

## Vitamin Composition in *Podophthalmus Vigil* (Fabricius)

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### ABSTRACT

Study of vitamins in different sexes of *Podophthalmus vigil*. Totally 4 fat soluble and 8 water soluble vitamins were reported in the present study. Among 4 fat vitamins, the vitamin A was maximum and vitamin E was minimum. Vitamins D & K were available in trace amount. Almost all the fat soluble vitamins were contributed significantly maximum in females than berried and males. And also among the water soluble vitamins, the contribution of vitamin C was maximum and B1 was minimum, B12 was available in trace amount in all sexes. In general vitamins were contributed maximum in females than berried and males.

**Keywords:** Vitamin, *Podophthalmus*, Crabs

### INTRODUCTION

Vitamins are generally acted as catalysts, helping the body to perform a multitude of functions that are essential to life. Vitamins are organic compounds representing a minor fraction in the diet; but are essential for numerous metabolic pathways and physiological functions towards good health, normal growth and functions of cells in all animals. Based on solubility, the vitamins are differentiated as fat soluble (A, D, E and K) and water soluble (B-Complex and C). Aquatic animals are good dietary source for these vitamins. The hepatic reserves of vitamins in aquatic animals are much more compared to mammals and birds. Since, the vitamins cannot be synthesized by the tissue, these have to be obtained only from food. The absence of a particular vitamin leads to serious metabolic disorders, which are properly referred to as avitaminosis. Even though vitamins are plenty in marine animals but limited studies are available in the edible crab, *Podophthalmus vigil*. Since *P.vigil* is consumed by local populations on regular basis. In the present investigation vitamin composition was studied in all sexes of *Podophthalmus vigil*.

### MATERIALS AND METHODS

The male, female and berried females of *P.vigil* were procured from Parangipettai (Lat. 11<sup>o</sup>21' N; Long. 79<sup>o</sup> 46' E) landing center. After reaching the laboratory they were washed carefully with

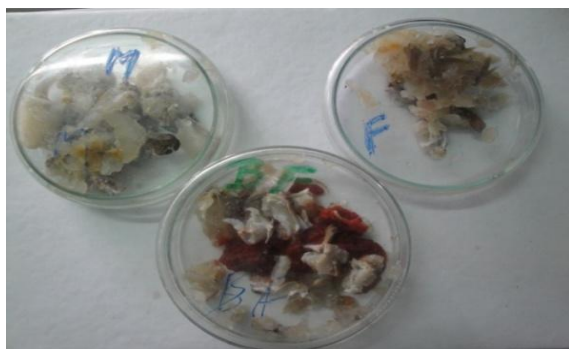
distilled water to remove the dust and algal particles and ice killed.

The carapace of the crab was opened and the edible parts of muscle tissues were removed with sharp forceps (Plates 1-2). The removed muscle tissues were homogenized with pestle and mortar. The grounded muscles were then freeze dried and powdered and eventually stored in refrigerator for further analysis. The fat soluble vitamins A, D, E & K and the water soluble vitamins B1, B2, B6, B12 and C were analyzed in the HPLC (Merck Hitachi L – 7400) following the method described by Sadasivam and Manickam (1996). The folic acid was estimated following the calorimetric procedure of Sethi (1997). The Niacinamide and Calcium Pantothenate were estimated by following the methods suggested in USP/NF 2000 Asian edition.

The data were subjected to One-way analysis of variance (ANOVA) and difference between means were determined by Duncan's multiple range tests (p<0.05) using SPSS version 17.0.



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Edible part of *P. vigil* Muscle tissue from Male, Female and Berried females

### RESULTS

#### Fat soluble vitamins

**Table1.** Fat soluble vitamins (mg/100g) in the muscle of *P. vigil* (Values are mean of three values  $\pm$  SE)

Sl.No.	Vitamins	Male	Female	Berried
1	A	0.476* $\pm$ 1.10	0.844 $\pm$ 2.15	0.577* $\pm$ 1.20
2	D	-	-	-
3	E	0.208 <sup>c</sup> $\pm$ 2.12	0.745 <sup>a</sup> $\pm$ 2.15	0.219 <sup>b</sup> $\pm$ 2.36
4	K	-	-	-

\*IU-International Unit - Trace amount  
Different superscripts in a rows are significantly different ( $P < 0.05$ )

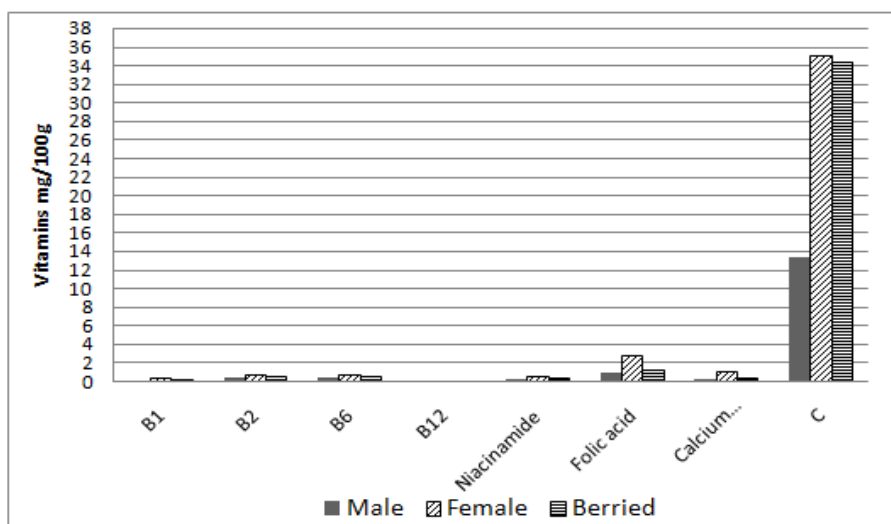
Totally 4 fat soluble vitamins are reported in *P. vigil* (Table1 & Fig1). In general vitamin A was maximum and Vitamin E was minimum.

**Table2.** Water soluble vitamins (mg/100g) in the muscle of *P. vigil*. (Values are mean of three values  $\pm$  SE)

Sl.No.	Vitamins	Male	Female	Berried
1	B1	0.105 <sup>c</sup> $\pm$ 1.82	0.249 <sup>a</sup> $\pm$ 2.00	0.113 <sup>b</sup> $\pm$ 1.72
2	B2	0.426 <sup>b</sup> $\pm$ 1.50	0.690 <sup>a</sup> $\pm$ 2.41	0.454 <sup>b</sup> $\pm$ 1.43
3	B6	0.415 <sup>c</sup> $\pm$ 2.14	0.586 <sup>a</sup> $\pm$ 2.34	0.436 <sup>b</sup> $\pm$ 2.45
4	B12	-	-	-
5	Niacinamide	0.208 <sup>c</sup> $\pm$ 2.43	0.423 <sup>a</sup> $\pm$ 2.11	0.220 <sup>b</sup> $\pm$ 2.11
6	Folic acid	1.052 <sup>c</sup> $\pm$ 1.28	2.788 <sup>a</sup> $\pm$ 2.23	1.121 <sup>b</sup> $\pm$ 1.43
7	Calcium Pantothenate	0.246 <sup>c</sup> $\pm$ 2.21	0.980 <sup>a</sup> $\pm$ 2.09	0.304 <sup>b</sup> $\pm$ 1.40
8	C	13.32 <sup>c</sup> $\pm$ 2.43	35.01 <sup>a</sup> $\pm$ 2.43	34.3 <sup>b</sup> $\pm$ 2.43

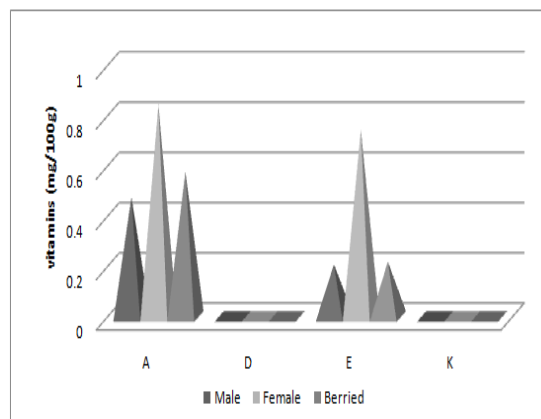
-Trace amount.

"Different superscripts in a rows are significantly different ( $P < 0.05$ )"



**Fig2 :** Water soluble vitamins (mg/100g) in the muscle of *P. vigil*.

Vitamins D & K were available in trace amount. Almost all the vitamins were contributed significantly maximum in females than berried and males.



**Fig1:** Fat soluble vitamins (mg/100g) in the muscle of *P. vigil*.

#### Water soluble vitamins

Totally 8 water soluble vitamins are reported in *P. vigil* (Table 2 & Fig.2). The contribution of Vitamin C was maximum and B1 was minimum. B12 was available in trace amount in all sexes. In general vitamins were contributed maximum in females than berried and males.

## DISCUSSION

Vitamins are low molecular weight compounds of widely differing composition which are essential to life and cannot be synthesized by the higher animals or synthesized only in insufficient quantity and hence must be supplied as a part of their diet. A lack of certain vitamins can lead to fatigue, poor skin, teeth and bones and in some cases of severe deficiency, it can lead to serious illness. Vitamins interact with other nutrients in processes such as metabolism, digestion and developing blood cells and some vitamins are said to slow down the ageing process, prevent cancerous cells attacking the body and strengthen the immune system. Totally 4 fat soluble vitamins were reported in the present study.

Vitamin A is available maximum in the females followed by berried females and males. Similar result was already reported by Thirunavukkarasu (2005) in *S.tranquebarica*. Mengqing *et al.* (2004) studied the effect of vitamin A supplementation in brood stock feed on reproductive performance and larval quality in *P. chinensis*. Alava *et al.* (1993) recorded the effect of dietary vitamin A in the ovarian development of *P. japonicas*. He *et al.* (1992) evaluated the dietary essentiality of fat-soluble vitamin A in *P. vannamei*.

Vitamin A is a fat-soluble vitamin, which can be destroyed by light and oxygen. Vitamin A is essential for vision, developmental growth, cellular differentiation and proliferation, reproduction and in the immune system. It is helping to support the immune system to fight against infections and resilience to anaemia, protection against pollution and respiratory system. A powerful anti-oxidant which helps to protect the cells against cancer by neutralizing "Free Radicals," necessary for new cell growth; guards against heart disease and stroke; lowers cholesterol levels; slows the aging process; protects against colds, flu and infections of the kidneys, bladder, lungs and mucous membranes; promotes healthy wrinkle-free skin, and helps in the removal of age spots and acne; promotes healthy hair and nails; protects against air pollutants and counteracts night blindness and weak eye sight; builds resistance to infections; slows the progression of osteoarthritis and cataracts; helps to prevent macular degeneration of the eyes.

Vitamin E is maximum in females followed by berried females and males of the present study. He *et al.* (1992) evaluated the dietary essentiality of fat-soluble vitamin E in penaeid shrimp *P. vannamei*. Alava *et al.* (1993) studied the effect of dietary vitamins E on the ovarian development of *P. japonicas*. He and Lawrence (1993) studied the vitamin E requirement of *P. vannamei*. Harlioğlu *et al.* (2002) estimated the effect of

dietary vitamin E on the pleopodal egg and stage-1 juvenile numbers of freshwater crayfish *A. leptodactylus*. Barim (2005) studied the effects of different levels of vitamin E added to the ration of freshwater crayfish. Vitamin E is a fat soluble vitamin made up of seven compounds called tocopherols, with alpha being the most active. It is an antioxidant and can be enhanced by other antioxidants such as Vitamin C and Selenium. This vitamin can be obtained within its natural form, or it can be synthesised (in other words a synthetic form of vitamin E), but the natural form of vitamin E is far more readily available for absorption by the body. Vitamin E is destroyed by cooking in open pans, but even more so by deep frying. However, some may also be lost during the commercial deep freezing, although nowhere near as much. Absorption of vitamin E takes place in the intestines with the help of bile salts. High concentrations of vitamin E can be found within the liver, fat storing tissues and muscles such as the heart. Also this vitamin can be found in the adrenal, pituitary and sex glands. If a person has excess vitamin E, then it is excreted through the urine.

Vitamin E is required by the body, for many different functions including protection of cells, fatty acids and certain vitamins from oxidation. Vitamin E also promotes normal blood clotting, preventing Vitamin A and saturated fats from breaking down into harmful substances in the body, the release of insulin from the pancreas, maintaining cardiovascular health, the increase in levels of "good" cholesterol and regeneration of the skin. Vitamin E requirements should be increased if you have stress, diabetes, drink chlorinated water, smoke, are going through menopause or subjected to high levels of pollutants.

If you are taking anything such as lipid lowering drugs, oral contraceptives, oestrogens, do a lot of strenuous activity, have a high consumption of refined foods or have malabsorption disorders, then your intake of Vitamin E should be increased to try and compensate. Vitamin E is not toxic to the body, although if taken in large quantities (1000+IU per day) then this vitamin may cause the user muscle weakness, fatigue or a possibility of gastro-intestinal upsets. Insulin dependent diabetics should always consult their health care provider prior to taking a vitamin E supplement, as the level of insulin could be reduced and should be monitored, as with people taking certain heart medications, as the person should be monitored and possibly their medication adjusted.

Vitamin E protects against approximately eighty diseases. It prevents thick scar formation when

applied topically, and accelerates the healing of burns. It reduces blood pressure, aids in preventing cataracts, relieves leg cramps, and enhances sperm production; promotes healthy skin and hair and prevents age spots; retards cellular aging due to oxidation; prevents and dissolves blood clots; slows the progression of Alzheimer's disease; significantly strengthens the immune system; supplies oxygen to the blood which is then carried to the heart and other organs thus alleviating fatigue; treats circulatory problems and prevents lung toxicity from air pollution; enhances sexual performance; improves muscle strength and stamina.

Studies have shown that low levels of Vitamin E in the blood increases the risk of certain types of cancer, particularly cancers of the gastrointestinal tract, breast, prostate, lung, and colon. Studies have shown that Vitamin E improves insulin action and it exerts a number of beneficial effects that aids in preventing long-term complications of diabetes, especially cardiovascular disease. Studies have shown that those who took Vitamin E on a regular basis had a 41 % lower risk of heart disease. Other studies have shown that people with existing heart disease, who started taking 400-800 IU of Vitamin E daily, had a 70% reduction in the number of heart attacks as compared to a placebo group.

Water-soluble vitamins are need to be consumed from foods every day, as any excess vitamins are lost through urine and cannot be stored in the body. All natural vitamins are organic food substances found only in living things, that is, plants and animals. With few exceptions, the body cannot manufacture or synthesize vitamins. They must be supplied by the diet or in dietary supplements. Vitamins are essential to the normal functioning of our bodies. They are necessary for growth, vitality, health, general well being, and for the prevention and cure of many health problems and diseases. Totally 8 water soluble vitamins are reported in *P.vigil*. B1 Vitamin is maximum in females than berried females and males. Thirunavukkarasu (2005) reported that B1 vitamin in *S.tranquebarica*. Vitamin B1 is known as the "Morale Vitamin" because of its beneficial effects on the nervous system and mental attitude. It enhances circulation, assists in blood formation, carbohydrate metabolism and digestion; plays a key role in generating energy; promotes good muscle tone; acts as an anti-oxidant, protecting the body from degenerative effects of aging; helps to prevent reoccurring canker sores; helps to maintain a healthy nervous system; prevents depression, alleviates fatigue, optimizes brain function and mental alertness; has been used to treat numbness of the hands and feet, poor circulation, tingling

sensations, weak or sore muscles, forgetfulness, heavy breathing, and irritability. Deficiency of this vitamin leads to the loss of appetite; weakness and feeling tired; paralysis and nervous irritability; insomnia; loss of weight; vague aches and pains; mental depression and constipation; heart and gastrointestinal problems.

B2 Vitamin is maximum in females than berried females and males. Thirunavukkarasu (2005) reported B2 vitamin in *S.tranquebarica*. It is necessary for red blood cell formation, antibody production, cell respiration, and growth; alleviates eye fatigue, and is important in the prevention of cataracts; aids in the metabolism of carbohydrates, fats and proteins; promotes the oxygenation of the skin, hair, and nails; eliminates dandruff; aids in the release of energy from food; reduces the occurrence of migraine headaches; helps to eliminate cracked mouth, lips, and tongue; supports the production of adrenal hormones. Deficiency of this vitamin resulted itching and burning eyes; cracks and sores in the mouth and lips; bloodshot eyes; purplish tongue; dermatitis; retarded growth; digestive disturbances; trembling; sluggishness and oily skin.

B6 Vitamin is maximum in females than berried females and males. Thirunavukkarasu (2005) reported B6 vitamin in *S.tranquebarica*. It significantly reduce the risk of heart disease by inhibiting the formation of homocysteine, a toxic chemical that attacks the heart muscle and allows the deposition of cholesterol around the heart muscle; aids in maintaining the central nervous system and normal brain function; reduces muscle spasms, leg cramps and stiffness of the hands; relieves nausea and migraines, lowers cholesterol; improves vision, and aids in the prevention of PMS; promotes red blood cell formation; aids the immune system and antibody production; aids in cancer immunity and in the prevention of atherosclerosis; is destroyed by alcoholic beverages. Deficiency of this vitamin leads to nervousness, insomnia, skin eruptions, loss of muscular control, anemia and mouth disorders.

Niacinamide is maximum in females than berried females and males. Thirunavukkarasu (2005) reported Niacinamide in *S.tranquebarica*. Niacinamide dilates blood vessels, thus increasing circulation and reducing high blood pressure; significantly lowers blood cholesterol and triglycerides; improves resistance to stress; regulates blood sugar; treats dizziness and ringing in the ears; helps to prevent depression, mental illness, and migraine headaches; aids in the functioning of the nervous system; helps to

eliminate canker sores and bad breath; protects against pollutants and toxins; gives you healthier looking skin and stimulates the sex drive. Deficiency of this vitamin leads to pellagra, gastrointestinal disturbance, nervousness, headaches, fatigue, mental depression, vague aches and pains, irritability, loss of appetite, insomnia, skin disorders, muscular weakness, indigestion, bad breath and canker sores.

Folic acid is maximum in females than berried females and males. Thirunavukkarasu (2005) reported folic acid in *S.tranquebarica*. It reduces the risk of a heart attack by lowering homocysteine levels. In recent years, high levels of homocysteine have been found to be associated with an increased risk of atherosclerosis (hardening of the arteries due to the accumulation of fatty plaques).

Protects against birth defects by helping regulate embryonic and fetal nerve cell formation; protects against intestinal parasites and food poisoning; may delay graying hair when used in conjunction with pantothenic acid and PABA; promotes healthier looking skin, is considered a brain food; is needed for energy production, and the formation of red blood cells; strengthens the immune system by aiding the proper formation and functioning of white blood cells; important for healthy cell division and replication. Deficiency of this vitamin leads to gastrointestinal disorders, anemia and pre-mature gray hair.

Calcium Pantothenate is maximum in females than berried females and males. Thirunavukkarasu (2005) reported calcium pantothenate in *S. tranquebarica*. It is necessary for the release of energy from carbohydrates, the synthesis and degradation of fatty acids and other acetylation reactions. This vitamin is also required for the production of steroid hormones, the adrenal gland's production of hormones and nervous system function. This is required to gain resistance to stress, shock and allergies, plus protection against radiation-caused cellular damage. Calcium Pantothenate deficiency is rare, though can occur in victims of starvation.

The deficiency symptoms include fatigue, depression, changes in personality, heart conditions, abdominal cramps, difficulty sleeping, numbness in the arms and legs, muscular weakness, and a greater sensitivity to insulin. Vitamin C is maximum in females than berried females and males. Thirunavukkarasu (2005) reported Vitamin C in *S.tranquebarica*. Alava *et al.* (1993)

studied the effect of dietary vitamins C on the ovarian development of *P. japonicas*.

A major and very potent anti-oxidant; plays a primary role in the formation of collagen, which is important for the growth and repair of body tissue cells, gums, blood vessels, bones and teeth; protects against the harmful effects of pollution; protects against infection, and enhances the immune system; helps to protect against many forms of cancer by counteracting the formation of nitrosamines (cancer-causing substances); protects against abnormal blood clotting and bruising, and may reduce the risk of cataracts; aids in the treatment and prevention of the common cold; prevents scurvy; reduces the effects of many allergy producing substances; helps lower blood pressure; is vital for wound healing; strengthens the blood vessels; reduces cholesterol and protects against heart disease; aids in the production of "anti-stress" hormones; is needed for healthy adrenal function; helps to expel heavy metals and other toxic substances from the body. From the study it could be confirm that vitamins are reported maximum in females than in males.

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