Web Blotch Disease of Groundnut (*Arachis hypogaea*) in Nsukka

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Abstract

Web blotch diseases of groundnut were observed in groundnut farms in Nsukka on the Spanish groundnut cultivars. The disease was characterized by tan-coloured web like blotches on infected leaves. Blotches have grayish irregular margins and lower leaves were affected while new leaves were rarely attacked. The fungus in culture showed a creamy white mycelial growth that became black or dark brown within two weeks when it produced abundant chlamydospores in chains. Pycnidia of the fungus were observed on leave tissues when the leaves were maintained in moist environment within four weeks. The organism is called Phoma sorghina and confirmed by International Mycological Society in Kew, England (IMI number 368112). The best type of inoculum of the organism was a two weeks old culture since it produces the best lesion than other sources of inoculum (9.5 ± 0.94). It also induces the highest leaf abscission (5.1 ± 1.9).The more the inoculum the higher the disease incidence (9.6 ± 0.94) at 10^5spores. Two weeks old inoculum was also the best at inducing lesions (11.30 ± .80) as well as inducing defoliation (5.5 ± 0.92).

Keywords: Web blotch diseases, Groundnut, Chlamydospores, *Phoma sorghina* inoculum

Introduction

Web blotch disease caused by *Phoma sorghina* is a disease of groundnut. It is a new disease in Nsukka groundnut growing environment. Different leaf spots have been studied as far as groundnut plants are concerned (*Shaza et al.,* 2004). Other leaf spot diseases are caused by *Alternaria* spp., *Phyllostica* spp., *Cercospora* spp., *Mycothecium* spp, *Zonathera* spp, *Sclerotium* spp*, Pestalotia* spp, and *Anthrancoses* spp. Similar symptom to web blotch diseases has been described (*Ganesan et al.,* 2007) but the causative organism and the size of blotches are different (Mathur *et al.,* 1992). They gave symptom that would have been web blotch but the organism was called Phoma leaf spots instead. The Spanish Valencia groundnut variety which has an erect growing habit seems to favour the disease more than the Virginia type (Cornelissen, 1995). The organism *Phoma sorgina* has been reported in cassava (Maduewesi, 1980).

This disease increases in incidence with defoliation when there is much rainfall (Blamey and Champman, 1992). It is believed that rain splash which is produced by irrigation may produce means for propagule dissemination (Dagnachew and Cadwel, 2003). It is possible that *Phoma sorgina* may be seen in other parts of Nigeria where groundnut is grown. The aim of the present study was to establish the occurrence of the web blotch disease caused by *Phoma sorghina* in groundnut within Nsukka agricultural zone.

Materials and Methods

Collection of diseased plants: Infected groundnut leaves or whole plant were collected and stored in polythene bags. A total of 32 whole plants were collected and16 farm in all were visited between July to December 2007.

Identification of causative organism: In the laboratory, diseased leaf areas adjacent to healthy areas were exercised and rinsed in 0.1% mercuric chloride for one minute. It is then transferred to sterile water at three changes. They were plated in water agar and incubated at room temperature. Seven days after the mycelial growth the water agar was transferred aseptically to Petri dishes where the pure culture of the organism develops. The organism was later sent to International Mycological Society Laboratory, Kew, England for identification (Blamy and Champman, 1992).

Inducing pycnidial growth on naturally infected groundnut leaves: Infected leaves were placed on Petri dishes and watered sparingly twice a week for four weeks. Particular care was taken to ensure that the leaves were not flooded. When the growing environment begins to turn brown, it signified that the organism has started growing.

Effect of inoculum concentration on web blotch disease development: A conidial suspension of the organism was prepared from pcynidia on inoculated autoclaved leaves. Petri dishes containing the pcynidia was flooded with water in a glass trough and later passed through 0.5mm sieve to remove residual mycelia.

Data analysis: The mean for these different variables were used. Student T test was then applied to evaluate the effect of different sources of inoculum on disease development as well as the effect of age of culture and inoculum size on diseases development (Woodson, 1981).

Results

Initially the leaves have tan coloured specks or streaks on the upper surface of the lower leaves which are smaller than the middle leaves. These discoloured areas expand forming large nearly circular brown to dark brown blotches with inconspicuous margins. Later they coalesce forming large blotches that covered half of the leaves. From Table 1, it could be seen that the best type of inoculum at inducing disease development is a two

week old culture, this is in terms of the number of spots on leaflets (15.4 ± 0.92) and number of leaflets that abscised per plant (5.1 ± 1.9). The higher the inoculum size the more the disease. This is shown by the number of leaf spots on leaves when the value of the inoculum was highest (4 × 10^5). The more number of months of the infection the higher the disease. There is zero disease development at one month of the age of culture. There is the best value in terms of disease development at this period (5.5 ± 0.92).

Table 1: Effect of different sources of inoculum on web blotch disease development

Sources of inoculum	Number of lesions on leaflets per plant[+]	Number of leaflets abscised per plant after 18 days[+]
A	15.4 ± 0.92	5.1 ± 1.9
B	14.3 ± 0.73	1.3 ± 0.3
C	13.4 ± 0.68	3.7 ± 0.63
D	14.9 ± 0.74	4.4 ± 0.83

+ Mean was taken from leaflets of 20 plants, A = 2 weeks old cultures, B = Diseased leaf tissue, C = Chlamydospores clusters and D = Conidial suspension

Table 2: Effect of inoculum size on web blotch disease development

Inoculum size Conidial/ml	Number of spots on leaflets[+]	Defoliation[+]
4 × 10^5	9. 2	46 .3[×]
4 × 10^4	5.6	36 .5[×]
4 × 10^3	1 .8	24 .0[×]
4 × 10^2	1 .2	19 .1[×]

+Mean was taken from leaflets of 20 plants

Table 3: Effect of age culture on disease development

Age of cultures	Number of spots on leaflets[+]	Defoliation[+]
1	0	0
2	9.95 ± 0.9	55 ± 0.92
3	11.3 ± 0.18	48 ± 0.82
4	4.50 ± 0.5	38.5 ± 0.83

+Mean was taken from leaflets of 20 plants

Discussion

Web blotch can occur on the same leaf with other leaf spot diseases. Lower leaves were most susceptible to the diseases than other leaves. Incubating infected leaves at room temperature for 2 days gave minimal growth of pycnidia. Inside pycnidia were spores which were known to cause more infection if they were made to be concentrated more on any side. Maduewesi 1980 has already reported this organism in cassava. Other symptoms of these organisms as reported in other plants include net blotch (Phipps, 1981), and leaf blotch (Marasas *et al.,* 1974). The organism produce oval conidial and numerous chlamydospores are seen in two weeks old culture. The two weeks old culture was the best at inducing symptoms than other sources of inoculum (Table 1). The more the inoculum size of the organism the more the diseases it causes (Table 2). This is in line with the findings of *Tindall* (2003) and Phipps (1985). Cultures were at their best in terms of causing disease when they were two weeks old. One week old culture gave no infection (Table 3), thus buttressing the findings of Dangnatchew *et al.* (1981). Stomatal movement was feeble in very young plant signifying that the organism may penetrate its host through the stomata. This condition of stomata movement was observed in this study. Web blotch disease of groundnut has added to numerous groundnut diseases that has defiled recent control around Nsukka .One problem of this disease is its rapid spreading nature .The disease spread very fast and covers affected leaves in a matter of days. The idea of expanding very fast causes enough disease within days and this has been a major problem at controlling most leaf disease of groundnut. *Taber et al.* (1994) added to the scenario is the fact that the disease can affect other crops from sick crops; a similar situation was reported for groundnut in Texas (Ardel, 1992).

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