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Survey of Seed-Borne Fungi of Zea Mays L. in Imo and Anambra States of Nigeria

Untersuchung von Mais-Saatgut hinsichtlich samenbürtiger Pilz in den Bundesländern Imo und Anambra, Nigeria

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1. Introduction

Maize is the next important cereal in the world after wheat and rice. Apart from its use as fodder, it is an important food in most tropical countries, Nigeria being no exception.

The importance of maize is evident, when the nutritive contents of the seeds are analysed. Berger (1) gave its water-free portion to contain 77% starch, 2% sugar, 9% protein, 5% fat and pentosan respectively and 2% ash. It is no wonder therefore that maize is a popular food crop and suitable nutrient media for various seed-borne fungi.

The cultivation of maize has not, however, made much impact on the nation's food strategy, owing maybe to various pathogens, most of which are seed-borne (8). Systematic investigations have so far not been done to evaluate the health conditions of the maize seeds intended for sowing. While the proper control of major seed-borne diseases enhances food production, their detection on seeds and possible elimination is a much more economic precautionary measure. This paper surveys the seed-borne fungi of the maize seeds commonly used for sowing in Imo and Anambra States of Nigeria.

2. Materials and Methods

The health condition of twelve samples comprising of 9 commonly used maize varieties collected from twelve widely separated seed multiplication centres was investigated.

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Eight hundred maize seeds of each sample were at randomly selected and plated on three pieces of moistened blotters — twenty-five seeds per plastic petri dish of 9 cm diameter. These seeds were then incubated at 20° C ± 1 under alternating circles of 12 hours near ultraviolet light (NUV) and darkness respectively for 8 days.

The identification of the fungal pathogens on the seeds was based on the growth characteristic and was aided by a stereoscopic binocular (6—50 times magnification). Slides were examined whenever necessary for conidial morphology.

Table 1: Composition of the seed-borne microflora in the various maize samples.

Sample	Variety	Place grown	Microflora composition
A	Composit C.	U N N	Fusarium moniliforme Sheld
B	N S 1	F A R T S	F. moniliforme Sheld
C	N S 1	Mbato in Imo State	Cephalosporium ssp. Curvularia lunata (Wakker) Boedijn C. geniculata (Tracey & Barle) F. moniliforme Sheld
D	N S 1	U N N in Anambra State	Cephalosporium ssp. Drechslera maydis (Nisikado) Subram & Jain F. moniliforme Sheld
E	Western	Ohafia in Imo State	Cephalosporium ssp. C. geniculata (Tracey & Barle) Boedijn F. moniliforme Sheld Verticillium ssp.
F	Western Yellow	Ugwuoba in Anambra State	Cephalosporium ssp. Drechslera maydis (Nisikado) Subram & Jain F. moniliforme Sheld

Continuation of Table 1

Sample	Variety	Place grown	Microflora composition
G	Local Yellow	U N N in Anambra State	Botryodiploidia ssp. Cephalosporium ssp. Curvularia eragrostidis (P. Henn.) J.A. Meyer C. geniculata (Tracey & Barle) Boedijn C. lunata (Wakker) Boedijn F. moniliforme Sheld F. semitectum Berk. & Rav. Phoma ssp.
H	Eafro 231	U N N	Cephalosporium ssp. F. moniliforme Sheld
I	Pioneer	U N N	Cephalosporium ssp. F. moniliforme Sheld F. semitectum Berk. & Rav.
J	Local soft	U N N	Cephalosporium ssp. F. moniliforme Sheld
K	Western White	U N N	Cephalosporium ssp. Curvularia inaequalis (Shear) Boedijn Drechslera maydis (Nisikado) Subram & Jain F. moniliforme Sheld
L	Bomo Local	U N N	Cephalosporium ssp. Fusarium moniliforme Sheld

3. **Results**

The seed examination recordings revealed that various seed samples in different varieties exhibited wide ranging composition of seed-borne microflora (Table 1). As could be seen from Table 2, varying infection percentages of various fungi were also recorded. The high incidence of *Fusarium moniliforme* Sheld and the consequent low rate of seed germination was clearly evident (Table 3), through not statistically correlated.

Table 2: Infection percentages of respective seed-borne fungi.

Fungi	%age No. of Samples infected	Average infection percentage (%)
Botryodiploidia ssp.	8,3%	0,5
Cephalosporium ssp.	83,3%	4,4
Curvularia lunata	16,6%	0,8
Curvularia geniculata	2,5%	0,6
C. eragrostidis	8,3%	0,3
C. inaequalis	8,3%	0,3
Drechslera maydis	25 %	1,0
Fusarium moniliforme	100 %	37,5
Fusarium semitectum	16,6%	1,2
Phoma ssp.	8,3%	9,0
Verticillium ssp.	8,3%	12,8

Table 3: Incidence of *F. moniliforme* and germination percentage of the infected seed lots.

Maize variety	Location	Incidence of F. moniliforme %	Germination %age of maize seeds
Eafro 231	U N N	9	73
West Yellow	Ohafia	6	0,0
West Yellow	Ugwuoba	93	43,0
Local Yellow	U N N	9	4,0
N S 1	U N N	72,0	69,0
N S 1	Mbato	60,0	79
N S 1	FARTS	69,0	94
Pioneer	U N N	55	63
Composit C.	U N N	1	56
Local soft	U N N	7	79
Western white	U N N	67	65
Bomo local	U N N	3	2

4. **Discussion**

From all the fungi recorded on the seeds of various samples and varieties, *Fusarium moniliforme* and *Cephalosporium* sp. were dominant. The former was found on all maize varieties in varying severity. Apart from three maize varieties that had no incidence of *Cephalosporium* species the rest also had varying degrees of infection ranging from 0.5—13%. The consistent association of this fungus with kernal rot, slow wilt, late blight and manifestation of discolouration of maize seed is an indication of its economic importance. Infection percentage for *Fusarium moniliforme* was much higher and ranged from as low as 1% to a heavy infection of 93%. The importance of *F. moniliforme* especially as it affects germination and seedling mortality have been investigated by Maric et al. (5, 6), Joffe (4), Neergaard (7). It is also known to induce seed rot, root and stalk rots as well as seedling blight.

Noble & Richardson (8) gave seven seed-borne fungi of economic importance on maize. The two dominant fungi in this investigation — *Cephalosporium* sp. and *Fusarium moniliforme* — as well as *Drechslera maydis (Helminthosporium maydis)* are of economic importance.

This study has so far revealed that the consistency of the seed-borne microflora vary with the maize varieties as well as their growing places. Germination of the seeds has no doubt been affected not only by the inherent factors but also the fungi borne by them. It has been observed that the more populous the seed-borne microflora was, the lower the germination percentage of the seed lot. *Fusarium moniliforme* was specifically also found to reduce germination especially when they grow profusely on the seeds. Such seeds with heavy or severe infections no doubt could have resulted to seed rot and seedling mortality in the field. In general the low germination percentages of the seeds seemed not only to be varietally induced. Similar varieties grown under different areas exhibited differential infection percentage of *F. moniliforme* as well as difference in seed germination. Western yellow of Ohafia origin though had only 6% *Fusarium moniliforme* infection, the seed germination was zero, while same variety from Ugwuoba with 93%, the highest percentage of infection, had 43% seed germination. The NS1 exhibited similar differential tendency.

Although *D. maydis* was encountered only in 25% of the seed samples examined with an infection percentage of the seeds ranging from 0.3 to 3%. Its presence, despite of the low infection percentage, is not unimportant. Not only that is could quickly become prevalent, once established as is the case with other maize producing areas but it is very destructive on maize expecially with its physiologic races.

It is therefore necessary for the health of our seeds to be tested first, to ensure a high planting value, which the disease-free seeds could guarantee. In our area when seeds do lots of long journey, the absence of seed health testing would automatically introduce inoculum to an area where they were hitherto completely absent. Even where the inoculum is already present, further introduction would intensify inoculum density. Worse is that more virulent physiological races could also be introduced with the seeds, to which local varieties become highly susceptible as was observed by Craig (2) and Danquah (3) in Nigeria and Ghana respectively. The importance of seed health test can, therefore not be over-emphasized, if maize should contribute effectively in the Nigeria's Operation Feed the Nation Programme as well as in world's food strategy.

5. **Summary**

Routine seed health tests were done on maize seeds (Zea mays L.) of Imo and Anambra States origin by blotter method. Many fungi including some of economic importance like *Fusarium moniliforme* and *Cephalosporium* sp. were found to be seed-borne. Both fungi were encountered in almost all the samples and the infection percentages were comparatively higher too. The consequences of these seed-borne pathogens have been discussed.

Zusammenfassung

Es wurden Routinegesundheitsuntersuchungen an Maiskörnern (Zea mays) aus den Staaten Imo und Anambra nach der Fließpapiermethode durchgeführt. Viele Pilze, einschließlich einiger von wirtschaftlicher Bedeutung, wie *Fusarium moniliforme* und *Cephalosporium* spp. wurden als samenbürtig erkannt. Beide Pilze wurden in fast allen Proben angetroffen und ihre Infektionsdichte war vergleichsweise hoch. Schlußfolgerungen für diese samenbürtigen Pathogene wurden diskutiert.

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References

1. BERGER, J., 1962: Maize production and the manring of maize. — Centre d'etude de l'azote, Geneva.
2. CRAIG, J., 1971: Occurrence of *Helminthosporium maydis* Race T in West Africe. — Plant Dis. Reptr., 55, 672—673.

3. DANQUAH, O. A., 1973: Studies on seed-borne fungi of rice. Sorghum and maize from Ghana. — Danish Govt. Institute of Seed Pathology for Developing Countries, Copenhagen, Denmark.

4. JOFFE, A. Z., 1971: Alimentary toxic Aleucia. Microbial Toxins. Vol. VII. — Academic Press, N.Y. and London.

5. MARIE, A.; PANIC, V., 1963: Fuzariozna plesnivost klipa kukuruza u nasoj zembji, savremena poljeprivreda, Novi sat.

6. MARIE, A.; MARKOVIC, Z.; OREZGIC, P., 1969: Epifitotiena pojava plesnivosti klipa kukuruza tokom 1968 g. i uticaj nekih agrotechnickih mera na intensitet zaranze. — Sast. bilja, 103, 15.

7. NEERGAARD, P., 1960, 1963, 1974: Report on comparative seed health testing of maize. — ISTA, Plant disease Committee, Copenhagen, pp. 15, 23, 25.

8. NOBLE, M.; RICHARDSON, M. J., 1968: An annotated list of seed-borne diseases. — Proc. Int. seed Test. Ass. 33, 1—191.