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# Species of *Atherigona* in Andhra Pradesh

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**Summary.** Records of *Atherigona* spp. bred from cultivated cereals, minor millets and wild grass hosts are given. A total of 19 plant hosts of *Atherigona* species is listed. *A. soccata,* sorghum shootfly, was by far the commonest species present on sorghum and it was also recorded from maize, pearl millet, *Echinochloa colonum, Eriochloa procera, Cymbopogon* sp. and *Paspalum scrobiculatum.* Numbers of *A. soccata* bred from grasses were very low. Data showed that species of *Atherigona* were in general highly specific in choice of plant host. *A. falcata* was the commonest grass living species, but tended to favour *Echinochloa colonum* and *E. crusgalli.* The dominant species on pearl millet was *A. approximata,* on *Panicum psilopodium, A. pulla* and on *Digitaria adscendens, A. oryzae.* An interesting and important record was the recovery of *A. eriochloae* from both sorghum and *Eriochloa procera.* This species was previously only known from the paratype described in 1926. Other species were bred from a range of host grasses.

## Introduction

The sorghum shootfly, *Atherigona soccata* Rond., is well known as a serious pest of sorghum in India (Jotwani *et al.,* 1970). It is also a widely distributed and occasionally damaging pest in Africa (Swaine and Wyatt, 1954; Langham, 1968; Deeming, 1971). Control of the fly has been achieved using systemic insecticides (Jotwani and Sukhani, 1968; Thobbi *et al.,* 1968; Barry, 1972). There have, however, been several reports of only partial success in controlling the fly with contact insecticides (Swaine and Wyatt, 1954; Wheatley, 1961) or failure to control it (Ingram, 1959). Davies and Jowett (1966) reported increases of levels of attack by shootfly after application of insecticides. Lately near Hyderabad several instances, both at the research centre and on farmers' fields have been noted of failure to control the sorghum shootfly with carbofuran, a powerful systemic (Davies and Reddy, unpublished). One suggestion made recently to explain these erratic results with insecticides is that several species of shootfly may be involved (Baliddawa and Lyon, 1974).

This paper reports on recent investigations carried out at Patancheru, Hyderabad, Andhra Pradesh, which shed more light on the relative abundance of *Atherigona* species on cereals and wild host grasses and their relationship to the cultivated sorghum crop.

## Breeding of flies from sorghum

As part of the routine study of the biology of *A. soccata,* many hundreds of specimens of *Atherigona* were bred out from field collected sorghum plants with 'dead hearts' over several crop seasons and at all possible times of the year.

Clearly over a period of months *A. soccata* was by far the most important species present, accounting for 97.5% of the male flies bred from a range of sorghum cultivars. There is an indication that the sex ratio is approximately 1:2. The record of *A. eriochloae* bred from the samples taken in December, 1975 is interesting, since this species was known only from the Malloch paratype (Pont, personal communication). The specimens confirm that there is no doubt about its identification or validity as a species. The flies emerged from 'ratoon' sorghum which was surviving in small amounts on an isolated area which had been harvested in October and where there was a great deal of grass growth. No insecticides had been applied in this area. Only three other species were bred and only a few

specimens obtained. Both grass and cereal breeding species were present. *A. orientalis* was recorded and is reported to be either predatory (Deeming, 1971) or a feeder on decaying vegetable matter (Pont, 1972).

A significant finding in the course of the investigation was that eggs were laid on certain hybrid cultivars, notably CSH-1, at a considerably later stage in crop growth than normal. Attack by *A. soccata* is usually stated to be negligible after five weeks. Adult flies were bred through from this material and data are given in Table 2. Again *A. soccata* was the dominant species accounting for some 95% of the males. The sex ratio was 1:3. The only other species bred out was *A. orientalis*.

TABLE 1. SPECIFIC IDENTITY OF *ATHERIGONA* BRED FROM A RANGE OF SORGHUM CULTIVARS IN THE PERIOD SEPTEMBER 1974 TO DECEMBER 1975

| Date emerged | Flies | | | Species of male flies | | | | |
|---|---|---|---|---|---|---|---|---|
| | Total | Male | Female | *soccata* | *orientalis* | *approximata* | *falcata* | *eriochloae* |
| 5.9.74–16.9.74 | 374 | 123 | 252 | 122 | 1 | | | |
| 5.10.74–30.10.74 | 435 | 151 | 284 | 150 | 1 | | | |
| 4.11.74 | 30 | 11 | 19 | 11 | | | | |
| 2.1.75–29.1.75 | 154 | 82 | 72 | 82 | | | | |
| 2.2.75–28.2.75 | 197 | 65 | 132 | 65 | | | | |
| 3.3.75–28.3.75 | 144 | 59 | 85 | 59 | | | | |
| 11.6.75 | 11 | 4 | 7 | 3 | | 1 | | |
| 13.9.75 | 24 | 2 | 22 | 2 | | | | |
| 13.11.75–30.11.75 | 186 | 52 | 134 | 50 | | | 2 | |
| 1.12.75–7.12.75* | 30 | 13 | 17 | 5 | | | 1 | 7 |
| Total | 1585 | 562 | 1023 | 549 | 2 | 1 | 3 | 7 |

*Sample collected on 'ratoon' kharif sorghum in the rabi season.

TABLE 2. SPECIFIC IDENTITY OF *ATHERIGONA* BRED FROM 2.5 MONTH OLD CSH-1 IN MARCH 1975

| Date emerged | Flies | | | Species of male flies | |
|---|---|---|---|---|---|
| | Total | Male | Female | *soccata* | *orientalis* |
| 6.3.75 | 79 | 28 | 51 | 28 | |
| 7.3.75 | 39 | 11 | 28 | 10 | 1 |
| 8.3.75 | 28 | 4 | 24 | 4 | |
| 9.3.75 | 29 | 5 | 24 | 5 | |
| 10.3.75 | 56 | 9 | 47 | 9 | |
| 11.3.75 | 55 | 7 | 48 | 7 | |
| 12.3.75 | 52 | 14 | 38 | 14 | |
| 13.3.75 | 58 | 22 | 36 | 18 | 4 |
| Total | 396 | 100 | 296 | 95 | 5 |

**Breeding of flies from other host plants**

Concurrently with breeding from sorghum, samples of dead hearts were collected from other cereal crops, minor millets and grasses. Results are given in Table 3.

*A. soccata* was bred from maize, pennisetum millet and some of the minor millets. Clearly it is not common in the wild grass fauna, it was bred only from *Echinochloa colonum, Eriochloa procera* and *Cymbopogon sp. A.*

TABLE 3. HOST PLANTS AND *ATHERIGONA* SP. RECORDED FROM PATANCHERU, HYDERABAD, INDIA

| Host plant | Flies | | Species of *Atherigona* | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Male | *soccata* | *approximata* | *falcata* | *oryzae* | *orientalis* | *pulla* | *punctata* | *eriochloae* | *atripalpis* | *laetia* | *miliaceae* | *reversura* | sp. nov. |
| *Zea mays* Linn. | 5 | 5 | 2 | | 1 | | 1 | | 1 | | | | | | |
| *Pennisetum typhoides* Stapf & Hubb | 90 | 28 | 7 | 21 | | | | | | | | | | | |
| *Eleusine coracana* Gaertn. | 1 | 1 | | | | | | | | | | | 1? | | |
| *Panicum miliaceum* Linn. | 3 | 1 | | | | | | 1 | | | | | | | |
| *Panicum psilopodium* Trin. | 168 | 67 | | | 1 | | | 66 | | | | | | | |
| *Cynodon dactylon* Pers. | 8 | 3 | | | | | | | | | | 1 | | 1 | 1 |
| *Dactyloctenium aegyptium* P. Beauv. | 6 | 2 | | | | | | | | | 2 | | | | |
| *Digitaria adscendens* (HBK) var. *criniformis* Henr. | 189 | 81 | | | 1 | 80 | | | | | | | | | |
| *Echinochloa colonum* Link. | 223 | 90 | 3 | | 82 | 3 | | 2 | | | | | | | |
| *Echinochloa crusgalli* P. Beauv. | 47 | 22 | | | 19 | | | 3 | | | | | | | |
| *Ischaemum pilosum* Wight | 1 | 1 | | | 1 | | | | | | | | | | |
| *Chloris barbata* Sw. | 4 | 1 | | | 1 | | | | | | | | | | |
| *Eragrostis cilianensis* Vignolo-Lutati | 1 | 1 | | | | | | | 1 | | | | | | |
| *Eriochloa procera* H. E. Hubb. | 58 | 17 | 2 | | 2 | | | 1 | 9 | 3 | | | | | |
| *Cymbopogon* sp. | 1 | 1 | 1 | | | | | | | | | | | | |
| *Setaria italica* P. Beauv. | 1 | 1 | | 1 | | | | | | | | | | | |
| *Paspalum scrobiculatum* Linn. | 2 | 2 | 2 | | | | | | | | | | | | |
| Unidentified grass | 78 | 26 | | | 24 | ? | | | | | | | | | |
| Unidentified grass | 20 | 8 | | | 8 | | | | | | | | | | |

*approximata* is a source of potential loss in pearl millet. Currently levels of attack at Patancheru, even given the current practice of growing several crops in a year, are low.

There was evidence that in general, species of shootfly were highly discriminating in choice of host. *A. falcata* was the dominant and most widespread species in grass and specimens were obtained from ten species, however it clearly preferred *Echinochloa colonum* and the related species *E. crusgalli*. It was also common in an as yet unidentified grass species. *A. pulla* occurred predominantly in *Panicum psilopodium* while *A. oryzae* was dominant in *Digitaria adscendens*. Of considerable interest is the host record for *A. reversura* Vill which had been previously recorded at ICRISAT from samples of sorghum seedlings thinned from an unsprayed experiment and caged for emergence. A closely related sub-species as yet unnamed (Pont, personal communication) was also bred from *Cynodon dactylon*. This had also been recovered previously from sorghum seedlings. A doubtful specimen of *A. miliacea* was bred from *Eleusine coracana* while *A. atripalpis* was confined to *Dactyloctenium aegyptium* and *A. eriochloae* to *Eriochloa procera*. This grass was also an important host of *A. punctata*.

## Discussion

The data show that several wild grasses carry *A. soccata*, however levels of attack are extremely low. Indications are that several cultivated cereals including maize (*cf* Nye, 1960), pearl millet and *Paspalum scrobiculatum* are attacked but relatively important levels of infestation are only found in *Pennisetum typhoides*. In maize, in spite of regular and extensive searches, very few flies were bred out of field collected seedlings. Since the cereals grow at the same time of the year as the main sorghum crops, they are not important as sources of 'carry over'.

Throughout these data, there is evidence that *A. soccata* is the dominant series on sorghum and that the occurrence of other species is negligible. There is little evidence to support the contention of Baliddawa and Lyon (1972) that the reason for erratic and contradictory results from insecticidal experiments in the past is due to a species mix, at least in our situation. Their data also indicate that in sampling in sorghum fields the proportion of species other than *A. soccata* is low. It is suggested that in view of recent observations by Ogwaro (unpublished) in Kenya, who also comments on the range of species present in sorghum, that a large number of flies are actually bred from sorghum seedlings to ascertain if species other than *A. soccata* are important in the African situation. Certainly in the experience of one of us (J.C.D.) at Serere, Uganda, species other than *A. soccata* were not important in the crop.

*A. approximata* is the dominant species on pearl millet, however, over several seasons infestation levels were low. A maximum percentage of dead hearts observed was 1.4%. This is in accordance with the observations of Jotwani *et al.* (1969).

Of the grass-breeding species *A. falcata* appears to be the most widespread, being especially common on the two *Echinochloa* species, the record from *E. crusgalli* being new. *Digitaria adscendens* was exclusively attacked by *A. oryzae* and was particularly common at the beginning of the 'dry season'. It has previously been recorded from this host in Japan (Pont, 1972). In this context the records of Granados (1972) that *A. soccata* completed development on three species of grass including this one in Thailand is of interest. We have never recovered *A. soccata* from this grass. *A. pulla* was found predominantly on *Panicum psilopodium,* which has not been previously recorded as a host, two other species *P. miliaceum* and *P. sumatrense* are listed. The records from *Echinochloa colonum* and *E. crusgalli* remove previous doubts (Pont, *loc cit*).

These data support and confirm the contention of Ramachandra Rao (1925) that shootflies tend to be rather specific in their preferences. Several new host records are established including, in particular, the cereal species *A. approximata* from *Setaria italica* and *A. oryzae* from *Echinochloa colonum.* The doubtful records of *A. pulla* from *Echinochloa* and *Eriochloa* noted by Pont (1972) are confirmed and reinstated respectively. The host records for *A. punctata,* with *Eriochloa procera* dominating are new. Previously *A. atripalpis* has only been recorded from *Setaria* spp. in India and China, the record from *Dactyloctenium aegyptium* is therefore unexpected. This grass is stated to be a common host of shootfly eggs in Thailand and although the adults were recovered from the grass in the field, they were not bred from egg to adult in the laboratory (Granados, 1972).

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