POPULATION DYNAMICS OF SORGHUM SHOOT FLY, *ATHERIGONA SOCCATA* (RONDANI) INFESTING SORGHUM

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Abstract: The present investigation carried out at Sorghum Research Station, SDAU, Deesa, and Gujarat, to study the population dynamics, varietal screening of sorghum and management of shoot fly *A. soccata*during *kharif*2012. The shoot fly incidence (1.52 eggs/plant) started from 7 days after germination (last week of July). The number of eggs per plant gradually increased with crop growth and maximum number of eggs *i.e.* 3.08/plant were observed after 21st days of germination (second week of August). Dead hearts due to shoot fly also started from 7 days after germination (last week of July) *i.e.* 8.15 per cent which increased with crop growth with maximum dead hearts (47.36%) and observed after 21st days of germination *i.e.* second week of August. It can be concluded that peak periods of shoot fly incidence and dead heart were from 21 days to 28 days after germination of the crop.

Keywords: Population, Sorghum, Shoot

INTRODUCTION

Sorghum [*Sorghum bicolor* (Linnaeus.) Moench] popularly known as jowar, belongs to the family gramineae. Cultivated sorghum is diploid (2n=2x=20) species and the genus sorghum is native to Africa and Asia. In India, sorghum is cultivated on an area of 2.68 million hectares and harvests 3.00 million tonnes with a productivity of 1117 kg/ha (Anonymous, 2011). It is extensively grown in Northern, Central and North-west regions of the country. States like Andhra Pradesh, Maharashtra, Karnataka, Tamil Nadu and Gujarat have major area and production of sorghum. In Gujarat, it occupied an area of about 125800 hectares with annual production of 139000 tonnes and productivity of 1119.5 kg/ha (Anonymous, 2011). In Banaskantha district, sorghum is grown on an area of 13200 ha with the production of 5700 tonnes and productivity of 434 kg/ha (Anonymous, 2011). Sorghum is also a traditional crop for Gujarat state.

More than 150 species of insects have been reported to damage sorghum. However, over a dozen species are serious and constitute a major constraint in sorghum production (Atwal and Dhaliwal, 2010). Major insect pest species attacking sorghum are sorghum shoot fly, *Atherigonasoccata*Rondani., stem borer, *Chilopartellus* Swinhoe., Gujarat hairy caterpillar, *Amsactamoore i*Butler., aphid, *Rhophalosiphum maidis* Fitch., armyworm, *Mythimnaseparata* Walker., gram pod borer, *Helicoverpa armigera* (Hubner)., thrips, *Caliothripsjonnuphilus* Rank., sugarcane leaf hopper, *Pyrillaperpusilla* Walker., sorghum midge, *Contariniasorghicola* Coquillett., sorghum earhead bug, *Calocorisangu status* Lethiery etc. Among these insect pests, shoot fly is one of the most important and destructive pests at seedling stage, which causes yield losses of 75.6 per cent in grain and 68.6 per cent in fodder (Mudigoudra*et al.*, 2009). Nearly 32 per cent of the crop is lost due to insect pests in India (Borad and Mittal, 1983).

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MATERIAL AND METHOD

In order to study the population dynamics of shoot fly in sorghum in relation to weather parameters, a field experiment was carried out on variety GJ-38. Plot was kept completely free from the insecticidal spray.

Experimental details

Location	:	Sorghum Research Station, SDAU, Deesa.
Season and Year	:	*Kharif*, 2012
Plot size	:	20 m x 20 m
Fertilizer	:	80:40:0 (N:P:K), Kg/ha
Seed Rate	:	12 kg/ha
Spacing	:	45 cm x 15 cm

The crop was raised as per all the recommended agronomical practices and the crop was kept unsprayed throughout the crop period. For recording the population (eggs and dead heart) of *A. soccata*, twenty five plants from the net plot were selected randomly. The weekly observations on number of eggs and dead hearts were recorded from each randomly selected plant starting to germination. Mean egg population per plant as well as per cent dead heart were worked out and the data thus obtained were subjected to correlation with weather parameters to ascertain the population fluctuation of the pest in relation to various weather factors.

RESULT AND DISCUSSION

An experiment was conducted to study the population dynamics of shoot fly *A. soccata* on

sorghum in relation to weather parameters. The activity of *A. soccata* was recorded as mean number of eggs per plant and mean per cent dead heart on sorghum crop periodically at weekly interval. The data on incidence of sorghum shoot fly on the crop cultivar GJ-38 during *kharif* season 2012 are presented in Table 1

Number of eggs per plant

The data summarized in Table 1 showed that the shoot fly incidence (1.52eggs/plant) started from 7 days after seed germination (last week of July). The number of eggs per plant gradually increased with crop growth and maximum number of eggs *i.e.* 3.08/plant were observed after 21 days of germination (second week of August). Thereafter, the number of eggs/plant declined and reached at its minimum *i.e.* 0.28 egg/plant after 63 days of germination (fourth week of September). After this period, eggs were not noticed on the plants up to harvesting of crop.

Per cent dead heart

The data summarized in Table 1 showed that dead hearts due to shoot fly (8.15 per cent) also started from 7 days after germination (last week of July) was increased with crop growth with maximum dead heart(47.36%) observed after 21days of germination *i.e.* second week of August. Further, per cent dead heart declined and reached at its minimum (6.52%) 70 days of germination (last week of September) of the crop.

Thus, it can be concluded that sorghum shoot fly laid eggs from last week of July to fourth week of September (*i.e.* 1st to 9th week after germination) in the crop. The peak periods of shoot fly incidence and dead heart were from 21 days to 35 days after germination of the crop. It was in concurrence with the study of Jotwani*et al.,* (1970) who also reported the most suitable crop age for shoot fly,*A. soccata*was within 21 days after germination.

Correlation with weather parameters

Correlation coefficient between numbers of eggs laid by shoot fly and weather parameters were calculated and presented in Table 2. It's clear from the data that all the weather parameters except bright sunshine hours had non-significant effect on the eggs laid by shoot fly on sorghum. Among these parameters maximum temperature (r= 0.02), minimum temperature (r=0.16), mean temperature (r=0.08) and wind speed (r= 0.08) had positive association while, rainfall (r= -0.03), morning relative humidity (r=-0.08), evening relative humidity (r= -0.03) and mean relative humidity (r= -0.06) were negatively associated with number of eggs of shoot fly per plant. However, the effect of bright sunshine was significantly negative (r= -0.65) with respect to number of eggs laid by shoot fly.

Further, the correlation coefficient between per cent dead hearts and weather parameters calculated (Table 2) indicated that all the weather parameters except bright sunshine had non-significant effect on the dead hearts on sorghum. Among the parameters, maximum temperature (r=-0.44), minimum temperature (r=-0.11), mean temperature (r=-0.35), and morning relative humidity (r=-0.01) had negative association while, wind speed (r= .03), rainfall (r=.30), evening relative humidity (r=0.18) and mean relative humidity (r=0.006) were positively associated with per cent dead heart. However, the effect of bright sunshine was significantly negative (r=-0.64) with per cent dead heart incidence in sorghum.

Table 1. Seasonal abundance of *A. soccata* in sorghum during *kharif* 2012

Month	week	SMW	Number of eggs/plant	Per cent dead heart
July	IV	30	1.52	8.15
August	I	31	1.96	24.58
	II	32	3.08	47.36
	III	33	2.24	39.50
	IV	34	2.76	31.78
September	I	35	1.64	30.58
	II	36	0.96	20.54

	III	37	0.56	18.02
	IV	38	0.28	10.61
	V	39	0.00	6.52

SMW = Standard Meteorological Week

Table 2. Correlation coefficient between eggs and dead heart caused by *A. soccata*with weather parameters in sorghum during *kharif* 2012

Weather parameters	No. of eggs/plant	Per cent dead heart
Maximum Temperature ($MaxT^0c$)	0.02	-0.44
Minimum Temperature ($MinT^0c$)	0.16	-0.11
Mean Temperature ($MT\ ^0c$)	0.08	-0.35
Relative Humidity Morning (RH_1 %)	-0.08	-0.01
Relative Humidity Evening (RH_2%)	-0.03	0.12
Mean Relative Humidity (MRH %)	-0.06	0.006
Rainfall (RF, cm)	-0.03	0.30
Bright Sunshine hours (BSS)	-0.65*	-0.64*
Wind Speed (WS, km/hour)	0.080	0.03

* Significant at 5% level

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