**Table 2.** *Percent abnormalities observed after treatment and recovery period in Zea mays*

| Conc. (mg/l) + treatment period (hr) | Diagonal pole and spindle | Pre-cauceous movement | C-metaphase | Stickiness | Breaks | Gaps | Exchanges | Bi- and multi nucleate cell |
|---|---|---|---|---|---|---|---|---|
| 50 + 24 | — | — | — | — | — | — | — | — |
| 100 + 24 | — | 0.1 | — | — | — | — | — | — |
| 200 + 24 | — | 0.1 | — | — | — | — | — | — |
| 500 + 24 | — | 0.4 | 0.1 | — | — | — | — | — |
| 50 + 48 | — | — | — | — | — | — | — | — |
| 100 + 48 | 0.3 | 0.1 | 0.1 | — | — | — | — | — |
| 200 + 48 | 0.3 | 0.4 | 0.3 | — | — | — | — | 0.2 |
| 500 + 48 | 0.5 | 0.6 | 0.9 | 0.4 | — | — | — | 0.4 |
| 50 + 72 | 0.4 | 0.2 | 0.3 | 0.1 | — | — | — | — |
| 100 + 72 | 0.6 | 0.4 | 1.4 | 0.3 | 0.2 | — | — | 0.2 |
| 200 + 72 | 0.6 | 0.7 | 1.9 | 0.3 | 0.3 | — | 0.4 | 0.5 |
| 500 + 72 | 0.9 | 1.0 | 2.0 | 0.8 | 0.4 | — | 0.6 | 0.6 |
| 50 + 96 | 0.8 | 0.6 | 1.0 | 0.4 | 0.5 | — | 0.2 | 1.2 |
| 100 + 96 | 1.0 | 0.9 | 1.6 | 1.0 | 0.9 | 0.7 | 0.5 | 0.4 |
| 200 + 96 | 1.8 | 1.4 | 1.9 | 1.3 | 1.3 | 1.2 | 0.9 | 0.9 |
| 500 + 96 | 2.3 | 1.0 | 2.6 | 2.1 | 1.9 | 1.3 | 1.3 | 1.4 |
| Control | 0.01 | 0.02 | — | — | — | — | — | 0.001 |

is partial[12,13]. As suggested by Wilson[14] this action is also attributed to respiratory inhibitory properties of the fungicide. Clastogenic effects were observed only at 48 hr of treatment and above. This effect suggests the effect of fungicide at $G_2$ phase of the cell cycle[15].

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## CHROMOSOMAL STABILITY IN INDUCED TETRAPLOIDS OF *ATYLOSIA SCARABAEOIDES* BENTH

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INDUCED autopolyploids, in general, have been observed to suffer from drastic reduction in seed setting owing to meiotic irregularities and physiological disturbances. However, autotetraploids can be of considerable use in the species grown for fodder than those raised for grain. The problem of the reduced seed setting can be overcome, to some extent, by practising selection for fertility in subsequent generations as was reported in various induced autotetraploids of buckwheat[1], *Brassica compestris* var *toria*[2], pearl

millet[3] and *Trigonella*[4]. *Atylosia scarabaeoides* Benth is an important legume component of tropical grasslands. This species occurs in diploid form, with $2n = 2x = 22$ chromosomes. The present communication deals with observations on some autotetraploids of this species in $C_6$ generation.

Twenty five, ten-day-old seedlings of *A. scarabaeoides* were immersed in 0.25% aqueous solution of colchicine for 3–6 hr during 1977. The immersion was done upto the hypocotyl region and the roots were covered with moist cotton pads to avoid dehydration. Five treated plants ($C_0$) survived and three of these were autotetraploids. Selection was practised in $C_1$ to $C_5$ generation to improve the seed setting. Fifty $C_6$ plants were raised during 1984. Out of these, 20 plants were observed for pollen stainability and chromosomal constitution. Of these, detailed meiotic analysis of six plants representing various levels of pollen stainability was carried out.

The flower, leaf and pods of the tetraploids initially isolated in $C_0$ generation are shown in figures 1–3. Even after rigorous selection for pollen fertility and plant vigour, considerable variation was observed in morphological features and pollen fertility of $C_6$ plants. Nevertheless all the twenty plants studied showed a euploid chromosomal constitution of $2n = 4x = 44$.

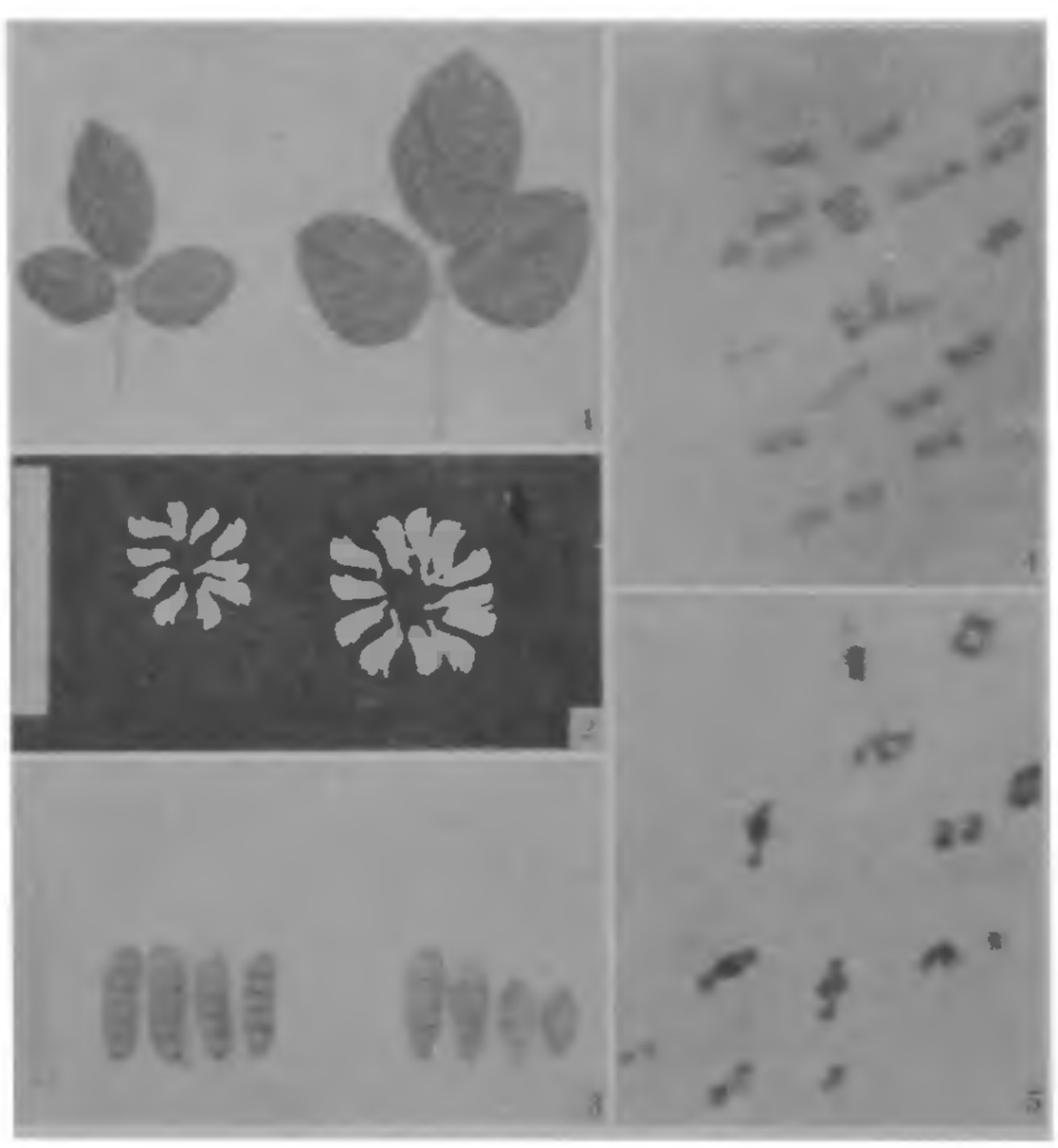
Chromosomal associations of six plants with different fertility status are presented in table 1. The maximum number of the quadrivalents per cell was 10 instead of the 11 possible (figure 5). The other extreme was represented by 22 bivalents (figure 4). Trivalents and univalents were observed in a low frequency. The anaphases in most cases were regular with 22:22 disjunction, but unequal disjunction was observed in 30% cases.

The pollen stainability percentage and the number of seeds set per pod in different tetraploid plants were variable and lower than the diploid progenitor (table 1).

Induced tetraploids of *A. scarabaeoides* had increased cell size. This was evident from the increased size of pollen grains also. Increase in cell size resulted in an increase in the size of organs with determinate growth *viz* flowers. Tetraploids were also late in flowering and maturity of pods, had good vigour but reduced fertility. Decrease in fertility in subsequent generations may take place due to aneuploidy. This had been observed in rye[5], where, 22.7% of plants were aneuploids with a lower seed set. In the present case, the low fertility could not be correlated with aneuploidy since no aneuploids were recorded. Unequal representation of different chromosomes can also be ruled out as the chromosomal associations of more than the level of ploidy status *viz* pentavalents and above were not observed in any of the plants. Also, the frequency of associations like trivalents and univalents was also found to be low.

The sterility of induced tetraploids can be ascribed to cytological and genetic causes. In the present case as many as 36.3 to 63.6% of chromosomes in different plants are involved in quadrivalent association (table 2). Despite the small size of chromosomes there is a tendency of maximum realization of quadrivalents, which is clear from the observations that 10 out of 11 possible quadrivalents were actually observed. The other extreme was represented by an association of 22 bivalents. Incidentally the highest and lowest number of quadrivalents, accompanied by highest and lowest number of bivalents have been observed in the same plant. This may be a pointer towards the fact that different chromosomal associations are formed at random in the case of these autotetraploids.

The multivalent configurations do not indicate a clear-cut correlation with pollen fertility in *Atylosia*



**Figures 1–5. 1–3.** Morphological features of the diploid and induced tetraploid of *A. scarabaeoides*. **1.** Leaves, **2.** Flowers, **3.** Pods (diploids on the left), **4–5.** Meiosis of the autotetraploids, **4.** Metaphase-I showing 22 bivalents, **5.** Metaphase-I showing 10 quadrivalents + 2 bivalents.

**Table 1** *Frequency of various chromosomal associations* at Metaphase-I in diploid and autotetraploid plants of Atylosia scarabaeoides.*

| Plant No. | Associations IV | III | II | I | Pollen stainability % | Seed set/pod |
|---|---|---|---|---|---|---|
| $C_{6-5}$ | 5–6 (5.5) | — | 10–12 (11.0) | — | 29.2 | 0–5 (2.88) |
| $C_{6-13}$ | 5–8 (6.6) | 0–1 (0.33) | 6–10 (8.0) | 0–1 (0.33) | 33.8 | 0–2 (1.3) |
| $C_{6-23}$ | 0–10 (5.8) | — | 2–22 (10.3) | — | 64.24 | 0–4 (1.81) |
| $C_{6-25}$ | 6–7 (6.66) | — | 7–10 (8.33) | 0–2 (0.66) | — | 0–4 (1.89) |
| $C_{6-33}$ | 4–9 (7.0) | 0–1 (0.33) | 4–12 (7.33) | 0–1 (0.33) | 31.14 | 0–2 (1.33) |
| $C_{6-59}$ | 2–6 (4.0) | — | 10–18 (14.0) | — | 36.08 | 5 (single pod harvested) |
| Control (Diploid) | — | — | 11.0 | — | 89.5 | 2–6 (4.23) |

Chromosome number $2n = 4x = 44$; * The figures in parenthesis represent average values.

**Table 2** *Percentage of chromosomes involved in various chromosomal configurations**

| Plant No. | Quadrivalents | Trivalents | Bivalents | Univalents |
|---|---|---|---|---|
| $C_{6-5}$ | 45.4–54.5 (50.00) | — | 45.4–54.5 (50.00) | — |
| $C_{6-13}$ | 45.4–72.7 (60.00) | 0–6.81 (2.25) | 27.7–45.4 (36.36) | 0–2.27 (0.75) |
| $C_{6-23}$ | 0–90.9 (52.72) | — | 9.09–100.0 (46.81) | — |
| $C_{6-25}$ | 54.4–63.3 (60.60) | — | 31.8–45.4 (37.86) | 0–4.54 (1.50) |
| $C_{6-33}$ | 36.3–81.8 (63.63) | 0–6.81 (2.25) | 18.18–54.5 (33.33) | 0–2.27 (0.75) |
| $C_{6-59}$ | 18.1–54.5 (36.36) | — | 45.4–81.8 (63.63) | — |

* The figures in parenthesis represent average values.

tetraploids as is apparent from table 1. Furthermore, pollen fertility does not seem to have any relationship with the number of seeds set per pod. The tetraploid progeny at $C_6$ level showed considerable variability for pollen stainability and the number of seeds set per pod. The occurrence of only euploid progeny at $C_6$ level indicates that a strong genetic balance is imposed during fertilization by elimination of unbalanced gametes. It is also possible that zygotes with unbalanced chromosome numbers fail to develop.

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## *PYTHIUM INFLATUM* MATTHEWS, —A NEW RECORD FOR INDIA

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DURING the course of a study on root rot and seedling diseases of some vegetable crops grown in Tarai region of Nainital, *Pythium inflatum* Matthews was isolated from some rotted roots of tomato (*Lycopersicon esculentum* Mill.) and found to be a new record for Indian mycoflora.

Rotted roots of young tomato plants were collected in fresh polyethylene bags and brought to the laboratory. These roots were washed thoroughly in tapwater to remove the adhered soil particles and finally rinsed with three changes of sterilized water. These infected parts were cut into small pieces and placed onto agar surface for 4 days at 20–22°C. Fungus was cultured on boiled hempseed halves and identified using standard monographs[1-3]. The identity of the culture was also confirmed from the C. M. I. Kew, England (IMI-277412). The species is described as below: