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POPULATION DYNAMICS OF SHOOT FLY *ATHERIGONA SOCCATA*

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ABSTRACT

Population dynamics of shoot fly *Atherigona soccata* Rondani was carried out at the Sorghum Research field, College of Agriculture, Indore, Madhya Pradesh during kharif, 2019-20. The incidence was assessed in terms of egg, deadheart, adult flies' activity. The results revealed that the peak incidence was observed during 29th and 30th standard meteorological week (SMW). The fish meal trap correlation studies showed that shoot fly eggs, showed a positive and significant correlation with maximum temperature (r = 0.73). Every unit increase in maximum temperature, results in increase of 0.81 eggs/ 5 plants, while deadheart (r = 0.68) and adult flies (r = 0.79) showed positive significant correlation with minimum temperature. The regression analysis revealed that for deadheart and adult flies, with every unit increase in minimum temperature there was a increase of 16.30% deadhearts and 7.79 adults.

Key words: *Atherigona soccata, Sorghum bicolor*, population dynamics, correlation, deadheart, oviposition, eggs, adults, fish meal trap, regression

Sorghum (*Sorghum bicolor* (L.) Moench) is one of the most important foods and fodder crop with a productivity of 1456 kg/ ha during 2017-18 (Anonymous, 2019), and in India, it is with a productivity of 780 kg/ ha (Anonymous, 2018). The insects pests are the reason behind this low productivity, and major ones are the shoot fly, grasshopper, grey weevil, stem borer, aphid and termite. Garg and Singh (2002) observed that among all these, the shoot fly *Atherigona soccata* Rondani (Diptera: Muscidae) is the most disastrous at the seedling stage (*Sharma et al.,* 2006a,b). Due to variation in the agroclimatic conditions, insects show varying trends in their incidence pattern and extent of damage. The weather factors play a key role in determining the incidence and dominance of a pest or pest complex (Meena *et al.,* 2013). Many researchers had assessed the correlation between shoot fly infestation and the ecological factors (Kandalkar *et al.,* 2001; Balikai and Venkatesh, 2001). The effect of sowing dates on the incidence and productivity of sorghum has also been evaluated (Ameta *et al.,* 2004). The present study is on the population dynamics of *A. soccata* on sorghum in relation to weather factors in the Malwa region of Madhya Pradesh.

MATERIALS AND METHODS

This study on the *A. soccata* in sorghum was carried out during kharif 2019- 20 at the All India Coordinated Sorghum Improvement Project (AICSIP), sorghum research farm, College of Agriculture, Indore. The sowing of sorghum variety RVJ-1862 was done on 1st July 2019 and the incidence was observed from germination till harvest at weekly interval, in terms of eggs, deadheart (%) and adults. Adults were monitored with plastic fishmeal traps, consisting of a plastic bottle with an entry hole on top for the flies and fish meal (20 g) placed inside and a small tube to hold dichlorvos soaked cotton to kill the trapped flies. Two fishmeal traps were set just after sowing the crop from July to October, 2019, with traps hung at 30 cm above the ground level. The population density was observed twice in a week. In the same way the number of eggs and deadhearts were also observed and counted from randomly selected five plants regularly. The meteorological data i.e. temperature (minimum and maximum in °C), relative humidity (morning, evening %) and rainfall (mm) were obtained from the Observatory, All India Co-ordinate Research Project for Dry land Agriculture, College of agriculture, Indore. the data obtained were correlated with weather factors and multiple linear regression analysis was done using WASP software.

RESULTS AND DISCUSSION

Atherigona soccata eggs were first observed at 27th standard meteorological week (SMW) when the crop was 7 days old (2.13 eggs/ 5 plants) (Fig. 1), with maximum being 7.32 egg/ 5 plants during 29 SMW. *The e*gg laying was observed up to 32nd SMW (0.76

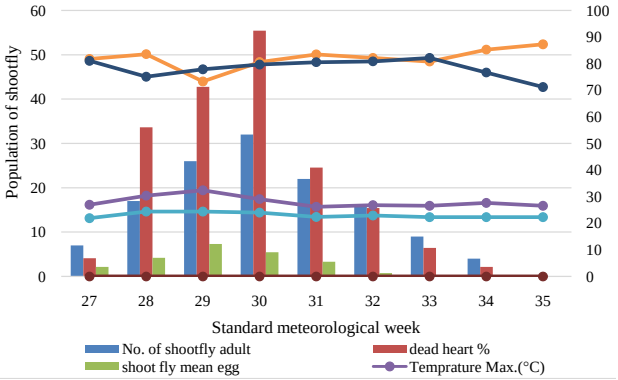

Fig. 1. Population dynamics of *A. soccata*

egg/ 5 plant). Correlation coefficients of occurrence of eggs with maximum temperature showed a significant positive correlation (r = 0.86) while with the morning relative humidity- RH, its value was 0.74, with evening RH it was 0.54, with rainfall it was -0.62 (Table 1). Regression equations Y=0.737x-18.18 (R^2 = 0.458) revealed that with every unit increase in maximum temperature, there was an increase of 0.81 egg/ 5 plants. Folane et al. (2014) observed egg laying on 14th and 21st days after seedling emergence, and showing a significant positive correlation with deadhearts. Similar observations by Sonawane (2017) that the initiation of shoot fly eggs and deadheart, was during 26th and 27th SMW, respectively.

The incidence of *A.soccata* was first observed during the 27th SMW (4.12% deadheart), and was observed till the vegetative stage up to 34th standard week (26 August 2019 i.e.) (Fig. 1); maximum deadhearts (55.43%) were found during 30th SMW (i.e. 23- 29, July); and this declined from 30th SMW to nil during 35th SMW (27th August- 2nd September 2019). Correlation analyses of deadhearts with weather factors revealed that minimum temperature exhibited a significant positive correlation (r = 0.86), while maximum temperature was with a positive nonsignificant correlation (r = 0.68); morning relative humidity (-0.49), evening relative humidity (-0.29), rainfall (-.057) and number of rainy days (-0.40) revealed a negative non-significant correlation (Table 1). The regression equations Y=16.38x-354.9 (R^2 = 0.743) showed that for every unit increase in temperature there was an increase of 16.30% deadhearts. These results agree with those of Raigar et al. (2002) that infestation initiated a week after germination, and was maximum during second week of August, reaching up to 55.99%. The present findings partially agree with those of Kandalkar et al. (2001) who revealed that the peak incidence was from 13 to 41 days after germination, with a significant negative correlation with minimum temperature values.

Atherigona soccata adults got trapped in fish meal trap when the crop was one week old and it rose to 7 flies/ trap during the 27th SMW (2- 8 July, 19) (Fig. 1), with maximum being 32/ trap during 30th SMW (23-29 July,19) and reduced gradually up to 34th SMW (4 flies/ trap). Correlation coefficients with minimum temperature was 0.79, and it was significant and positive, while other weather factors exhibited non-significant values (Table 2). The regression equation Y=7.79x-164.3 (R^2= 0.531) revealed that with every unit increase in minimum temperature there was an increase of 7.79 adults. Singh et al. (2017) observed a peak incidence during kharif season- August, and was active from 27th to 44th SMW. Similar observations were made by Vaidya and Sabale (2007). The weather parameters viz., maximum temperature, morning RH, and bright sunshine hours had a significant positive correlation with adult catches; while minimum temperature, afternoon RH and rainfall intensity showed significant negative correlation with egg laying and adult catches.

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Table 1. Correlation/ regression coefficients- weather factors vs *A. soccata* (kharif 2019)

S.No.	Shoot fly	Correlation coefficient (r)	Temperature maximum (°C)	Temperature minimum (°C)	Regression equations
1	No. of egg/ 5 plant	Byx	0.86*	-	Y=0.737x-18.18 (R^2 = 0.458)
		R	0.81	-	
2	Deadheart (%)	Byx	-	0.86*	Y=16.38x-354.9 (R^2 = 0.743)
		R	-	16.3	
3	Flies/ trap	Byx	-	0.79 *	Y=7.79x-164.3 (R^2 = 0.531)
		R	-	7.79	

*Significant at p=0.05; r = correlation coefficient; byx = regression coefficient

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