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SHORT COMMUNICATION

Utilization of Plant Based Attractants in *Labeo rohita* Advanced Fingerlings Diet

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ABSTRACT

Feed attractants are the substances which are added in trace amount in a diet to enhance the overall palatability and dry matter intake of feed. A 30 day experiment was conducted to study the efficacy of plant based attractants in the feed of *Labeo rohita* advanced fingerlings (average weight 17.0±0.05 g) and 10 fingerlings were stocked in duplicate for each dietary treatment. The initial body weight of the fish of each group was non-significant (P>0.05). The diet was formulated with rice bran, mustard oil cake, fish meal, vitamin and mineral mixture, binder along with 1% of different feed attractants and different feeds were named as F_1 (Control), F_2 (Ekangi, *Kaempferia galanga*), F_3 (Kharboj, *Cucumis melo*) and F_4 (Marigold, *Tagetes patula*). The net weight gain were 2.53±0.23, 4.16±0.15, 5.50±0.4 and 2.41±0.35 (g/30 days) respectively in F_1 to F_4. The water quality such as dissolved oxygen, pH and temperature ranged from 5.5-6.5 mg/l, 7.2-7.4 and 30.50-32.0°C respectively during the experimental period in treatment groups. The growth study with different attractants revealed that the final weight, net weight gain, specific growth rate, daily growth co-efficient was significantly (P<0.05) higher in F_3 having 1% kharboj. However, Feed conversion ratio was (P>0.05) lower in F_3 having kharboj as feed attractants. Thus, from the present experiment it may be concluded that F_3 having 1% kharboj performed better in terms of growth performance and feed intake in *Labeo rohita* advanced fingerlings *vis-a-vis* other feed treatments.

Key words: Ekangi, Growth, kharboj, *Labeo rohita*, Marigold

Among all animals, fish are one of the most sensitive to tastes. Feed attractants are added in trace amounts in the fish diets to enhance feed intake and to fulfill the nutrient requirement (Harpaz, 1997). The primary mode of feed detection by fish is through olfaction or sight Paul, 1996. Dietary feeding stimulants are essential to enhance feed intake by fish. Feed attractants are applied either internally or externally in the formulated feed. This approach draws the animal towards the feed and helps to initiate feed consumption. Many types of small molecular weight compounds are being investigated as potential feed attractants for various fish species used in aquaculture. These compounds include organic acids, sugars, aldehydes, alcohols, amines, hydrocarbons, nucleotides, nucleosides, betaine and free amino acids (Kasumyan and Doving, 2003). Uses of various plant-based attractants have been tried in a preliminary study in Indian Major Carps as reported earlier by Venkateshwarlu *et al.* (2009). They reported that attractant activity of different herbs is species and age specific in case of Indian Major Carps. Oliveira and Cyrino (2004) reported that attractants can improve acceptability of artificial diets by fry and fingerlings, increasing intake of unpalatable feeds and improving growth rate, while reducing feeding time and feeding wastes. Lee and Mayer (1996) reported that supplementation of artificial diets with attractants can increase acceptability and consumption of low palatable diet which ultimately enhance the growth rate and productivity. The main objective of the present study was to evaluate efficacy of different plant attractants on rohu diet, so that the economically available local materials can be utilized as feed attractants in aquaculture.

Four different diets were formulated with rice bran, mustard oil cake, fish meal, vitamin and mineral mixture along with different plant based attractants (Table 1 and 2). The control diet was named as F_1 (control diet). Three experimental diets having 1% level

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Table 1. Herbs and their plants used for attraction activity

English name	Botanical name	Family	Parts used
Ekangi	*Kaempferia galangal*	Zingiberacaea	Rhizomes
Kharboj	*Cucumis melo*	-	Roots
Marigold	*Tagetes patula*	Asteraceae	Flower

of ekangi, kharboj and marigold were designated as F_2, F_3 and F_4, respectively. The above-mentioned attractants were collected from different places of West Midnapore, West Bengal. The ingredients were finely powdered and weighed separately. The dough obtained from thorough mixing of the ingredients with water and were fortified with vitamin mineral mixture where tapioca was used as binder substances, was extruded through 1.0 mm diameter in a feed pelletizer. The pellets were sun dried, crumbled and packed in air tight plastic container for future use.

The advanced fingerlings of rohu were collected from Carp Fish Hatchery, District West Medinipur, West Bengal and were acclimatized to laboratory condition for 7 days in stocking tank. Group of 10 fish of average body weight (17±0.05 g) were randomly distributed in glass aquaria (24" × 12" × 12") of 100 L capacity. An air stone (connected with aerator) was provided to maintain the optimum dissolved oxygen in each tank. Cleaning of the tank was done by replacing 10% of aquaria with freshwater at every 5 days interval. Water quality parameters like pH, temperature and dissolved oxygen were measured at regular interval. All the fish were fed with corresponding diet in two divided meals at 2% of their body weight at 10.0 A.M and 4.0 P.M. respectively.

Proximate composition of experimental diets and carcass composition was determined according to AOAC (1990). Water parameters were monitored following the methods of APHA (2005). Weighing and mortality rate of fish was recorded at fortnight interval. At the end of the experiment individual body weight of all fish per tank was weighed. Standard procedures and formulae of Castell and Tiews (1980) were used for the calculation of NWG, PER, FCR, percent survival rate and SGR. DGC were calculated as per Cowey (1992). Another parameter used to calculate the efficiency of the attractants was the

Table 2. Ingredients and proximate composition (% DM basis) of different feeds and attractants

Particulars	F_1	F_2	F_3	F_4
Rice bran	45	44	44	44
Mustard oil cake	44	44	44	44
Fish meal	8	8	8	8
Vit+Min mix	2	2	2	2
Binder (tapioca)	1	1	1	1
Ekangi	-	1	-	-
Kharboj	-	-	1	-
Marigold	-	-	-	1
Proximate Composition of Feed				
Dry Matter	91.43±0.05	90.01±0.46	90.95±0.06	90.75±0.44
Crude Protein	25.2±0.01	25.15±0.26	25.14±0.16	24.99±0.21
Crude Fat	5.49±0.02	5.41±0.01	5.36±0.06	5.26±0.16
Crude Fibre	10.68±0.07	10.55±0.07	10.49±0.12	10.51±0.11
Total Ash	11.57±0.06	11.40±0.11	11.44±0.08	11.38±0.13

Data presented as Mean±S.E.

Table 3 Growth performance of *Labeo rohita* advanced fingerlings fed with different attractants

Particulars	F_1	F_2	F_3	F_4
Initial Weight (g)	17.0±0.5	17.0±0.5	17.0±0.5	17.0±0.5
Final Weight (g)	19.53^{a}±0.23	21.16^{b}±0.15	22.50^{c}±0.40	19.41^{a}±0.35
NWG (g/30 d)	2.53^{a}±0.23	4.16^{b}±0.15	5.50^{c}±0.4	2.41^{a}±0.35
SGR (% BW gain/d)	0.46^{a}±0.04	0.73^{b}±0.02	0.93^{c}±0.06	0.44^{a}±0.06
DGC	2.82^{a}±0.26	4.62^{b}±0.16	6.12^{c}±0.45	2.68^{a}±0.39
FCR	3.84^{b}±0.08	3.40^{a}±0.15	2.97^{a}±0.03	4.65^{c}±0.15
PER	0.10^{a}±0.01	0.17^{b}±0.01	0.22^{c}±0.02	0.11^{a}±0.02

Data presented as Mean±S.E. ^{abc} values bearing different superscripts in a row differ significantly (P<0.05); NWG: net weight gain, SGR: Specific growth Rate, DGC: Daily growth coefficient, FCR: Feed conversion ratio, PER: Protein efficiency ratio

responding time and it was calculated by stop watch. Data were subjected to statistical analysis as per Snedecor and Cochran (1994) and the least significance difference (LSD) was used for comparison of the mean values.

Table 1 listed the selected herbs and their parts used for attraction activity. Diet formulation of the present experiment is presented in Table 2 which revealed that proximate composition was similar in all the feeds. Water quality parameters *viz,* temperature, pH and dissolved oxygen ranged from 30.50-32.0°C, 7.2-7.4 and 5.5-6.5 mg/l respectively during the experiment (Table 4). The water quality parameters were within the range for carp culture as reported by Banerjee (1967). Perusal of data (Table 3) revealed the growth performance of rohu advanced fingerlings fed with different plant based feed attractants. The initial weight of each group of fish was alike. The final weight, net weight gain (NWG), specific growth rate (SGR), protein efficiency ratio (PER) and daily growth coefficient (DGC) was significantly (P<0.05) higher in F_3 having 1% Kharboj. However, Feed conversion ratio (FCR) ratio was significantly (P>0.05) lower in F_3 having 1% Kharboj. The mortality of fish was nil during the experimental period of 30 days. The survival rate (%) did not differ significantly (P<0.05) among the feed treatments. Table 5 revealed the feeding attraction time toward different attractants of rohu advanced fingerlings. The data presented in Table 6 indicated the carcass composition of *Labeo rohita* fed with different plant based feed attractants. The table revealed that carcass crude protein, crude fat and total ash was non-significant among the groups.

Incorporation of plant instead of animal protein is now the need of current aquaculture practices. But at the same time plant protein in fish feed introduces an alien taste and flavor to the feed which would reduce the feed intake (Paul *et al.,* 2012). To overcome such problem introduction and application of feed attractants in fish feed may stimulate the feeding and acclimatize fish to less palatable protein source (Venkateshwarlu *et al.,* 2009). Addition of attractant in fish feed had positive effect on prawn (Harpaz, 1997) and rohu (Paul *et al.,* 2004). Earlier report of Paul *et al.* (2014) also

Table 4. Hydro-biological parameters of experimental tank

Particulars	Range
Dissolved oxygen	5.58-5.86 mg/l
pH	7.22-7.40
Temperature	30.48-31.22°C

Table 5 Feeding attraction activities of different attractants on Rohu advanced fingerlings

Attractants	Responding time (in second)
Ekangi	575.5 ± 17.5^{b}
Kharboj	422.5 ± 12.5^{a}
Mari gold dust	1230.5 ± 29.5^{c}
Blank	1509 ± 11.0^{d}

Data presented as Mean±S.E. ^{abc}values bearing different superscripts in a row differ significantly (P<0.05)

Table 6. Carcass proximate composition (% w/w basis) of advanced rohu fingerlings fed with different attractants

Particulars	F_1	F_2	F_3	F_4
Moisture	78.64±0.3	78.28±0.46	78.53±0.06	78.49±0.14
Crude Protein	11.14±0.17	11.12±0.09	11.46±0.12	11.10±0.02
Crude Fat	2.53±0.05	2.74±0.09	2.93±0.05	2.57±0.12
Total Ash	3.19±0.04	3.23±0.06	3.47±0.09	3.43±0.04

Data presented as Mean±S.E.

reported that 1% incorporation level of awbel (*Cuscuta reflexa*) increased the growth performance of *Cirrhinus mrigala*. Similarly, 1% level of ekangi improved the growth performance of pabda and feed having 1% level of tambul had shown better performance in terms of growth in *Catla catla* fingerlings (Paul *et al.,* 2012;2013). Two distinct criteria for food preference are commonly recognized *i.e.*, attractiveness which is measured by the behavioral response of an animal while edibility is measured by intake of food (Takeda and Takii, 1999). Shankar *et al.* (2008) reported that 0.25% incorporated betaine showed higher growth performance in rohu fingerlings. Paul and Giri (2015) reported from their study that supplementation of Kharboj (*Cucumis melo*) at 1% level can be incorporated as an effective plant attractant in the feed of rohu fingerlings which is in agreement with our study. The result of the present study revealed that the improved growth performance in rohu has been observed in F_3 having 1% Kharboj, the reason behind that the growth performance of young fish in terms of protein efficiency ratio and nutrients retention has been enhanced due to supplementation of stimulants/ attractants. Harpaz (1997) reported that addition of an attractant leads to an additional thirst in food searching activity which is ultimately accompanied by increased food consumption and the report is also in agreement with our study. However, the possible mechanism responsible could be the activation of olfactory nerves or nerve associated with taste or feeding behavior (Nakajima *et al.,* 1989).

The attractiveness of different attractants was measured based on the time the animal had spent in the respective tanks. According to Venkateshwarlu *et al.* (2009) 743 seconds was the responding time for kharboz and 1150 seconds for ekangi in rohu which was higher than the our results. Venkateshwarlu *et al.* (2009) also reported that catla had shown higher attraction toward ekangi whereas kharboj showed the highest activity on mrigal and in case of rohu, kakla exhibited the highest activity. In the present study Rohu had shown the better response in Kharboz rather than the other attractants. However, in case of marigold dust responding time was significantly (P>0.05) lower than the blank. The present experimental study provided with the evidence that the feed attractants are able to increase the feed intake. The study also revealed that the most feed intake by the rohu advanced fingerlings occurred in kharboj with the minimum responding time. However, marigold was not effective as much as kharboj and ekangi.

CONCLUSION

Three of the feed attractants investigated in this study proved effective in increasing the palatability of feed with low amount of feed wastage. Based on the present study it is concluded that use of kharboj at 1% level in the diet of *Labeo rohita* advanced fingerlings could lead to their improved growth performance. Future studies should focus on the development of effective carp feed attractants so that with non-conventional fish feed resource attractants will help to increase the feed intake.

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