

Prevalence and intensity of sorghum anthracnose in Ethiopia

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Introduction

Ethiopia is an East African country located between 3–15° N and 33–48° E. Sorghum (*Sorghum bicolor*) is the third most widely cultivated crop, next to teff (*Eragrostis tef*) and maize (*Zea mays*) in Ethiopia, growing on more than 1 million ha of land (CSA 2003).

Despite its importance in Ethiopian agriculture, sorghum production is affected by different biotic and abiotic constraints among which sorghum anthracnose is an important biotic constraint. Sorghum anthracnose, caused by *Colletotrichum sublineolum*, is one of the most important sorghum diseases limiting grain production in most sorghum growing regions (Hulluka and Esele 1992). Sorghum anthracnose was first reported in 1902 from Togo. It may cause yield loss up to 50% or even more (Ngugi et al. 2000, Thakur and Mathur 2000).

Previous studies have revealed the importance of sorghum diseases including anthracnose in the world at large and in Africa in particular (Hulluka and Esele 1992, King and Mukur 1994, Esele 1995). However, most of the studies do not provide quantitative measurement in terms of disease severity. On the other hand such information is of paramount importance as it can be related to yield loss and hence economic impact of the disease (Jeger 1990, Ngugi et al. 2002).

Assessment of the prevalence and severity of plant diseases is important to map the geographic distribution and determine the status of the disease in addition to providing baseline data to prioritize research problems. Ngugi et al. (2002) have determined the prevalence and severity of sorghum anthracnose along with other foliar diseases for areas located in western Kenya. To the best of our knowledge no such extensive and quantitative survey has been done on sorghum anthracnose in Ethiopia. So the objective of this survey was to determine the prevalence and severity of sorghum anthracnose in northern, southern, southwestern and eastern Ethiopia.

Materials and methods

Survey area. The survey was conducted in four regional states, which represent more than two-thirds of the country during the 2005 cropping season. The survey route followed major roads to towns and localities in each regional state. A total of 568 farmers' fields in 63 districts of 21 administrative zones within 4 regional states were assessed for the prevalence and intensity of sorghum anthracnose.

Anthracnose assessment. The survey covered more than 3,000 km with frequent stopping at 5- to 10-km intervals depending on the variability of fields in terms of altitude, cropping system, sorghum variety and level of anthracnose infection. Five farmers' fields were assessed at each stop. Thus 5–60 fields were assessed per zone and in total, 568 fields were surveyed. The sorghum crop was between milk and hard dough stage during the survey program in all fields. Anthracnose severity for a farm was determined as average leaf area affected for 20–30% randomly selected plants per farm.

Data analysis. The mean severity data recorded for each farm in a district was calculated to obtain anthracnose severity for the district and a similar principle was applied to determine the severity of anthracnose in a zone [represented by set of districts, number (range) of districts surveyed in each zone] and regional state [represented by set of zones, number of zones (range) assessed in each region]. Mean disease severity of each region and administrative zone was used to make quantitative comparison among the surveyed areas.

Results and discussion

Sorghum anthracnose was prevalent in all sorghum producing regions included in this survey. Anthracnose

severity ranging from 1 to 84% was recorded across the surveyed localities. Fifty-one percent of the surveyed areas had anthracnose severity less than 20% and hence considered as having low level of anthracnose infection (Fig. 1). On the other hand, 14% of the surveyed areas were considered as having very severe anthracnose

infection with more than 60% severity. However, the severity of the disease showed marked variations among regional states, administrative zones and districts. At the regional level, anthracnose severity ranged from about 10% to more than 50%. Tigray and Amhara regional states recorded the lowest level (about 10%) of anthracnose

Table 1. Severity of sorghum anthracnose in 21 administrative zones of Ethiopia.

Region	Zone	No. of farms assessed	Severity (%)		Level of infection
			Range	Mean	
Tigray	Central Tigray	30	1.6–12	4.8	Low
	North Tigray	20	3.5–26.2	9.1	Low
	South Tigray	35	5.2–21.8	15.2	Low
Amhara	South Gondar	10	0.0–5.0	1.1	Low
	North Gondar	35	2.3–36.2	9.0	Low
	South Wollo	50	7.5–11.2	9.5	Low
	North Shewa	15	8.3–13.5	10.9	Low
	East Gojam	20	5.0–25.0	13.6	Low
	North Wollo	40	5.5–37.6	19.2	Low
Oromiya	North Shewa	10	10.0–30.0	15.2	Low
	West Harargie	49	14.3–22.3	15.8	Low
	East Shewa	15	16.2–16.7	16.5	Low
	East Harargie	49	2.9–38.4	20.1	Low
	Jimma	60	37.0–81.9	61.7	Very severe
SNNPR	Hadiya	5	5.0–38.0	15.2	Low
	Alaba-Liyu	10	5.0–75.0	31.7	Moderate
	Guragie	20	26.2–52.8	33.9	Moderate
	Dawro	25	19.4–83.9	36.2	Moderate
	Wolayta	25	44.6–61.9	56.9	Severe
	Kefa	40	45.7–82.5	71.1	Very severe
	Yem-Liyu	5	60.0–95.0	80.3	Very severe

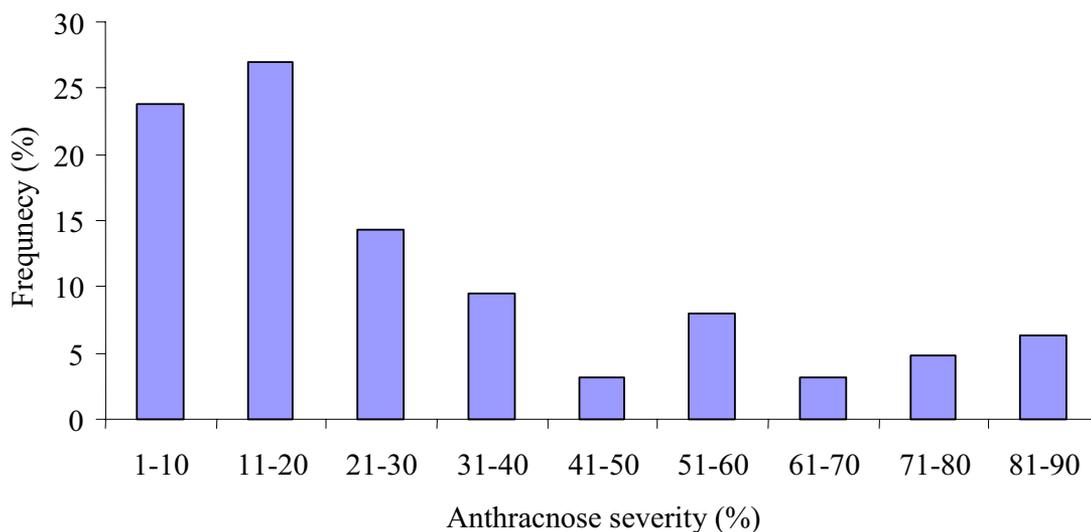


Figure 1. Frequency distribution of sorghum anthracnose severity classes.

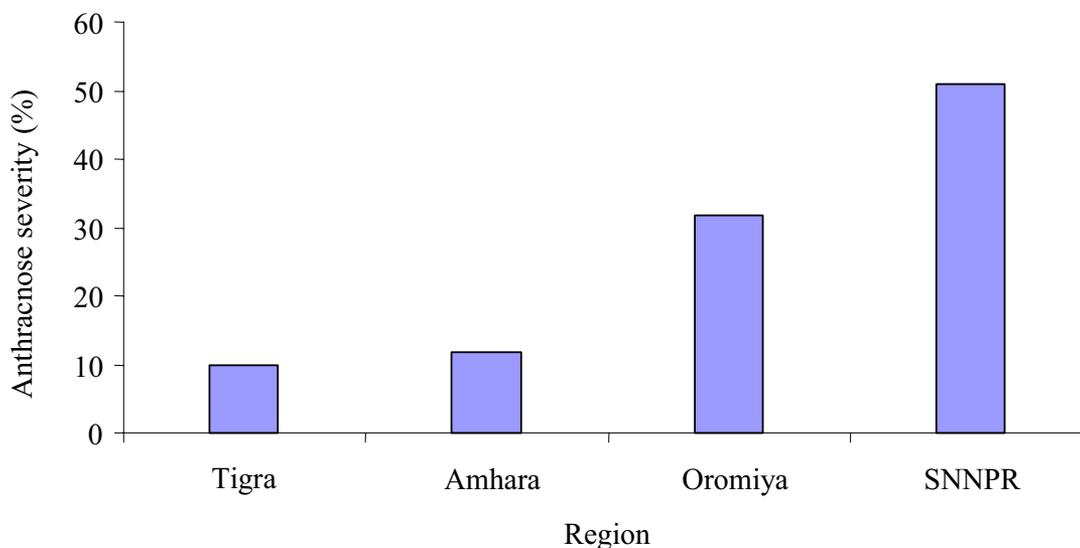


Figure 2. Severity of sorghum anthracnose in four regional states of Ethiopia in 2005.

infection while Oromiya with average anthracnose severity of more than 30% was considered as having an intermediate level of anthracnose (Fig. 2). The highest mean anthracnose severity (more than 50%) was recorded in Southern regional state. The high levels of infection in South and Oromiya regions could be attributed to the presence of more humid and warm climate in many of the surveyed areas of these regional states.

A more or less similar trend was observed between administrative zones within and outside a region. Anthracnose severity showed a marked variation between administrative zones (Table 1). South Gondar had the lowest severity (1%) followed by Central Tigray, North Gondar, North Tigray and South Wello, which had 4.8, 9.0, 9.1 and 9.5% severity, respectively. Yem-Liyu, with anthracnose severity of 80%, was found to have the highest score followed by Kefa, Jimma and Wolayta in that order.

All administrative zones with low level of anthracnose were found in the northern regions of Amhara and Tigray while those located in the Southern and Oromiya regions had high level of infection. Variations in anthracnose severity within a region may be due to differences in weather and sorghum variety during the survey year.

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