staminal bundles and the alternating five as petal bundles (Figs. 5, 6). The bundles supplying the perianth parts divide to form smaller bundles in the respective organs (Figs. 4–7, 12).

The basal peripheral portion of the ovary is 'disc-like'. It is non-vascularised and the cells show deep staining vacuolated cytoplasm (Fig. 7).

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INFLUENCE OF AGE OF HOST PLANT ON THE EXPRESSION OF ACQUIRED LOCAL AND SYSTEMIC ANTIVIRAL RESISTANCE INDUCED BY TREATMENT WITH TRICHOTHECIUM POLYSACCHARIDE IN *N. GLUTINOSA*

IT has already been reported[2,3,1,6] that fungus *Trichothecium roseum* produces in culture a complex polysaccharide that inhibits a number of unrelated virus infection in plants by exerting action primarily directed against the host while possessing no virucidal activity *in vitro*. The extent of inhibition of virus infection depends not only on the dosage of the inhibitor employed but also on the identity of the host plant and the interval of time it remains in contact with the host.

A method for the laboratory production of the polysaccharide from the homogenised fungus culture was described by Gupta and co-workers[4]. The antibiotic, designated as T-poly, was shown to induce local as well as systemic antiviral resistance in treated *N. glutinosa* plants and these responses could be partially reversed by timely application of actinomycin-D, suggesting that DNA–dependant–RNA synthesis is required for the expression of antiviral activity in plants treated with T–poly. Recently[5], T–poly (250 ppm) sprayed 24–48 hours before inoculation was shown to be effective to the tune of about 50% in preventing PVY transmission by aphids on *D. metel*, *N. tabacum* cvs white Burley and Samsun but not on *N. glutinosa*.

We have now seen that the antiviral resistance to TMV infection induced by T–poly in *N. glutinosa* is greatly influenced by the age of the host and the manner in which it is administered.

The fungus *T. roseum* ex Fries (Himachal strain) was maintained and produced T–poly in a medium containing magnesium sulphate, sodium nitrate, peptone and yeast extract. The samples of T–poly always contained traces of nitrogen (0·9–2·4%).

The *N. glutinosa* plants were raised in glass house as described earlier. *N. glutinosa* seedlings were transplanted at 2 leaf stage and raised in garden soil in 22·5 cm pots in glass house. At intervals following 13 to 70 days after transplantation, very young immature upper leaves and the matured old basal leaves were removed and only the five middle order leaves in a plant were retained for investigations reported here.

TMV was maintained by regular passage in *N. tabacum* cv NP31; whenever needed 1·0 gm of the infected leaf sample showing obvious mosaic symptoms were crushed to a pulp in 10 ml distilled water. The infected juice was squeezed out through cheese cloth, centrifuged at 3000 rpm and the supernatant fluid diluted 10 fold with water. Extract prepared in this way constituted the standard challenge inoculum.

In the first experiment two basal leaves per plant (*N. glutinosa* of varying age groups) were treated by *rubbing* either with T–poly or water, and the upper leaves were left untreated. Fortyeight hours later, all leaves of the test plants were washed and challenge inoculated with standard infectious TMV leaf extract. Results (Table I) show, firstly, the per cent reduction in lesion count due to treatment is more significant in 35 day (86%) and in 50 day old (97%) plants, than in any other age group. Apparently, the younger (13–15 days) and the older (65 to 70 days) plants are weakly sensitive to the action of T–poly.

The experiment was repeated with 35 and 50 day old plants treated with T–poly, applied either by *rubbing* or by *spraying*. The reduction in lesions obtained in the *basal treated leaves* of the 50 day old plants was 96 and 60% respectively and in the *upper untreated leaves* the corresponding figures being 82 and 50%. In the case of 35 day old plants, however; the resistance develops at remote site as strongly as it does locally at the site of treatment regardless how T–poly was applied. This is interpreted to mean that an antiviral factor (inter-

TABLE I

Effect of preinoculation rubbing of 2 basal leaves with T-poly on the percent reduction in virus infectivity in five different age groups of N. glutinosa *plants*

Groups (age of plants) (days)	Two basal leaves treated per plant with	Leaf position*	Lesion/leaf ± S.E. mean	Total lesions (U + B)	% Reduction in lesion**
13–15	H_2O	U	31 ± 5·54	72	61·0
		B	41 ± 3·28		
	T-poly	U	12 ± 2·89	28	
		B	16 ± 7·52		
20–22	H_2O	U	93 ± 4·08	201	67·0
		B	108 ± 1·78		
	T-poly	U	29 ± 3·16	68	
		B	39 ± 2·33		
35	H_2O	U	116 ± 0·50	236	86·0
		B	120 ± 0·912		
	T-poly	U	27 ± 13·88	33	
		B	6 ± 17·30		
50	H_2O	U	63 ± 4·37	151	96·0
		B	88 ± 2·58		
	T-poly	U	3 ± 4·27	5	
		B	2 ± 1·38		
65–70	H_2O	U	42 ± 2·19	94	51·0
		B	52 ± 5·73		
	T-poly	U	26 ± 7·18	46	
		B	20 ± 3·07		

* Total number of leaves per leaf position was 8;

** $\dfrac{(H_2O) - (T\text{-poly})}{H_2O} \times 100$.

TABLE II

A comparison of the effect of two different methods of treatment with T-poly on the per cent reduction of virus infectivity in two age groups of N. glutinosa *plants*

Method of treatment	Age of plant	Two basal leaves per plant treated with	Reduction in virus infectivity: Local (basal leaves) Lesion/leaf ± S.E. mean	% reduction	Systemic (upper leaves) Lesion/leaf ± S.E. mean	% reduction
Rubbing	35 days	H_2O	138 ± 3·47	97·0	188 ± 9·80	98·0
		T-poly	6 ± 5·73		5 ± 1·30	
	50 days	H_2O	56 ± 4·08	96·0	26 ± 4·70	82·0
		T-poly	2 ± 1·52		3 ± 2·36	
Spraying	35 days	H_2O	183 ± 10·55	94·0	138 ± 13·48	94·0
		T-poly	12 ± 5·00		8 ± 2·34	
	50 days	H_2O	26 ± 4·90	60·0	26 ± 4·90	50·0
		T-poly	10 ± 1·40		12 ± 3·80	

tein like substances, the formation of which is influenced by the age of the host plant, is responsible for the development of acquired local as well as systemic resistance in this host.

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EFFECT OF ALTOSID ON THE BLOOD PROTEIN OF CATERPILLAR OF *SPODOPTERA LITURA* FB. (NOCTUIDAE : LEPIDOPTERA)

Introduction

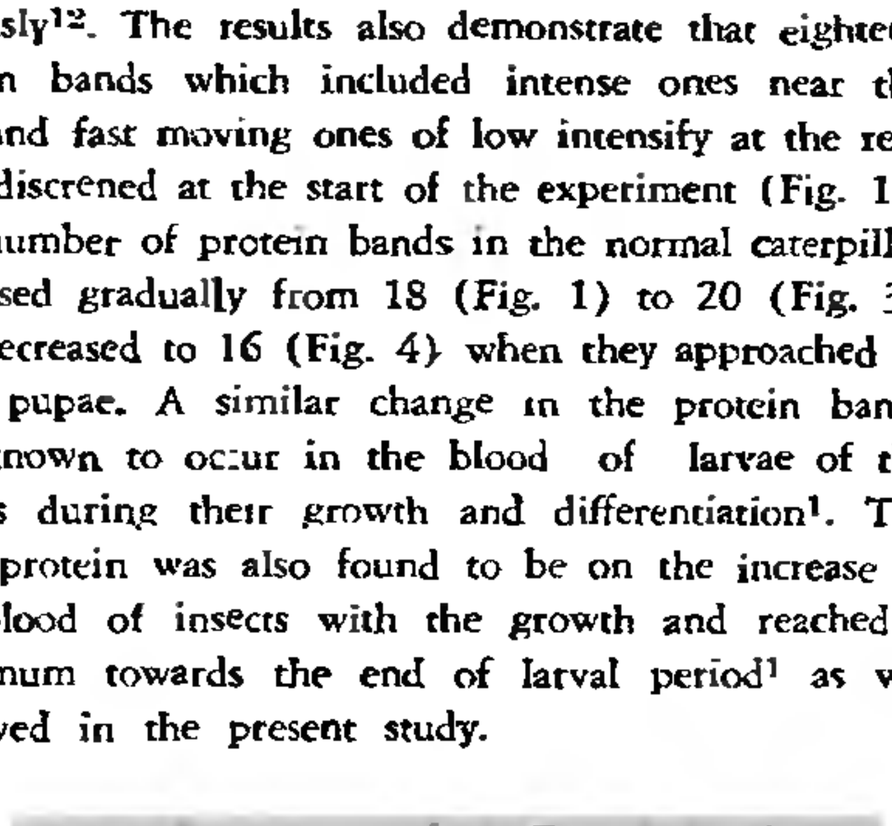
ALTHOUGH considerable progress has made with chemistry[2] and morphogenetic effects of insect growth regulators[3], not much is known on their effects on the physiology of insects. Williams[8] has advanced a theory that juvenile hormone may block the derepression of transcription or utilization of fresh genetic information. It has also been known that juvenile hormone blocks DNA synthesis or structural proteins[4] and in certain systems stimulates the synthesis of RNA and protein. As not much information is available on the protein synthesis in the blood of larvae, treated with insect growth regulator, the present investigation was undertaken with tobacco caterpillar *Spodoptera litura*.

Materials and Methods

The caterpillars were reared on castor bean leaves as described earlier[10]. Freshly moulted last instar larvae were topically treated with 100 μg of Altosid [Isopropyl (2E, 4E)–11–methoxy–3, 7, 11–trimethyl–2–4 dodecadionate; Zoecon Corporation, Calif., U.S.A.] as described by Sundaramuthy[11]. The haemolymph was quickly drawn from the larvae by severing prolegs and immediately assayed. The total protein was quantified by the method of Lowry *et al.*[5]. Ten μl of the whole blood in 40% sucrose solution was electrophoresed on 10% polyacrylamide gel by following the method outlined by Davis[3]. The results are presented in Figs. 1 to 7 and Table I.

Results and Discussion

The exogenous application of insect growth regulator has totally prevented the larvae to transform into pupae, but allowed them to moult into superlarvae. The superlarvae lived only for 36 h after eclosion as against 6–8 days reported in the earlier study[11]. The short life span of the superlarvae observed in the present investigation might be due to non-feeding of larvae as the mouth parts of superlarvae got modified variously[12]. The results also demonstrate that eighteen protein bands which included intense ones near the start and fast moving ones of low intensify at the rear were discrened at the start of the experiment (Fig. 1). The number of protein bands in the normal caterpillar increased gradually from 18 (Fig. 1) to 20 (Fig. 3) and decreased to 16 (Fig. 4) when they approached to form pupae. A similar change in the protein bands was known to occur in the blood of larvae of the insects during their growth and differentiation[1]. The total protein was also found to be on the increase in the blood of insects with the growth and reached a maximum towards the end of larval period[1] as was observed in the present study.



FIGS. 1–4. The electrophoretic pattern of the blood protein of normal caterpillar of *S. litura*.

Administration of Altosid to the caterpillars has sharply modified the electrophoretic mobility of blood proteins (Figs. 5, 6, 7). With no reduction in the total protein synthesized (Table I) the number of protein bands increased to 19 (Fig. 5) from 19 (Table I) and decreased to 16 (Fig. 6) within 24 h. However,