Application of Medicinal Herbs to Aquaculture in Asia

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ABSTRACT

Aquaculture has increased greatly in Asia, but there are various problems associated with acquacultural production one of which is the use of antimicrobial agents resulting in more resistant bacterial strains which adversely affect human health and the natural environment. This paper presents information on the role and application of herbs for aquaculture in Asia.

Key words: Medicinal herbs – Aquaculture - Asia

Asian countries have witnessed the growth of aquaculture in recent years. The ultimate goal is to produce the greatest possible weight per culture unit in most aquacultural operations for culture fish, crustaceans or mollusc.

As aquacultural production becomes more intensive, the incidence of disease including various infectious diseases has increased as a result of it leading to significant economic losses. Diseases are a crucial factor which inhibits the expansion of aquaculture. Various chemotherapeutants have been used for treatment or prevention of diseases. However, the use of antimicrobial agents in aquaculture has resulted in more resistant bacterial strains. These resistant bacterial strains could have a negative impact on the therapy of fish diseases or human diseases and the environment of the fish farms (1).

Herbs have been widely used in veterinary and human medicine. They are natural products that are not only safe for consumers but also widely available throughout Asia. Nowadays herbs or herbal products also have a significant role in aquaculture.

Rotenone is a traditional herb widely used to kill fish in shrimp ponds, because it is highly toxic for fish even at low concentration and is rapidly degraded in the natural environment (2). Schnick (3) reported that an effective dose of rotenone is 50-200 mg/l depending on the purpose of treatment, the fish species present, and condition at the time of application.

Wild satavari (*Asparagus racemous*) is widely used in India as ayurvedic (an ancient Indian Vadec system of medicine) medicine for promoting human growth. It produced a similar result in *Labeo rohita* fry (4).

Many kinds of herbal medicine have been used in China to control fish disease and have produced satisfactory results (5) **(Table 1)**. Shagnliang et al (6) reported the antimicrobial activity of 5 Chinese herb extracts, *Stellaria aquatica*, *Impatiens biflora*, *Oenothera biennis*, *Artemisia vulgaris* and *Lonicera japonica* against 13 bacterial and 2 viral fish pathogens. *Aeromonas salmonicida* and *Edwardsiella ictaluri* were the most sensitive to these extracts. Among them,

S. aquatica was the most effective both in terms of the number of pathogens inhibited and the degree of inhibition. *L. japonica* showed some inhibitory action against both IPN and IHN viruses, while *A. vulgaris* and *S. aquatica* only inhibited IHN virus.

In Vietnam, the Institute of Ecology and Bioresources has undertaken applied research on some medicinal herbs for prophylaxis and treatment of fish and shrimp diseases such as ulcer, intestinal disease, white mouth, white head, red skin, and red spot in fish, and luminescence and brown spot disease in shrimp (7) **(Tables 2,3).**

In Thailand, during the outbreak of epizootic ulcerative syndrome (EUS) in 1983 the snake-head fish farmers in Uthaitanee, used the bark of cork wood tree (*Sesbania grandiflora*) for the treatment of haemorrhage lesions. Most of the fish recovered after treatment. Since 1990 many kinds of herbs have been introduced to shrimp farms suffering from infectious diseases. For example, garlic or onion has been mixed into pellets for daily feeding to shrimps to prevent bacterial infection. A scientific study to prove the antibacterial activity of guava (*Psidium guajava*) against bacteria pathogenic for shrimp was initiated in 1992 (8). The minimum inhibition concentrations of guava against *Vibrio* and *A. hydrophila* were 1.25 and 0.625 mg/ml respectively. They found that guava eliminated luminous bacteria from black tiger shrimp (*P. monodon*) more effectively than oxytetracycline (9). Direkbusarakom et al (10) reported that *Phyllanthus amarus* and *P. urinaria* contained an antiviral substance which was active against yellow head virus. Many kinds of Thai traditional herbs showed antiviral and antibacterial activity against fish and shrimp pathogenic agents **(Tables 4,5)** (11,12,13)

However, our knowledge and understanding of the application of medicinal herbs to aquatic animal production is still somewhat limited, and further research on this subject is required.

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Table 1. Medicinal herbs and their application for control of fish diseases in China (5)

Medicinal herb	Disease	Dosage	Application	Direction
Euphorbia humifusa	Enteritis	500 g dry or 2.5 kg fresh /100 kg of fish	Feeding	Once a day for 3 consecutive days
Acalypha australis	Enteritis, Gill rot	125-500 g dry or 2 kg fresh/ 100 kg of fish	Feeding	Once a day for 3 consecutive days
Polygonum hydropiper	Enteritis, Gill rot	500 g dry or 1.5 kg fresh /100 kg of fish	Feeding	Once a day for 3 consecutive days
Andrographis paniculata	Enteritis	2 kg dry or 3 kg fresh /100 kg of fish	Feeding	
Portulaca oleracea	Enteritis	1.5-3 kg fresh /100 kg of fish	Feeding	
Artemisia argyi	Enteritis, Gill rot	mixed with 100 g powder of *A. paniculata* & 500 g powder of *P. oleracea*/10,000 fingerlings	Immersion	
Duchesnes indica	Enteritis	1 kg fresh/100 kg of fish	Feeding	
Sapium sebiferum	White head	250 g leaf powder/100 kg of fish	Feeding	
Pinus massoniana	Enteritis, Gill rot Lernaeosis	5 kg *Acorus calamus* and 5 kg castor oil plant	Immersion	Spread them in 1/15 ha water area to control Enteritis & gill rot for lernaeosis, 20 kg pine per in 2-3 batches, grind them 1/15 ha water area
Cayratia japonicus	White head, White mouth	1.5-3 kg leaf	Immersion	Grind the leaf & spread in the pond to make 1.5-2 ppm
Melia azedarach	Trichodinasis & Lernaeosis			
Rheum officinals	White head White mouth, Gill rot	Immerse 1 kg *R. officinals* in 20 lit of 0.3% ammonical water for 6-12 h & then dilute & spread in pond water per 1/5 ha. water area to make the concentration 2.5-3.7 ppm	Immersion	
Galla chinensis	White head, White mouth		Immersion	Grind decocted *G. chinensis* and spray them over the pond
Area catechu	*Botrioceohalus gowkongensis*, Tape worm, Cestode	One part of *A. catechu* with 5 parts of feed	Feeding	Once per day for seven consecutive days

Table 2. Medicinal herbs and their application treatment of parasite infection in Vietnam (7)

Medicinal herb	Disease	Dosage	Application	Direction
Melia azedarach	Lernaeosis	0.3-0.5 kg/ton	Immersion	Spread to the pond
Derris ellipica	Argulus	-		
Areca catechu	Helminthosis in catfish	5 g/ 1 kg of fish	Mixed with pellet	Feeding
Leucaena glauca	Helminthosis in catfish	2 g/1kg of fish	Mixed with pellet	Feeding

Table 3. Antibacterial activity of Vietnam's herbs against some fish and shrimp pathogenic bacteria (7)

Medicinal herb	Inhibitory effect	Treatment for disease
Euphorbia hirta	*Aeromonas hydrophila*	Brown spot in *M. rosenbergii* and red spot disease in grass carp
Euphorbia thymipholia	*Vibrio parahaemolyticus*	Vibriosis of *Penaeus monodon*
Wedelia calendulacea	*A. hydrophila*	Brown spot in *M. rosenbergii* and red spot disease in grass carp
Eclipta alba	*A. hydrophila* and *Edwardiella tarda*	Necrosis in catfish
Lactuea indica	*A. hydrophila*	Brown spot in *M. rosenbergii* and red spot disease in grass carp
Portulaca oleracea	*A. hydrophila*	Brown spot in *M. rosenbergii* and red spot disease in grass carp
Phyllanthus urinaria	*A. hydrophila* and *Edwardiella tarda*	Bacterial disease of *Pangasius fish*
Polygonum hydropiper L.	*A. hydrophila*	Bacterial disease of *Pangasius fish*

Table 4. Antiviral activity of Thai traditional herbs against fish and shrimp pathogenic virus (13)

Herb	Antiviral against fish pathogenic virus (Plaque reduction rate, %)			Antiviral against shrimp pathogenic virus (Survival rate of shrimp, %)	
	IHNV	IPNV	OMV	YHV	WWSV
Cassia alata	99	< 0	100	100	53.3
Calophyllum inophyllum	97	< 0	92	100	100
Clinacanthus sp.	100	< 0	100	100	NT
Clinacanthus nutans	100	< 0	100	100	100
Glinus oppositifolis	97	< 0	76	0	46.7
Hura crepitan	65	< 0	21	100	NT
Momordica charantina	68	< 0	47	0	45
Ocium sanctum (red)	100	< 0	100	100	0
O. sanctum (white)	99	< 0	100	100	0
Orchocarpus siamensis	97	< 0	91	40	NT
Phyllanthus acidus	100	< 0	100	100	76
P. amarus	100	< 0	100	100	58
P. debelis	97	< 0	93	0	82
P. reticu;atus	100	< 0	99	20	50
P. urinaria	100	< 0	100	100	100
Psidium guajava	100	< 0	100	100	85
Tinospora cordifolia	100	< 0	90	100	0
T. crispa	97	< 0	91	80	68

Table 5. Antibacterial activity of Thai traditional herbs against fish and shrimp pathogenic bacteria (13)

Herb	Percent of inhibited strain in each concentration of herb (mg/ml)						
	0	**0.31**	**0.625**	**1.25**	**2.5**	**5**	**10**
Andrographis paniculata	0	0	0	0	8.3	33.3	83.3
Cassia alata	0	0	0	0	0	0	8.3
Clinacanthus nutans	0	0	0	0	0	0	0
Eclipta alba	0	0	0	0	8.3	33.3	100
Momordica charantia	0	0	0	75	100	100	100
Ocimum sanctum (red)	0	0	0	0	0	0	0
O. sanctum (white)	0	0	0	0	0	0	0
Phyllanthus acidus	0	0	0	0	0	0	0
P. amarus	0	0	0	0	0	0	8.3
P. debelis	0	0	0	0	0	16.7	91.7
P. pulcher	0	0	0	0	0	0	8.3
P. reticulatus	0	0	0	0	8.3	33.3	100
P. urinaria	0	0	0	0	8.3	16.7	91.7
Psidium guajava	0	0	8.3	25	50	100	100
Tinospora cordifolia	0	0	0	0	0	0	8.3
T. crispa	0	0	0	0	0	0	0

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บทคัดย่อ

สถาพร ดิเรกบุษราคม[1]

การประยุกต์ใช้พืชสำหรับการเพาะเลี้ยงสัตว์น้ำในเอเชีย

การเพาะเลี้ยงสัตว์น้ำมีการขยายอย่างกว้างขวางและมีปัญหาหลายประการตามมา ปัญหาหนึ่งคือการใช้สารต้านจุลชีพ ซึ่งมีผลทำให้เกิดการดื้อยาของแบคทีเรีย จึงมีผลต่อมนุษย์และสภาพแวดล้อม วัตถุประสงค์ของบทความนี้เพื่อให้ข้อมูลเกี่ยวกับบทบาทและการประยุกต์ใช้พืชชนิดต่าง ๆ โดยการเพาะเลี้ยงสัตว์น้ำ

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