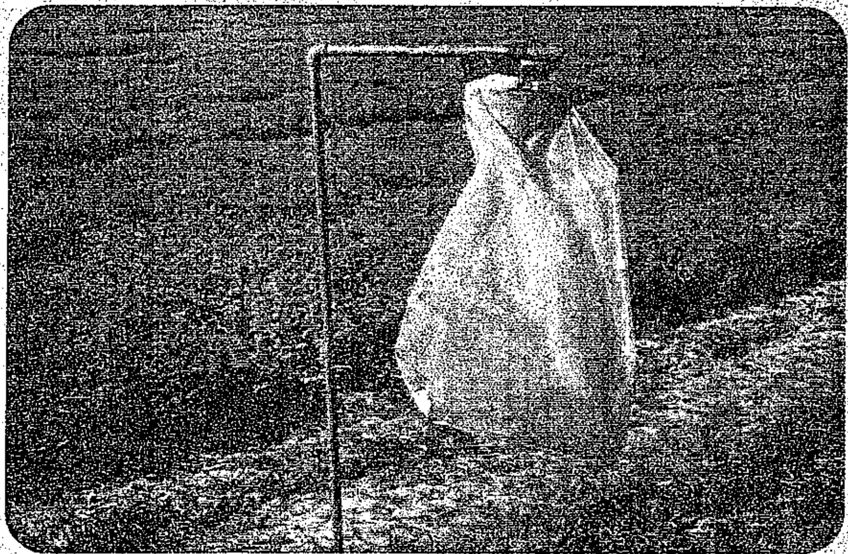
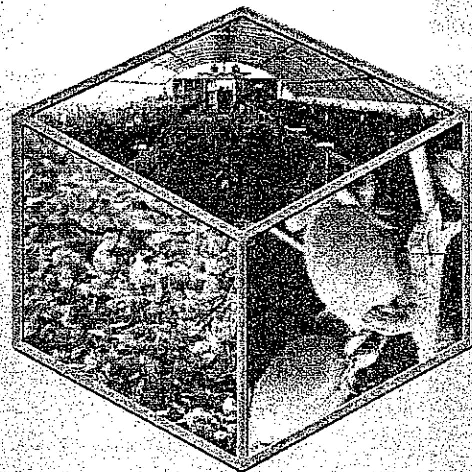


Advances in Management of Biotic and Abiotic Stresses in Pulse Crops



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ovipositon, and inspite of similar level of pod damage the selections significantly outyielded the controls. These observations suggest that *Maruca* resistant lines recovered from pod damage to produce good yield. Further, it was also evident that resistant reaction was conditioned through some compensation mechanisms. Flowering and maturity data of selections (Table1) showed that the recovery from initial flower/pod damage was quick. It may also be possible that after initial damage the *Maruca* larva for some reasons is not able to cause further damage to pigeonpea flowers and pods in the tolerant lines. This could be due to poor larval growth and /or any other interference in the normal growth cycle of larva. To understand this phenomenon, studies under controlled conditions are necessary.

The trials conducted to assess the utility of *Maruca* tolerant selections in managing the pest economically showed that in each year and in each treatment the *Maruca* resistant selection MPG 537 was superior to control ICPL 87 (Table 3). In these experiments, more or less similar yields were recorded with 2 and 3 sprays and in these situations the mean superiority of MPG 537 over control was 137% and 119%, respectively. Under no spray condition in 1994/95 season the control ICPL 87 failed while MPG 537 produced 0.65 t/ha yield. Data on pod damage for 1994/95 trial was not available. In the subsequent year, the *Maruca* resistant and susceptible lines recorded similar pod damage and confirmed the observation recorded on inbred line tests (Table 2).

Maruca resistant lines can play an important role in integrated pest management schemes. Since pesticides account for about 50% of the pigeonpea production cost in Sri Lanka, adoption of Maruca resistant lines might prove boon to the resource poor farmers. However, more on-station and on-farm trials in different agro-ecological conditions are needed to validate the economic gains from this successful and important plant improvement endeavour.

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Waterlogging in Pigeonpea

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ABSTRACT

Waterlogging is a major constraint in stabilization of productivity of rainy season crops including pigeonpea. Genetic variation exists for waterlogging tolerance in pigeonpea germplasm. Preliminary study on the inheritance of waterlogging tolerance indicated that the tolerance was controlled by dominant genes. Selections showed consistent performance and offer scope for breeding high yielding waterlogging tolerant cultivars in pigeonpea.

Waterlogging for short periods is a persistent problem in several states of India. It is on increase due to climatic change and deforestation and is one of the major abiotic stresses of the rainy season crops. According to National Commission on Agriculture of India (1976), about 6 million ha land in India suffer from this stress mainly in West Bengal (1.85 m ha), Punjab (1.09 m ha), Uttar Pradesh (0.81 m ha), Haryana (0.62 m ha), Gujarat (0.48 m ha), Rajasthan (0.35 m ha), Andhra Pradesh (0.34 m ha), Bihar (0.12 m ha) and Maharashtra (0.11 m ha). In addition, Kerala (61,000 ha), Orissa (60,000 ha), and Madhya Pradesh (57,000 ha) also encounter annual waterlogging threats. Introduction of canal irrigation appears to be the major reason for the rise in the waterlogging (4). Pigeonpea is an important crop in South Asia, Eastern and Southern Africa, and the Caribbean region. Traditionally, the medium- and long-duration cultivars and landraces are invariably cultivated as rainfed crop in the soil with high clay content and characterized by high moisture holding capacity and poor drainage. Waterlogging is a major constraint in the stabilization of productivity of rainy season crops including pigeonpea (7). Low yields of pigeonpea in some areas may be attributed due to waterlogging (9). Recently, the adoption of short-duration pigeonpea maturing in 120-150 days is on increase. These types are more sensitive to short-term waterlogging in comparison to the long-duration types because they have less time to recover from this stress (6). Since pigeonpea is sown at the onset of rainy season the crop encounters waterlogging situations during early growth stages. The extent and period of waterlogging may vary from few days to few weeks. The waterlogging damage results either in total plant loss or in reduced biomass and yield. Some soil management practices such as ensuing appropriate slopes and drains and adoption of ridges and furrow system can reduce the losses caused by waterlogging but these options are expensive and difficult to adopt in the entire area due to time and /or financial constraints. Therefore, to minimize losses due to waterlogging, it is necessary to tackle this problem at genetic level by developing cultivars which can withstand the waterlogging stress and have greater recovery from the damage.

Genetic variation for waterlogging tolerance in pigeonpea has been reported

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(1,3). The observed variation, however, were confounded due to inability to control the level of waterlogging and interference from *Phytophthora* blight disease. In addition to predisposing plants to *Phytophthora*, waterlogging allows infection to spread rapidly from one part of the field to the other (8). Considering these limitations a pot technique to screen pigeonpea genotypes for tolerance to waterlogging at ICRISAT has been developed(2). In this technique pigeonpea seedlings are raised in pots kept at about field capacity (30% w/w) for 40 days before submerging them for up to 8 days in water-filled troughs. The prominent symptoms of waterlogging susceptibility include leaf chlorosis and senescence of the leaves, beginning with the lower ones and progressing upwards. This is followed by wilting and death of the plants.

It has been reported that it is not the excess water in the root zone but the poor soil aeration (anaerobic condition) which generates unhealthy physiological changes in woody plants and subsequently influences growth and development of plants (5). This condition severely affects the metabolism of plants by disabling the oxidative phosphorylation pathway. Large differences among short-duration pigeonpea genotypes for waterlogging tolerance have been observed at ICRISAT. The tolerance reaction was invariably associated with presence of air filled lenticles and development of adventitious roots just above the water level and submerged area of the main stem. Preliminary studies on the inheritance of waterlogging tolerance indicated that the tolerance reaction is controlled by dominant genes. The selections showed consistent tolerant reaction and offer scope for breeding high yielding waterlogging tolerant cultivars in pigeonpea.

Under irrigated or waterlogging situations, it is often accompanied by high salinity. Thus it would be more effective if waterlogging tolerance breeding programme is combined with that of salinity tolerance. Some genotypes such as ICPL 227 have shown tolerance to both waterlogging and salinity (1). Considering the annual losses caused by these abiotic stresses it is essential to intensify research in this area.

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Insect Pest Management in Mungbean and Urdbean in India

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ABSTRACT

Mungbean, *Vigna radiata* (L.) Wilczek and urdbean, *Vigna mungo* (L.) Hepper, are widely grown food legumes in the entire Indian subcontinent, during the spring/summer season and the rainy season. About 271 species of insect pests are known to damage these crops during the entire growing season and also as stored grain pests. Severe losses are caused by a complex of stem flies during the seedling stage, a large defoliator fauna consisting of grasshoppers, flea beetles, hairy caterpillars, semiloopers and other lepidopteran caterpillars during the vegetative stage and by a varied flower and pod feeding fauna consisting of sucking bugs, thrips, flower and pod webber, and lepidopteran pod borers. This large insect pest fauna is normally regulated by an equally large and varied parasitoid and predator fauna and also by disease pathogens, which if conserved, provide an effective natural control of crop losses. However, this balance gets disturbed due to several cultural practices, indiscriminate insecticide use and due to the hot and humid sub-tropical environment, where these crops are normally grown. Present status of insect pest management practices including host-plant resistance and insecticide use is discussed. On-farm demonstrations have shown that substantial increase in productivity will come only from successful insect pest management. For sustainable insect pest management an integrated approach based on suitable combination of cultural practices, with available host-plant resistance and need based insecticide use that would cause minimum disruption of the natural control agents is suggested.

India is the largest producer of mungbean, *Vigna radiata* (L.) Wilczek and urdbean, *Vigna mungo* (L.) Hepper in the world. India accounts for almost 65% of world mungbean area and 54% of world production (13). The average productivity of 380 kg/ha is low compared to the genetic potential of 1000-1500 kg/ha. The literature on insect pests and their management on these crops have been reviewed (4,7,13,15). Although 271 species of insect pests have been reported to feed on these crops world wide (4), only 64 attack mungbean in India (9) and of these only 44 are considered as potential insect pests (15). This large bio-diversity of insect pests in India and in South East Asia include agromyzids, weevils, beetles, moths, hemipterous plant sucking

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