'U' like notch (figure 1b). The data card is then a combination of holes and 'U's (figure 1b). While using the key, cards are sorted out on needles, selecting the character states present in the specimen. The needles are pushed through the particular holes and the whole stack of cards is lifted up on the needles. Those cards representing the taxa with the character states selected would fall down, the rest being retained on the needles. The process is repeated selecting other character states till the identification is complete. If the holes of character states not present in the taxon are notched, the cards of taxa with the selected character states ould stay on the needles rather than dropping off them[5].

Edge-punched cards are patented, special manufacture items that have to be imported into several countries like India. This is probably one of the reasons for the very rare use of edge-punched cards in India. Another disadvantage of the standard edge-punched cards is that the hole (character state) taking capacity is low relative to the card size. For example, the card in figure 1 is 15 cm × 10.5 cm and takes only 71 holes. The French Institute card takes 162 holes but is considerably large (24 cm × 18 cm). The more the number of character states to be represented, the larger is the size of the card, which becomes unwieldy particularly when these sets are meant to be field keys.

In order to overcome these difficulties, the author proposes the use of standard computer cards as edge-punched cards. The computer card is handy in size (18.7 cm × 8.2 cm) and accommodates 80 holes along each of the two long sides (total 160 character states) (figure 2a). If required, another 16 character states can be accommodated on the short sides of the card. Computer cards are inexpensive, easily available and card punches are easily accessible. To prepare blanks, all the holes in rows 0 and 9 are machine punched and the edges of the card along these rows trimmed leaving a 2 mm margin (figure 2a).

Data are incorporated the same way as the standard cards, by clipping the holes out (figure 2b). The names of the character states corresponding to the holes can be printed on all cards if required or a hand written master card can be made for this purpose. Data loaded cards can be wax coated (by dipping in molten wax) to make them hardier and damp proof. A polyclave of this kind to the species of *Cassia* occurring in India is in use in the author's laboratory (Rao and Subhashini, unpublished).

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EVIDENCE FOR SEED TRANSMISSION OF *XANTHOMONAS CAMPESTRIS* PV. *ORYZAE*

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BACTERIAL blight of rice caused by *Xanthomonas campestris* pv. *oryzae* has been known to occur in India since 1951[1]. Its occurrence has become more common with the introduction and large scale cultivation of high yielding susceptible cultivar TN 1 in 1965. Since then, it occurs year after year in different rice growing areas. Infected seeds are believed to serve as the primary source of inoculum[2,3]. However, this has been questioned[4-7]. The severe outbreak of bacterial blight epidemic in the non-traditional rice growing areas (Punjab and Haryana) is of special significance with reference to primary source of inoculum for inducing such wide spread disease. An attempt was made to study the movement of the bacterium in rice seedlings raised from infected seeds. The results are presented in this paper.

Seeds of the rice cultivars Parwanipur 1 (Parwanipur, Nepal), TN 1 and Karuna (CRRI, Cuttack) and IR 8 (Amritsar, Punjab) severely affected by bacterial blight were collected in September 1979, 1980 and 1981, respectively. They were dried and stored in cloth bags in the laboratory. These seeds were sown after six months in 20 cm diameter Petri dishes filled with sterilized soil and the dishes were watered with sterile water twice daily. The temperature and relative humidity during the experimental period ranged between 20° and 37° C and 50 and 75%, respectively.

Seeds treated with a solution of Agrimycin and Ceresan wet for 12 hr followed by hot water treatment at 52° to 54° C for 30 min served as control[8].

In a different experiment, seedlings of cultivars Karuna, IR 8 and TN 1 were raised from 9-month-old seeds outside in the the open in 30 cm diameter earthen shallow pans filled with mango orchard soil supplemented with 1 g of ammonium sulphate per kg of soil. Similarly, seedlings were also grown from seeds of the cultivar IR 8 collected from Amritsar. Seedlings were regularly observed for symptom appearance.

Wilting started to appear 15 to 20 days after sowing and the number of wilted seedlings increased gradually until 30 days after sowing. Similarly, Srivastava and Rao[3] reported that seedlings raised from infected seeds were killed in 3 to 5 weeks indicating that the disease was systemic and transmitted internally. The wilted seedlings were carefully uprooted and their roots washed thoroughly in running tap water. Sections of roots, coleoptile, leaf sheath and leaves were mounted on a slide in a drop of water and observed under the microscope. Profuse bacterial streaming was observed in sections from coleoptiles, leaf sheaths and first leaves and the bacterial oozing decreased in the top portions of the tubular leaf sheaths. The topmost wilted leaf showed only feeble oozing of the bacterium. However, vascular bundles of roots did not possess the bacterium indicating that the bacterial cells present in the seed are activated by moisture. These multiply and move upwards along with the transpiration stream finally resulting in the wilting of seedlings. The bacterium was isolated from such wilted seedlings in potato-sucrose-agar medium and its pathogenicity was confirmed by inoculating on healthy plants of IR 8.

However, the seedlings raised in the open showed typical leaf blight symptoms 60 days after sowing to the extent of 10, 3 and 7% in Karuna, IR 8 and TN 1, respectively. Seedlings grown from seeds (cv. IR 8) collected from Amritsar also showed leaf blight infection in 60-day-old plants.

Interestingly, the susceptible rice cultivars differed markedly in the extent of disease transmission. The highly susceptible TN 1 did not develop the symptoms of wilting, though it expresses severe disease incidence at the maximum tillering or heading stages of the crop. This may be because TN 1 possesses larger quantities of phenolic prohibitions toxic to the pathogen[9] than IR 8 or to the presence of high number of bacteriophages in the seed[10] The later development of the disease may be due to escape of few remaining cells of the bacterium into the vascular system, which invariably took longer time in symptom expression. On the other hand, IR 8, Karuna and Parwanipur 1 showed an efficient transmission of the disease to an extent of 5, 23 and 85% of wilted seedlings, respectively.

The movement of the bacterium in the diseased seedlings was monitored for the first time in this study. Upward movement of the bacterium has been observed in seedlings artificially inoculated by dipping the roots in bacterial suspension to induce wilting[11]. My results show that the bacterial cells carried by the seeds, multiply under favourable conditions, move upwards with the growth of the seedlings and infect the aerial parts.

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ON THE DISTRIBUTION OF PLASMODESMATA IN THE EUPHORBIALES

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THE presence or absence of plasmodesmata in the mature foliar epidermis of the family Euphorbiaceae