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Plants traditionally used in fish harvest & angling potential feed attractants in aquaculture

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Several herbal materials have been in use for alluring fish during harvest and angling by traditional farmers in different parts of India. Experiments were conducted using behavioural trough to evaluate 10 herbs collected from Tripura state as feed attractants on post larvae of giant freshwater prawn (*Macrobrachium rosenbergii*) and fingerlings of Indian major carps *catla* (*Catla catla)*, *rohu* (*Labeo rohita)* and *mrigala* (*Cirrhinus mrigala).* The herbs used in the study are *jatamansi, ekangi, latkhandhana, jayatri, kakla, latakasturi, aobel, bhuski, kharbaz* and *tambul*. The powdered herbal materials were incorporated in starch at 1% level to make a dough and it was placed in different compartments of the trough for evaluation. The results of experiments clearly demonstrated higher feeding attractant activity of herbal materials compared to commercially available chemoattractant, betaine. The post larvae of freshwater prawn were attracted in greater numbers towards *ekangi, kakla* and *bhuski* compared to betaine. The attractant activity of different herbs was found to be species specific in case of Indian major carps. The highest attractant activity was shown by *latkhandhana* on *catla, kakla* on *rohu,* and *kharbaz* on *mrigala*.

Key words: Fish attractants, Freshwater prawn, Aquaculture, *Catla, Rohu, Mrigala*

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Substances incorporated in feed at low level to enhance feed intake, growth and utilization are called as attractants. The use of an attractant in manufactured aqua feed has received considerable attention in the recent years. Chemical compounds such as organic bases, betaine, terpenes and sulphur compounds are reported to induce olfactory and gustatory stimuli in fish[1-3]. Considering the importance of various behavioural components of fish, such as arousal, search, uptake and ingestion phases, it is logical to assume that by adding attractants to the feed, the animals could be attracted towards it in a shorter period of time, creating the conditions for faster ingestion. Therefore, emphasis has been given to incorporate attractants in feed manufacture as these would result in rapid feed consumption, which eventually increase growth, survival and reduce the production time[4].

Several plant materials have been in use for alluring fish during harvest and angling by traditional farmers in different parts of India. In Northeast India, aqua farmers and anglers have been using several locally available herbal materials as bait to capture the fishes. The use of herbs for attracting fish by local folk is considered indigenous traditional knowledge, as it has been passed from generation to generation by word of mouth and confined to certain localities. The traditional knowledge, which is the wisdom developed over many generations needs to be scientifically validated and utilized in wider applications[5]. In view of the growing importance of feed attractants in aquaculture, the traditional knowledge of aqua farmers assumes lot of significance. The main objective of the study was to evaluate herbal materials for attractant activity on giant freshwater prawn (*Macrobrachium rosenbergii*) and Indian major carps, *catla* (*Catla catla), rohu* (*Labeo rohita)* and *mrigala* (*Cirrhinus mrigala)*, so that the locally available materials can be utilized as feed attractants in aquaculture of economically important finfish and shellfish.

Methodology

The herbal materials were collected from Tripura (Table 1; Figs. 1-10). Post larvae of freshwater prawn (*Macrobrachium rosenbergii*) were collected from a

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Fig.1 Roots of Jatamansi

Fig.2 Rhizomes of Ekangi

Fig.3 Flowers of Jayatri

Fig.4 Seeds of Latkhandhana

Fig.5 Seeds of Latakasturi

Fig.6 Seeds of Tambul

Fig.7 Fruits of Kakla

Fig.8 Fruits of Aobel

Fig.9 Seeds of Bhuski

Fig.10 Roots of Kharbaz

Table 1—Herbs and their parts used for evaluation of attraction activity

Local name	Plant name	Family	Parts used
Jatamansi	*Nardostachys jatamansi*	Valeriana-ceae	Roots
Ekangi	*Kaempferia galanga*	Zingibera-ceae	Rhizomes
Latkhandhana	*Bixa orellana*	Bixaceae	Seeds
Jayatri	*Myristica fragrans*	Myristica-ceae	Flowers
Kakla	*Piper cubeba*	Piperaceae	Fruits
Latakasturi	*Abelmoschus moschatus*	Malvaceae	Seeds
*Aobel**	-	-	Fruits
*Bhuski**	-	-	Seeds
*Kharbaz**	-	-	Fruits
*Tambul**	-	-	Seeds

local hatchery and reared on commercial feed for 20 days. The fingerlings of *catla* (average weight of 5.3 gm), *rohu* (7.7 gm), and *mrigala* (7.3 gm) were obtained from a fish farm in Kosamba of Gujarat. The procured fingerlings were acclimatized for 20 days in a cement cistern of size 4×2×1 m till their use in the experiment during which they were fed with practical diet with 36% crude protein. The test animals were kept under starvation for one day prior to the experiment in order to elicit behavioural responses. The attractant activity of herbal materials was evaluated by using an acrylic behavioural trough (70 cm × 70 cm × 30 cm). The trough has two distinct chambers and one of the chambers was divided into five compartments. Each compartment was provided

with an inlet from where water was flowed into the compartment. The bigger chamber served as the reservoir, which has five outlets just opposite to the compartments in order to allow water to flow towards reservoir. The powdered herbal materials were incorporated at 1% level into starch and made it as dough and placed in different chambers. The animals were kept in the reservoir of the trough and the movements of the animals towards different compartments were recorded. The attractant activity was compared with control and commercially available feed attractant, betaine in each trial.

Results and discussion

Fish feeding pattern, whereby preferred foods are searched for and ingested, is one of the most important behaviour patterns exhibited by fish. Two distinct criteria for food preference are commonly recognized, i.e. attractiveness, which refers to the selection of potential food item and edibility, which refers to the rate at which that food is ingested. Attractiveness is measured by the behavioural response of an animal while edibility is measured by intake of food[6]. The behavioural analysis of feeding responses of *M. rosenbergii* showed that food searching and substrate probing were greatly enhanced in the presence of aqueous solution of betaine[1,7,8]. In the study, the supplementation of *bhuski* and *ekangi* attracted 36% and 33% of animals, respectively compared to betaine which could attract only 14% animals (Table 2). From these facts it seems that the traditionally used herbal materials could elicit higher attraction than betaine which is the commercially available chemoattractant. Unlike shellfish, finfish exhibit schooling behaviour in a group, which makes it difficult to evaluate the attractiveness of test materials. Thus, a single fish was taken in the experiments conducted for Indian major carps. The attractiveness of different herbs was measured based on the time the animal had spent in the respective compartments.

Catla showed higher attraction towards *ekangi*, *latkhandhana* and *aobel* than betaine and control. In case of *rohu*, *Kakla* exhibited the highest activity followed by *ekangi, latakasturi, kharbaz,* and *tambul*. *Kharbaz* showed the highest activity followed by *aobel, latkhandana, tambul, kakla* and *jayatri* on *mrigala* compared to betaine and control (Table 3). The attractant activity of herbal materials was found to be species specific. Currently, the diets used for feeding fish or prawn contain high levels of protein in general and fishmeal in particular[9]. Such diets are not only costly, but contribute to the eutrophication of receiving water because of high levels of phosphorus excreted from the fish[10]. Moreover, future supplies of fishmeal are expected to decrease, or at best remain constant, while aquaculture production increasing at a steady rate. So, the use of plant proteins is necessary to replace animal proteins. Many attempts have been made on the replacement of fishmeal with plant protein sources such as soybean meal and water hyacinth leaf meal[11,12]. But use of these plant proteins in grower formula diets introduces an alien taste and flavour to the feed, which would reduce the acceptability. This situation requires application of feed attractants that may stimulate feeding and acclimatize fish to less palatable protein sources. It

Table 2—Feeding attraction activity of herbs on *Macrobrachium rosenbergii* post larvae

Test material at 1% level	Attraction activity* on post larvae of Freshwater prawn
Control	6±1.14
Betaine	14±2.86
Aobel	11±2.37
Bhuski	36±2.88
Ekangi	33±2.88
Jatamansi	11±2.37
Jayatri	-
Kakla	26±2.88
Kharbaz	-
Latakasturi	13±2.88
Latkhandhana	-
Tambul	16±2.88

Table 3—Feeding attraction activity of herbal materials on major carps

Attractant	Time spent in different compartments (in seconds)		
	Catla	*Rohu*	*Mrigala*
Control	47±6.00	-	40±6.00
Betaine	40±5.00	138±14.00	60±28.00
Aobel	145±12.00	-	171±21.00
Bhuski	-	36±3.00	40±7.00
Ekangi	223±18.00	1150±48.00	-
Jatamansi	-	-	-
Jayatri	23±4.00	-	100±14.00
Kakla	-	1260±52.00	104±16.00
Kharbaz	305±25.00	743±25.00	285±26.00
Latakasturi	-	830±22.00	30±5.00
Latkhandana	480±32.00	-	163±12.00
Tambul	55±8.00	503±18.00	140±16.00

can be concluded that the herbal materials have the potential to be used as feed attractants in aqua feeds. In view of the significance of optimal diet development in aquaculture, further studies are necessary to evaluate dietary supplementation with herbal materials in field conditions.

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