Diseases and parasitic weeds of sorghum in Tanzania: occurrence and incidence, 1986–1990

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Abstract Sorghum is an important subsistence crop in Tanzania. Surveys were carried out between the 1986 and 1990 crop seasons to determine the prevalence of diseases and parasitic weeds in the major sorghum-growing areas of Tanzania. Twenty diseases of sorghum and three parastic weeds were observed. Grain moulds (several fungi), grey leaf spot (*Cercospora sorghi*), anthracnose (*Colletotrichum graminicola*), rust (*Puccinia purpurea*), leaf blight (*Exserohilum turcicum*), ladder leaf spot (*Cercospora fusimaculans*), sooty stripe (*Ramulispora sorghi*) and zonate leaf spot (*Gleocercospora sorghi*), were economically important diseases. *Striga asiatica* was the most common parasitic weed in Tanzania. Ilonga in the low-altitude (≤ 1000 m) zone and Hombolo in the mid-altitude (> 1000 m) zone were identified as locations with a high frequency of diseases and striga incidence. These locations were recommended for resistance screening against most of the leaf diseases, grain moulds and *S. asiatica*.

Keywords Grain moulds; grey leaf spot; anthracnose; *Striga asiatica*

Introduction

Sorghum [*Sorghum bicolor* (L.) Moench] is a major cereal crop in Tanzania. Because of the broad genetic diversity in the local land cultivars, sorghum grows under a wide range of agroecological conditions (Doggett, 1980; Mann, Kimber and Miller, 1983). More than 95% of the total sorghum is produced by subsistence farmers; it is consumed in the form of thick porridge (*Ugali*). Since the mid-1970s there has been a sequence of dry years throughout Tanzania, and drought-tolerant cultivars of sorghum were released in the marginal rainfall areas by the National Sorghum Improvement Program (Mitawa, Saadan and Mudolwa, 1985). Among the released cultivars, cvs Tegemeo and Lulu were white grain sorghums while cv. Serena had brown grain. These three cultivars are now extensively cultivated and the average sorghum production has gone up by 10% (SADCC/ICRISAT, 1989). With the introduction and expansion of high-yielding cultivars in monoculture, diseases and *Striga* spp. have become increasingly important constraints to sorghum production in Tanzania (Ebbels and Allen, 1979; Shao, 1984). The objective of this survey was, therefore, to determine the prevalence of sorghum diseases and parasitic weeds in the different agroecological zones and to identify locations where diseases and *Striga* spp. develop consistently at high frequencies under natural infection conditions so that these locations can be used for future resistance screening.

Materials and methods

Surveys were conducted between the 1986 and 1990 crop growing seasons, both in farmers' fields and at research stations in the two agroecological zones (*Table 1* and *Figure 1*). At research stations, diseases were recorded in several national and international introductions which included improved high-yielding cultivars. In farmers' fields, diseases were monitored both on local land-races and on improved sorghums. The crop was between the flowering and hard-dough growth stages (Vanderlip and Reeves, 1972) during these surveys.

The incidence of diseases and of *Striga* spp. (percentage plants affected) was visually assessed on a rating scale of 1–5 (1, no disease; 2, 1–5%; 3, 6–20%; 4, 21–50%; 5, > 50% plants infected). Disease and *Striga* spp. incidence was recorded in 300 plants in random rows in a field. The incidence in each field in a location was used to calculate the location average in a year. These averages indicate relative prevalence of diseases and *Striga* spp. during the year of survey.

Disease samples from different locations were sent to the CAB International Mycological Institute (IMI), Kew, Surrey, UK, for detailed identification and verification. Ergot (*Sphacelia sorghi*) samples were

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Table 1. Altitude and mean rainfall of the locations representative of surveyed areas for sorghum diseases and parasitic weeds in Tanzania between the 1986 and 1990 crop seasons

Location	Altitude[a] (m)	Mean annual rainfall (mm)
Low-altitude		
Naliendele	120	1050
Mlingano	184	1100
Ifakara	240	1526
Ilonga	506	1045
Mid-altitude		
Gairo	—[b]	600
Singida	—	700
Hombolo	1120	578
Ukiriguru	1236	1067
Mwanhala	1343	767

[a]Above sea level; [b]data not available

sent to the Imperial College of Science and Technology, London, UK, and long smut (*Tolyposporium ehrenbergii*) samples were sent to Wye College, Ashford, Kent, UK, for identification.

Results and discussion

Twenty endemic diseases caused by fungi and three *Striga* spp. were identified (*Table 2*). The incidence of various sorghum diseases and *Striga* spp. varied between years (*Table 3*). Most of these diseases and *Striga* spp. have been reported previously (Tarr, 1962). The presence of Acremonium wilt was confirmed and the pathogen identified only to generic level. Oval leaf spot (*Ramulispora sorghicola*) was recorded for the first time in Tanzania. *Striga euphracoides*, although reported earlier (Tarr, 1962), was not observed. The most common diseases and *Striga* spp. that were encountered consistently during the survey period are described below.

Most common diseases and *Striga* spp.

Grain moulds (several fungi). Grain moulds were found, caused by several unspecialized fungi, and *Fusarium* spp. were dominant. Disease incidence was always highest at Ilonga (*Table 3*) because this location had high rainfall and humidity during grain filling. Mouldy grains were also observed in the marginal rainfall areas in seasons when rainfall continued even after flowering of the crop. Thus, grain moulds are the most common panicle problem in Tanzania (*Table 4*). Local sorghums escaped these problems because they were late maturing; however, newly developed sorghum cultivars were found filling grains during the middle of the rainy season, and had more severe grain mould than land-race cultivars. On the basis of the first two years of survey results, screening for grain mould resistance was started at Ilonga. Brown sorghums (IS 9470, IS 23599, IS 24995, cv. Framida and cv. Serena) were found to be more resistant to grain mould than white sorghums (cvs Lulu and Tegemeo).

Grey leaf spot (Cercospora sorghi *Ell. & Ev.).* Grey leaf spot was widely distributed throughout Tanzania. Disease severities were higher in farmers' fields than in research stations. Grey leaf spot incidence was higher in the low-altitude (≤ 1000 m) zone than in the mid-altitude (> 1000 m) zone (*Table 4*).

Anthracnose [Colletotrichum graminicola *(Ces.) Wilson].* The presence of the disease (Tarr, 1962) was confirmed. Anthracnose occurred from the low- to the mid-altitude region. Shao (1984) reported a high incidence of anthracnose at Mlingano and Ilonga research stations. During 1986–1990, the disease was observed at Ilonga, Hombolo, Mwanhala, Ukiriguru and Ifakara (*Table 4*). A high incidence (> 80%) was observed only at Ukiriguru in 1990. Sorghum cultivars such as cvs Serena, Framida, Segaolane and the hybrid DC 75, from southern African countries, were less susceptible to anthracnose. Similarly, sorghum line SC 326–6 from Texas A&M University and the USAID Collaborative Research Support Program on International Sorghum and Millet (INTSORMIL) USA, and sorghum lines IS 18688 and R 6956 from the ICRISAT Center, India and SADCC/ICRISAT, Zimbabwe, respectively, had low anthracnose severities. Sorghum cultivar Tegemeo from Tanzania was moderately susceptible.

Rust (Puccinia purpurea *Cooke).* Rust was widespread from the low- to the mid-altitude zones. High incidences of rust were observed at research stations and farmers'

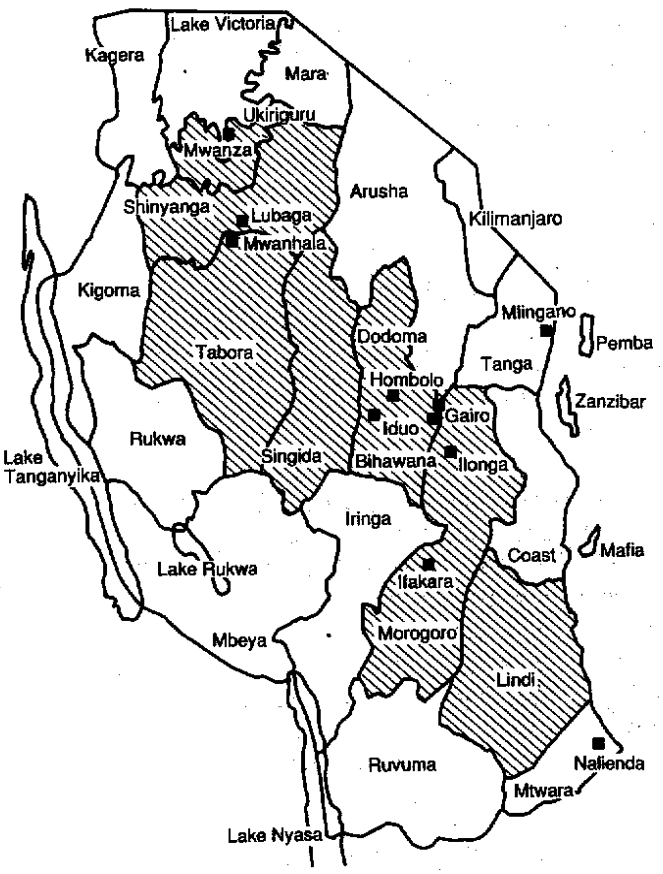

Figure 1. Sorghum-growing areas (▨) and locations for resistance screening of various diseases (■) in Tanzania

Table 2. Sorghum diseases, their causal organisms and parasitic weed species identified at different locations in Tanzania between the 1986 and 1990 crop seasons

Disease/parasitic weed	Causal organism[a]	Location
1. Acremonium wilt	*Acremonium* sp. (W 3064, IMI 332055)[b]	Hombolo
2. Anthracnose	*Colletotrichum graminicola* (W 3049, IMI 327288, W 3058, IMI 327289, W 3076, IMI 330196)	Ifakara, Ilonga, Hombolo, Ukiriguru
3. Charcoal rot	*Macrophomina phaseolina*	Ilonga
4. Downy mildew	*Peronosclerospora sorghi*	Ilonga, Singida, Ukiriguru
5. Ergot	*Sphacelia sorghi* (W 2898, IMI 317872)	Ilonga, Hombolo, Ukiriguru
6. Grain moulds	Complex of fungi	Ilonga, Ifakara
7. Grey leaf spot	*Cercospora sorghi* (W 3047, IMI 328104, W 3057, W 3062, W 3066)	Ilonga, Ifakara, Hombolo, Ukiriguru
8. Ladder leaf spot	*Cercospora fusimaculans* (W 3057, W 3066)	Ifakara, Hombolo, Ukiriguru
9. Leaf blight	*Exserohilum turcicum* (W 3052, IMI 328103, W 3068, IMI 330195)	Iduo seed farm, Ifakara, Hombolo, Ukiriguru
10. Leaf spot	*Phoma sorghina* (W 3047, W 3050, IMI 328101)	Ukiriguru
11. Leaf spot	*Mycosphaerella* sp. (W 3050, IMI 328102)	Ukiriguru
12. Rough leaf spot	*Ascochyta sorghina* (W 3061, IMI 331471)	Singida
13. Rust	*Puccinia purpurea* [W 3048, IMI 325545, W 3053, W 3065, IMI 325547 associated with *Eudarluca caricis* (W 3053, IMI 325546)]	Ilonga, Hombolo, Mwanhala, Ukiriguru
14. Sooty stripe	*Ramulispora sorghi* (W 3062, W 3067, W 3069, W 3074)	Ilonga, Hombolo, Ifakara
15. Stalk rot	*Fusarium moniliforme* (W 2877)	Hombolo, Ukiriguru, Ilonga
16. Head smut	*Sporisorium reilianum*	
17. Covered kernel smut	*Sporisorium sorghi* (W 2878, IMI 317224)	Singida, Dodoma
18. Long smut	*Tolyposporium ehrenbergii*	Bihawana, Hombolo
19. Loose kernel smut	*Sphacelotheca cruenta*	Ilonga, Hombolo
20. Zonate leaf spot	*Gloeocercospora sorghi* (W 3072, IMI 332611)	Ifakara, Hombolo
21. Viral diseases	—[c]	Hombolo, Ilonga
22. Bacterial diseases	—	Ilonga
23. Parasitic weed	*Striga asiatica*	Ilonga, Hombolo, Mwanhala, Mwele, Naliendele, Ukiriguru
24. Parasitic weed	*Striga hermonthica*	Ukiriguru
25. Parasitic weed	*Striga forbesii*	Ilonga

[a]Stage of the causal organism (fungus/*Striga* spp.) as found/observed or identified at IMI is the one cited (synonyms are mentioned in the text); [b]diseased samples identified by IMI; [c]causal agents not confirmed or identified

Table 3. Mean incidence of disease and *Striga* spp.[a] at different locations during the 1986–1990 crop seasons in Tanzania

	Gairo				Hombolo				Ilonga					Singida		Ukiriguru		
Disease/*Striga* spp.	1987	1988	1989	1990	1987	1988	1989	1990	1986	1987	1988	1989	1990	1988	1989	1988	1989	1990
Anthracnose	2	2	3	3	4	5	5	4	4	5	4	5	5	2	2	4	4	4
Leaf blight	1	3	3	3	4	4	5	4	2	1	1	3	1	5	4	3	4	4
Rust	3	3	3	3	4	4	5	5	5	4	4	4	5	2	3	3	3	5
Sooty stripe	1	1	3	3	4	4	4	5	2	2	2	3	3	2	2	3	3	2
Zonate leaf spot	1	1	1	1	4	4	5	4	2	2	2	2	1	1	2	2	2	2
Rough leaf spot	1	1	1	1	2	2	2	1	1	1	1	1	1	2	2	1	2	1
Grey leaf spot	2	3	3	3	4	4	4	5	5	4	5	5	5	2	3	2	2	2
Ladder leaf spot	4	3	3	3	3	3	3	3	2	3	3	3	3	4	4	2	1	3
Undetermined leaf spot[b]	1	1	1	1	2	2	2	2	1	3	2	2	1	2	1	1	3	3
Viral disease	1	1	1	1	2	1	1	1	2	2	2	3	2	2	2	2	2	2
Bacterial diseases	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	2	2	1
Downy mildew	1	1	1	1	1	1	1	1	3	3	2	4	4	5	3	2	1	2
Acremonium wilt	1	1	1	1	3	2	2	1	3	2	2	2	2	1	1	2	2	1
Grain moulds	5	3	3	2	5	5	5	5	5	5	5	5	5	3	3	3	3	4
Ergot	1	1	1	1	1	1	2	3	2	2	2	3	2	1	1	1	5	3
Covered kernel smut	1	1	1	1	2	1	1	2	1	1	1	1	1	1	5	1	1	1
Head smut	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2
Long smut	1	1	1	1	5	4	3	2	1	1	1	1	1	1	1	1	1	1
Loose kernel smut	1	1	1	1	2	2	2	2	2	3	4	3	3	2	2	3	3	2
Striga asiatica	1	1	1	1	2	5	4	4	1	1	1	1	1	1	1	3	3	3
S. hermonthica	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	5	4
S. forbesii	1	1	1	1	1	1	1	1	2	1	1	2	2	1	1	1	1	1

[a]Diseases and *Striga* spp. were scored on 1–5 rating scale: 1, no disease or *Striga* spp. present; 5, > 50% plants infected. Screening for resistance is possible at locations where disease/*Striga* incidence ≥ 4; [b]symptoms were similar to those of oval leaf spot

fields at Hombolo and Ilonga. Low incidences of the disease were found in farmers' fields at Gairo and Ifakara and at the Singida and Ukiriguru research stations (*Table 4*). The effect of this disease on the crop yield appeared to be relatively mild, possibly because it tended to appear during the grain development growth stage of the crop. However, late-planted sorghums were found to be susceptible to rust: cultivars such as cvs Tegemeo, Lulu and Serena all developed high rust severities (> 50%) towards maturity. Rust was found associated with hyperparasite *Eudarluca caricis* (Fr.) O. Eriks.

Table 4. Mean incidence[a] and ranking of the most commonly occurring diseases and *Striga* spp. in low-altitude and mid-altitude sorghum-growing zones, during the 1986–1990 crop seasons in Tanzania

	Low-altitude zone[b]		Mid-altitude zone[c]					
Disease/Striga spp.	IFA[d]	ILO	GAI	SIN	HOM	UKI	Mean	Rank over locations
Grain moulds	5.0	5.0	3.3	3.3	5.0	3.3	4.15	1
Grey leaf spot	4.0	4.8	2.8	2.5	4.3	2.5	3.48	2
Anthracnose	3.0	4.6	2.5	2.0	4.5	4.0	3.43	3
Rust	2.0	4.4	3.0	2.5	4.5	3.5	3.33	4
Leaf blight	3.0	1.6	2.5	4.5	4.3	3.7	3.26	5
Ladder leaf spot	4.0	2.8	3.3	4.0	3.0	2.0	3.18	6
Sooty stripe	3.0	2.4	2.0	2.0	4.3	2.7	2.73	7
Zonate leaf spot	4.0	1.8	1.0	1.5	4.3	2.0	2.43	8
Striga asiatica[e]	1.0	1.0	1.0	3.8	3.0	1.8	1.8	9

[a]Disease and *Striga* spp. were scored on a 1–5 rating scale: 1, no disease or *Striga* spp. present; 5, ≥ 50% plants infected. Screening for resistance is possible at locations where disease/*Striga* spp. scores ≥ 4; [b]≤ 1000 m above sea level; [c]> 1000 m above sea level; [d]IFA, Ifakara; ILO, Ilonga; GAI, Gairo; SIN, Singida; HOM, Hombolo; UKI, Ukiriguru. Surveys were conducted only in 1990 at Ifakara, therefore not included in *Table 3*. [e]*Striga asiatica* was also observed (incidence = 5) at Naliendele and Mlingano locations in the low-altitude zone. Other diseases and *Striga* spp. were not observed at these locations. Similarly, at Mwanhala in the mid-altitude zone, the incidences of *S. asiatica* and long smut were 5 on 1–5 rating scale. Other diseases and *Striga* spp. were not present, therefore not included in *Tables 3* and *4*.

Leaf blight [Exserohilum turcicum *(Pass.) Leonard and Suggs.]*. Leaf blight occurred everywhere from the low- to the mid-altitude region, but had a higher incidence in the mid- than in the low-altitude region (*Table 4*). Disease severities were consistently higher at the Iduo Seed Farm and in farmers' fields at Singida than at Hombolo, Ilonga and Ukiriguru research stations. Iduo Seed Farm was identified as a location for resistance screening. Most of the sorghum cultivars were highly susceptible to leaf blight in the Singida area, except cvs Tegemeo and Serena.

*Ladder leaf spot (*Cercospora fusimaculans*)*. Ladder leaf spot disease of sorghum, apparently distinct from grey leaf spot, was observed in Tanzania in the 1940s (Wallace and Wallace, 1947). Ladder leaf spot caused by the fungus *Cercospora fusimaculans* was recently identified from Rwanda and Comayagua (Honduras) by Wall *et al.* (1987). Its scalariform or ladder-like elliptical lesions made it distinguishable from grey leaf spot. The disease was observed from the low- to the mid-altitude zones, at the research stations at Ilonga, Gairo, Hombolo, Ukiriguru and Ifakara as well as in farmers' fields in the Singida area (*Table 4*). High disease severities (> 60%) were observed on sorghum introductions.

Sooty stripe [Ramulispora sorghi *(Ell. & Ev.) Olive & Lafebvre]*. Sooty stripe occurred from the low- to the mid-altitude zones. Disease incidence in general was low, except at Hombolo and Ifakara (*Table 4*). At Hombolo, most of the improved sorghums, apart from Tegemeo, were found to be highly susceptible to sooty stripe.

*Zonate leaf spot (*Gloeocercospora sorghi *Bain & Edg.)*. A high incidence of zonate leaf spot was observed at Ifakara, a location with a high rainfall in the low-altitude zone. A low incidence of zonate leaf spot was recorded at Gairo, Ilonga, Singida and Ukiriguru research stations and in farmers' fields (*Table 4*). Many improved sorghums from the Tanzanian national programme were susceptible to zonate leaf spot.

Striga *spp.* Tanzania lies in a unique belt of the tropics where the three most important species of *Striga* in Africa, namely *S. asiatica* L. Kuntze, *S. hermonthica* (Del) Benth., and *S. forbessi* Benth. exist sympatrically. In the past, *S. hermonthica* has received particular attention with regard to resistance breeding (Doggett, 1982). However, from this survey it has become apparent that *S. asiatica* is the most common and widely distributed species throughout Tanzania. *S. asiatica* was found at a high incidence on sorghum and other cereal crops at Hombolo, Mwanhala, Mwele and Naliendele areas. Recently, at Mwele Seed Farm, Tanga, 30 ha of land were abandoned, as far as sorghum and maize seed production are concerned, because of a severe and protracted outbreak of *S. asiatica* (personal observation during these surveys). Mwele appeared to be a good location for screening for resistance to *S. asiatica*.

S. hermonthica still had a localized distribution in the areas near Lake Victoria up to Kisumu in Kenya. Crops affected included sorghum, maize and finger millet. Pearl millet was relatively free of both *S. asiatica* and *S. hermonthica*. The Ukiriguru research station could serve as a location to screen for resistance against these two species of *Striga*.

S. forbesii also had a localized distribution and was observed only in the low-altitude zones, in particular at Ilonga research station and in nearby farmers' fields; it was also observed in maize fields. The distribution of the parasite is not well known and needs more intensive survey. Local cv. Bangala appeared to be more susceptible to *S. forbesii*.

Other diseases

Downy mildew. Wallace (1952) reported downy mildew [*Peronosclerospora sorghi* (Weston & Uppal) Shaw] to be widespread and sometimes very destructive in

Tanzania. It was always observed sporadically at Ilonga and Ukiriguru research stations. High incidences (> 30%) were observed in farmers' fields in Singida, affecting local sorghum cv. Mbangala. However, another sorghum cv. Baganhilo was found to be resistant. Similarly, Tegemeo and Serena did not show any downy mildew symptoms but were observed to be susceptible in plots affected by downy mildew in Zambia and Zimbabwe.

Ergot. The honey/sugary disease or ergot (*Sphacelia sorghi* McRae imperfect state of *Claviceps sorghi* Kulk *et al.*) was first reported in Tanzania by Mason (1926). Since then it has been consistently observed in the country (Wallace, 1937; Wallace and Wallace, 1949; Tarr, 1962, Doggett, 1980; De Milliano *et al.*, 1991a). A low incidence of ergot infection was observed in low- to mid-altitude regions and at Hombolo, Ilonga and Ukiriguru research stations. Ergot was observed mainly in introduced sorghum populations and on male-sterile hybrid parents. An increased use of male sterility and the introduction of unadapted germplasm are likely to enhance the development of ergot.

Covered kernel smut. Wallace (1937) reported incidences of covered kernel smut [*Sporisorium sorghi* (Ehrenberg) Link (syn. *Sphacelotheca sorghi* Link) Clinton] ranging from 8 to 100% in farmers' fields. Between 1986 and 1990 the disease reached a high incidence (40%) in only one of the farmers' fields in the Singida area; it also occurred in the Dodoma region and at the Hombolo research station. Covered kernel smut can be effectively controlled by treating the seed with chemicals such as thiram. Tegemeo, a cultivar from Tanzania, was less susceptible to covered kernel smut than was cv. Segaolane from Botswana.

Head smut. During the 1988–1989 season, head smut [*Sporisorium reilianum* (Kühn) Langdon & Fullerton (syns.) *Sphacelotheca reilianum* (Kühn) Clinton and *Sorosporium reilianum* (Kühn) McAlpine] was observed in local sorghums in farmers' fields in the Singida area. In the 1989–1990 crop season, low incidences of head smut were recorded at Hombolo and Ukiriguru research stations and in nearby farmers' fields. Similarly, disease was sporadic in farmers' fields in Dodoma region.

Long smut. The disease [*Tolyposporium ehrenbergii* (Kühn) Patouillard] was reported as being of little importance in Tanzania (Tarr, 1962). Between 1986 and 1990 it was observed only in the mid-altitude region. However, recently long smut has been observed in low-altitude regions of Tanzania and in other southern African countries (De Milliano *et al.*, 1991b). Long smut was consistently observed at a high frequency in Bihawana in Tanzania; this location could, therefore, be used for resistance screening. Long smut was also recorded in farmers' fields in the Hombolo and Lubaga areas. The incidence of this disease in this area was low (< 2%).

Loose kernel smut. A sporadic incidence (< 1%) of loose kernel smut [*Sphacelotheca cruenta* (Kühn) Potter] was observed at Hombolo and Ilonga research stations at a late stage of sorghum development. Disease mainly affected ratoons and secondary tillers.

Rough leaf spot. Wallace (1937) reported that rough leaf spot (*Ascochyta sorghina* Sacc.) attacked seedlings, showing long grey lesions on the leaves and raised black pycnidia of the fungus which gave a sandpaper-like roughness, but caused little damage on older plants. Low incidences of rough leaf spot were observed in farmers' fields in the Singida area and at the Ukiriguru research station.

Undetermined leaf spot. Symptoms similar to oval leaf spot (*Ramulispora sorghicola* Harris) were observed in farmers' fields in the Singida area and at Ukiriguru and Ilonga research stations. Disease was moderately severe on local sorghums. The identity of the pathogen could not be confirmed.

Wilt. Symptoms similar to Acremonium wilt were observed at Ilonga, Hombolo and Ukiriguru research stations; wilt incidence was low. In 1988, the Commonwealth Agricultural Bureaux (CAB) International Mycological Institute, isolated only *Fusarium moniliforme* Sheldon from the diseased samples; however, samples sent to them in 1989 revealed the presence of *Acremonium* sp. *F. moniliforme* was earlier reported as a cause of sorghum stalk rots in Tanzania (Wallace and Wallace, 1949).

Stalk rots. Charcoal rot caused by pathogen *Macrophomina phaseolina* (Tassi) G. Goid. was observed only at Ilonga during the 1989–1990 cropping season. It was reported to be associated with *F. moniliforme* and sorghum cv. Martin was found to be susceptible (Wallace, 1952).

Diseases caused by viruses. Low incidences of virus diseases were observed only at the research stations at Hombolo, Ilonga and Ukiriguru. The identity of the viruses could not be established; however, symptoms resembling maize stripe virus infection were observed.

Diseases caused by bacteria. A few plants with symptoms resembling bacterial leaf stripe (*Pseudomonas andropogonis* Smith.) and bacterial leaf streak [*Xanthomonas campestris* pv. *holicicola* (Elliot) Dye.] were observed in both farmers' fields and research stations at Ilonga and Ukiriguru. The identities of the bacteria causing these diseases need confirmation.

Summary and conclusions

The surveys carried out in the two major sorghum-growing agroecological zones of Tanzania indicated that grain moulds, grey leaf spots, anthracnose, rust

and leaf blight are the most important and widespread diseases. Downy mildew, ergot and sooty stripe are the diseases of growing importance; other diseases are of minor importance. *S. asiatica* is the most important parasitic weed in Tanzania.

On the basis of these surveys, the ICRISAT Center, SADCC/ICRISAT and National Sorghum Improvement Program of Tanzania have given priority to the initiation of collaborative research on major diseases and *S. asiatica* in Tanzania. Investigations are aimed at developing cultivars resistant to these diseases and *S. asiatica*. Sources of resistance to grain mould, leaf blight, anthracnose, downy mildew diseases of sorghum and *S. asiatica* have been identified. These sources are being tested or used in the region where these diseases and Striga problems are serious and widespread. Seeds of resistant lines are maintained by the Genetic Resources Unit and Cereals Pathology Unit at ICRISAT and are available on request.

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