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EFFECTS OF TILLAGE PRACTICES ON THE INCIDENCE AND SEVERITY OF *CERCOSPORA* LEAF-SPOT DISEASE IN *VIGNA RADIATA* (MUNGBEAN) CULTIVATED IN OWERRI, IMO STATE

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ABSTRACT: *Vigna radiata* (L.) Wilczek (Mungbean) was planted in flat beds, ridges and zero tillage systems to investigate the effects of these various tillage systems on the incidence and severity of *Cercospora* leaf spot disease. The experiment was arranged in randomized complete block design with 3 treatments (the tillage systems) and three replications. Mungbean seeds were planted under the different tillage systems in a plot size of 10m x 2m, at spacing of 30cm x 30cm, giving a population of 222 plants per plot in each tillage system. The plots were weeded at 2 weeks interval till the harvesting of seeds. Fertilizer (NPK 15:15:15) was applied at the rate of 200kg/ha at 3 weeks after germination. Observations were made on the number of plants affected by the leaf spot disease/tillage system, severity of leaf spot disease/tillage system, seed weight and seed yield/tillage system, respectively. Results showed that zero tillage system gave the highest number of plants affected by leaf spot disease with mean of 70.6 which was significantly different ($P \leq 0.05$) from that of flat bed and ridge tillage systems. Consequently, zero tillage system recorded the highest percentage (95.49) of infected mungbean plants. Flat bed system recorded the highest seed weight (5.2g), though not significantly different from that of ridge system (5.0g), but both are significantly different ($p \leq 0.05$) from that of zero tillage (3.9g). On the other hand, ridge system gave the highest mean seed yield (47.4kg/ha), though not significantly different from the flat bed system, but was significantly different from the zero tillage system. From the observations in this study, *Cercospora* leaf spot can be better managed when mungbean is planted on either ridge or flat bed, instead of zero tillage; ridge and flat bed also guarantee improved seed yield.

KEY WORDS: Mungbean,Tillage practices ,*Cercospora*, Leaf-spot disease, Incidence, Severity

INTRODUCTION

Vigna radiata (L.) Wilczek (Mungbean) is one of the important pulse crops of Asia which is gradually being widely cultivated in Nigeria. Mungbean is consumed as a seed sprout or in processed forms that include cold jellies, noodles, cakes and brew and could also be eaten roasted, fried or boiled (AVRDC, 2002).

Pulses are least expensive source of food protein and are two to three times richer in protein than cereals and even more than that in tubers. According to Gopalan *et al*. (2000), in comparism to other pulses, mungbean has been found to be rich in dietary iron. Agugo (2004) reported that mungbean is composed of reasonable percentages of moisture, digestible crude protein, fat, crude fibre, hence a good source of livestock feed.

Like other pulses, mungbean is vulnerable to myriad of pests and diseases that hamper its production potential, especially in Nigeria.

According to Thakur *et al*. (1977), average low yield of the crop could be due to low inherent yield potential, but majority of the factor is attributable to its susceptibility to diseases. Leaf spot disease caused by *Cercospora canescens* (Ellis & Martin) is a serious disease in the mungbean growing areas, especially, areas with high humidity during the growing periods.

Cercospora leaf spot is one of the important diseases that cause serious losses in mungbean crop. Quebral and Cagampang (1970) reported up to 23% losses in yield of the crop to leaf spot disease, but Iqbal *et al*. (1995) observed loss of up to 61% in grain yield. The disease starts appearing about 30-40days after planting, however, depending on the temperature and humidity; it spreads rapidly in susceptible varieties causing premature defoliation and reduction in size of pods and grains (Iqbal *et al*.,2004). Several researchers had reported the effective control of the disease with the application of fungicides (Singh and Naik, 1977; Singh and Singh, 1978). However, according to Hossian *et al*. (1981), Jadhaw and Sharuna (1983), Iqbal *et al*. (1990) and Iqbal *et al*. (2004), the cheapest, practical and economical control of the disease can be achieved by using genetic stock that is resistant to the disease.

The need for increasing food production in developing countries, especially where substantial level of production comes from the resource poor farmers, has encouraged more researches in the principles of disease control in crops. According to Dufour (2001), cultural management practices such as tillage operation can be modified to achieve better pest and disease control and high crop productivity.

The present study was conducted in order to assess the extent to which tillage practice can be encouraged or otherwise control the incidence of *Cercospora* leaf spot in mungbean.

MATERIALS AND METHODS

The field experiment was conducted between May and July, 2008 at the Teaching and Research Farm of the Faculty of Agriculture and Veterinary Medicine, Imo State University, Owerri. Owerri is situated between latitudes 5° 0'N and 6° 0'N and longitudes 6° 5'E and 7° 0'E within the rainforest belt of the south-eastern Nigeria. The area has an annual rainfall range of 2500mm-3000mm which is evenly distributed between March and October. Temperature range during cropping season is 27-30°C, with a relative humidity of 75% (NIMET, 2007).

The experimental site was manually cleared of existing vegetation, and then divided into three blocks measuring 33m x 2m each, with 1m path in between.

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The blocks were further divided into three subplots measuring 10m x 2m each, with 1m path in between. The experiment was arranged in a randomized complete block design with three replications. The treatments were represented by three tillage systems; ridge system, flat bed system and zero tillage system.

Mungbean seeds collected from Michael Okpara University of Agriculture, Umudike were planted in the different tillage systems, at a spacing of 30cm x 30cm, giving a plant population of 222 per plot in each tillage system. The plots were weeded at 2 weeks interval till the harvesting of seeds. Fertilizer (NPK 15:15:15) was applied at the rate of 200kg/ha at 3 weeks after planting. Data were collected on the following parameters; number of plants affected by leaf spot disease/tillage system, severity of leaf spot disease/tillage system base on the following scale 0 spot on the leaf = 1 (no disease), 1-2 spots on the leaf = 2 (mild disease) 3-5 spots on the leaf = 3 (moderate disease), 6 and above spots on the leaf = 4 (severe disease) and percentage of infection/tillage system,Seed yield/tillage system. Data collected were analysed by the analysis of variance method. Treatment means were separated by least significant difference test at 5% level of probability (Onuh and Igwemma, 2001).

RESULTS AND DISCUSSION

The result in Table 1 showed that more mungbean plants were infected by the leafspot disease, with an average number of 70.6 plants infected in the zero tillage system. This was significantly different ($P \leq 0.05$) from the mean number of mungbean plants infected by the leaf spot disease in the flat and ridge tillage systems.

The observed significant effects of tillage systems on the number of mungbean plants affected by leafspot disease showed that tillage practices influenced the incidence and severity of the disease in the mungbean plant. High number of mungbean plants affected by the disease in the zero tillage may be attributed to the fact that the soil pathogens were undisturbed since the soil was not put to fine tilth. All these created a conducive environment for the growth of the pathogens, development and attack on the mungbean plant, resulting to high leafspot disease on the mungbean seedlings on zero tillage. This is confirmed by the work of Ihejirika *et al*. (2003), who reported that tilling the soil exposed the soil pathogens to sunlight and heat, thereby discouraging pathogenic attack on plants.

Table 1: Mean number of mungbean plants affected by leafspot disease in the tillage systems.

Tillage systems	Mean number of mungbean affected by leaf spot disease
Flat	16.3[b]
Ridge	16.6[b]
Zero	70.6[a]

Means with the same letter are not significantly different ($P \leq 0.05$).

Table 2: Number of seedlings in each disease score group, and percentage infection of mungbean plants grown in the different tillage systems.

Tillage Systems	Score 1 No Spots	Score 2 Mild Spots	Score 3 Moderate Spots	Score 4 Severe Spots	No. of Affected Plants	Total No. of Seedlings	% Infection
Flat bed	173	25	12	12	49	222	22.07
Ridge	172	27	13	10	50	222	22.52
Zero	10	49	48	115	212	222	95.49

The above table 2 indicated that number of mungbean seedlings affected by leaf spot disease was more in zero tillage practice, and consequently, this tillage practice had the highest percentage of leaf spot infection. The severity of leaf spot disease was observed to be significantly higher in the mungbean seedling cultivated under zero tillage system than in the flat bed and ridge tillage systems, respectively (Table 2). The high incidence of leaf spot in the mungbean seedlings growing under zero tillage may be attributed to the pathogens in the soil that were not distributed since the soil was not put to five tilth like in the flat bed and ridge systems. This condition may have created a conducive environment for the leaf spot pathogens to attack the mungbean seedlings, resulting in high leaf spot disease severity by the zero tillage system, compared to the flat bed and ridge systems which had lower severity of leaf spot disease. Ihejirika *et al*. (2003) reported similar trend, but added that tilling the soil exposed the soil pathogens to sunlight and heat, thereby discouraging pathogenic attack on plants.

Yield of mungbean under different tillage systems

Results showed that the flat bed tillage system recorded the highest mean seed weight (5.2g) though not significantly different from the ridge system with 5.0, but was significantly different from zero tillage system which recorded the least seed weight of 3.9 (Table 3).

In Table 3 also, the highest seed yield was obtained from the ridge tillage system with a value of 52.2kg/ha though not significantly different from the mean seed yield of 47.4kg/ha obtained from the flat bed tillage system. However, these values are each significantly different from the 25.1kg/ha seed yield recorded in the zero tillage system.

The higher seed yield recorded in mungbean plants under ridge and flat bed systems may be attributed to fine soil texture obtained in the nature of their land preparation which guaranteed good soil and organic matter mixture, destruction of hardpan and provision of more soil value which formed the root base. These provisions, according to Gayiri *et al*. (1994) resulted in high yield of the mungbean in the flat bed and ridge systems, contrast to the zero tillage system.

Table 3: Mean seed weight and seed yield of mungbean plants under different tillage systems.

Tillage systems	Mean seed weight (g)	Mean seed yield (kg/ha)
Flat bed	5.2[a]	47.4[a]
Ridge	5.0[a]	52.2[a]
Zero	3.9[b]	25.1[b]

Means in the same column with the same letter are not significantly different at $p \leq 0.05$.

CONCLUSION

Management of *Cercospora* leaf spot disease of mungbean was investigated under flat bed, ridge and zero tillage systems, respectively. It was observed that the leaf spot disease incidence and severity were lower in the flat bed and ridge tillage systems. Zero tillage system showed increase in the incidence and severity of the disease. Also, seed weight and seed yield were higher in the flat bed and ridge systems than in the zero tillage. It was therefore concluded that *Cercospora* leaf spot can be better managed when mungbean is planted on either ridge or flat bed instead of zero tillage.

REFERENCES

Asian Vegetable Research and Development Centre (AVRDC) (2002). High Yielding, MYMV-resistant mungbean limes for South Asia. AVDC Publication No. 02: 542

Auguo, B.A.C (2004). Advance in Legume Science. *Field Crops Res.* 8: 187-98

Dufour, R., 2001. Biointensive Integrated Pest Management (IPM).

Gayiri, P.R., V.K. Arora, and M.R.Chaudhary, (1994). Maize growth responses to deep tillage straw mulching and farm yard manure in coarse textured soils of N. W. India. Soil Use and Mgt.,10: 15-20

Gopalan, C., B.V. Rama Sastri, and S.C. Balasubramanian, (2000). Nutritive Value to Indian Foods. National Institute of Nutrition, *Indian Council Med. Res.,* 6-10

Hossain, I.M.A.Q Sheikh and A.A. Khan, (1981). Field screening of mungbean (*Vigna radiata* L.) germplasm for resistance to *Cercospora* leaf spot in Bangladesh. *SABRAO J.,* 13: 180-2

Ihejirika, G.O., E.U. Onweremadu and C.I. Duruigbo, (2003). Effects of organic manure and plant densities on severity of leaf spot disease and yield of groundnut in ultisols. Proc. Ann. Conf. Agric. Soc. Nigeria. University of Calabar, 2003. 10-3

Iqbal, S.M., A. Ghafoor, M. Bashir and B.A Malik, (1995). Estimation of loses in yield components of mungbean due to *Cercospora* leaf spot. *Pakistan J. Phytopathol;* 7: 80-1

Iqbal, S.M., M. Zubair and A.M. Haqqani, (2004). Resistance in mungbean to Cercospora leaf spot disease. *International J. Agric & Bi*ol., 6(5): 792-3

Iqbal, S.M., M.R. Malik and B.A. Malik, (1990). Economics of foliar fungicides against *Cercospora* leaf spot disease of mungbean. *Sarhad J. Agric.,* 6: 485-9

Jadhaw, V.M.R., and B.L. Sharma, (1983). Field reaction of mungbean (*Vigna radiata* L.) Wilczek varieties to *Cercospora* leaf spot in North Madhya Pradesh. *Legume Res.,* 6: 99-100

Nigeria Meteorological Agency (NIMET), (2007). Annual weather records for Owerri, Imo State. 18-25.

Onuh, M.O. and A.A. Igwemma, (2001). Applied Statistical Techniques for Business and Basic Sciences. Skillmark Media Ltd. Owerri, Nigeria. 341

Quebral, F.C. and I.C. Cagamparg, (1970). Influence of *Cercospora* leaf spot control on yield of mungbean. Agriculture at *Los Banos*, 10: 7-12

Singh, D.V. and R.R Singh, (1978). Field evaluation of fungicides for the control of *Cercospora* leaf spot of green grain. *Pesticides,* 12: 28-9

Singh, S.D. and S.M.P Naik, (1977). Field control of *Cercospora* leaf spot of urd by fungicides. *Indian J. Mycol. Pl. pathol,* 6:99

Thakur, P.R., P.N. Patel and J.P. Verma, (1977). Genetic relationship between reactions to bacterial leaf spot, yellow mosaic and *Cercospora* leaf spot diseases of mungbean (*Vigna radiata* L.) *Enphytica,* 26: 765-74.