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Research Paper

Host specificity and preference assessment for *Mizelleus indicus* (Jain, 1957), Pandey et al. 2003 on experimental hosts

Zoology

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ABSTRACT

Host specificity is an enduring establishment and reproduction of monogeneans on the fish host. They are remarkably host specific, being strictest in the parasitic platyhelminths. Host specificity among monogeneans is governed by a number of dynamic interactions, involving host recognition, attachment, successful propagation of parasite depends on appropriate host stimuli perceived by the parasite. Present study was initiated to investigate the extent of host specificity in M. indicus (Jain, 1957) Pandey et al., 2003, in different hosts.

Introduction

The concept of host specificity in case of fish parasitic monogeneans can be recognized as enduring establishment and reproduction of monogeneans on the fish host (Buchmann and Lindenstrøm, 2002). Monogeneans of fish are known to be remarkably host specific which is regarded as strictest in the parasitic platyhelminths (Bychowsky, 1957; Poulin, 1992 and Rhode, 1993). It can be established that the number of monogenean species is at least as high as the number of fish species and a tentative estimate of more than 25,000 species has been estimated (Whittington, 1998). Host specificity has been studied extensively by workers like Bakke *et al.,* 1992; Buchmann and Uldal, 1997 and Buchmann, 1998 in gyrodactylids because of their economic significance and potential for translocation of pathogenic species. However, these viviparous parasites are transmitted by contagion, and the mechanisms determining host specificity in gyrodactylids may differ from the more typical oviparous monogeneans that transmits via free swimming larva (Ernst and Whittington, 2001).

Host specificity among monogeneans is governed by a number of dynamic interactions (Buchmann and Lindenstrøm, 2002) *i.e.,* the parasite is able to recognize host molecules emitted over short distances. When contacting the host, substances present in parasite and host must be compatible. The anatomical state of the substrate must fit the attachment structures of the monogenean. Following attachment, successful propagation of parasite depends on appropriate host stimuli perceived by the parasite. Nutritive host material must be recovered and utilized by the monogenean and translocated for productive purposes.

Kearn (1967) demonstrated that chemosensory cues are important for *Entobdella soleae* (a common parasite of sole *i.e., Solea solea*) larvae to identify their specific host and that adult worms are unable to remain attached for more than 24 hours when transferred to 'alien' pleuronectid hosts. In the view of certain reports regarding alien hosts workers like Hargis, 1953, 1957; Llewellyn, 1957; Tinsley, 1974, 1978; Lambert, 1981; Kok and Du Preez, 1987, 1997 and Ernst and Whittington, 2001 have emphasized the need for extensive experimental studies on the host specificity. The aim of present investigation was to study the degree of host specificity of *M. indicus* (Jain, 1957) Pandey *et al.,* 2003, in different hosts.

Materials and Methods

Host Specificity

To test the concept of switch over to another host by the *M. indicus* (Jain, 1957) Pandey *et al.,* 2003, various fishes (experimental hosts) like *Catla catla*(Ham.); *Cyprinus carpio*(Linn.); *Labeo rohita*(Ham.); *Cirrhinus mrigala*(Ham.); *Clupisoma garua*(Ham.); *Clarias lazera* (Val.); *Clarias batrachus*(Linn.); *Mystus vittatus*(Bloch.); *Mystus aor*(Ham.); *Mystus tengara*(Ham.); *Eutropiichthys vacha* (Ham.) and *Wallago attu*(Bl. and Schn.) were used as a potential secondary host.

Table-1: Results of host specificity experiment of *M. indicus* (Jain, 1957) Pandey *et al.,* 2003

	Fish	Gp	20th Day	Avg.	25th Day	Avg.	Susceptibility
1.	*Catla catla* (Ham.)	1	0	0.67	0	0	N
		2	0		0		
		3	2		0		
2.	*Cyprinus carpio* (Linn.)	1	0	0.33	0	0	N
		2	0		0		
		3	1		0		
3.	*Labeo rohita* (Ham.)	1	0	0	0	0	N
		2	0		0		
		3	0		0		
4.	*Cirrhinus mrigala* (Ham.)	1	2	1	0	0	N
		2	1		0		
		3	0		0		
5.	*Clupisoma garua* (Ham.)	1	9	10.33	8	11.33	Y
		2	10		14		
		3	12		12		
6.	*Clarias lazera* (Val.)	1	3	1	0	0.33	N
		2	0		0		
		3	0		1		
7.	*Clarias batrachus* (Linn.)	1	1	0.33	0	0.33	N
		2	0		1		
		3	0		0		
8.	*Mystus vittatus* (Bloch.)	1	8	9	12	9.67	Y
		2	11		8		
		3	8		9		
9.	*Mystus aor* (Ham.)	1	10	9	6	8	Y
		2	10		8		
		3	7		8		
10.	*Mystus tengara* (Ham.)	1	6	8.33	9	7	Y
		2	9		5		
		3	10		7		
11.	*Eutropiichthys vacha* (Ham.)	1	12	10.33	5	8	Y
		2	9		11		
		3	10		8		
12.	*Wallago attu* (Bl. and Schn.)	1	18	17	16	14.66	Y
		2	19		15		
		3	14		13		

Gp= Group ; Avg= Average ; N= No ; Y= Yes;

For this purpose, infection free fishes were obtained at 10-15 days old stage. These fishes were reared in laboratory conditions in separate aquaria and water tanks at the Department of Zoology, C. C. S. University Meerut. Six fish of each type were kept in each aquarium. These aquaria were equipped with the arrangements for water circulation. For infecting fishes Ernst and Whittington (2001) method with slight modifications was followed. For this purpose, gills from fishes infected with *M. indicus* (Jain, 1957) Pandey *et al.,* 2003, were hanged in the aquaria. This procedure was repeated daily for the period of 20 days, replacing hanging gills with fresh infected gills daily. After which fishes were sacrificed for the recovery of worms on 20th and 25th day respectively. The data obtained was recorded thoroughly. If 5 or more worms were recovered from a fish during the 20-25th day, it was defined as susceptible. The fishes having less than 5 worms were treated as non-susceptible.

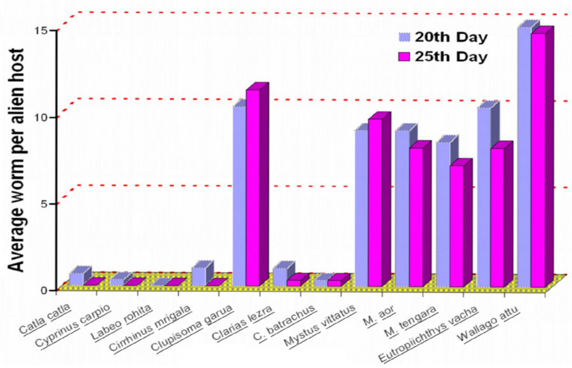

Fig. 1 : Host specificity observation on various experimental hosts for *M. indicus* (Jain, 1957) Pandey *et al.,* 2003

During the study *M. indicus (*Jain, 1957) Pandey *et al.,* 2003, was allowed to infect eleven different fishes besides *W. attu* (Bl. and Schn.) through exposure to previously infected gills. On 20th day of exposure to infected gills *M. indicus (*Jain, 1957) Pandey *et al.,* 2003, was recovered from all fishes except *Labeo rohita* (Ham.). Although, the average worm recovery was as low as 0.33 for *C. batrachus* (Linn.) and *Cyprinus carpio* (Linn.). Whereas, highest number of worms were recovered from natural host *W. attu* (Bl. and Schn.) *i.e.* 17 followed by *Clupisoma garua* (Ham.) (10.33) and *Eutropiichthys vacha* (Ham.) (10.33). On the twenty fifth day, worms were absent in case of *Catla catla* (Ham.)*, Cyprinus carpio* (Linn.) and *Cirrhinus mrigala* (Ham.) and hence not found susceptible for infection. Whereas, the worm recovery was only 0.33 which is too low to be considered as susceptible in case of *C. lazera* (Val.) and *C. batrachus* (Linn.). *Clupisoma garua* (Ham.) (10.33) was found to be highly susceptible for infection followed by *M. vittatus* (Bloch.) (9.67), *M. aor* (Ham.) (8), *M. tengara* (Ham.) (7) and *Eutropiichthys vacha* (Ham.) (8). However, *W. attu* (Bl. and Schn.) (14.66) was found to be the most preferred being the natural host. It was also noticed that when *W. attu* (Bl. and Schn.) was kept with another susceptible fish, *Mizelleus indicus (*Jain, 1957) Pandey *et al.,* 2003, preferentially settles on the gills of *W. attu* (Bl. and Schn.).

Discussion

The selection of a certain host species by an ectoparasitic monogenean must be governed mainly by factors in the host surface. Thus, chemical stimuli emitted from the host have been suggested to attract the parasites and even initiate certain behavioral and physiological changes in the parasite. In addition, anatomical structures of certain host surfaces are likely to show higher compatibility with some parasite attachment mechanisms. In order to reproduce satisfactorily, the monogenean must feed on host material which can be absorbed and used for production of eggs or larvae. This means that the feeding systems (mouth parts and pharynx) and digestive apparatus (including enzyme array) of the parasite must be equipped to cope with the structures and molecules in the host surface. The composition of the host surface including amino acids, fatty acids, carbohydrates, vitamins and minerals must fit the needs of the reproducing parasites (Buchmann and Lindenstrøm, 2002).

Desdevises *et al.* (2002) while working on determinants of host specificity in the genus *Lamellodiscus* tried to find out link between specificity and phylogeny, specificity and environmental factors, specificity and taxonomic diversification and specificity and morphological adaptations. They reported that host specificity in monogeneans appear to be highly constrained by phylogeny but also linked to the host size. They further hypothesized that specificity is controlled by intrinsic, phylogenetically related characteristics largely. However, experimentally they failed to predict, the role of size of host in the concept of host specificity.

The author agrees with Desdevises *et al.* (2002), that phylogenetic characters are important determinants of host specificity as a result of which these monogeneans acquire marked preference for a particular type of host.

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