Sorghum Root and Stalk Rots: Basic Disease Problems

Summary and Synthesis

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The eight background papers on basic disease problems provide an overall view of the biology of the causal agents and the epidemiology of root and stalk rot diseases. Since the effects of plant physiological and environmental factors and disease control are presented in later sessions, my comments will be confined to crop loss and some aspects of the biology of the causal organisms.

Crop Loss Caused by Root and Stalk Rots

All the authors of the background papers on specific diseases have reported that root and stalk rots cause crop losses. However, the few data available are from experiments conducted at research stations or in glasshouses. There is a dearth of quantitative crop loss data from farmers' fields. Unless sorghum scientists are able to show that root and stalk rots cause unacceptable crop losses in farmers' fields, there is little justification for funds to be spent on research for their control. I would recommend that systematic crop loss surveys in farmers' fields be conducted in areas where root and stalk rots are thought to be economically important.

Causal Organisms and their Distribution

Of a number of organisms often isolated from diseased roots and stalks, the well-known causal agents are the fungi *Macrophomina phaseolina*, *Fusarium moniliforme*, *Periconia circinata*, *Pythium* spp, and *Colletotrichum graminicola*.

M.phaseolina and *F. moniliforme* appear to be widely distributed in sorghum-growing areas. *P. circinata*, formerly thought to be restricted to the USA, has recently been reported from Australia, where it appears to cause little damage to sorghum (Mayers 1976). Perhaps *P. circinata* is more widespread in sorghum-growing areas than has hitherto been reported, and surveys like those conducted by Mayers in Australia would help to determine its distribution.

The identity of the *Pythium* spp, particularly those implicated in root rots, is still incomplete, as is their distribution and importance on a regional or global basis.

Recently, *Acremonium strictum*, a vascular pathogen that causes leaf and stalk death, has been recognized as an important disease in the Americas. The occurrence of this pathogen in other parts of the world needs to be watched since the disease can be very destructive.

Other fungus-incited diseases not included in the presentations but reported by Tarr (1962) include pink root rot (*Pyrenochaeta terrestris*), southern sclerotial rot (*Corticium rolfsii*), and rhizoctonia stalk rot (*C. solani*). Bacteria, particularly *Erwinia* spp, have also been implicated as causal agents of stalk rots in the Philippines (Karganilla and Exconde 1972), in India (Anahosur 1979), Nigeria (King 1973), and the USA (Zummo 1969). Very little is known about the etiology of these diseases. This is an obvious area for future research.

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International Crops Research Institute for the Semi-Arid Tropics. 1984. Sorghum Root and Stalk Rots, a Critical Review: Proceedings of the Consultative Group Discussion on Research Needs and Strategies for Control of Sorghum Root and Stalk Rot Diseases, 27 Nov - 2 Dec 1983, Bellagio, Italy. Patancheru, A.P. 502 324, India: ICRISAT.

Diseases of Complex Etiology

With the exception of anthracnose, acremonium wilt, and pokka boeng where initial infection is through the stem or panicle, all the other diseases considered in the background papers appear to be of complex etiology involving more than one pathogen or pathogen' species. This has been clearly brought out in the papers by Zummo, Mughogho and Pande, Partridge et al., and Claflin. The frequent association of the causal agents in isolations from diseased roots and stalks needs investigation to determine the nature of association, i.e., whether the organisms can cause disease singly, in succession, or together, and if synergism occurs. The work of Partridge and coworkers at the University of Nebraska on the temporal and spatial succession of fungi on roots and stalks should be conducted at other sorghum-growing locations worldwide to determine the nature of the association, and also the pathogen species involved at different locations.

The role of nematodes in the root and stalk disease complex has hardly been researched, and the areas of future research suggested by Claflin need attention.

Other Aspects of the Biology of Causal Organisms

Very little is known about pathogen dissemination, survival, and source and form of initial inoculum for most of the root and stalk rot diseases. The possible existence of physiological races, as has been shown for anthracnose, also needs elucidation. This is important in utilization of resistance in disease control.

References

ANAHOSUR, K.H. 1979. Bacterial stalk rot of sorghum in regional research station, Dharwad. Sorghum Newsletter 22:121.

KARGANILLA, A.D., and EXCONDE, O.R. 1972. Bacterial stalk rot of corn and sorghum. Philippine Phytopathology 8:4 (abstract).

KING, S.B. 1973. Plant pathology annual report (sorghum): Major Cereals in Africa Project. Samaru, Nigeria: Institute of Agricultural Research.

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TARR, S.A.J. 1962. Diseases of sorghum, sudan grass and broom corn. Kew, Surrey, U.K.: Commonwealth Mycological Institute. 380 pp.

ZUMMO, N. 1969. Bacterial soft rot, a new disease of sweet sorghum. Phytopathology 59:119 (abstract).

Discussion

Etiology/Succession

Doupnik:
Dr. Zummo, is root rot a prerequisite to stalk rot?

Zummo:
When fusarium stalk rot is found, root damage is found with it.

Doupnik:
If fusarium stalk rot comes first, are the roots predisposed to infection?

Zummo:
You can have fusarium root rot without stalk rot. But you don't see stalk rot without root rot.

Frederiksen:
Fusarium stalk rot can come from rachis and peduncle infection and move down the stalk under wet weather conditions.

Mughogho:
Macrophomina stalk rot is preceded by root rot.