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RESEARCH ARTICLE :

Effect of date of sowing of little millet on shoot fly, *Atherigona pulla* (Wiedemann) incidence

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SUMMARY : The investigation was carried out on effect of date of sowing of little millet on shoot fly incidence during 2015-16 at Zonal Agricultural and Horticultural Sciences (ZAHRS), UAHS, Hiriyur. The shoot fly incidence was found to be higher in 15th July to 15th October sown crops. The peak incidence was observed on 15th August (26.26 % deadhearts) and 15th October (24.22 % deadhearts) sown crops whereas low incidence was on 1st May (0.70 % deadhearts) sown crop. The higher number of eggs per plant was noticed on 15th August (2.09 eggs/plant) sown crop whereas low on 1st and 15th May (0.29 eggs/plant) sown crops. Shoot fly incidence had direct significant and negative association with the relative humidity.

KEY WORDS :
Little millet, Shoot fly, Date of sowing

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BACKGROUND AND OBJECTIVES

Little millet (*Panicum sumatrense* Roxb.) is an important indigenous crop of Indian Subcontinent. It is grown in Tamil Nadu, Karnataka, Andhra Pradesh, Orissa, Bihar, Madhya Pradesh and Maharashtra. It is locally known as Same or Samai. It matures very early in 70-75 days it serves as an ideal catch crop for multiple and relay cropping systems. It is well known for its drought tolerance and is one of the least water demanding crops. This crop being eco-friendly is highly suitable for sustainable agriculture. The nutritional quality of this grain is superior to fine cereals. Although this crop has best of the attributes, its cultivation sometime srequires attention to manage the only serious pest, shoot fly (*Atherigona pulla*). This pest alone can cause loss upto 80 per cent or even 100 per cent (Jagadish *et al*., 1995). Considering seriousness of this pest, an attempt has been made to study the effect of date of sowing on incidence of the shoot fly to predict its occurrence and to develop precise management practices against it.

RESOURCES AND METHODS

In order to study the incidence of shoot fly on little millet a field trial was carried out during 2015-16 at Zonal Agricultural and

Horticultural Sciences (ZAHRS), UAHS, Hiriyur. Sukshema variety of little millet was selected for sowing. The crop was sown in an area of 27 m^2 area with three subplots of 3 m x 3 m (9 m^2 area) in size. The seeds were sown by adopting a spacing of 30 cm between the rows. Crop was sown sequentially at fortnightly intervals starting from 1st day of May' 2015 to till 15th day of December' 2015. A total of 16 sowings were accommodated during this period. All the recommended agronomical practices (except plant protection measures) were adopted on time. The crops were allowed for natural infestation by shoot fly without taking any control measures.

Egg count of shoot fly was done on 14, 21 and 28 days after emergence of crop. Five plants were randomly selected and total number of eggs on all the five plants was counted which was then averaged to get number of eggs per plant. Likewise, Number of plants with deadhearts caused by shoot fly per plot was recorded. Total number of plants was also counted and per cent deadhearts was computed and expressed as percentages by the following formula.

$$\text{Deadheart incidence (\%)} = \frac{\text{Number of plants with deadhearts / plot}}{\text{Total number of plants /plot}} \times 100$$

OBSERVATIONS AND ANALYSIS

The results obtained from the present study as well as discussions have been summarized under following heads:

Number of eggs per plant :

Significantly less mean number of eggs per plant on little millet (0.29 eggs/plant) was noticed during 1st May and 15th May sown crops. Whereas, significantly highest mean number of eggs per plant was observed on 15th August (2.09 eggs/ plant) followed by 15th October (1.84 eggs/plant) sown crops (Table 1). These findings are in agreement with Karibasavaraja (2003) and Shekarappa and Ramegowda (2005) who noticed highest number of shoot fly eggs during 2nd week of August (3.2 eggs/ plant) and 3rd week of July (4.5eggs /plant), respectively, but

Table 1: Effects of date of sowing on oviposition by shoot fly, *A. pulla* in little millet during 2015-16

Date of sowing	Eggs per plant			
	14 DAE	21 DAE	28 DAE	Mean
01-05-2015	0.27 (0.87)^{g}	0.20 (0.83)^{h}	0.40 (0.94)^{hi}	0.29^{i}
15-05-2015	0.20 (0.84)^{h}	0.40 (0.94)^{gh}	0.27 (0.87)^{i}	0.29^{i}
01-06-2015	0.40 (0.94)^{fg}	0.53 (1.01)^{fgh}	0.60 (1.05)^{ghi}	0.51^{hi}
15-06-2015	0.47 (0.98)^{f}	0.73 (1.11)^{efg}	0.67 (1.08)^{fghi}	0.62^{ghi}
01-07-2015	0.67 (1.08)^{e}	0.87 (1.17)^{ef}	0.80 (1.14)^{efgh}	0.78^{fgh}
15-07-2015	2.27 (1.66)^{a}	1.73 (1.49)^{bc}	1.53 (1.42)^{ab}	1.84^{ab}
01-08-2015	1.93 (1.56)^{a}	1.33 (1.35)^{cd}	1.33 (1.35)^{abcd}	1.53^{bc}
15-08-2015	2.27 (1.66)^{a}	2.33 (1.68)^{a}	1.67 (1.47)^{a}	2.09^{a}
01-09-2015	1.27 (1.33)^{bc}	1.53(1.42)^{c}	1.40 (1.38)^{abc}	1.40^{c}
15-09-2015	1.20 (1.30)^{bc}	1.53 (1.42)^{c}	1.13 (1.28)^{bcde}	1.29^{cde}
01-10-2015	1.40 (1.38)^{b}	1.40 (1.37)^{cd}	1.27 (1.33)^{abcd}	1.36^{cd}
15-10-2015	2.07 (1.60)^{a}	2.13 (1.62)^{ab}	1.33 (1.35)^{abcd}	1.84^{ab}
01-11-2015	1.20 (1.30)^{bc}	1.00 (1.22)^{de}	0.93 (1.20)^{defg}	1.04^{def}
15-11-2015	0.87 (1.17)^{de}	1.00 (1.22)^{de}	1.07 (1.25)^{cdef}	0.98^{ef}
01-12-2015	0.80 (1.14)^{de}	0.87 (1.17)^{ef}	0.67 (1.07)^{fghi}	0.78^{fgh}
15-12-2015	1.00 (1.22)^{cd}	0.80 (1.14)^{efg}	0.93 (1.19)^{defg}	0.91^{fg}
S.E.±	0.03	0.06	0.06	
C.D.(P=0.05)	0.10	0.19	0.19	
C.V%	4.69	8.51	8.83	
F test	*	*	*	

Figures in the parentheses are $\sqrt{x + 0.5}$ transformed values;DAE= Days after emergence

Means in the columns followed by the same alphabet do not differ significantly by DMRT (P=0.05)

on sorghum.

Per cent deadheart :

The early sown crops (during May) recorded very low infestation (0.70 to 4.0 % deadheart). Significantly high per cent deadhearts was recorded on 15th August (26.26 %) and 15th October (24.22 %) sown crops in little millet (Table 2). The present findings are corroborated with Deepthi (2007) who noticed peak incidence (62.0 % deadhearts) of sorghum shoot fly during 1st week of August.

Correlation of shoot fly incidence with abiotic factors at different dates of sowing :

Morning relative humidity (r=-0.35) and evening relative humidity (r=-0.26) had direct significant and negative association with number of eggs per plant and per cent deadheart by shoot fly in little millet ecosystem (Table 3). If the relative humidity is more than 60 per cent it favours shoot fly incidence but when it drops below 60 per cent exhibits negative effect on shoot fly incidence. This might have affected the physiology, development, longevity and oviposition

Table 2 : Effects of date of sowing on deadhearts caused by shoot fly, *A. pulla* in little millet during 2015-16

Date of sowing	Deadheart per cent			
	14 DAE	21 DAE	28 DAE	Mean
01-05-2015	0.33 (2.66)^{h}	0.78 (5.04)^{i}	1.00 (5.69)^{i}	0.70^{d}
15-05-2015	1.33 (6.60)^{h}	4.22 (10.53)^{h}	6.44 (13.86)^{h}	4.00^{cd}
01-06-2015	1.33 (6.60)^{h}	4.89 (11.79)^{h}	7.11 (14.75)^{h}	4.44^{cd}
15-06-2015	8.78 (17.19)^{ef}	15.22 (22.82)^{e}	20.11 (26.52)^{de}	14.70^{b}
01-07-2015	11.22 (19.53)^{e}	14.22 (21.99)^{ef}	17.11 (24.27)^{f}	14.18^{b}
15-07-2015	14.78 (22.59)^{cd}	22.89 (28.52)^{bc}	35.44 (36.52)^{a}	24.37^{a}
01-08-2015	16.00 (23.55)^{bcd}	20.57 (26.89)^{d}	33.44 (35.30)^{a}	23.34^{a}
15-08-2015	20.78 (27.10)^{a}	27.57 (31.63)^{a}	30.44 (33.45)^{b}	26.26^{a}
01-09-2015	14.33 (22.23)^{d}	27.22 (31.41)^{a}	27.11 (31.32)^{c}	22.89^{a}
15-09-2015	17.56 (24.77)^{bc}	22.89 (28.52)^{bc}	26.78 (31.10)^{c}	22.41^{a}
01-10-2015	17.89 (25.01)^{b}	24.57 (29.66)^{b}	20.78 (27.01)^{d}	21.08^{a}
15-10-2015	16.00 (23.54)^{bcd}	22.22 (28.06)^{cd}	34.44 (35.91)^{a}	24.22^{a}
01-11-2015	10.33 (18.70)^{e}	13.22 (21.14)^{f}	17.44 (24.53)^{f}	13.67^{b}
15-11-2015	8.45 (16.83)^{efg}	13.22 (21.14)^{f}	18.11 (25.04)^{ef}	13.26^{b}
01-12-2015	5.78 (13.88)^{g}	12.89 (20.85)^{f}	11.78 (19.76)^{g}	10.15^{b}
15-12-2015	7.22 (15.51)^{fg}	8.57 (16.64)^{g}	12.45 (20.38)^{g}	9.41b^{c}
S.E.±	0.99	0.82	0.91	
C.D.(P=0.05)	2.95	2.45	2.72	
CV%	9.54	6.34	6.20	
F test	*	*	*	

Figures in the parentheses are *arc* sine transformed values; DAE= Days after emergence
Means in the columns followed by the same alphabet do not differ significantly by DMRT (P=0.05)

Table 3: Correlation of shoot fly, *A. pulla* with abiotic factors at different dates of sowing during 2015-16

Factors	Little millet	
	Eggs/ plant	Deadheart (%)
Maximum temperature (^{0}C)	-0.17	0.14
Minimum temperature (^{0}C)	0.09	0.16
Morning relative humidity (%)	-0.29*	-0.27*
Evening relative humidity (%)	-0.30*	-0.23*
Rainfall (mm)	0.08	0.15

* indicate significance of value at P=0.05

of shoot fly. The present findings are in similar with the Pavana Kumar *et al*. (2015) who reported, relative humidity had negative correlation with shoot fly incidence.

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