Diseases and Decay Fungi in Windbreaks in Oklahoma

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ABSTRACT

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Six windbreaks in west central Oklahoma were surveyed four times in one year for diseases and decay fungi associated with trees in each windbreak. The most severe diseases were Ganoderma root rot and Thyronectria canker on honeylocust, *Phellinus pini* root rot of Austrian and ponderosa pines, Cytospora dieback of cottonwood, and *Phellinus robineae* stem decay of black locust.

Many windbreaks were planted in Oklahoma during the Prairie States Forestry Project (PSFP) (1935–1942) and are now in a state of decline. Most of the windbreaks are oriented east to west; they are at least 800 m long and consist of several rows (9). Windbreaks help conserve topsoil in the Great Plains region, and there has recently been an increase of new windbreaks being planted in Oklahoma (2). Most of the disease research concerned with windbreaks has originated in the northern Great Plains area (5–7,9). No inventory of diseases has been conducted in windbreaks in Oklahoma nor has there been an assessment of trees used as structural components of the windbreaks in relation to disease stress.

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MATERIALS AND METHODS

Six selected windbreaks in Kingfisher and Blaine counties (west central Oklahoma) that were planted during the PSFP were each surveyed for disease and decay organisms four times (December 1980 and March, June, and September 1981). Windbreaks in Kingfisher County and eastern Blaine County were planted on soils classified as major land resource area (MLRA) type central rolling red prairies (MLRA 80A). Windbreaks in western Blaine County were on central rolling red plains (MLRA 78). The number of structural components (= rows) for each windbreak was 5, 9, 10, 10, 10, and 14. The large number of components, compared with the narrow or single-row windbreaks now being planted, was typical of the structural concepts for windbreaks during the PSFP (2).

The 17 species of trees in the six windbreaks are listed in Table 1. Desert willow, red cedar, and red mulberry were structural components in all six windbreaks.

RESULTS

The diseases and decay fungi observed in the selected windbreaks are listed in Table 1. The state of decline present in these windbreaks is indicated by the frequency and numbers of dieback and blight diseases and wood-rotting organisms observed.

The most severe diseases observed were Ganoderma root rot and Thyronectria canker on honeylocust, *Phellinus pini* (Thore ex Fr.) Pil. root rot of Austrian and ponderosa pines, Cytospora dieback of cottonwood, and *Phellinus robineae* (Murr.) A. Ames stem decay of black locust.

Observations on *P. pini* infection of pine in one windbreak showed that 59 trees from a total of 97 were either windthrown or missing, which represented a stand reduction of 61%. The disease was identified on dead and windthrown trees based on the fertile fruiting bodies and sterile mycelial growth over the exposed root system.

Fruiting bodies of *Thyronectria* sp. were observed on 34 dead and dying trees of the 50 honeylocusts in one windbreak. Several openings had been cut into this windbreak to renovate terraces for an adjacent wheat field, which divided it into several sections.

Incidence of *P. robineae* on black locust was assessed in two windbreaks. In the first windbreak, black locust was indiscriminately interplanted with pine. Only nine trees were located and two had visible fruiting bodies of *P. robineae*. In the second windbreak, where 191 black locust trees were present, 45 dead or dying trees had visible fruiting bodies and an additional 64 were dead with no visible symptoms.

Root-rotting organisms were found

during all survey periods. *Ganoderma lucidum* (Leyss.) Karst. root rot was commonly observed on honeylocust and, to a lesser extent, on Kentucky coffeetree and sycamore. *Pleurotus ostreatus* Fr. was frequently observed fruiting at the base of dead red mulberry trees, and *Armellariella tabescens* (Scop. ex Fr.) Singer was occasionally observed in great masses at the base of Siberian elm.

DISCUSSION

Diseases found in Oklahoma windbreaks were similar to those reported for the Great Plains (1,3,5). Crowe et al (1) documented the severity of Thyronectria

Table 1. Diseases and decay fungi observed in six windbreaks in Oklahoma during December 1980–September 1981

Host		Disease	
Species	**No. of windbreaks**	**Type**	**Pathogen**
Catalpa speciosa Warder (catalpa)	1		None
Celtis occidentalis L. (hackberry)	2	Twig dieback	*Libertella* sp., *Valsa celtidis* Cke.
Chilopsis linearis (Cav.) Sweet (desert willow)	6	Wood rot	*Funalia gallica* (Fr.) Bond. et Singer
		Canker	Unknown
Fraxinus pennsylvanica Marsh. (green ash)	3	Wood rot	*Bjerkandera adusta* (Willd. ex Fr.) Karst., *Datronia mollis* (Summerf. ex Fr.) Donk, *Xylaria carpophila* (Pers.) Fr.
		Twig dieback	*Cytospora annularis* Ell. & Ev., *Diplodia infuscans* Ell. & Ev., *Libertella* sp.
		Anthracnose	*Gloeosporium aridum* Ell. & Holw.
		Leaf spot	*Piggotia fraxini* Berk. & Curt.
Gleditsia triacanthos L. (honeylocust)	4	Wood rot	*Acladium* state of *Botryobasidium* sp., *Irpex lacteus* (Fr. ex Fr.) Fr., *Pluteus cervinus* Fr., *Schizophyllum commune* Fr., *Xylaria carpophila*
		Branch dieback	*Cytospora gleditschiae* (Ell. & Barth.) Ferd. & Winge, *Libertella gleditschiae* Wint.
		Root rot	*Ganoderma lucidum* (Leyss.) Karst.
		Stem canker	*Phellinus robineae* (Murr.) A. Ames
		Canker and dieback	*Thyronectria austro-americana* (Speg.) Seeler
Gymnocladus dioica (L.) K. Koch (Kentucky coffeetree)	1	Root rot	*Ganoderma lucidum*
		Twig dieback	*Phoma* sp.
Juniperus virginiana L. (red cedar)	6	Wood rot	*Daedalea juniperina* Murr.
		Cedar-apple rust	*Gymnosporangium juniperi-virginianae* Schw.
		Seedling blight	*Phomopsis juniperovora* Hahn
Maclura pomifera (Raf.) Schneid. (Osage orange)	5	Branch dieback	*Botryodiplodia theobromae* Pat., *Sphaeropsis maclurae* Cke.
Morus rubra L. (red mulberry)	6	Wood rot	*Funalia gallica*, *Pleurotus ostreatus* Fr., *Polyporus arcularius* Batsch. ex Fr., *Xylaria carpophila*
		Branch dieback	*Botryodiplodia* sp., *Libertella* sp., *Valsa morigena* Berk. & Curt.
		Root rot	*Armellariella tabescens* (Scop. ex Fr.) Singer
		Associated fungi	*Chlorophyllum molybdites* Massee
Pinus nigra Arnold (Austrian pine)	1	Pinecone infection	*Diplodia pinea* (Desm.) Kickx
P. ponderosa Laws. (ponderosa pine)	1	Root rot	*Phellinus pini* (Thore ex Fr.) Pil.
Platanus occidentalis L. (sycamore)	1	Heart and root rot	*Ganoderma lucidum*
		Anthracnose	*Gnomonia veneta* (Sacc. & Speg.) Kleb.
		Canker	*Nectria* sp.
		Branch dieback	*Valsella* sp.
Populus deltoides Marsh. (cottonwood)	2	Wood rot	*Hypoxylon* sp., *Schizophyllum commune*
		Branch dieback	*Cytospora chrysosperma* Pers. ex Fr., *Tubercularia* sp.
		Twig blight	*Venturia macularis* (Fr.) Mull. & Arx
		Leaf spot	*Cercospora* sp.
		Associated fungi	*Coprinus* sp.
Robinia pseudoacacia L. (black locust)	2	Wood rot	*Crepidotus* sp., *Xylaria carpophila*
		Stem decay	*Phellinus robineae* (Murr.) A. Ames
Sapindus drummondii Hook & Arn. (soapberry)	1	Branch dieback	*Cytosporella* sp.
Ulmus americana L. (American elm)	1	Wood rot	*Coriolus versicolor* (L. ex Fr.) Quél., *Crepidotus subnidulans* (Overh.) Hes. Sm., *Gloeophyllum saepiarium* (Wulf. ex Fr.) Karst., *Nummularia discreta* (Schw.) Tul., *Polyporus arcularius*
		Branch dieback	*Tubercularia* sp., *Valsa sordida* Nits.
		Anthracnose	*Gloeosporium inconspicuum* Cav.
		Black leaf spot	*Gnomonia ulmea* (Schw. ex Fr.) Thüm.
		Sterile fruit body	*Polyporus* sp.
U. pumila L. (Siberian elm)	4	Wood rot	*Bjerkandera adusta*, *Coriolus versicolor*
		Root rot	*Armellariella tabescens*
		Branch dieback	*Tubercularia ulmea* Carter, *Valsa sordida*
		Canker	*Botryodiplodia hypodermia* (Sacc.) Petr. & Syd.
		Wetwood	Bacterium (in slime flux)

canker of honeylocust in Kansas. The incidence of this disease in Oklahoma indicates that Thyronectria canker can be a limiting factor in using honeylocust in windbreak plantings. J. W. Riffle et al (*unpublished*) found an increasing trend in incidence of *P. robineae* stem decay of black locust with age of plantings in Oklahoma. In their survey, they found a 22% incidence of stem decay in 40-yr-old windbreaks. Our survey in PSFP windbreaks on central rolling red prairies (MLRA 80A, Kingfisher County) showed a 23.5% incidence of *P. robineae* with a total loss of 59% of black locust trees attributed to disease and other factors. Because of an increasing demand in Oklahoma for black locust, silvicultural practices should be investigated to reduce the incidence of *P. robineae* stem decay and extend the usefulness of black locust in windbreak plantings.

In Oklahoma, there is a lack of severity of several diseases reported in the northern Great Plains. For instance, *Fomes fraxinophilus* (Peck) Sacc. infection of green ash, which was common in windbreaks in Nebraska (7) and North Dakota (10), has not been observed during our surveys. *Tubercularia ulmea* Carter and *Botryodiplodia hypodermia* (Sacc.) Petr. & Syd., common disease organisms in the northern Great Plains (3,6), were limited to small branch dieback and cankers in windbreaks surveyed.

The extremes of temperature and moisture in Oklahoma may be the main reason for the differences in severity and incidence of many of these diseases. The severity of Cytospora canker on cottonwood has been associated with water stress (8). Oak mortality during 1978 and 1980 in Arkansas, Mississippi, and Florida was reported to be triggered by drought (4). In addition, the natural decline of windbreaks planted during the PSFP may contribute to an increase in disease and decay organisms. Observations on disease incidence and severity indicate that the use of such trees as honeylocust, black locust, Austrian pine, ponderosa pine, and American elm as components in windbreaks in Oklahoma should be moderated in favor of trees more adapted to environmental stresses of the southern Great Plains. Additional information concerning disease incidence and severity in windbreaks in other areas of the southern Great Plains and on other tree species used in windbreak plantings would benefit agencies responsible for production of trees used in new windbreak plantings and renovation projects.

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LITERATURE CITED

1. Crowe, F., Starkey, D., and Lengkeek, V. 1982. Honeylocust canker in Kansas caused by *Thyronectria austro-americana*. Plant Dis. 66:155-158.
2. Howard, P. M. 1979. Keeping windbreaks on the Plains. Pages 1-4 in: Windbreak Management. Collection of papers presented at a workshop. Norfolk, NE. October 1979. Great Plains Agric. Counc. Publ. 92. 132 pp.
3. Krupinsky, J. M. 1981. *Botryodiplodia hypodermia* and *Tubercularia ulmea* in canker on Siberian elm in northern Great Plains windbreaks. Plant Dis. 65:677-678.
4. Lewis, R., Jr. 1981. *Hypoxylon* spp., *Ganoderma lucidum* and *Agrilus bilineatus* in association with drought related oak mortality in the South. (Abstr.) Phytopathology 71:890.
5. Peterson, G. W., and Riffle, J. W. 1979. Tree diseases and windbreak management. Pages 49-59 in: Windbreak Management. Collection of papers presented at a workshop. Norfolk, NE. October 1979. Great Plains Agric. Counc. Publ. 92. 132 pp.
6. Riffle, J. W. 1978. Development of canker on *Ulmus pumila* related to month of inoculation with *Botryodiplodia hypodermia*. Phytopathology 68:1115-1119.
7. Riffle, J. W., Ostrofsky, W. D., and James, R. L. 1981. *Fomes fraxinophilus* on green ash in Nebraska windbreaks. Plant Dis. 65:667-669.
8. Starkey, D. A., Mistretta, P. A., Atkinson, L. L., Overgaard, N. A., Covington, S. A., and Wortham, A. M. 1981. Evaluation of cottonwood decline and mortality in the riparian woodland of the Beaver river in Texas County, Oklahoma, 1981. USDA For. Serv., Southeast. State and Priv. For., Pineville, LA. Rep. 81-2-27. 29 pp.
9. Tinus, R. W., ed. 1976. Shelterbelts on the Great Plains. Great Plains Agric. Counc. Pub. 78. 218 pp.
10. Walla, J. A., and Riffle, J. W. 1981. *Fomes fraxinophilus* on green ash in North Dakota windbreaks. Plant Dis. 65:669-670.