and with increase in dosage it lowered the oviposition rate and could produce 100% sterility. Hemel induced only about 26% sterility at 25 ppm.

In pupal treatment tepa produced 100% sterility with 10,000 ppm whereas metepa and apholate at the same concentration induced only 95% and 90% sterility respectively. The lower concentrations of tepa, apholate and metepa also proved to be quite effective in inducing considerable sterility (5,000 ppm). Hemel, though highly toxic, was found to be better than hempa against pupal treatment.

In larval treatment apholate proved to be the best as it shows least toxic effect and causes maximum sterility. In *C. p. quinquefasciatus* Muller3 has shown similar effect of apholate, metepa and tepa in larval treatment. The effectiveness of aziridine compounds such as tepa, metepa and apholate were to be expected as they are not great species specific. The activity of hempa and hemel on the larvae is most interesting; as non-alkylating chemosterilants they are quite specific in their activity against *C. fatigans*.

Pupal treatment is more advantageous as pupae can tolerate very high concentration of chemosterilant and also selective treatment of males and females at this stage is possible. At higher dosage all the chemicals showed an appreciable toxicity. One useful feature observed in pupal treatment is that the oviposition rate was not decreased as much as in the case of larval treatment. The high effectiveness of tepa against pupae cannot be accounted on the basis of its structure. It has been pointed out that there is no correlation between the number of aziridine rings and the decrease or increase in their sterilising capacity.6 However, the present data clearly indicate that the activity of a chemosterilant against one instar is different compared to that on other instars of the same insect as shown in case of metepa and tepa where pupal treatment is considerably more effective than larval treatment. Derivatives of aziridines as chemosterilants seem to affect the genetic material of the organism producing dominant lethal mutations that render them sterile.8 The exact mode of action of these alkylating and non-alkylating chemosterilants are yet to be elucidated.

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**SOME NEW OBSERVATIONS ON PHLOEM IN LUFFA CYLINDRICA (L.) ROEM.**

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THOUGH much work has been done recently in the study of phloem, many details regarding the structure of a mature sieve-tube element remain unsettled. Some points of disagreement are the nature of slime, its relationship with the cytoplasm, location of cell contents and their nature in a mature uninjured sieve-tube element. It is generally accepted that the central cavity of a mature sieve-tube element is filled with some contents, though controversy regarding their nature persists. According to Duloy, Mercer and Rathgeber, a mature sieve-tube element is without any cytoplasm and its walls are lined with a parietal layer which surrounds dispersed fibrils of slime present in the lumen. According to Kollmann the slime is specific cytoplasmic differentiation, rather than a final product of metabolism. Hence the whole contents of a mature sieve-tube element are cytoplasmic. Engleman3 believes that fibrillar and/or amorphous slime is present along with other cytoplasmic materials in the sieve-tube element. Several other workers believe that sieve-tube elements contain internal strands, which traverse through the sieve plates of consecutive elements, though their interpretations regarding the nature are varying. During the course of our investigation
on the phloem in the petiole of Luffa cylindrica, we have observed certain mature sieve-tube elements with peripheral cytoplasm and slime and specialized parenchyma cells with extruded nucleoli and callose deposition on lateral as well as end walls.

are disturbed in the sectioned material ("A" in Figs. 1-4). A number of strands of varying thickness are longitudinally and transversely placed in the peripheral contents. The contents of the sieve tube element appear occasionally withdrawn from the lateral walls.

![Image](image_url)

**FIGS. 1-7.** Figs. 1-4. Mature sieve-tube elements illustrating peripheral contents and a central cavity. A region where central cavity is exposed. Rupture of the peripheral contents is also evident. Figs. 5-7. Specialized parenchyma cells. Fig. 5. A specialized parenchyma cell showing vacuoles, enlarged nucleoli, and chloroplasts at early stages of their disorganization. Fig. 6. Illustrates the extruded nucleolus (unlabelled arrow) and nucleus with scanty contents. The disorganizing chloroplasts are grouped at B; Fig. 7. A specialized parenchyma cell showing callose deposition at the lateral and end walls (unlabelled arrows). All, x 866.

Figures 1-4 illustrate the peripheral contents of the sieve-tube elements. The mature sieve plates have scanty callose. Sieve areas are also present on the lateral walls. The peripheral contents are present surrounding a central cavity. This cavity is exposed at a number of places where the peripheral contents

Many workers believe that as the sieve-tube element matures, the breakdown of the tonoplast allows the contents of the vacuole to mix up with the cytoplasm and the lumen is filled with vacuolar fluid, slime and cytoplastic material. Englerman coined a new term "mictoplasm" for this mixture. Evert et al. believe
that slime is probably the only substance of cytoplasmic origin in the central cavity of mature sieve-tube elements and is present in the form of continuous strands through the sieve plates. Thaine\textsuperscript{6} depicts the strands in mature sieve-tube elements as cytoplasmic and names them as "transcellular strands". On the basis of its response to the bromphenol blue test\textsuperscript{9} for proteins, we believe that the strands observed in \textit{Luffa} are of slime.

The presence of a central cavity apparently without any mixing up of peripheral cytoplasmic contents is new to phloem study. Recently similar observations have been encountered in mature sieve-tube elements of a number of woody dicotyledons by Professor Evert (personal communication). We could not observe any membraneous system delimiting the central cavity and the peripheral contents in \textit{Luffa}. But there are reports of a tonoplast in a mature sieve-tube element also. Schumacher and Kollmann\textsuperscript{10} and Kollmann\textsuperscript{11} have reported tonoplast in a mature sieve-tube element of \textit{Passiflora}. Though a distinct tonoplast is not present in \textit{Cucurbita} and \textit{Primula},\textsuperscript{12} it is believed that a delimiting membrane between parietal layer of cytoplasm and the central cavity is present in the mature sieve-tube elements.

The specialized type of phloem parenchyma cell observed in \textit{Luffa} has the following features:

(1) The cell is generally associated with the sieve-tube elements of inner and outer phloem. It is shorter or longer or rarely equal in length with the associated sieve-tube elements.

(2) The cell in its early ontogeny resembles a normal parenchyma cell having a large nucleus with one or more nucleoli, vacuoles with tonoplast and chloroplasts. The cell wall is thick or thin with primordial pits.

(3) During the early stage of specialization the nucleoli enlarge (Fig. 5), later extrude out and lie in the cytoplasm (unlabelled arrow in Fig. 6).

(4) Simultaneously chloroplasts group together and show signs of disorganization by losing their shape, size and avidity for staining ("B" in Fig. 6). The vacuoles are not discernible. The nucleus shows less contents.

(5) The cell at this stage shows callose deposition at primordial pits on lateral as well as end walls (unlabelled arrows in Fig. 7).

(6) Most of these cells ultimately obliterate with the associated sieve-tube elements.

Specialized parenchyma cells intergrade between companion cells and ordinary parenchyma cells in primary as well as secondary phloem of dicotyledons.\textsuperscript{13-16} Cheadle and Esau\textsuperscript{19} distinguished the specialized parenchyma cells as ontogenetically related to the sieve-tube elements. In \textit{Luffa} this point requires further study. The specialized parenchyma cells of \textit{Luffa} show a feature distinguishing it from all the other similar types reported so far, in exhibiting the extruded nucleolus. The extrusion of the nucleolus, nucleus with scanty contents, deposition of callose and distintegration of chloroplasts are features of morphologic and physiologic specialization, indicative of stages of differentiation of a sieve element.

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