

COMPARING SORGHUM CULTIVARS FOR RESISTANCE TO SORGHUM MIDGE IN THE TIHAMA REGION OF YEMEN

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Abstract:

The sorghum midge, *Contarina Sorghicola* COQ, is an important pest of sorghum in the Tihama Region of Yemen. Five sorghum cultivars were selected from ICRISAT International Sorghum Midge Screening Nursery "ISMN" (1985) and tested along with three local cultivars in a randomized block design with four replicates in 3.4x4m plot size. The local cultivars (Qaera, Sepon and Zaer) were used as controls. The percentage of midge damaged grains and healthy grains were recorded from six panicles selected at random.

Five lines from ICRISAT-ISMN were found more resistant than the local cultivars, and higher in yield as compared to local varieties.

The cultivar IS-3461 appeared to be the most midge resistant amongst the cultivars tested. For this cultivar the maximum damage in 3 years was 2%, compared to 6% in the other ICRISAT cultivar IS-19512 and 35% in the local cultivar Zaer.

Introduction

The midge *Contrarinis sorghicola* Coq. (Cecidomyiidea: Diptera) is one of the most prominent of approximately 150 species of insect pests of sorghum worldwide (Harris, 1976; Davis, 1982). This pest causes appreciable loss of sorghum grains and also affects forage production (Young and Teetis, 1977). Harris (1985) mentions that there is a chance that developing grains are attacked by midge larvae if sorghum has been grown between latitude 40 N and 40 S.

The adult fly lays eggs in the florets during flowering. The larvae feed on the contents of the developing ovary, which results in the formation of chaffy grains. The damaged florets can be recognized by the presence of pupal cases attached to them near the exit holes on the glumes or by the oozing of orange-red fluid upon pressing (Nataragan and Challish, 1985).

Recurrent annual losses are estimated at 4% of the total sorghum crop. In Texas alone, the estimated loss has exceeded \$ 10 million per annum on several occasions (Wiseman et. Al., 1976). Harris (1961) indicated that the recurrent overall losses in Nigeria for 1958 was ranging between 5 to 10 %, which is the case in most of the malor? growing areas. Local losses in some African and Asian countries may exceed 50%. In Yemen, the sorghum midge was found in most growing areas but it is a major pest in the Tihama. The estimated presentage of damage in the region was found to be about 70% of the total yield (Muharram, 1988).

Cultural practices, chemical control and resistant varieties are currently recommended to control the sorghum midge. Chemical control is costly and numerous applications are required, as infestation is often prolonged. The use of resistant or less susceptible cultivars is an effective promising way in keeping the midge populations below the economic threshold levels.

References to midge resistance in sorghum was first made by Ball and Hasting in 1912. Later, Evelyn (1951) found varietal resistance to midge in sorghum in the Gezira (Sudan). Bawden and Neve (1953) reported that Nunaba cultivar was resistant to midge attacks. Rossetto et. al. (1975) used a cage technique to maintain heavy artificial infestations of midge on whole heads of a midge resistant line (AF-28) in the absence of susceptible varieties.

Resistance to sorghum midge mainly consists of cultivar nonpreference to adults, reduced oviposition, and antibiosis (Sharma, 1985). Floral morphology, and tannin content of grain play an important role in genotypic resistance to sorghum midge (Sharma 1990).

Because the midge is an important sorghum pest in the Yemen, the objective of this research was to examine the ability of different varieties to resist the sorghum midge, as a way of IPM. Five lines from ICRISAT and three local varieties were used in this study.

Materials and methods

Three trials in the winters of 1986, 1987 and 1988 were conducted at Surdud Experimental Farm in the Tihama region where sorghum is the main cultivated crop. Five

ICRISAT sorghum cultivars (IS7005, IS8571, IS19512, IS3461 and AF-28) that were screened in 1985 and found to be the most resistant varieties have been used together with three local varieties (Qaera, Zaer and Saepon1-80).

The randomized complete block design was used with four replications. The seeds were sown on 18th of September, which was about three weeks later than the normal sowing date. This was done to maximize the opportunity for the midge to attack the crop. For every 8 test rows, two rows of susceptible cultivars were planted 20 days earlier to increase the chance of infestation and increase midge populations. The plot size was 21 m² and the distance between rows was 70cm.

Midge damage (Number of florets with midge larvae) was determined from a sample of 500 florets taken at random from 5 panicles 15 days after anthesis. The florets were collected by detaching three primary branches from the top, the middle, and the bottom portions of each panicle. Samples were taken from five randomly selected panicles of each replicate. These primary branches were detached. From this, 500 florets were examined and midge damaged florets without grains were separated.

Midge-damaged chaffy florets were pressed between the tips of blunt forceps. Spikelets infested with midge larvae leaked red liquid while pressed. The number of midge infested grains were counted to estimate the loss when the cultivars were moist. Yield was estimated from the weight of grains taken from the two middle rows in each plot and the results converted to tons/ha.

Results and Discussion:

The results are presented in table (1), which shows that the five ICRISAT cultivars (IS7005, IS19512, IS3461, IS8571 and AF-28) have consistently recorded a lower level of midge infection during the three years studied as compared to the local cultivars (Qaera, Zaer and Sepon1-80). The Zaer variety was infected the most (48.7%) in 1987, while the Quara variety was infected in the same year the least (11.6%). On the other hand, the ICRISAT cultivars showed more consistency in the infection rate during the three years of study.

Midge resistance has been evaluated in one agro-climatic zone. So, the infection rate varied with each cultivar in the consequent years especially with local ones. Qaera, Zaer and Sepon have been found more susceptible to midge than the ICRISAT varieties. The average seed damage caused by midge was found to be 23%, 35% and 29% for the three local cultivars respectively over the three years, while it was 5.6, 4.4, 6.2, 4.6 and 2.0% for the ICRISAT cultivars.

The highest infection rate (49%) was found in the Zaer variety in 1987, in Qaera was established in 1986 (29%), while Sepon was highly infected in 1988 (36%). In contrast' the ICRISAT cultivars showed a very low infection rate (1.2% to 6.6%) and of the five varieties IS3461 was found to have the lowest infection rate during the three-year period (1.7%, 3.1% and 1.2%). Significant differences (5% level) in seed damage were found between the local and ICRISAT cultivars. The ICRISAT cultivars have shown a high resistance for the midge and this is in line with the findings of other researchers in Australia (Agrawal and

Abraham, 1986), India (Sharma et. al., 1983, 1990, 1993 Natarjan and Chellish, 1985) and Brazil (Faris et. al., 1979).

Based on yields, the local cultivars produced 0.1-0.7 ton/ha while the ICRISAT cultivars produced 0.4-1.7 ton/ha.

Table (1)
Midge infection rate of eight sorghum cultivars

Cultivar	Seed damage			Mean of 3 years
	1986	1987	1988	
Qaera	146.6	58.0	139.0	114.5 d
Zaer	65.5	243.5	243.5	175.0 f
Saepon	113.0	138.0	178.0	143.0 e
Is 7005	33.0	32.0	19.5	28.2 abc
Is 8571	25.0	15.0	23.0	22.0 ab
Is 19512	31.0	30.5	31.5	31.0 c
AF 28	26.5	17.8	24.0	22.8 ab
Is 3461	8.5	15.5	6.0	10.0 a
Mean	65.1	69.2	79.6	68.3

Table (2)
Grain yield of eight sorghum cultivars

Cultivar	Grain yield o/ha			Mean of 3 years
	1986	1987	1988	
Qaera	0.20	0.30	0.10	0.20 a
Zaer	0.30	0.40	0.30	0.30 a
Saepon	0.70	0.30	0.20	0.40 a
Is 7005	1.40	1.40	0.60	1.10 c
Is 8571	1.70	0.70	0.40	0.90 b
Is 19512	1.60	1.00	0.60	1.10 c
AF 28	1.50	0.90	0.50	1.00 cb
Is 3461	1.70	0.90	0.50	1.00 cb
Mean	1.10	0.70	0.40	0.80

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مقارنة اصناف الذرة الرفيعة من حيث مقاومتها للماسح في اقليم تهامة باليمن

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ملخص :

يعتبر الماسح احد الآفات الهامة على الذرة الرفيعة في اقليم تهامة باليمن . وفي هذه التجربة، جرى اختيار خمسة من اصناف الذرة المستقدمة من المركز الدولي لبحوث المناطق الاستوائية وشبه الجافة (اكريسات)، تم اختبارها مع ثلاثة اصناف محلية في تجربة باستخدام تصميم القطع العشوائية ذات اربعة مكررات كان حجم قطعة الارض فيها ٣,٤ × ٤م. وقد تم استخدام الاصناف المحلية قيرع، وسيبون وزعر كشاهد .

تم اخذ قراءات نسبة الحبوب المتبقية بأضرار الماسح والحبوب السليمة من ستة سنابل مختارة عشوائيا . بينت النتائج ان الاصناف الخمسة المستقدمة من اكريسات كانت اكثر مقاومة للاصابة بالماسح واعلى من حيث الانتاجية مقارنة بالاصناف المحلية .

كما اتضح ان الصنف آي إس - ٣٤٦١ كان الاكثر مقاومة للاصابة بالماسح من بين الاصناف التي جرى اختبارها . وخلال ثلاثة اعوام بلغ الحد الأقصى للضرر الناجم عن الاصابة بالماسح في هذا الصنف ٢% مقارنة بـ ٦% في صنف اكريسات الاخر آي إس-١٩٥١٢ و ٣٥% في الصنف المحلي زعر .