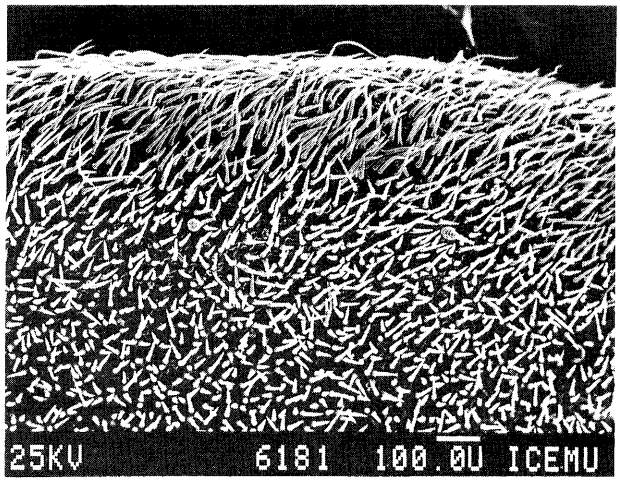

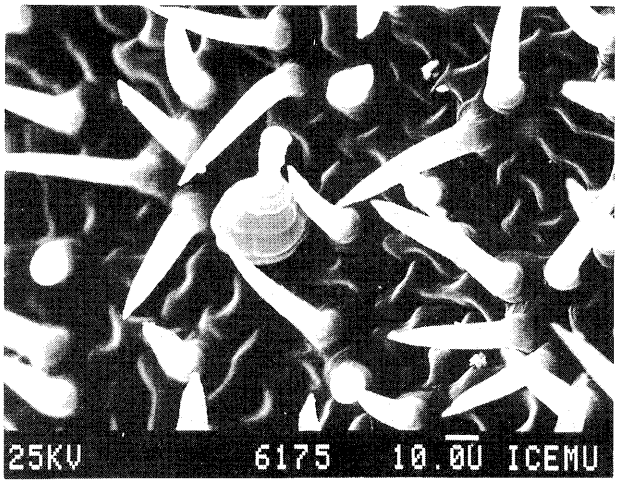

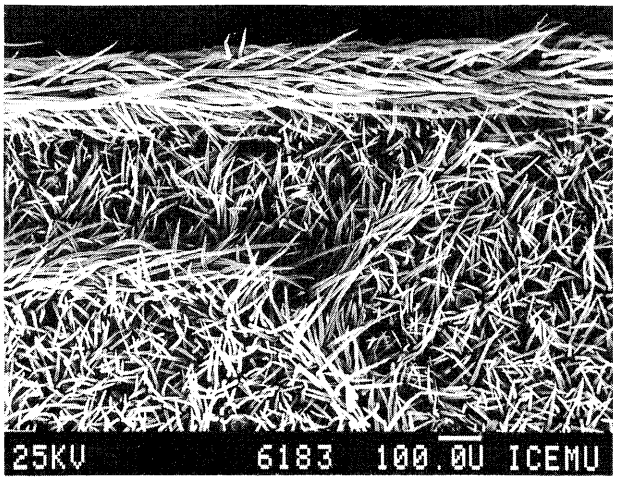

Figure 1. Electron micrographs of pigeonpea leaf surface: (a) upper surface, (b) trichome Type A on the upper surface, and (c) lower surface.

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Using Sticky Traps to Monitor Populations of *Trichogramma* egg Parasitoids

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Helicoverpa armigera (Lepidoptera: Noctuidae) is one of the most serious pests of pigeonpea. Many *H. armigera* natural enemies, including egg parasitoids belonging to the genus *Trichogramma* (Hymenoptera: Trichogrammatidae), appear to be less effective on pigeonpea than on other crops (Romeis and Shanower 1996). One possible way to enhance the efficacy of naturally occurring *Trichogramma* parasitoids may be the manipulation of the cropping system as reported by Duffield (1994). He reported high levels of egg parasitism on pigeonpea intercropped with sorghum and concluded that *Trichogramma* populations could move from sorghum to pigeonpea when the two crops flowered at similar times. He was able to detect *Trichogramma* using sticky traps and egg cloths within both intercrops (Duffield 1993).

In this study sticky traps were used to continuously monitor the population dynamics of naturally occurring *Trichogramma* egg parasitoids in pigeonpea and sorghum in the 1995 rainy season. The field (0.25 ha) had a

4-m border of sorghum (CSH 9). Plots (8 rows) of short-duration pigeonpea (ICPL 87) were intercropped with sorghum (4 rows) within this border. Glass tubes (3.4-cm diameter; 14.5-cm length) coated with transparent insect glue (Tanglefoot®, Tanglefoot Company, Michigan, USA) were used as sticky traps. White paper was rolled inside the glass tube as this color was found to be preferred by the parasitoids (Romeis, unpublished data). The surface area of the trap was approximately 132 cm^2 (12 × 11 cm). Five traps were placed in each crop: at panicle height in sorghum (1.5 m) and at canopy height in pigeonpea (0.7 m). Traps were left in the field for 2 or 3 days. Before removal they were covered with clear plastic for easier handling. The number of parasitoids caught per trap per day was counted under a dissecting microscope in the laboratory.

Up to 9 parasitoids day^{-1} were caught on traps placed in sorghum (Fig. 1). The maximum parasitoid density in sorghum was detected when *H. armigera* egg density was greatest (standard week 39). Regardless of the high parasitoid population in sorghum, the parasitoid population in pigeonpea remained low, even at the highest egg density (week 39). In contrast to findings by Duffield (1994), no movement of parasitoids between the two crops was detected. Sticky traps are a useful tool in monitoring the dynamics of natural occurring *Trichogramma* populations in the field.

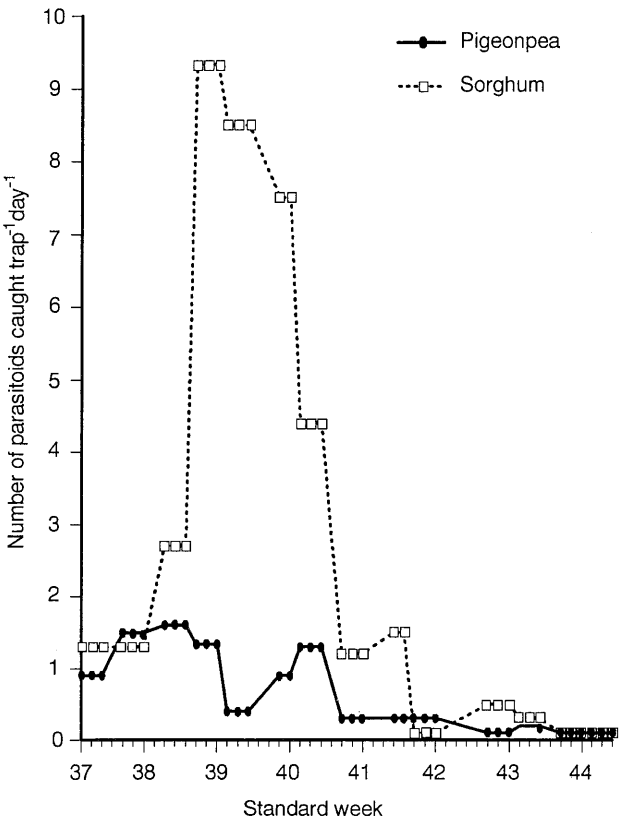

Figure 1. Number of *Trichogramma* parasitoids caught per sticky trap per day in sorghum and pigeonpea, IAC, rainy season 1995.

Acknowledgement. We thank Mrs Jyothirmayi for her technical assistance. Support to JR by Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) is gratefully acknowledged.

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Biotechnology

RFLP Analysis of Cytoplasmic-Genic Male-Sterile Lines of Pigeonpea Developed by Interspecific Crosses

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Pigeonpea is a partially cross-pollinated crop. The outcrossing nature of pigeonpea is being exploited for hybrid breeding using stable genetic male sterility discovered by Reddy et al. (1978). Commercial production of pigeonpea hybrid using genetic male-sterile lines poses problems of seed purity as fertile plants from the plots must be rouged out. The alternative has been to look for cytoplasmic-genic male-sterile lines, which has been successfully exploited in several crops and has overcome many of the disadvantages associated with the ge-