



International Journal of  
**Agricultural  
Research**

ISSN 1816-4897



Academic  
Journals Inc.

[www.academicjournals.com](http://www.academicjournals.com)

## Effects of Maize Intercropping on Incidence and Severity of Leafspot Disease (*Cercospora arachidicola* Hori) and Nodulation of Groundnut

G.O. Ihejirika

Department of Crop Science and Technology, Federal University of Technology,  
Owerri, Imo State, Nigeria

**Abstract:** A two seasons experiment conducted in 1999 and 2000 planting seasons, respectively to determine the effects of maize intercropping and plant density on the incidence and severity of *Cercospora arachidicola* Hori and nodulation of groundnut. Investigation revealed that groundnut intercropped with maize was highly significant on incidence and severity of *Cercospora arachidicola* Hori leafspot disease of groundnut at 0.05 probability level. Intercropping showed a significantly lower leafspot disease severity 0.64 and 0.76 and a lower nodulation of 86.4 and 87.0% in 1999 and 2000, respectively in comparison with sole groundnut 0.77 and 0.86 leafspot disease severity and 88.5 and 98% defoliation in 1999 and 2000, respectively. Plant density 250,000 plants ha<sup>-1</sup> recorded 0.00 incidence of leafspot disease at 4 weeks of plant age in both seasons, as well as least severity of leafspot disease 0.30 and 0.35 but high nodulation of 14.75 and 13.95 in 1999 and 2000, respectively while 1,000,000 plants ha<sup>-1</sup> had highest severity 1.15 and 1.24 but low nodulation 12.63 and 11.05 in 1999 and 2000, respectively. There is also a direct relation on severity of leafspot disease with age of groundnut planted in both seasons. Groundnut intercropped with maize had significantly high nodulation 12.44 and 13.05 when sole groundnut 11.31 and 11.55 in 1999 and 2000, respectively were low.

**Key words:** Maize, intercropping, leafspot, nodulation, groundnut

## INTRODUCTION

Groundnut (*Arachis hypogaeae* L.) is a leguminous seed crop rich in fats and protein. It serves as food and feed for man and animals, respectively. Although mainly cultivated in the savannah areas of Nigeria, groundnut is also important in the cropping system of the forest south. Its cultivation is difficult in the forest south mainly because of high incidence and severity of diseases. Leafspot disease is the major foliar disease reducing groundnut yields wherever they are grown. (Subrahmanyam *et al.*, 1980) and yield losses from this disease have been estimated at 15.50% under no chemical control application (Smith, 1954). The principal effect of *Cercospora arachidicola* Hori (early leafspot) is to cause premature defoliation and Porter *et al.* (1980), observed that there is no uniform method of assessing the disease resistance. Hamson *et al.* (1961) and Ford and Hewitt (1980) revealed that visual estimate of percentage of leaves with leafspots and percentage defoliation were efficient evaluation methods when large numbers of entries are to be tested. The call for self-sufficiency in food production today requires that more land area be brought under arable land use and also low input technologies affordable by resources poor farmers be developed. The use of leguminous crops like groundnut to supply cheap nitrogen, use of intercropping and planting densities are low input technologies needed

**Corresponding Author:** G.O. Ihejirika, Department of Crop Science and Technology,  
Federal University of Technology, Owerri, Imo State, Nigeria

in the agricultural sector to reduce the incidence and severity of early leafspot disease of groundnut. Intercropping in addition to disease severity reduction, provide good yield of additional crop for a particular field (Okpara *et al.*, 1995; ICRISAT, 1987; Tilahun, 1995). Obi (1991) reported an increase in nodule number on legume growing with maize while Ihejirika and Nwifo (2001) and Ihejirika *et al.* (2003) observed that plant densities have great influences on yield and leafspot disease severity of Benniseed and groundnut, respectively.

The objective of this research is to determine the effect of intercropping groundnut with maize and appropriate planting density to be adopted so as to reduce the incidence and severity of leafspot disease of groundnut as well as improve nodulation of groundnut.

## MATERIALS AND METHODS

Experiments were conducted in the School of Agriculture and Agricultural Technology research farm of Federal University of Technology, Owerri in 1999 and 2000, respectively, using an erect (early maturing cultivars) of groundnut and maize cultivars TZSR (Tropical *Zea mays* streak resistant) white. Thirty-two (32) plots were marked out and plots were prepared based on four (4) planting densities 10×10, 20×20, 30×30 and 40×40 cm, respectively giving 1,000,000; 250,000; 111,111 and 62,500 plants ha<sup>-1</sup>, respectively as sole groundnut and groundnut intercropped with maize. They were laid out in randomized complete Block Design replicated four times.

Data were collected on the severity of leafspot disease, percentage defoliation and nodulation in 1999 and 2000, respectively. The severity of a disease was estimated using the following visual observation and scoring as described by Hamson *et al.* (1961) and Ford and Hewitt (1980), according to the following format:

Severity estimation (%)	Scale
0	0
1-20	1
21-40	2
41-60	3
61-80	4
81-100	5

The percentage defoliation was determined by counting abscised and retained leaflets.

At Nodulation harvest ten sampled plants from each treatment were carefully uprooted. The roots were immersed in water to remove the soil attached to the root. This followed by counting the number of nodules from the sampled plants and recorded.

## RESULTS

Results obtained from the investigation revealed that maize intercropping was highly significant on leafspot disease severity, percentage defoliation and nodulation at 0.05 probability level in 1999 and 2000, respectively. Leafspot disease incidence and severity increases with plant's age with highest severity at 12 weeks of plant age (Table 1). Maize intercropping recorded significantly lower early leafspot disease severity (0.64 and 0.76) in comparison with sole groundnut (0.77 and 0.86), which were high. It also recorded lower percentage defoliation (86.4 and 87.0%) and nodulation (12.44 and 13.5) when sole groundnut (88.5 and 98.9%) and (11.31 and 11.55) defoliation and nodulation, respectively were high in 1999 and 2000, respectively (Table 2).

Table 1: Incidence and severity of leafspot disease at different time of plant age

Parameters	Weeks after planting					
	4		8		12	
	1999	2000	1999	2000	1999	2000
Maize intercrop						
10×10 cm	0.75	0.88	1.75	1.90	2.75	2.92
20×20 cm	0.00	0.00	0.25	0.27	1.15	1.20
30×30 cm	0.02	0.10	0.50	0.62	2.50	2.60
40×40 cm	0.25	0.32	0.55	0.68	2.35	2.42
LSD <sub>0.05</sub>	0.215	0.222	0.325	0.360	0.260	0.300
Sole groundnut						
10×10 cm	0.35	0.65	1.00	1.20	2.25	2.35
20×20 cm	0.00	0.08	0.28	0.35	1.25	1.40
30×30 cm	0.25	0.30	0.53	0.66	2.00	2.15
40×40 cm	0.27	0.45	0.56	0.70	2.02	2.08
LSD <sub>0.05</sub>	0.200	0.195	0.280	0.206	0.277	0.245

Table 2: Effect of intercropping and plant density on leafspot severity, percentage defoliation and nodulation

Parameters	Leafspot disease severity		Percentage defoliation		Nodulation	
	1999	2000	1999	2000	1999	2000
Maize intercrop	0.64	0.76	86.4	87.0	12.44	13.05
10×10 cm	1.15	1.24	85.8	86.2	12.63	11.05
20×20 cm	0.30	0.35	75.4	74.5	14.75	13.95
30×30 cm	0.70	0.71	83.5	84.2	12.13	12.00
40×40 cm	0.72	0.79	84.0	83.6	11.00	10.45
LS D <sub>0.50</sub>	0.212	0.253	1.98	1.94	2.14	2.45
Sole groundnut	0.77	0.86	88.5	98.9	11.31	11.55
10×10 cm	1.64	1.88	88.6	89.2	10.30	10.00
20×20 cm	0.66	0.60	77.0	76.0	12.80	12.06
30×30 cm	1.14	1.30	84.2	85.0	10.50	10.90
40×40 cm	1.10	1.54	85.4	86.0	9.70	10.00
LSD <sub>0.5</sub>	0.501	0.493	1.83	1.90	2.06	2.19

250,000 plants ha<sup>-1</sup> recorded 0.00 incidence of leafspot disease at four weeks of plant's age in 1999 and 2000. In all the seasons investigated, 250,00 plants ha<sup>-1</sup> recorded least leafspot severity (0.30 and 0.35) while 1,000,000 plants ha<sup>-1</sup> recorded highest (0.15 and 1.24) in 1999 and 2000, respectively (Table 2). However 111,111 and 62,500 plants ha<sup>-1</sup> produced statistically similar result (0.70 and 0.71) and (0.72 and 0.79) in 1999 and 2000. 250,000 plants ha<sup>-1</sup> recorded lower defoliation (75.4 and 74.5%) but higher nodulation (14.75 and 13.95) while 1, 000,000 plants ha<sup>-1</sup> recorded highest defoliation (85.8 and 86.2%) but lowest nodulation (12.63 and 11.05) in 1999 and 2000 (Table 2).

## DISCUSSION

Lower leafspot disease severity recorded by maize/groundnut intercrop in two seasons may be attributed to the fact that intercropping provides a complimentary use of resources such as water, nutrients and sunlight coupled with reduced soil erosion by the dense and diversified maize root system. All these provided barrier against disease penetration, attack and symptom manifestation and thus encourage nodulation of groundnut in line with Subrahmanyam *et al.* (1980) and Gajini *et al.* (1994). Higher nodulation record by groundnut intercropped with maize than sole groundnut, may be attributed to the fact that intercropping is more efficient in using soil nitrogen resulting to increase in nodule number in line with Thompson (1977). But inconsistencies which result in reduced nodulation may be attributed to factors like cropping pattern, vagaries of climate, upsurge of disease outbreak in line with Obi (1991) and FAO (1996). Lower leafspot disease recorded by 250,000 plants ha<sup>-1</sup> and

high nodulation may be attributed to the fact that plant densities has large influence in yield (nodulation) of plant mixtures as proposed by Tilahun (1995), Ihejirika and Nwugo (2001) and Ihejirika *et al.* (2003). Direct relationship existing between leafspot disease severity with plant age may be attributed to the fact that plants respond more to disease as they age. At early developmental stages, plants do not respond quickly to disease attack and they have greater ability to withstand the attack. Also at this stage they are physiologically and metabolically active as such possess ability to suppress disease symptoms and manifestations.

In conclusion, maize intercrop recorded a significantly lower leafspot disease severity and percentage defoliation than sole groundnut. It also recorded higher nodulation than sole groundnut in 1999 and 2000. Plant density 250,000 plants ha<sup>-1</sup> recorded the lowest leafspot disease severity while 1,000,000 plants ha<sup>-1</sup> recorded the highest in both seasons.

## REFERENCES

- FAO, 1996. Food and Agricultural organization of the United Nations. Trade Year Book.
- Ford, J.E. and D. Hewitt, 1980. In: Vicia Foba. Bond, D.A. (Ed.), Feeding Values, Processing and Viruses. The Hague: Martinus Nijhoff., pp: 125-139.
- Gajiri, P.R., V.K. Arora and M.R. Chaudhary, 1994. Maize growth responses to deep tillage straw, mulching and farmyard manure in coarse textured soils of N.W. India. Soil Use and Manage., 10: 15-20.
- Hanson, W.D., R.C. Leffell and R.W. Howell, 1961. Fixation of Nitrogen in tropical soils. Crop Sci., 1: 121-126.
- ICRISAT, 1987. International Crops Research in Semi-Arid Tropics. Research on Grain Legumes in Eastern and Central Africa, pp: 120.
- Ihejirika, G.O. and M.I. Nwugo, 2001. Plant Population and Nitrogen application on severity of leafspot disease of Bennisseed. Afr. J. Sci. Technol., 2: 203-207.
- Ihejirika, G.O., E.U. Onweremadu and C.I. Duruigbo, 2003. Effects of organic manure and plant densities on severity of leafspot disease and yield of groundnut in an ultisols. Paper presented at 37th Ann. Confr. Agric. Soc. of Nigeria University of Calabar, pp: 10.
- Obi, I.U., 1991. Maize its Agronomic, Diseases, Pest and Food Values. Optimal Computer Solutions Ltd Publ., pp: 206.
- Okpara, D.A., C.P.E. Omaliko and R.A.E. Ugboja, 1995. Evaluation of the Periodicity of African Yam bean (*Sphenostylis stenocarpa*)/Yam (*Discorea rotundata*) intercrops under different African Yam bean plant densities. J. Sci. Eng. Technol., 2: 9-15.
- Porter, D.M., D.H. Smith and R. Rodriguez-Kabana, 1982. In: Peanut Science and Technology H.E. Pattee and C.T. Youngs (Eds.), pp: 326-410. Peanut Res. Educ. Soc. York, T. X.
- Smith, B.W., 1954. Foliar Diseases. pp: 55-57. In: Compendium of peanut Diseases. American Psychopathological Society, pp: 77.
- Subrahmanyam, P., V.K. Mehan, D.J. Nevill and D. MacDonald, 1980. Research on fungal diseases of groundnut ICRISAT. Proceeding of an international workshop on groundnut, pp: 193-198 ICRISAT, Patancheru, A.P. India.
- Thompson, D.R., 1977. The effect of cereal heights in performances of stand intercropped with Soya bean. M.Sc Thesis, University of Dar es Salaam, Morogoro, Tanzania.
- Tilahun, A., 1995. Yield grain and risk minimization in maize (*Zea mays* L.) through cultivate mixtures in semi and zones of the rift valley of Ethiopia. Exp. Agric., 31: 161-168.