from the Russian variety "Virovsky bellie", was found to be highly uniform and homozygous with no further segregation in the 8th generation of inbreeding. In contrast to population, its plants had practically no anthocyanin pigments in the stem and leaves and the flowers were dark-violet in colour. In the year 1971, i.e., in the 15th generation of inbreeding, two of its plants appeared to differ from the rest in the size of the leaves, flowers and growth. They were not only completely self-sterile but also produced no seed at all even under parthenogenesis. These plants were suspected to be autotetraploids. A cytological investigation was, therefore, undertaken to see whether these plants were polyploids or not.

For cytological analysis flower buds from suspected polyploid plants as well as the plants of the inbred line, LB-274, were fixed in the Carnoy's solution for six hours. The anthers were squashed in 1% aceticarmine and examined. 50 pollen mother cells were scored in each case. The plants of the inbred line, LB-274, showed normal meiotic division, forming 9 bivalents at Metaphase-I. The number of rod bivalents, however, varied from one to three per cell. But quite a different picture was found in the plants, suspected to be tetraploids. In them all the p.m.c. were polyploids with various types of configurations known for a typical auto-tetraploid. No diplod cell was observed. An analysis of 50 cells at meiosis gave the following results :

<table>
<thead>
<tr>
<th>Quadrivalents</th>
<th>Trivalents</th>
<th>Bivalents</th>
<th>Univalents</th>
<th>No. of cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>1</td>
<td>7</td>
<td>4</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>0</td>
<td>6</td>
<td>5</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>3</td>
<td>10</td>
<td>3</td>
</tr>
</tbody>
</table>

Their complete sterility may be attributed to highly irregular meiosis and self-incompatibility.

Presence of polyploid cells in the inbred lines of allegamous populations is not new. It has been reported in rye,2,3. Rees4 has noted 1% polyploid cells in an inbred line of rye. Such cells have also been observed in one of the inbred lines of radish, LS-337/255. From these, errors at the pre-meiotic mitoses have been inferred in the homozygotes. It seems that in the present case pre-meiotic errors have led to the formation of unreduced diplod gametes which on fusion gave rise to polyploid plants.

The author wishes to record his sincere thanks to Dr. S. I. Narbut of the Chair of Genetics and Plant Breeding, Leningrad State University, Leningrad, for the material.

Department of Botany, NARSINHA DAYAL,
Patna University, Patna-5 (Bihar), August 22, 1974.

1. Narbut, S. I., Genetika (USSR), 1966, 5, 89.

PEMPHIGUS BURSARIUS L. PRODUCING GALLS ON LOMBARDY POPLAR IN KASHMIR

The Lombardy Poplar, *Populus nigra italica* Muench., is commonly grown in Kashmir on the roadsides and is a graceful avenue tree. The author collected a large number of pear-shaped or irregularly purse-shaped galls formed at various positions on the leaf stalks (Fig. 1). The causative agent was subsequently identified as *Pemphigus bursarius* (L.) (Homoptera : Aphididae). These galls were particularly more numerous on the lower leaves. On dissection each gall was found occupied by a large sized fundatrix, a considerable number of alate females, numerous young ones belonging to various developmental stages, honey-dew and cast skins entangled in a white powdery matter.

![Fig. 1. Galls of *Pemphigus bursarius* (L.) on Lombardy Poplar. (X) Beak-like escape vent in the gall.](image)

The gall formation gets initiated in early spring when a fundatrix hatching from an over-wintered egg pierces the petiole of an unfolding leaf to suck the sap. The plant cells at this region multiply so as to give rise to a rather lopsided purse-like structure enclosing the fundatrix. The fundatrix reproduces asexually within the gall to give rise to a generation of alate viviparous females which
escape from the gall in late summer particularly during August, when most of such galls are found empty. Populations of this aphid were detected on younger shoots of Lombardy Poplars in early autumn, and were found to consist of both males and females. It could not be ascertained in the preliminary observations whether these aphids had dispersed to the younger shoots after escaping from the mature galls, or had meanwhile migrated to the roots of various Compositae which serve as the secondary hosts for this aphid elsewhere, before returning to the Lombardy Poplars in early autumn. The autumn generation reproduces sexually and the eggs over-winter on the young twigs. This aphid appeared to be exclusively restricted to the Lombardy Poplars and was not recovered from any other Populus species in Kashmir. The average sized galls measured 1.5-2.0 cm. This is the first report of Pemphigus bursarius (L.) from Kashmir. Govt. Agriculture College, M. ZAKA-UR-RAB. Sopore (Wadura), Kashmir. August 12, 1974.


STUDIES IN GERANIALES

III. The Structure and the Development of the Fruit Wall in Averrhoa carambola L.

Averrhoa carambola, a member of the family Oxalidaceae, is a moderate sized tree, with minute rose-purple flowers, arranged in axillary cymes, often forming panicles. The fruit is a five or six angled berry with acute lobes and arillate seeds. Since these fruits are rich in acid juice, they are eaten raw, cooked or preserved, and are prescribed as antiscorbutics. The structure and the development of the fruit wall has not yet been worked out in this interesting genus.

The fruits of different ages, collected in August 1972 from plants growing locally, were preserved in 70% alcohol. The material was dehydrate by passing through tertiary butyl alcohol grades and embedded in paraffin wax. The study was based on transverse sections of the fruits of different ages, varying in length from 3 mm to 40 mm and stained in Safranin-Fast green.

In a T.S., the pericarp of a young fruit (3 mm) is 14 or 15 cells thick, the cells being compact and parenchymatous. The cells of the outer epidermis are more or less rectangular and those of the inner epidermis are tangentially elongated. The layer, lying immediately next to the inner epidermis also has cells which are somewhat tangentially elongated. The cells are richly cytoplasmic and undergo both anticlinal and periclinal divisions. At this stage a few tannin cells are found interspersed in the pericarp (Fig. 1).

Figs. 1-4. Averrhoa carambola L. Some stages in the development of fruit wall as understood from transverse sections. Fig. 1. From fruit about 3 mm in length, ×260. Fig. 2. From fruit 6-8 mm in length, ×60. Fig. 3. From fruit 12-15 mm in length, ×20. Fig. 4. From fruit about 40 mm in length, ×20.

The cell divisions continue until the fruit attains a length of about 6-8 mm. At this stage the pericarp may be distinguished into three more or less distinct zones: (i) exocarp or epicarp consisting of a few layers of small, more or less cubical cells; (ii) mesocarp that constitutes the main bulk of the pericarp with several layers of irregular cells and (iii) endocarp with elongated cells of 4 or 5 layers including the inner epidermis. The development of tannin is maximum at this stage (Fig. 2).

In a fruit measuring 12-15 mm in length cell division ceases to occur and the further growth is entirely by cell enlargement, especially in the mesocarp. Tannin also disappears by this time and the cells of the endocarp become compressed by the enlarging cells of the mesocarp (Fig. 3).

The subsequent increase in the size of the fruit is by cell enlargement in the region of the mesocarp. In a fruit about 40 mm in length, the enlargement of the cells is so vigorous that the cell walls