levels of ploidy by the species. *Solanum nigrum* does not seem to have exhausted the means of polyploidy in its strides for evolutionary progression.

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PYRAMIDISATION OF RESISTANT GENES FROM MUTANTS FOR INCREASED DEGREE OF RESISTANCE TO BACTERIAL LEAF BLIGHT

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BACTERIAL leaf blight (*Xanthomonas campestris* pv. *oryzae* (Ishiyama) Dye is a widely occurring disease of rice in Asia. It has attracted attention in India, being a major disease and due to recent epidemic in Punjab in 1980. So far it has defied chemical control. However evolution of cultivars with built-in resistance appears to be the best alternative. Success achieved in development of high yielding resistant cultivars through hybridisation is inadequate. Induced mutation technique has been employed for improving resistance to the disease in susceptible cultivars[1-5]. However, moderate degree of resistance has been reported by this technique. Moderate degree of resistance was also found by Padmanabhan *et al.*[6] in the mutants having yield potential similar to their parent Vijaya, a high yielding susceptible cultivar utilised for inducing resistance through mutation. In the present investigation the mutants were utilised for the first time to pyramidise the resistant gene from the mutants for building effective resistance against bacterial leaf blight maintaining the high yielding base.

TABLE 1

Information on control (Vijaya), Vijaya mutants (parents) and F_1's

Control/ Mutants	Lesion length cm	F_1 plant	Lesion length cm
Control—			
Vijaya	24.7	*Single cross:*	
Vijaya mutants—			
Parents		159-9 × 129-15	11.5
159-9	13.1	185-34 × 187-2	9.1
129-15	13.5	*Double cross:*	
185-34	13.0	(159-9 × 129-15)	
187-2	13.5		3.0
		(185-34 × 187-2)	

In a bid to pyramide resistant genes, comparatively resistant mutants with good plant vigour as compared to Vijaya were inter crossed (table 1). The F_1 obtained from a single cross was again crossed to F_1 of another single cross.

The subsequent F_1 plants of double cross were raised in *kharif* 1979. The F_2 population of both single and double crosses along with single cross F_1's and double cross F_1, including the parent Vijaya were grown in *rabi* 1980 and inoculated with a local isolate of the pathogen by the method described by Padmanabhan *et al*[6]. Their reactions to bacterial leaf blight were grouped as resistant (R) having lesion length upto 2 cm, moderately resistant (MR) having 2.1–6 cm and susceptible (S) having 6.1 cm and above. F_3 progenies from resistant segregants were grown and inoculated during *kharif* 1980 to determine the behaviour of the lines for lesion length.

Shorter lesion length was exhibited by F_1 plants of single crosses over the mutants and by F_1 of double cross over F_1 of single crosses (table 1).

The F_2 population of single crosses which gave unimodal distribution of lesion length showed 15.4 and 19% segregants having lesion length below 2 cm. This indicated qualitative improvement towards resistance over the mutant parents utilised. Further F_2 population of the double cross showed 28% of resistant plants which is higher as compared to resistant plants in F_2 population of the respective single cross. A quantitative improvement towards resistance *i.e.* increase in percentage of resistant segregants in F_2 population of the double cross over the F_2 population of single crosses is indicated (table 2).

Four families out of 38 F_3 progenies raised from resistant segregants showed most narrow range of

TABLE 2

Percentage of plants showing R, MR, and S reactions in F_2 population and F_3 lines of the crosses of mutants of Vijaya*

F_2/ F_3	R (0-2.0†)	MR (2.1-6.0)	S (6.1 and above)
Vijaya (Control)	0.0	0.0	100.0
F_2			
159-9 × 129-15	15.4	77.7	7.0
185-34 × 187-2	19.0	80.3	0.7
(159-9 × 129-15) (185-34 × 187-2)	28.0	68.5	3.7
F_3 lines			
1	88.5	11.5	0.0
3	77.8	22.2	0.0
6	84.2	15.8	0.0
14	66.7	33.3	0.0

* R—Resistant; MR—Moderately resistant; S—susceptible. † Lesion length in cm.

lesion length in their plant population towards resistance as a result of accumulation of resistant genes. It is evident that the improvement for the resistance achieved through pyramidisation in the families is of greater magnitude (table 2). It indicates that the approach of pyramidisation could help to achieve effective resistance to bacterial leaf blight.

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STUDIES ON THE BIOLOGY OF A PREDATOR, *CARDIASTETHUS* SP. (HEMIPTERA: ANTHOCORIDAE) FOUND IN THE GALLERIES OF *NEPHANTIS SERINOPA* MEYR. (LEPIDOPTERA: XYLORICTIDAE)

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THE pirate bugs (Anthocoridae) exercise an important check on aphids, scale insects, thrips and other small insect pests[1]. Barber[2] has given an extensive account of *Orius* (*Triphleps*) *insidiosus* (Say), and its role in the control of the corn earworm, *Heliothis obsoleta* (F). Rao *et al.*[3] reported from S. India an anthocorid bug, *Triphleps* sp. as a predator of the eggs of *Nephantis serinopa* Meyrick, the caterpillar pest of coconut. The present authors report for the first time a species of *Cardiastethus* being present in different parts of Kerala, as predators on the eggs and early larval stages of *N. serinopa*.

Eggs are cylindrical with one end oval and the other end having a rounded operculum. The chorion is hard. Newly laid eggs are white and measure 0.54 mm long and 0.20 mm wide. After about a day, eggs turn pink. The incubation period is 4-5 days. Upon hatching the operculum is opened to one side and the first instar nymph emerges.

Total duration for the 5 nymphal instars is on an average 18-22 days. The details of each stage are given in table 1. The nymphs are pink with 3rd, 4th and 5th abdominal segments bearing red spots dorsally. Upon their emergence, the nymphs start actively feeding on the haemolymph of the prey.

The newly emerged adults are at first light red and then gradually turn deep brown. The female (figure 1) is larger than the male, her abdomen wider and longer, with the apex projecting a little beyond the posterior margin of the wing membranes. Females measure 1.50 to 2 mm in length and 0.50 to 0.70 mm in width.

Predatory behaviour

The immature stages as well as the adults are predaceous. Eggs and first instar larvae of *N. serinopa* are pierced (figure 2) and the fluid contents removed leaving the host desiccated and shrunken. Feeding time lasts from 5 to 15 min depending on the stage of the prey. While feeding the rostrum is withdrawn at intervals and inserted at fresh points. It was found, how-