

**COMPARATIVE POPULATION DENSITIES OF CERTAIN
PREDATORY SPECIES IN TWO COTTON FIELD ECOSYSTEMS IN
UGANDA.**

BY

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ABSTRACT

Survey and comparative population densities of common predatory groups and/or species associated with cotton pests in cotton agro- ecosystems in Uganda were conducted at each of Namulonge and Serere Agricultural and Animal Production Research Institutes; NAARI and SAARI, respectively during 1994/95 and 1995/96 cotton growing seasons. Direct counts of predators were recorded weekly. The survey revealed the following species; *Cheilomenes lunata*, *C. vicina*, and *Scymnus* spp. (Coccinellidae), *Chrysoperla carnea* S. and *Chrysopa* spp. (Chrysopidae), *Orius* spp. (Anthocoridae), *Paederus sabaeus* E. (Staphilinidae), *Diaperasticus erythrocephalus* O. (Forficulidae), *Xanthogramma (Ischiodon) aegyptium* W. and *Syrphus* spp. (Syrphidae), *Pheidole* spp. and *Myrmecaria* spp. (Formicidae), and several groups of true spiders. Trend of predators population was almost similar in the two working sites, it peaked by mid-season and continued relatively high up to the end of the season. Ants, true spiders and *Orius* spp. were the most abundant groups and/or species of predators in cotton fields in Uganda. Negative influence of chemical applications on predators' population (27-55 % reduction) was recorded.

Key Words: Cotton, Uganda, Predators, Survey, Population densities

INTRODUCTION

Indeed, it would not be possible to produce cotton crop economically, or at all, without the regulatory impact of parasitic and predacious species on the pest complex. On the other hand, in many areas the heavy use of chemical pesticides virtually eliminates these natural control agents and is usually followed by secondary-pest outbreaks (EL-Heneidy *et al.*, 1987).

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More than 600 species of predatory arthropods have been found in cotton, where they do an effective role of keeping most insect pests below crop-damaging numbers (Whitcomb, 1981). Predation is common among insects, and some of the most successful cases of biological common control have been recorded through predators. Predators are carnivores as both immature and adult stages, but some, such as certain species of lacewings (*Chrysopa* spp.) are predaceous only as larvae.

Predatory insects are widely recognized in pest management programmes. Inevitably the first step in any study of the role of natural enemies in pest control involves a field survey to determine what species are present and how their numbers vary in relation to those of the pest insect. This usually means that intensive field sampling is carried out using a variety of techniques over a number of seasons, in order to gain some insight into the magnitude of seasonal fluctuations and some indications of the relative importance of different natural enemies species.

Methods to evaluate predation have been reviewed extensively (Grant and Shepard, 1985. Luck *et al.*, 1988, Seymour and Jones, 1991), most of them have considered the visual count technique as the most bias-free and convincing way to evaluate the predators under field conditions.

This study was carried out to up-date the survey of common species of predators associated with cotton pests in cotton fields in Uganda done by Coaker, 1959, and Nyiira, 1970, as well as to study the population fluctuations of certain species in two different cotton agro-ecosystems; the dry region in north-east and the wet region in south and west of Uganda (Anon, 1991 and 1993, and EL-Heneidy *et al.*, 1996).

METHODS AND TECHNIQUES

Studies were conducted in two experimental plots (A&B) located at each of Namulonge and Serere Agricultural and Animal Production Research Institutes, NAARI and SAARI, representing the two different cotton agro-ecosystems; the wet and the dry regions of Uganda, respectively during the two cotton growing seasons 1994/95 and 1995/96. Studies were carried out during the two seasons at NAARI and for only one season, 1995/96, at SAARI. Experimental plots, approximately 0.5 hectare each, were planted with the recommended cotton varieties, BPA,89 and SATU,85 at the recommended planting periods, during July and June at NAARI and SAARI, respectively. The plots were surrounded by conventional farming system crops; mainly sorghum, maize, beans and cassava. Regular cultural practices were conducted throughout the seasons. To avoid any possible disruption in the dynamics of the predators population, no insecticides were applied in the experimental plots throughout the two seasons of work, except plot B at NAARI,95, where two chemical treatments (by Decis and Thionex) were applied to control high infestation of bollworms by

early November and December, 95.

Beginning 1-2 weeks after germination (WAG), designated 100 plants / sampling occasion / plot / location were inspected weekly and visual counts of the common predators associated with cotton pests on the cotton plants (EL-Heneidy *et al.*, 1996) were recorded. Direct counts of both predaceous immature and adult stages of certain predators species and/or groups were taken. Stratified scouting technique was used in this study (Carcia *et al.*, 1982 and Legaspi *et al.*, 1989).

RESULTS AND DISCUSSION

a- Survey:

The survey of common predatory species and/or groups associated with cotton pests in cotton fields in Uganda revealed the following species: the lady beetles, coccinellids, *Cheilomenes lunata** and *C. vicina**, and *Scymnus* spp.; lacewings, chrysopids, *Chrysoperla carnea* Steph. and *Chrysopa* spp.; minute pirate bug, anthocorids, *Orius* spp.; rove beetles, staphylinids, *Paederus sabaesus*** Erichson; earwigs, Forficulidae, *Diaperasticus* (Elaunom) *erythrocephalus*** (Olivier); hover flies, syrphids, *Xanthogramma* (*Ischiodon*) *aegyptium*** Wied. and *Syrphus* spp.; ants, formicids, *Pheidole* spp. and *Myrmecaria*** spp., and several groups of true spiders. Most of these species indicated in the previous list were recorded earlier in Uganda by Coaker, 1959 and Nyiira, 1970, but only at the genus level.

b- Population Dynamics:

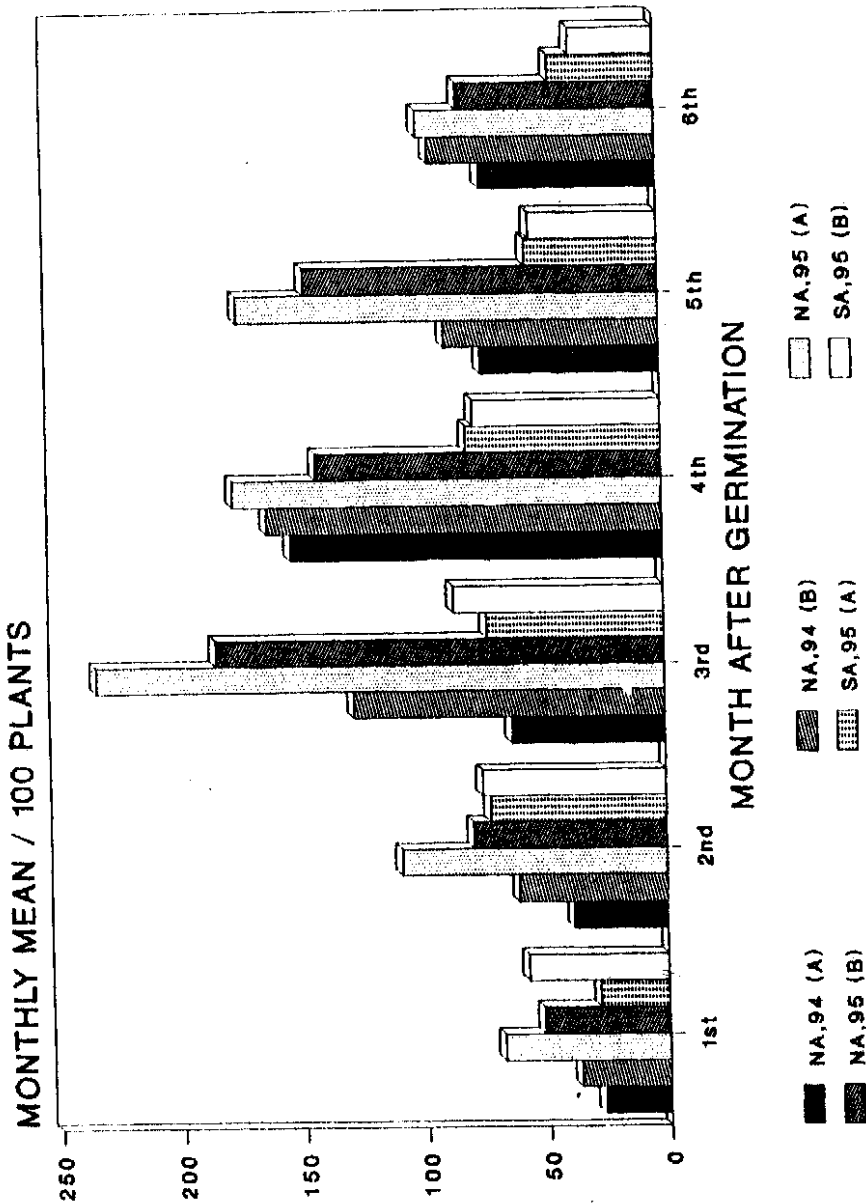
Generally, the trend of the total predators population was relatively similar in the two seasons at NAARI and in the two areas (Fig. 1). It built up gradually by the beginning of the season to reach its peak mostly around the 3rd and the 4th month after germination (MAG) and then decreased gradually towards the end of the season. This trend is in agreement with the findings of EL-Heneidy *et al.*, 1987, 1995 and 1996.

As shown in the figure, the total population of the predators at NAARI,95 was relatively higher not only than that of NAARI,94 but also of SAARI,95. Comparatively, the total population as well as the monthly mean were higher at NAARI than at SAARI. Highest monthly peaks, 153, 162.8 and 233.4, 184.5 individuals/100 plants were recorded in plots A and B at NAARI,94 and 95, respectively in correspondence to 80.5 and 77.5 at SAARI, 95.

* Species identified by the authors with the assistance of Kawanda Insect Museum, Kawanda Research Institute, Uganda.

** Species identified by The Natural History Museum in London, U.K.

Fig. (1): Monthly mean numbers of predators / 100 plants in cotton fields at NAARI and SAARI in 1994/95 and 1995/96 seasons.



Highest numbers of predators counted throughout the study were 317 and 365 individuals/100 plants in plots A and B at NAARI,95 respectively during the 3rd week of 3rd MAG. The correspondents were 111 and 100 individuals/100 plants in plots A and B at SAARI,95 during the 4th week of 4th and 3rd MAG, respectively.

Two chemical applications, with Decis and Thionex, were done in plot B at NAARI,95 to control high infestation of bollworms during 1st week of 4th and 5th MAG. The two sprays led to a sharp decline (55 and 27 %, respectively) in the total population of the predators in the plot. El-Heneidy *et al.*, 1987 and EL-Heneidy and Sekamatte, 1996a recorded 70-80 % reduction in predators population after using the pesticides in cotton fields.

Relative abundances of different species and/or groups of the recorded predators are illustrated in Figures (2, 3 and 4). Clearly, the most abundant species and/or groups in both locations were the ants, true spiders, *Orius* spp., coccinellids (*Scymnus* and *Cheilomenes* spp.), and rove beetles. Ants and true spiders predominated most of the other species, while *Orius* spp. ranked third in the order (Van Den Berg and Cock, 1995).

Rove beetles, *Paederus* spp. population was apparently much higher at NAARI,94 but it declined drastically at NAARI,95. It was very low at SAARI, 95.

Lacewings, earwigs and hover flies were recorded with the lowest populations among the predators in the cotton plots of the two locations. Sorghum and maize showed more attractiveness to the earwigs than cotton. (EL-Heneidy and Sakamatte, 1996b).

Seasonal incidence of the predatory species and/or groups in the two sites showed the following:

- The coccinellids, *Cheilomenes lunata* and *C. vicina*, and *Scymnus* spp. were mostly common in early and mid-season, but *Scymnus* spp. continued relatively high up to the end of the season at NAARI,95. Peaks of the *Cheilomenes* spp. (41 beetles/100 plants) and of *Scymnus* spp. (163 beetles/100 plants) attained during the 4th week of 1st MAG and the 3rd week of 3rd MAG, both at NAARI, 95, respectively.
- *Orius* spp. and the rove beetles, *Paederus* spp. were almost common in mid- and late season in both locations. *Orius* spp. peaked (138 bugs/100 plants) at NAARI,95 during 2nd week of 5th MAG, while the peak of *Paederus* spp. (77 beetles/100 plants) was recorded at NAARI,94 during the 4th week of 4th MAG.
- Ants and true spiders were recorded in all the sampling occasions throughout the growing seasons in the two working sites. They were mostly common in mid- and late season and they were relatively higher at NAARI than at SAARI, particularly by the end of the season. Ants peaked (216

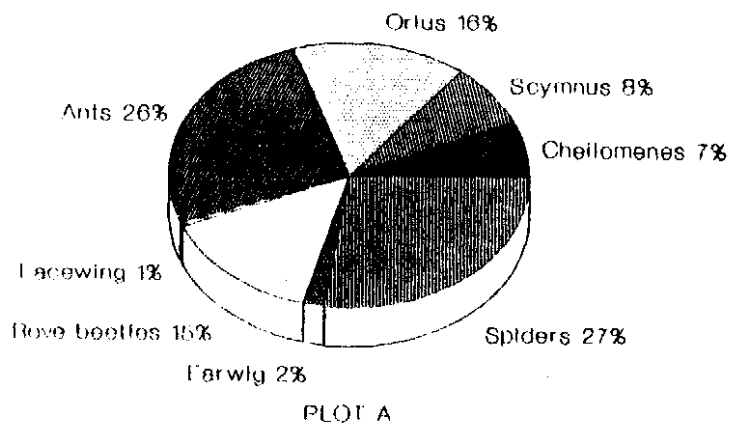
individuals/100 plants) at NAARI,95 during the 4th week of 5th MAG. True spiders peaked (55 spiders/100 plants) also at NAARI,95 during the 3rd week of 3rd MAG.

- Populations of the lacewings, earwigs and hover flies were scattered in the two areas throughout the season with relative increase by mid-season. It could be concluded that:
- The active period of the predators, which is almost by mid-late season coincides with the high populations of most of the key cotton pests in Uganda, mainly the *lygus* bugs, bollworms stainers and partly the secondary pests (Sekamatte, 1994, EL-Heneidy *et al.*, 1996 and EL-Heneidy and Sekamatte, 1996b). EL-Heneidy *et al.*, 1995 recorded significant interactions between the cotton pests and most of the their associated predators through- out the cotton growing season.
- Ants may be highly effective predators of insect larvae, pupae and adults, but they have a negative effect if they interfere with other natural enemies or are direct pests themselves.
- insecticide applications showed negative influence on the predator populations, 27-55 % reduction was recorded (El-Heneidy and Sekamatte, 1996a). The two chemicals; Decis and Thionex, used at NAARI,95 in plot B caused 55 and 27 % reduction, respectively.
- It is difficult to quantify with precision the effect of insect predators in keeping pest species below economic densities. The complexities are so great that quantification of the importance of beneficial species, singly or in mixed populations is rather unlikely.
- The methodology used in this study was simple, based on visual recording in the field and facilitated interpretation of the findings. This method has been adapted to assist in IPM training of extension personnel and smallholder cotton farmers in Uganda.
- In this study the authors tried to up-date the common predatory species surveyed by Coaker, 1959 and Nyiira, 1970 in cotton fields in Uganda as well as to study their seasonal abundances. However the study is not conclusive for purposes of implementations in IPM. More field validation studies are still needed before recommendations are made.

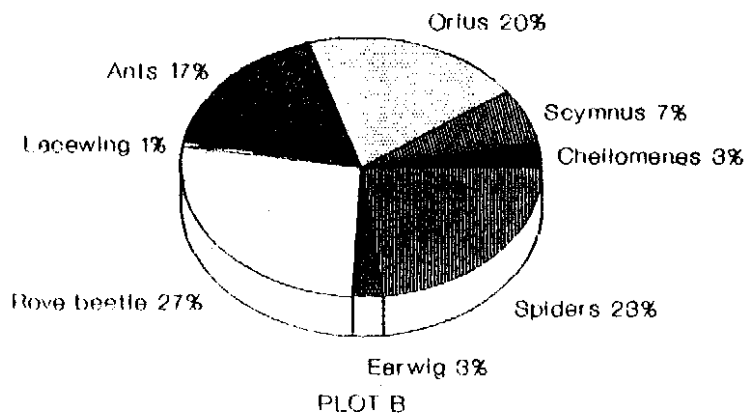
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Fig. (2): Percentages of representation of predatory species at NAARI in 1994/95 season.

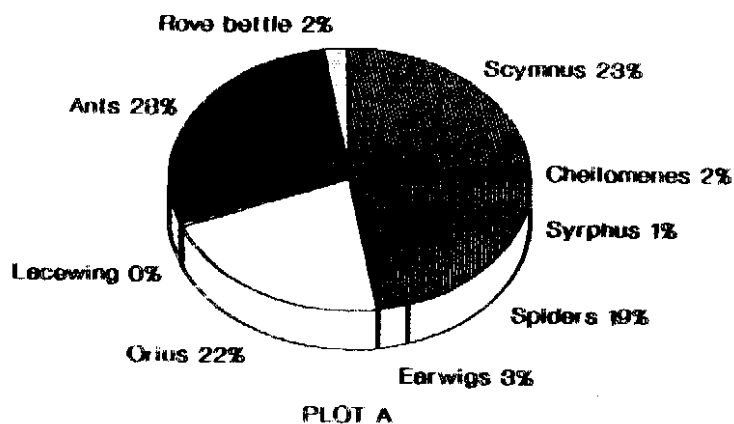


NAARI,94

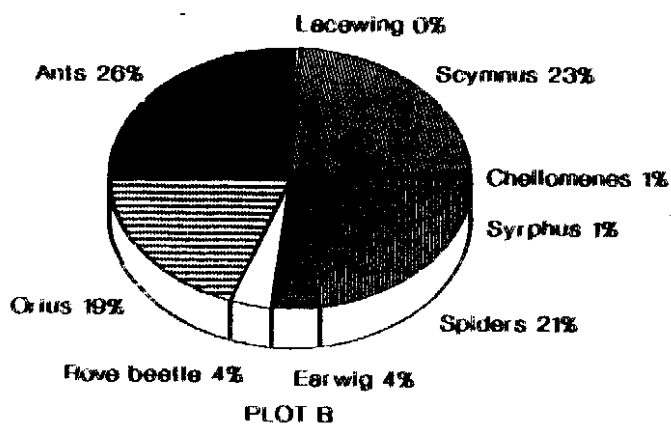


NAARI,94

Fig. (3): Percentages of representation of predatory species at NAARI in 1995/96 season.

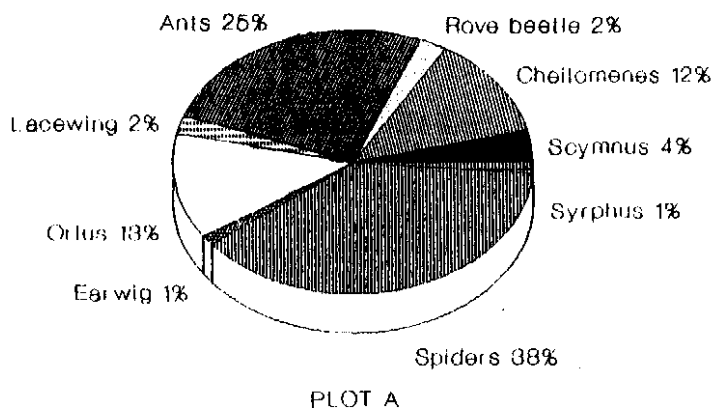


NAARI,95

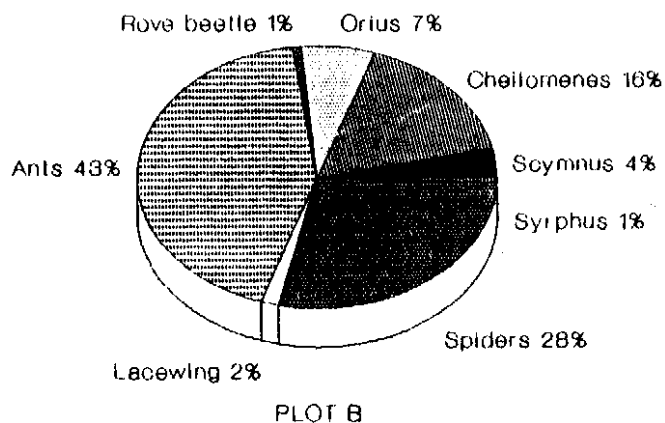


NAARI,95

Fig. (4): Percentages of representation of predatory species at SAARI in 1995/96 season.



SAARI,95



SAARI,95

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كثافة عددية مقارنة لبعض أنواع المفترسات الهامة في نظامي بينيين بحقول القطن في أوغندا

أحمد حسين الهندي وبن سكماماتي
معهد البحوث الزراعيه والانتاج الحيواني بسوروتي - أوغندا

تم حصر ودراسة مقارنة للكثافة العددية لأنواع ومجاميع المفترسات الشائعة المصاحبة لأفات القطن في نظامين بينيين في أوغندا بكل من معهدى البحوث الزراعيه والانتاج الحيواني بنامولنجي وسيريري خلال موسمي القطن ١٩٩٤/١٩٩٥، ١٩٩٥/١٩٩٦ على التوالي.

سجلت أعداد المفترسات أسبوعيا بطريقة العد المباشر. أوضح الحصر الأنواع التالية:-

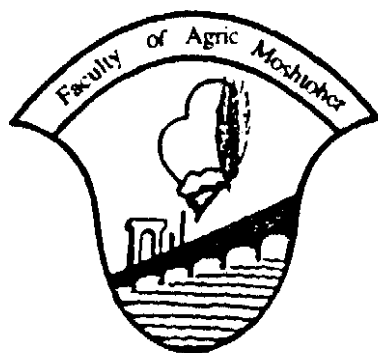
Cheilomenes lunata, *C.vicinia*, and *Scymnus* spp. (coccinellids) *Chrysoperla carnea* S. and *Chrysopa* spp. (Chrysopids). *Orius* spp. (anthocorids). *Paederus sabaeus* E. (staphyllinids). *Diaperasticus erythrocephalus* O. (libidurids), *Xanthogramma (lsciodon) aegyptium* W. and *Syrphus* spp. (syrphids). *Pheidole* spp. and *Myrmicaria* spp. (formacids), and several groups of true spiders.

كان اتجاه تعداد المفترسات متشابها في موقعي العمل، بلغ التعداد قمته في منتصف الموسم، واستمر نسبيا عالياحتي نهاية الموسم، كان النمل والعناكب الحقيقية وبقة الأوريس الأوفر عددا بين مجاميع وأنواع المفترسات بحقول القطن في أوغندا، كان تأثير المعاملة بالمبيدات الكيماوية سلبيا على تعداد المفترسات (٢٧-٥٥٪خفض).

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