C).

RESULTS

Fig. 1 shows the efficacy of different doses of fungicides on *Cercospora* leaf spot of groundnut. All the treatments used reduced the disease development as compared to control.

Nativo fungicide performed best against rest of all. It showed 61% disease development followed by Triazole as compared to control. Chlorothalonil showed 79% as compared to control, while Mancozeb and Propineb showed high disease development 81% and 85%, respectively as compared to control.

Nativo (@ 0.97 g/L) was the most effective one while rest of doses applied related to control. Triazole performed the second best fungicide in the experiment @ 3 ml/L gave best result. Propineb was the least effective fungicide as compare to rest of others. The result relates with (Porter, 1970; Culbreath *et al*. 2002) that stated that efficacy of fungicides increases the yield and decreases the disease development (Hagan *et al*., 2006).

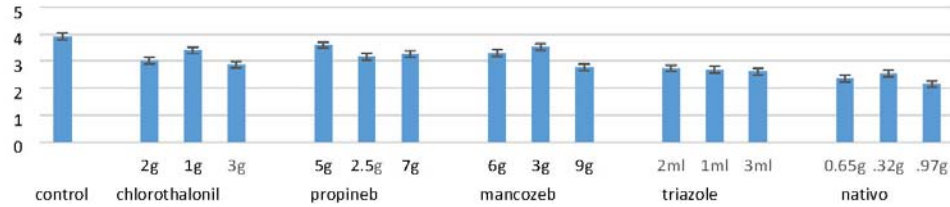

Figure 1 - Efficacy of different doses of fungicides on *Cercospora* leaf spot of groundnut

Fig. 2 reflects the efficacy of different doses of fungicides on groundnut pod yield. All the fungicides showed an increase in pod yield as compared to control.

Maximum pod yield was obtained by Nativo (2008.89 g), followed by Triazole (1668.89 g) as compared to control (487 g). Chlorothalonil showed moderate pod yield (1233.33 g) as compared to control, while minimum pod yield (1064.44 g and 1123.33 g) was obtained when groundnut was sprayed with Propineb and Mancozeb, respectively.

Maximum pod yield (2137 g) was obtained when Nativo was used @ 0.97 g/L, while 1980 g and 1910 g pod yield was obtained when groundnut was sprayed with dose rate of 0.65 g/L and 0.32 g/L of water, respectively, as compared to control. Triazole was the second best fungicide used; @ 3 ml/L gave best pod yield (1813 g), followed by 1ml/L (1673 g) and 2 ml/L (1520 g) as compared to control (487 g).

Propineb was the least effective fungicides as it gave minimum pod yield (770 g), when was used @ 5 g/L of water as compared to other four fungicides and control.

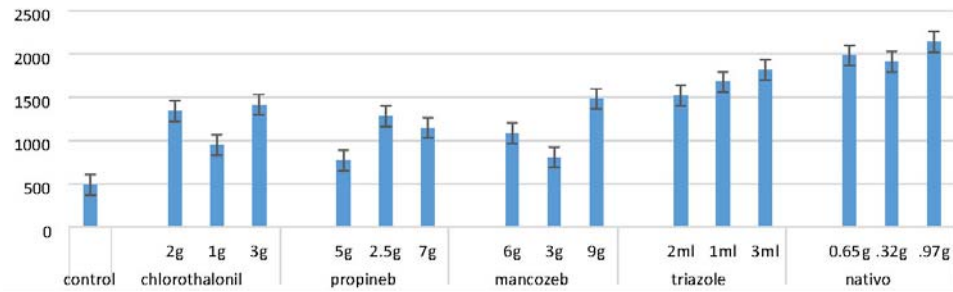

Figure 2 - Efficacy of different doses of fungicides on groundnut yield

DISCUSSION

Fungicides are used on different crops to control fungal pathogens in the world. In our present study five different fungicides were used to control *Cercospora* leaf spot of groundnut. Out of all fungicides used, Nativo, was the most effective fungicide that exhibited highest effect to control *Cercospora* leaf spot of groundnut than Bentax T (Bdliya and Kura, 2007), because of chemical composition of Bentax T as it has Thiram in it. Sunkad *et al.* (2005) used Chlorothalonil (0.2%), Propiconazole (0.1%) and Mancozeb (0.1%) to control *Cercospora* leaf spot and rust of groundnut but their results were different from our results. Their results showed that Chlorothalonil was more efficient than Propiconazole and Mancozeb.

CONCLUSIONS

Results showed that Nativo was the best fungicides to control *Cercospora* leaf spot of groundnut, followed by Triazole and Chlorothalonil. Dose rate of Nativo @ 0.97g/L was the most effective one, followed by Triazole @ 3ml/L gave best result. Maximum pod yield was obtained by Nativo (2008.89 g), followed by Triazole (1668.89 g) as compared to control (487 g). Maximum pod yield (2137 g) was obtained when Nativo was used @ 0.97 g/L, while 1980 g and 1910 g pod yield was obtained when groundnut was sprayed with dose rate of 0.65 g/L and 0.32 g/L of water, respectively, as compared to control. Triazole was the second best fungicide used; @ 3 ml/L gave best pod yield (1813 g), followed by 1ml/L (1673 g) and 2 ml/L (1520 g) as compared to control (487 g).

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