

# Effects of Some Selected Fungicides on *Cercospora* Leaf Spot of Cowpea (*Vigna unguiculata* L.) in Sokoto, North-Western Nigeria

Muhammad, A. S.\* and B. Garba

Department of Crop Science, Usmanu Danfodiyo University, Sokoto

\*Corresponding Author's Email: abkrgwn@yahoo.co.uk

**Abstract** – A field study was conducted at Usmanu Danfodiyo University Dry land, Teaching and Research Farm during the 2013 cropping season to evaluate the efficacy of three fungicides on *Cercospora* leaf spot disease of cowpea. The experimental design used was randomized complete block design replicated three times with carbendazim 12%+ mancozeb 63% WP (A), hexaconazole 0.5% (B), tricyclazole 75% WP (C) and control (D) as treatments. The parameters assessed were disease incidence, disease severity, number of pods per stand, pod weight and 100 seed weight. Disease incidence and severity were found to be significantly ( $P>0.05$ ) lower in cowpea treated with the fungicides particularly, carbendazim 12%+ mancozeb 63% WP and higher in the untreated cowpea. All the yield parameters were higher in plants treated with carbendazim 12%+ mancozeb 63% WP and lowest in the untreated cowpea.

**Keywords** – Cowpea, *Cercospora* Leaf Spot, Incidence and Severity, Yield.

## I. INTRODUCTION

Cowpea (*Vigna unguiculata* (L.) Walp) is known to be affected by several fungal, viral and bacterial diseases. One of such fungal diseases reported to cause serious yield loss in cowpea is the *Cercospora* leaf spot caused by two fungi namely *Cercospora canescens* Ellis and Martin and *Mycosphaerella cruenta* Lanthanus (Akande, 2007). Yield loss attributed to *Cercospora* leaf spot in susceptible cowpea genotypes varies between 36% and 42% (Ferry *et al.*, 1977). Out of 75 cowpea lines evaluated in 1999 and 2000, about 40% of the germplasm was found susceptible to *Cercospora* leaf spot diseases (Ajibade and Amusa, 2001), with Ife brown, a widely adopted and cultivated cowpea cultivars in South-western Nigeria, having 80% *Cercospora* incidence on the field. Field observation revealed crop loss of over 40% in *Cercospora* endemic field (Ajibade and Amusa, 2001; Plantwise, 2010). According to Booker and Pathmanathan (2007), *Cercospora* leaf spot is a serious limitation to cowpea production, resulting in yield loss of as much as 42 percent.

There is the need to reduce the yield losses from crop disease since it is possible that the cultural practices including use of resistant varieties may fail to provide the desired level of disease control or in the case of disease epidemic outbreak, the last option is use of chemical (fungicides) control. Therefore, the use of different fungicides to test their efficacy on disease is a step in the right direction. The chemicals are applied singly or in

combination to determine the most effective in the control of *Cercospora* leaf spot.

### 1.1 Aim and Objective

The aim and objective of this study is therefore, to determine the efficacy of some selected fungicides on the incidence and severity of *Cercospora* leaf spot of cowpea.

## II. MATERIALS AND METHODS

The experiment was carried out in the year 2013 cropping season at the Dry land, Teaching and Research Farm of the Department of Crop Science, Usmanu Danfodiyo University Sokoto. Sokoto is located in the Sudan savannah on latitude 13° 01'N and longitude 5° 15'E; the soil is sandy and lies at an altitude of 350, with minimum and maximum temperature of 15°C and 40°C respectively and 645mm of rainfall (SERC, 2012).

The treatments consist of hexaconazole 0.5%, carbendazim 12%+ mancozeb 63% WP, tricyclazole 75% WP and control. The experiment was laid out in a randomized complete block design (RCBD). The field layout consist of three blocks, each block consist of four plots measuring 4x4m (16m<sup>2</sup>). A space of 1m was left between each block and 0.5m between the replicate (plot) respectively. Each plot consists of five rows with a spacing of 0.75m between rows and 0.3m within the row. The land was cleared of shrubs and stubbles, and ploughed with tractor. The soil was prepared to provide sufficient tilth for good root growth. Cowpea genotype SAMPEA-2 were sown 2-3 seeds per hole on a single row 4 m long at a spacing of 30 x 75cm. Fertilizer was applied at the rate of 15 kg/ha nitrogen as a starter dose for a good crop and phosphorus in the form of single super phosphate, at the rate of 30 kg of P/ha. Weeding was carried out manually using hoe, at 2 and 5 weeks after sowing to ensure weed free field. The cowpea plants were protected from insects attack by the blanket application of Cypermethrine + Dimethoate insecticide applied at the rate of 50g a.i./ha 3 weeks after seedling emergence and twice, 35 and 56 days after sowing, after anthesis. The fungicides were applied five times, on weekly basis, according to the manufacturers guide; 500 gm/ha, 1500 ml/ha and 400 ml/ha for carbendazim + mancozeb (A), hexaconazole (B) and tricyclazole (C) respectively. Ten plants were selected randomly in each plot for data collection. Parameters taken were disease incidence, severity, number of pods, seed weight and haulm yield. Data on incidence of the disease were taken at 9 weeks after sowing and at harvest. The number of stand showing symptoms of the disease in each



plot were counted and expressed as percentage of the number of stand in each. The severity of the disease was recorded using modified scale of Park (1987), of 1 – 6 in terms of leaf coverage by the cercospora leaf spot, where 1 = no visible symptom and 6 = more than 80% of the leaf lamina covered by the spots. Ten plants were selected at random which were observed and scored. Based on the extent of disease establishment on each, a scale number was assigned.

The data collected were subjected to analysis of variance (ANOVA) based on randomized complete block design and the difference between the mean was determined using Duncan Multiple Range Test (DMRT) as described by Gomez and Gomez (1984).

### III. RESULTS AND DISCUSSION

#### 3.1 Disease incidence and severity

Disease incidence at 9 weeks after sowing and at harvest is presented in Table 1. The result revealed that there was significant ( $P>0.05$ ) difference across the treatments. Treatment carbendazim 12%+ mancozeb 63% WP (A) had the lowest followed by hexaconazole 0.5% (B) and then tricyclazole 75% WP (C). The control had the highest incidence of disease. At harvest there was also significant ( $P>0.05$ ) difference among the treatments. The control D recorded the highest and lowest was obtained in treatment

A, while treatment B and C recorded similar incidence of disease with that of treatment A.

Disease severity at 9 weeks after sowing and at harvest is represented in Table 1. There was significant ( $P>0.05$ ) difference among the treatments. The lowest disease severity was recorded in cowpea plants treated with carbendazim 12%+ mancozeb 63% WP (A) and the highest was recorded in the control (D). The plants treated with fungicides hexaconazole 0.5% (B) and tricyclazole 75% WP (C) had statistically similar disease severity. This may be due to more efficacy of carbendazim 12%+ mancozeb 63% WP than the other two fungicides, as far as disease control is concerned. The efficacy of fungicides to control cercospora leaf spot and other fungal diseases has been documented (Ferry *et al.*, 19779; Uwala, 1998). Furthermore, it has been reported that combination of two fungicides provides better control of disease than any single among the fungicides. Culbreath *et al.* (2001) reported that, tank- mix combination of chlorothalonil + propiconazole provided better control of leaf spot disease of peanut than chlorothalonil alone or propiconazole. It also agrees with James *et al.* (2005) who reported that, Mixing fungicides that decrease anthracnose symptoms, such as chlorothalonil and mancozeb, may provide more satisfactory control of *C. gloeosporioides* during production of *E. fortunei* than applying those same fungicides alone.

Table 3.1: Effect of fungicides on disease incidence and severity of cowpea at 9 WAS and at harvest during 2013 cropping season

Treatment	Disease incidence (%)		Disease severity (%)	
	At 9 WAS	At harvest	At 9 WAS	At harvest
Carbendazim+mancozeb (A)	5.10 <sup>d</sup>	12.58 <sup>bc</sup>	5.81 <sup>c</sup>	9.83 <sup>c</sup>
Hexaconazole (B)	10.48 <sup>c</sup>	13.46 <sup>b</sup>	7.91 <sup>b</sup>	11.93 <sup>b</sup>
Tricyclozole (C)	12.92 <sup>b</sup>	13.13 <sup>b</sup>	7.00 <sup>b</sup>	11.03 <sup>b</sup>
Control (D)	17.45 <sup>a</sup>	32.68 <sup>a</sup>	8.86 <sup>a</sup>	18.83 <sup>a</sup>
SE±	0.56	2.00	0.13	0.86
Significance	*	*	*	**

Means followed by the same letter are not significantly different at 5% level of significance, according to Duncan Multiple Range Test (DMRT). WAS= weeks after sowing \* and \*\* = 5% and 1% level of probability respectively

#### 3.2 Yield

The result showed that there was significant difference ( $P>0.05$ ) among the treatments. Application of carbendazim 12%+ mancozeb 63% WP gave significantly higher number of pods than that of tricyclazole 75% WP having more pod number (13.67) than hexaconazole 0.5% and control who had pod number (9.67) and (8.67) respectively. This may be due to effectiveness of carbendazim 12%+ mancozeb 63% WP than that of hexaconazole 0.5% and tricyclozole 75% WP. Moreover, the result showed that the weight of cowpea pods per 16m<sup>2</sup> area, as influenced by the fungicides on the disease, was highest in plants treated with carbendazim 12%+ mancozeb 63% WP (1050g) followed by those treated with hexaconazole 0.5% (275.62g), tricyclozole 75% WP (619.00g) and the lowest was recorded in the control

(223.36g). The 100 grains weight (g) of cowpea plants treated with carbendazim 12% +mancozeb 63% WP was significantly ( $P>0.05$ ) higher than that recorded by plants treated with hexaconazole 0.5% and tricyclozole 75% WP which had statistically similar 100 grains weight. The lowest was recorded by the control. This may also be due lower disease incidence and severity in the fungicides treated cowpea crops as a result of more efficacy of carbendazim 12%+ mancozeb 63% WP than the other two fungicides. It has been reported that combination of two fungicides provides better control of disease than any single among the fungicides. Culbreath *et al.* (2001) reported that, tank- mix combination of chlorothalonil + propiconazole provided better control of leaf spot disease of peanut than chlorothalonil alone or propiconazole.

Table 3.2: Number of pods per stand, pods weight and 100 grain weight (g), as influenced by fungicides application during 2013 cropping season

Treatment	Yield		
	Number of Pods per Stand	Pod Weight (Kg/ha)	100 Grain Weight (g)
Carbendazim+mancozeb (A)	23.00 <sup>a</sup>	1050.00 <sup>a</sup>	14.35 <sup>a</sup>
Hexaconazole (B)	12.67 <sup>b</sup>	595.62 <sup>b</sup>	13.47 <sup>b</sup>
Tricyclozole (C)	13.67 <sup>b</sup>	619.00 <sup>b</sup>	13.65 <sup>b</sup>
Control (D)	8.67 <sup>cc</sup>	423.36 <sup>c</sup>	11.00 <sup>c</sup>
SE±	1.56	50.66	0.20
Significance	**	*	*

Means followed by the same letter are not significantly different at 5% level of significance according to Duncan Multiple Range Test (DMRT). \* and \*\* = 5% and 1% level of probability respectively

#### IV. CONCLUSION

From the results of this study, it's of paramount importance to evaluate the efficacy of fungicides for the control of crop diseases. This is particularly essential during severe outbreak of the disease in order to curtail the eminent heavy yield losses. In this study, the efficacy of some selected fungicides on the incidence and severity of *cercospora* leaf spot disease of cowpea, growth, yield and disease parameter were assessed, and fungicide application was found to significantly reduce the incidence and severity of *cercospora* leaf spot of cowpea caused by *cercospora canensce*. Fungicides application reduced disease incidence and severity from 26 – 70%, 58.8 – 61.5% and 10.7 – 34.4%, 36.6 – 47.8% at 9 WAS and at harvest, respectively. In the same vein, yield was increased from 57.7 – 165.3%, 40.7 – 148% and 22.5 – 30.5% for number of pods per stand, pods weight and grain weight respectively. Carbendazim 12%+ mancozeb 63% WP recorded the lowest disease incidence and severity with corresponding higher yields while, control recorded the highest disease incidence and severity with corresponding lowest yield.

#### RECOMMENDATION

Based on this result, farmers should spray their cowpea with carbendazim 12%+ mancozeb 63% WP for the control of *Cercospora* leaf spot disease of cowpea.

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#### AUTHOR'S PROFILE



#### Dr. Abubakar Siddiq Muhammad

Contact Address: Department of Crop Science,  
Usmanu Danfodiyo University, P.M. B. 2346,  
Sokoto, Sokoto State, Nigeria

Next of Kin: Muhammad Bello Muhammad (Elder Brother)

Email: abkrgwn@yahoo.co.uk, :

abubakar.siddiq.muhammad@gmail.com

Cell Phone Numbers: 07035852572, 08168114499,

#### EDUCATIONAL BACKGROUND

Institutions Attended with Dates:

Academic Qualifications Dates with dates:

Primary School Certificate (PSC) 1979

West African School Certificate (WASC) 1984

B. Agriculture 1997

M.Sc Crop Protection (Plant pathology) 2002

PhD Crop Protection (Plant pathology) 2012

#### WORK EXPERIENCE

Assistant Lecturer 1998-2003

Lecturer II 2003-2012

Lecturer I 2012- to Date