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Study on the Abundance and Infestation of Blowfly During Drying of Fish in the Coastal Area of Bangladesh

Mohammed Ashraful Azam Khan and Yusuf Sharif Ahmed Khan
Institute of Marine Sciences, Chittagong University, Chittagong, Bangladesh

Abstract: The present study was undertaken to observe fish drying practice in the remote and isolated island of Bangladesh. Experiments were conducted to assess the cured loss of blowfly and its larva "Maggot" infestation, their diurnal activities and seasonal abundance on traditional sun drying of ribbon fish at field level. Experiments were carried out at a concentration of 0.12, 0.06 and 0.03% pirimiphos-methyl (organophosphorus) along with that "Nogos" of 0.25% (present practice) and saturated brine treatment in reducing blowfly infestation. The treatment of saturated brine and 0.03% pirimiphos-methyl gave comparatively good result (yield 41.5 - 41.6%) than control; whereas 0.12 and 0.06% pirimiphos-methyl treatment gave fair result (yield 42.7 - 43.2%), "Nogos" 0.25% treatment gave complete protection against blowfly infestation. Blowfly infestation on untreated control ribbon fish gave an yield 36.6% of about 5% less than the treated one.

Key words: Pirimiphos-methyl, Nogos, brine, blowfly, dry fish, Bangladesh

Introduction

Bangladesh is blessed with fairly vast fishery resources, inland as well as marine. From the perspective of natural gift of aquatic resources, fish and other fishery items have played an important role on the culture and life style of the people of Bangladesh.

Sun drying of fish is a common practice in Bangladesh for long preservation. This practice is usually made in the remote coastal isolated islands and in inland depressions where chilling and freezing facilities are lacking. Most of the marine fishes caught in remote areas and islands viz. Moheshkhali, Sonadia and St. Martins are simply sun dried and a portion is cured. It is noticed that a substantial amount of these fishes is being damaged or infested during sun drying (Coulter and Disney, 1987).

Blowfly (*Chrysomya* sp.) infestation is widely distributed in the oriental Australian regions and adjacent parts of the palaearctic regions. It was also reported in South-East Asia and was shown to be a principal cause of damage of the salted dried fish (Esser, 1988). Field observations as well as information of the curers indicated that about 30% of the fish was infested by blowfly and their larvae "Maggot" at the beginning of drying (Walker and Greely, 1990). This infestation was due to application of traditional methods of drying in tropical countries such as Bangladesh (Ahmed *et al.*, 1989; Bhuiyan, 1990).

In the drying yard, fish are relatively wet (moisture content 50% or more) and are prone to infestation by blowflies (Walker, 1987). Duration of infestation was longer in the rainy season and even in dry season when the sky remained over-cast with clouds, the fish drying periods are prolonged. The larvae of blowfly "Maggot" locally called "Lot Puka" can very quickly consume the soft tissues and make colossal damage, leading to weight loss to the curers (Gordon *et al.*, 1989).

In Bangladesh dried fishes are important source of low cost dietary protein. At present total fish production is about 1.2 million tones, of which 15% of fishes are dried for mass people consumption at the scarcity of fresh fishes. In the drying yard it was found that 5-10% of the fish product lost due to blowfly infestation. This loss inspired the curers for the addition of unapproved insecticide that will cause health hazard in long run. In order to save the mass people from health hazard approved insecticide as well as some preventive measures have to introduce the research activities.

Materials and Methods

In order to determine the abundance of spoilage due to blowfly during fish drying season (post-monsoon, October, 98-March, 99) and to observe the magnitude of such spoilage and its subsequent infestation in the drying yard at Sonadia, St. Martins and Moheshkhali islands of Cox's bazar, Bangladesh. Six experiments were conducted in six fish drying months in the Institute of Marine Sciences laboratory, Chittagong University. Processing experiments to demonstrate the use of pirimiphos-methyl, brine treatment and currently practiced "Nogos" treatments were carried out at a commercial fish-drying yard in Sonadia island, Cox's bazar, Bangladesh. Blowflies were counted at an interval of 15-30 minutes on a specific number of ribbon fish to assess their seasonal abundance and diurnal activity. For each of the experiments 10 fish were used for uniformity.

Experiments were conducted purchasing ribbon fish (*Trichiurus* sp.) from the fishermen in the field.

Chemicals: The pirimiphos-methyl is an organophosphorus insecticide; 2-diethylamino-6-methylpirimidin-4-yl-dimethyl phosphorothionate ($C_{11}H_{19}N_3O_3PS$) is newly registered and marketed by ICI plant protection division, UK, as brand name (Actellic).

Experiment 1: Ten fish were dipped in the saturated brine solution for 3 hours to allow penetration of salt in the mouth and gill regions, where blowfly generally laid eggs.

Experiment 2-4: Each batch of 10 fish were dipped in six liters each of 0.12, 0.06 and 0.03% emulsion of pirimiphos-methyl respectively, for 15 seconds.

Experiment 5: Ten fish were dipped in 0.25% emulsion of "Nogos" for 15 seconds to observe the degree of effectiveness.

Experiment 6: Ten fish were dipped in coastal water served as control. After dipping each batch of fish were allowed for one minute to drain off excess water and were placed on elevated rack for drying.

Continuous observation was made on the landing of blowfly, their subsequent egg deposition and hatched larval infestation. In every evening and morning the fish were individually examined for larval infestation for two days of drying and were graded as follows:

Code	Observation
O	No larvae present, No damage.
L	< 20 occasional larvae, light damage <1% fish.
M	20-60 scattered larvae, medium damage 1-10% fish.
H	Numerous larvae, feeding packs, heavy damage <10% fish.

The fish were left to dry (up to 5 days) until the processors judged the process to be completed. After drying the fishes were weighed and inspected for larval infestation and damage as stated above. The above regime is taken from the scheme devised and developed for use in Indonesia (Esser *et al.*, 1986) and Thailand (Rattagool *et al.*, 1988).

Corresponding Author: Mohammed Ashraful Azam Khan, Assistant Professor, Institute of Marine Sciences, University of Chittagong, Chittagong-4331, Bangladesh

Results and Discussion

Blowfly count: Blowfly landing was monitored during 6 field experiments by taking direct count at 15 and 30 minutes intervals on experimental fish in first two drying days. The number of counts taken ranged from 21 to 31 per day and the number of fish used in each experiment ranged from 27 to 38. In these experiment it was observed that the mouth and gill region of the fish were the places where blowfly laid eggs and the hatched larvae infested and hollowed the soft tissues of the fish, especially of the body cavity.

Fifteen to thirty minute's interval counts indicate that in the fine morning the visit of blowfly was comparatively low but this activity increased and attained first peak at 10 am (111 No.) and decreased to very low visit at 1.15 pm (15 No.) in the first day of drying. In the evening activity of blowfly again increased and attained peak at 4.00pm (121 No.). This well-defined bipolar activity perhaps was due to the interference of intense heat and low relative humidity around 1.00pm and comparatively high relative humidity and low temperature in the morning and evening hours (Table 1). In the first day of drying the highest visit of blowfly was associated with cloud. The bipolar activity was also clear in the second day of drying.

In the trials 1, 3 and 6, the mean count was higher on the 1st day than the 2nd day, whereas in experiments 2 and 5, the mean count was higher on the 2nd day than the 1st day (Table 2). In the experiment 4 nearly it mean count in two consecutive days was observed. This difference could be due to the fact that the fish becomes less attractive to blowfly with the decreased level of moisture.

Data indicate that blowfly abundance had two peaks i.e. 1st in Nov.'98 and 2nd in March, 99. The lowest abundance was observed in Dec. '98 (Table 2, Fig.1). This can be explained in a way that at the beginning of fish drying the natural population of blowfly was low (October' 98) and subsequently this population increased in Nov.,99 because of ideal breeding substratum i.e. drying fish, the waste and human excreta. In the following month (Dec.98) the population went down in both days of drying and this could be due to low temp. (21.03 ^{0}C) and arid air (69.25% relative humidity). The curers claimed that in the extreme winter (Dec. '98- Jan. '99), blowfly infestation could not cause severe losses because the arid air absorbed moisture rapidly from the fish and the fish became unsuitable for fly and its larva "Maggot".

Nuorteva (1965) stated that blowfly, *Calliphora* sp., showed clear bimodality of activity during warm period, whereas Esser (1988) while working in Indonesia recorded blowfly, *Chrysomya megacephala*, which showed a tendency to increase during afternoon when overcast condition prevailed. In these findings the higher mean count of blowfly was observed in March' 99. This finding supports the statement of Esser (1988) who states that in the rainy season, when fish landings are down, the total amount of fish will be decreased and the drying rates may also be reduced. Fish will remain sufficiently moist to both attract ovipositing blowflies and support larvae for a longer period, which result in an increased infestation and fish damage.

Blowfly infestation: Insects, pests especially blowfly can damage soft tissues of fish during sun drying. During experiment, it was observed that various concentrations of pirimiphos-methyl (0.12, 0.06 and 0.03%) did not show any repulsive effect on blowfly landing and the same was true for treatments of fish with "Nogos" and brine.

Result showed that 0.12 and 0.06% pirimiphos-methyl emulsion treatment shows the similar infestation as well as damage whereas 0.03% pirimiphos-methyl treatment and brine treatments also show similar result. On 0.03% pirimiphos-methyl treatment larval damage varied between light (20%) damage and medium (10%) damage whereas in case of brine treatment damage varied between light (30%) and medium (10%) damage. The hazardous dose of "Nogos" treatment adopted by the curers at present is also tried in this study at a concentration of 0.25%. This dose gave cent percent control measure against blowfly infestation (Table 3, Fig. 2). The untreated control was severely affected by blowfly and its larvae "Maggot" infestation. In this case damage varied between light (10%), medium (40%) and high (50%). This damage rendered a weight loss of about 5%, which was more than the treated fish samples.

Egg batch deposition in different treatments was more or less same but the pirimiphos-methyl treatment at 0.12% showed more egg batch than 0.06% treatment. This could be due to the fact that these experimental fish were adjacent to partly deteriorated drying fish of "Bhodhar". In the "Nogos" treated fish no larvae developed from the eggs. In pirimiphos-methyl treatment tiny larvae developed but died after few hours and very few remained alive and infested soft tissues at a very low rate.

Esser *et al.* (1988) observed that treatment of 0.03% pirimiphos-methyl on fish did not show any repellent effect against visit and oviposition of blowfly. They also observed that inspection of fish after drying revealed considerable damage to the untreated fish, which suffered larval infestation of about 2.03% and more weight loss than the treated fish. The 0.03% pirimiphos-methyl treated fish only occasionally incurred larval infestation and this was generally at a low level and the fish were of superior quality

Table 1: Abundance of blowfly recorded on ribbon fish during first two days of drying

Time/ Hours of the day	8am	9am	10am	11am	12Noon	1pm	2pm	3pm	4pm	5pm
1st day Av. Temp. (0°C)	23.5	26	27.5	29	30	30	29.5	28	28	27.5
2nd day	23	25	26	27	28	29	29	28.5	28	28
1st day Av. R.H. (%)	90	83	78	71	68	68	67.5	67	69	70
2nd day	91	82	74	68	64	63	65	69	68	70
Intervals (15 Minutes)	0 15 30 45	0 15 30 45	0 15 30 45	0 15 30 45	0 15 30 45	0 15 30 45	0 15 30 45	0 15 30 45	0 15 30 45	0 15 30 45
1st day No. of blowfly	39 42 48 44	-82-103*	111100 82 73	56423034	-4223-	17 15 37-	50 63-68	708293117	1219799104	- 83 - -
2nd day	- 18 2131	38524056	7898113-	79536127	4836-29	20101013	-305360	-394746	-5048-	39 - - -

* The sky was remaining cloudy from 9.30 to 10.30am and from 3.30 to 4.30pm in the first day of drying R.H = Relative Humiditys

Table 2: Abundance of blowfly in ribbon fish during drying at Sonadia Island

			Blowfly count			
Months	Experiment	Numbers of fish	N_1	1st Day	N_2	2nd Day
October'98	01	30	28	32.71 ± 8.31	29	30.51 ± 8.49
November'98	02	28	25	39.12 ± 14.95	26	48.42 ± 23.16
December'98	03	27	31	14.55 ± 4.75	30	12.83 ± 3.40
January'99	04	36	27	16.33 ± 4.97	30	16.46 ± 4.23
February'99	05	29	24	37.42 ± 19.44	22	38.95 ± 22.17
March'99	06	38	31	66.70 ± 30.64	30	44.77 ± 23.89

N_1 and N_2 indicates the number of count taken on 1st Day and 2nd Day,

Table 3: The larval infestation and damage of blowfly in the drying yard at Sonadia Island, Cox's Bazar, Bangladesh

Treatments	Weight of 10 fish (gm)	Larval damage O	L	M	H	Weight achieved after drying (gm)	Percentage yield
Saturated Brine	3180	60	30	10	--	1320	41.51
Pirimiphos Methyl 0.12%	3100	80	20*	--	--	1325	42.74
Pirimiphos Methyl 0.06%	3050	90	10*	--	--	1320	43.28
Pirimiphos Methyl 0.03%	3120	70	20	10	--	1300	41.67
Nogos 100 ec 0.25%	3180	100	--	--	--	1330	42.22
Control	3110	--	10	40	50	1140	36.66

*Newly hatched eggs, Dipping time is 15 seconds, # O = No damage, L = Light damage, M = Medium damage, H = High damage, Percentage yield B

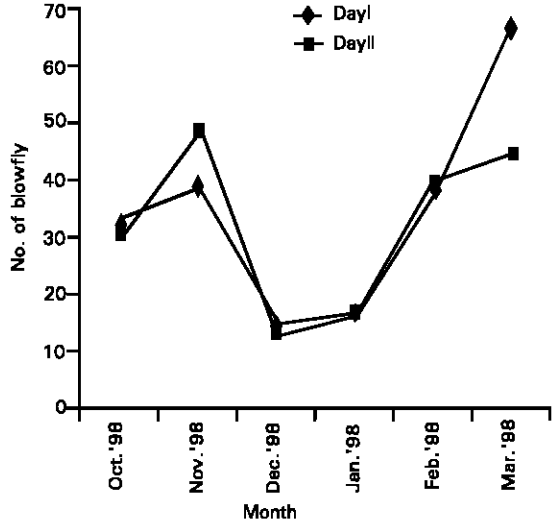

Fig. 1: Seasonal abundance of blowfly on 1st and 2nd day of drying

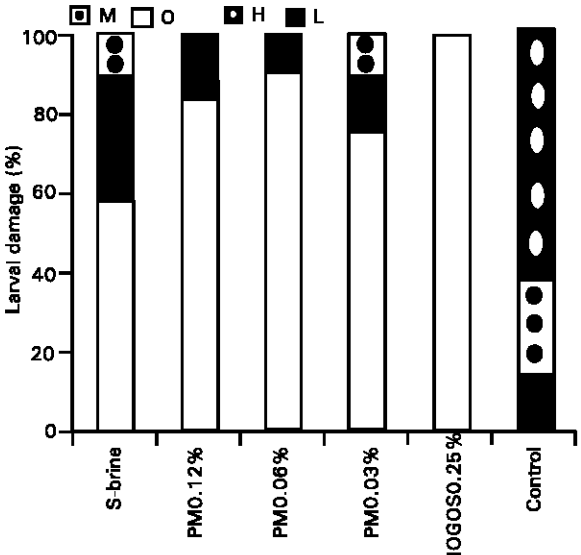

Fig. 2: Larval damage of blowfly in the Sonadia drying yard

compared to control. Rattagool *et al.* (1988) observed that blowtly deposited eggs in the abdominal cavity or under the opercula, resulted in 92% infestation of the control fish.

The insecticide treatments of pirimiphos-methyl (0.06 and 0.03%) and deltamelthrin resulted in complete protection against larval infestation during the experiment. In the present observation, treatment of 0.12 and 0.06% pirimiphos-methyl resulted in better protection but 0.03% pirimiphos-methyl and brine treatment resulted in light to medium damage, whereas 0.25% "Nogos" treatment gave complete protection. Each and every untreated control fish was highly damaged and suffered weight loss of about 5%, which was more than the treated one. These findings agree with the finding of Esser *et al.* (1988) but differ from the results of the Rattagool *et al.* (1988).

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