



**REVIEW OF ARTHROPODS AND THEIR ROLES IN MEDICAL AND NUTRIENT  
VALUES IN THE WORLD**

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**ABSTRACT**

Arthropods are very important in human societies. Human exposed to pathogen and non-pathogenic agents all over the history and has used lots of methods for the control and treatment of such diseases. Maggototherapy is one of such measures. This article is a review on several aspects of arthropods roles in medical and nutrient values in the world. The related investigations were searched from websites and reliable published texts. Different databases were explored based on appropriate key words. Several arthropods and their products have been used for food, decoration and treating different diseases such as immunosuppressive diseases, allergy, diabetics, audit, pulmonary and nervous, cancer, psychiatric, dermatosis, Parkinson, Alzheimer and cancer. This review article will introduce some arthropods and their roles in Medical and nutrient values in related to economic, health and treatment of some human societies in the world.

**KEYWORDS:** Arthropod, Medical, Nutrition, Maggototherapy, Cancer.

**INTRODUCTION**

Biological toxins produced by organisms to kill or harm other living beings are produced toxicological and pharmacological effect of both effects, including abundant natural resources of new compounds that may be used as a background material for the design of drugs anticancer is considered in the future. Currently, many active principles biotoxins produced by Hodder development of new drugs to treat diseases such as cancer which is used for.<sup>[1]</sup> The difference in the structure and composition of biotoxin would provide valuable ideas for the production of anti-tumor drugs.

Bees branch of arthropods and insects that category when the sting causes pain and subsequently with "severe damage and may even cause the death of many vertebrates and humans to cause the insects to have a combination tubers out fine produce and inject venom are known. The complex combination of biochemical and physiological mechanisms that lead to the creation of beings is the goal. Insecticides not only a defense mechanism but it is also used for anesthesia and death bait in addition to the role of these compounds have been studied for some human diseases.

Although bee stings may cause serious problems to human health but effective biological compounds such as biogenic amine and immune system-activating peptide in bee venom has been proved. Recently, anti-cancer potential of bee venom has been studied.<sup>[2]</sup>

Moradi et al 2013 was reported, honey, sting, pollen, royal jelly, propolis, and wax are products that have used for treating different diseases such as blood diseases, allergy, diabetics, pulmonary and nervous disease, audit, eye, immunosuppressive diseases, cancer, psychiatric, dermatosis, shagas and malaria, and virus and giardia borne diseases.<sup>[3]</sup>

Peptides lyses of tumor cells up to 50 times are more sensitive than normal cells. Polybia-MPI significantly inhibits the proliferation of tumor cells and can by disrupting the cell membrane structure Nfz Tvzhsans and death of cancer cells will bring.<sup>[4]</sup>

Lactat dehydrogenase (LDH) release in non-cancerous cells, fibrous blast is negligible. The researches showed that polybia-MPI is relatively less effect on normal cells and by choosing targeted cancer cells and destroy them. In another study, were identified anti-cancer molecules

of *Vespa simillima* venom, quinone, 7, 8-seco-para-ferruginone (SPF). This compound has killing effect on cancer cells in the rat liver Fujiwara *et al.* (2008) was reported the potential anti-cancer effects of bee venom in the preliminary stage of cancer cell.<sup>[5]</sup>

Bee scientific name of *Aphis mellifera* of the order Hymenoptera has the social lives.<sup>[6,7]</sup> Honey product from bees that has products from around 5,000 years ago and used for treatment of wounds and burns.<sup>[8,9]</sup> Historical evidence shows that honey was discovered from about 2000 years before bacteria in the treatment of infected wounds.<sup>[10,11]</sup>

So that the contents of an Egyptian papyrus from 3500 to the year before shows that honey used for to treatment of wounds of gastrointestinal, eye and kidney.<sup>11</sup> In 50 BC Pedanius Dioscorides was used honey as a medicine to treat old wounds.<sup>[10,11]</sup>

Avi Sina has been used the honey bee for healing burns.<sup>[10]</sup> In the Quran, in Surah Nahl verses 69 and 68 and Sura Muhammad, page 15 verse referred to the healing power of honey.<sup>[11-13]</sup>

Cancer is a major health problem considered in the worldwide. Since the disease distributed with high mortality around the world, it is necessary find an emergency rote of treatment. At the present there are some treatments methods such as radiation therapy, surgery, chemotherapy, and stem cell hormone therapy.<sup>[14]</sup>

Chemotherapy used for treatment of the diseases but we need to the development of new strategies for the use of anti cancer biological agents. In this regard, anti-cancer drugs produce from natural sources may be more effective than conventional chemotherapy drugs.<sup>[15]</sup>

Currently, many researchers around the world are found more toxic compounds that have anticancer effects. Fire ant venom through its bite necrosis, which contains the alkaloid compounds, was used for paralyzed of prey. Fire ants can bite and sting, they cause allergy, purulent boil, that remain for 24 hours. Special mound nest was formed during a period of 5 months after the establishment of the colony. A mature colony can produce new 4500 queen during the year. Venom of fire ants, solenopsis spesces has effect on cancer cell.<sup>[16]</sup>

Many peptides isolated from spider venom, such as U-ACTX -1- u- ACTX-2 -, and Protoxins I and II are responsible for blocking calcium ion channels. Thrixopelma pruriens, which considered as the blocker of NATH channel and prevents the proliferation of cancer cells.<sup>[17]</sup>

The effects of spider venom *Macrothele raven* (Araneae, Hexathelidae) at doses of 10, 20 and 40 mg per liter were confirmed on the proliferation of human cervical cancer

cells (HeLa) by both vivo and in vitro methods.<sup>[18]</sup> The injection of poison of these spiders to naked mice (nude) subcutaneously will stay small skin tumor size compared with the control group. In addition, intravenous administration of spider venom was inhibits growth of human breast cancer cells from MCF- 7.<sup>[19]</sup>

A similar study the effects of anti-cancer compounds of Psalmotoxin 1, the venom of the spider species, *Macrothele raveni* have been reported against the malignant gliomas tumor. In addition, growth inhibition effect of the venom has been reported on human hepatocellular carcinoma BEL-7402 cells.<sup>[20]</sup>

Insects and arthropods important play role in traditional medicine in many countries, especially in South-East Asia. At the present is located the traditional medicine market in South Korea. Only 17% of the product types are known as the drug, for the treatment of human arthritis and fungal diseases. Silk moth larvae are used for the treatment of stroke. Many traditional medicines derived from arthropods traditionally collected and some imported from China. In many countries, people are merging modern scientific medicine with traditional medicine. Traditional Chinese medicine is similar to the Southeast Asian country, but the country has its own traditions.

So far, numerous articles and books have been published in relation to benefit of arthropods due to medicinal and nutrient values of insects.<sup>[21,22]</sup> The value of imported arthropodes to South Korea was increased and reached to \$ 1,850,137 in 1992,<sup>[23]</sup>

Mantis eggs used to stimulate and strengthen human sexual behaviors, especially in men the remaining wild bees and their nest is used for the treatment of infected wounds.<sup>[24]</sup> The extract mole cricket, larvae of beetle scarab and cicada nymphs used to treat the bacterial and fungal wound.<sup>[25]</sup> Cicada pupae traditionally used to treat hearing problems and throat inflammation.<sup>[26]</sup>

Usually poison of bees, scorpions and hexapoda was used as defend against enemies, as well as paralyzing their prey.<sup>23</sup> Similarly, insects, such as cricket's striped soil, scarab beetle larvae, and nymphs of the field Cicada used for the treatment of fungal infections. Ants are major role in treat the fungal and bacterial wound healing.<sup>[26]</sup>

Aquatic beetles, tripunctatus *Cybister* have phenolic compounds with anti-microbial and anti-fungal effects.<sup>[27-29]</sup> Usually larvae of moth, *Hepialis* species *Beauveria bassiana* that infected with the fungus, *C. sinensis*, was used for stroke treatment.<sup>[30]</sup>

Firooz far *et al* 2012 was reported total of 89 flies (55 females and 34 males) were collected from Hashtgerd area, central Iran. In the first generation, 299 flies were produced in the laboratory including 105 (35.12%)

males, and 194 (64.88%) females. The female/male sex ratio was reported as 1.61 for parents, whereas it was 1.84, 1.30 for F1 and F2 generations respectively. In total, 432 flies were reared in F3 generation including 173 (40.04%) males, and 259 (59.96%) females, and the sex ratio was reported as 1.49. Fly larvae of *Lucilia sericata* was reared and used for healing chronic wounds after surgery.<sup>[31]</sup>

In the same study, A total of 218 flies were collected in three rounds of sampling from the field of Tehran and Karaj Counties, central Iran. The female/male of parent ratio was calculated as 1.72 in Tehran and in Karaj areas, whereas it was 2.20% and 1.81%, respectively in F1 and F2 generations, respectively. This procedure used for preparing of maggot to treatment of infected wound. This method is comparable to the conventional methods of treatment in modern medicine.<sup>[32]</sup>

Royal Jelly is used to treat symptoms of menopause. Bee and ant venom used to treat joint swelling and is effective in patients with rheumatoid arthritis. Brown resinous substance like wax in the hive by bees, is effective for the treatment of ulcers and gastritis. Honey and other bee products have strong antimicrobial effects. Honey from ancient times to treat some diseases and have been used for healing.

However, the emergence of antibiotic resistant strains of bacteria have been confusing to use of anti bacterial grugs . Brown resinous substance like wax of bee venom has killing effect on bacteria. This is probably due to the present of Flavinoide material in bee venom. Uses of the products of the hive are suitable for wound healing.<sup>[33]</sup> Honey has antibacterial plant compounds. Seems to be alive and safe Clostridia spores have been involved in this practice.

The antibacterial effect of brown resinous substance in bee venom was investigated. *Apis mellifera*. and *Tetragonisca angustula* venoms have killing effects on *Staphylococcus aureus* and *Staphylococcus aureus*. Minimum Inhibitory Concentration of honey produced by the species of *A. mellifera* was reported range as 23.126 to 70.185 mg/ ml and for *T. angustula* was reported as range 142.87 to 214.33 mg/ml. The minimum inhibitory concentration of brown resinous of *A. mellifera* was reported in the range of 0.36 to 3.65 mg/ml and for *T. angustula* as range 0.44-2.01.

The brown resinous substance like wax, the highest antibacterial activity against *Staphylococcus aureus* was compared to honey. However, both wax and honey-like brown resinous substance with antibacterial are activity against *Staphylococcus aureus*.<sup>[34]</sup>

Baculoviruses a rod-shaped virus that is divided into two genera: nucleopolyhedroviruses (NPV) and granuloviruses (GV). While GVs contain only one nucleocapsid is the virus envelope, NPVs of two units

(SNPV) or the (MNPV) nucleocapsids. Most of the virion is surrounded by Granvlyn GVs and poly dimenhydrinate NPVs. Baculoviruses with more than 600 species of invertebrates known viral host. Larvae of moths and butterflies immature species are the hosts of the virus. But among mosquitoes, flies and even shrimp have also been identified. The virus among humans and other mammals and reptiles can not be seen. Baculoviruses have 80 to 180 kbp, double-stranded DNA.<sup>[35]</sup> The aim of new research about viruses is the developed product in the interests of human nature by inserting the data of new propein in gene of baculoviruses through the genetic engineering.

Alzheimer's disease considered as nervous system disease occurs almost in old age and characterized by symptoms of almost in the memory and cognitive abilities generally. The most pathological features of the disease is atrophy of the hippocampus, the cortex, the anterior brain, frontal cerebral cortex in the formation of plaques of beta-amyloid and tangles of nerve that will increased in the APP, PSN-1/2, TAU genes by mutations.

#### METHODOLOGICAL TRENDS

This article is the result of a study and review of the literature related to the topic in scientific texts and websites. In this regard, the appropriate key words used in relation to traditional medicine and nutrient values.

#### RESULT AND DISCUSSION

Humans have consumed arthropods for many years. At least 1 400 species have been recorded as human food. There are scatter data due to eating insects in the human societies, but some data indicated to vital and preferred food and an essential source of protein, fat, minerals and vitamins. In both rural and urban societies of some developing countries, insects are source of food and published the essential elements that human need to growth and development. The percentage of Protein and amino acid content in some edible insects was shown in Table 1. The mean maximum of protein was reported in order odonata and the mean minimum was mentioned in order orthoptera. The mean maximum of amino acid was mentioned as 48.72 on Hemiptera and the mean minimum was mentioned as 32.88 in Lepidoptera. In essential amino acid, the mean maximum was reported as 18.65 in Hemiptera and the mean minimum was mentioned as 13.92 in Lepidoptera (Table 1).

Table2 was shown the Percentage of Fatty acids, saturated and unsaturated in edible insects. The mean maximum of saturated faty acid was reported in *Schistocerca gregaria* (Forska) male adult as 40.3 and the mean minimum was mentioned in *Rhynchophorus phoenicis* (Fabricius) as 0.3. The mean maximum of un saturated amino acid was mentioned as 62.44 on *Polyrhachis dives* Smith and the mean minimum was mentioned as 0.65 in *Macrotermes annandalei*.

Table 3 was shown Percentage of Lipid in edible insects. The mean maximum of Lipid was reported in order Hemiptera as 30.43 and the mean minimum was mentioned in order Lepidoptera as 4.74.

Percentage of Carbohydrate in edible insects was shown in Table 4. The mean maximum of carbohydrate was mentioned as 8.20 on Lepidoptera and the mean minimum was mentioned as 2.17 in Homoptera.

Table 5 was shown some edible element content of insects based on the Percentage of dry weight. In essential amino acid includes; Phosphorus, Magnesium, Iron, Zinc, Copper, Magnesium, Calcium, Sodium, and Potassium.

Active compounds were produced by animals, plants and microorganisms used in the development of new drugs to treat diseases such as cancer. Poisonous arthropods, like scorpions, bees, wasps, spiders, and ants have active molecules that effect on physiology of human cell. This compounds on these venom have great potential in animal tumor control.<sup>[1]</sup>

One of the molecules in the insect venom is mastoparan, amphipathic molecules containing 14 amino acid peptides effects on increasing the permeability of mitochondria in cancer cells and subsequently to inhibit the growth of cancer cells. The release of cytochrome molecule CIN has prevented the development of human chronic myelogenous leukemia.<sup>[2]</sup>

Polybia-MP-II and Polybia-MP-III peptides isolated from bee venom prevents lysis of human red blood cells and Polybia-MPI is killing effect on tumor.<sup>[36,37]</sup> MPI belongs to a family of antibiotics peptides that targeted on non-polar lipids cell membrane, and development the ion permeable channel surface, resulting in depolarization, irreversible cell lysis and death of cancer cells.<sup>[3]</sup>

The release of LDH (lactate dehydrogenase) considered as a pre-cancer substrate has been demonstrated in human bladder cancer cells, B16, EJ, prostate cancer, PC-3 cells and also human umbilical vein endothelial cells (HUVEC). The secretion of LDH in the normal of the blast fibrous and non-cancerous cells is very low. The researches showed that polybia-MPI is relatively less effect on normal cells and by choosing targeted cancer cells and destroy them.

Venom of fire ant, *Solenopsis invicta* have alkaloids that inhibit the phosphorylation of Akt-1 in the amino acids tyrosine 308 and serine 473. The mouse embryonic fibroblast prevents the development of cancer. Inhibition of Akt may lead to the development of anti-cancer drugs in the future.<sup>[38]</sup>

The structure of a bee venom of *Vespa simillima*, were identified that effects on cancer cell. The molecules,

quinone, 7, 8-seco-para-ferruginone (SPF), prevent the proliferation of cancer cells in the rat liver.<sup>[4]</sup> In addition the cancer cells resistance to chemotherapy drugs and this route of treatment often led to serious adverse events.<sup>[39,40]</sup>

Phospholipase - D is released from the venom of brown spider, which causes rapid lysis of red blood cells and inhibition of blood cancer.<sup>[41]</sup> Hyaluronidase of the spider venom also increases tissue permeability and subsequently disappearance of the tumor.<sup>[42,43,44]</sup> Installation of oxyopinin, from venom of wolf spider increased permeability of the lipid membrane of cancer cells and cause their death.<sup>[45,46]</sup>

Pancratistatin (PST) in the venom of the spider *Pantratum littorale* has effect on cancer human neuroblastoma cells (SHSY-5Y), human lymphoma (Jurkat) and breast cancer (MCF-7). Although anti-tumor effects of these compounds were well known, but the compound did not have an adverse effect on normal cells.<sup>[47-49]</sup> Antitumor activity of gomesin, The strong antimicrobial peptides isolated from hemolymph spider of *Acanthoscurria gomesiana* was examined in both *in vitro* and *in vivo* assay. PST Ointment in the treatment group to inhibit the growth and proliferation of cancer cells among the B16F10-Nex2 mice compared to the control. In addition, cytotoxic effects of this compound was reported on tumor endothelial cells (HUVECs) compared with the control group.<sup>[50]</sup>

Cantharidin is derived from the bodies of blister beetles for the treatment of warts and used *Molluscum Contagiosum*.<sup>[51]</sup> In addition to honey, brown resinous substance like wax, royal jelly and bee venom have antibacterial activity known.<sup>[52]</sup>

Some members of calliphoridae family, and the species of *Cochliomyia hominivorax* that cause myiasis is medical important. In maggoterapy used the species of *Lucilia sericata* and *Phormia regina* maggots. The species of the *Calliphora vicina*, *Chrysomya nufifacies*, *Lucilia Caesar*, *L. cuprina*, *L. illuster*, *Phormia regina*, from family Calliphoridae and the species of *Wohlfahrtia nuba* from sarcophagidae are mostly used in Maggoterapy.

Honey has high permeability and moisture in wound healing and helps skin repair, moisture honey from pain and prevent cell destruction during dry dressing and changes the growth of blood vessels and stimulates monocytes.<sup>[11, 13, 53]</sup>

Treatment of diabetic ulcers: study on the treatment of diabetic foot ulcers with local honey and olive oil has been administered. The 55-year-old man with a 12 year history of type 2 diabetes in the leg 2 × 2 with the size and depth of 4 cm was treated with penicillin 6.3.3 and betadine lavage treatment was not achieved, with a mixture of honey and olive oil at 40 ° C for 5-7 minutes,

the mixture was treated, the patient's wound 5 days after treatment with granulated honey and fully recovered after one month. Also, up to 2 weeks after treatment no observed recurrence.<sup>[54]</sup> In another study in Iran, a randomized clinical trial was carried out and were examined the effect of topical treatment of honey after surgery in 24 cases of pilonidal sinus. In treated group, wound was clear, odorless, non-purulent discharge and also cell culture was negative. Whereas, in the control group that daily washing with soap and warm water wound of secretion was very bad smell and using the results of cell culture.<sup>[55]</sup>

Insects are as a food source. The insects e protein content are 20 to 70 %, amino acids 30 to 60%, fat 10 to 50%, fatty acids, carbohydrates, 2 to 10%, and also various of minerals, vitamins and other elements of improvement of human health. Insects represent significant sources of energy in the earth that are still not fully used globally.<sup>[56-66]</sup> In China, consumption of various insects such as ants, termites, worms, moths and butterflies were 3000-year history.<sup>[57,67]</sup> The history of insects in China was published.<sup>[56,57,65,66]</sup> Human body needs protein and amino acids, enzymes, hormones and hemoglobin, antibodies of edible insects to produce nitrogen for the balance of acid and alkali, conversion and transport of important genetic information.<sup>[58,66,59,61-64]</sup> The egg, larva, pupa, and adult of class insects are varies between 20- 70 percent crude protein. One-day larvae of Ephemeroptera are 66.26% crude protein. The larvae of Anizoptera is 40-65%, in the eggs and larvae of Zygoptera 40-57% crude protein, Coleoptera larvae have 42- 73% and in , Coleoptera larvae have 23- 66% and in Lepidoptera have 20-70% crude protein. The amount of protein in larval bees, wild bees, ants and other Hymenoptera was reported as ranged 38-76%. *Ephemerella jianghongensis* (Oreder Lepidoptera) larvae have a 66.26% and *Sphaerodema rustica* 73.52% protein. Insect protein is more than the plant.

More than 20 types of amino acids presented in human proteins. Eight of them belong to the basic amino acids and about 100 types identified in edible insects, 10 – 30% are essential amino acid and 35-50% can provide to essential humans amino acids.<sup>[68]</sup>

Fat is an important component of the human body and in the role of storage and supply of energy and involved the protection of different organs. Fat can also help to absorption of vitamins, phosphate, carbohydrate and cholesterol and supporting many components of tissues and cells as well as involved in combination with protein. This combination is useful for the human brain and liver, reducing blood fat, cholesterol and promoting safety as well as premature aging of skin cells. Fatty acids are divided to saturated and unsaturated fatty acids. Unsaturated fatty acids is useful and can be development of human, protect the skin and help reduce the formation of blood clots and clotting platelets.<sup>[68]</sup> Most species of edible insects are rich unsaturated fatty acid. *Oxya chinensis* species are contains 2.2% fat wheras *Ostrinia furnacalis* with 46.08% and *Pectinophoa gossypeilla* 48.49% of the fat. The highest percentage of fat in the larvae and pupae was reported in *Musca domestica*, *Dendrolimus houi*, and *Chilo Fuscidentalis* respectively. It should be noted that the amount of fat in the adult stage insects are less than in larvae and pupae stages .Vitamins are a group of organic compounds that are essential for the metabolism of the human body. Since the vitamin is not produced in the human body, must be absorbed by food. The vitamins in edible insects are low and not enough. According to recent studies, insects have carotene, vitamin B2, B6, D, E, K, A, B1, C.<sup>[66,69,70]</sup>

Carbohydrates are the most important nutrients in the human body. Their main source of protein intake and decrease body heat and can help to detoxification of toxins.<sup>[68]</sup> The amount of carbohydrates in the insect body is varies between 1-10 %. Mites on tea plant have range 16-27%. Polysaccharides are the structure of carbohydrate that increases the human body's immune function.<sup>[72]</sup>

Chitin is a macromolecular compound and considered as very high safety and nutritional value. Chitin can be used to stop bleeding, prevent blood clotting and wound healing and produce cosmetics. The silkworm moth pupae was reported as 5 to 15% and dried to the 73.3% and the last pupal stage as 55.5% .Chitin in pupal stage of *Dendrolimus houi* is 47.7% and in adult stage was reported as 83.17%.<sup>[66, 68]</sup>

**Table1. Protein and amino acid content in some edible insects (Percentage of dry weight)**

Insect Order	Protein			Amino acid			Essential Amino acid		
	Max.	Min.	Average	Max.	Min.	Average	Max.	Min.	Average
<b>Ephemeroptera</b>	66.26			97.65			81.23		
<b>Odonata</b>	65.45	46.73	58.83	51.70	36.10	46.03	19.08	13.04	16.12
<b>Isoptera</b>	-	-	-	58.27	33.96	44.03	20.88	12.77	16.74
<b>Orthoptera</b>	65.39	22.80	44.10	57.51	20.23	38.87	19.92	7.98	13.95
<b>Homoptera</b>	57.14	44.67	51.13	53.19	32.59	42.45	21.92	12.38	16.34
<b>Hemiptera</b>	73.52	12.49	55.14	59.68	38.09	48.72	22.18	14.73	18.65
<b>Coleoptera</b>	66.20	23.20	50.41	62.97	13.27	39.74	28.17	4.45	17.13
<b>Lepidoptera</b>	68.30	14.05	44.91	61.84	13.27	32.88	25.60	4.45	13.92
<b>Hymenoptera</b>	76.69	12.65	47.81	81.27	21	45.18	33.62	8.42	16.23

Table2. Percentage of Fatty acids, saturated and unsaturated in edible insects

Species	Saturated		Un saturated		
	(1)‡	(2)‡	‡(3)	‡ (4)	‡(5)
<i>Macrotermes annandalei</i> (Silvestri)	18.54	9.98	51.14	13.01	0.65
<i>Macrotermes subhyalinus</i>	33	1.4	9.5	43.1	3
<i>Oxya chinensis</i> (Thunberg)	25	26.1	27.1	2.3	-
<i>Locusta migratoria migratorioides</i> (R. & F.)	25.5	5.8	47.6	13.1	6.9
<i>Melanoplus sanguinipes</i> (Fabricius)	11	4	19	20.2	43
<i>Schistocerca gregaria</i> (Forska) male adult	40.3	6.7	31.7	7.5	3.6
<i>Schistocerca gregaria</i> (Forska) female adult	34.6	5.8	37.6	10.2	6.2
<i>Rhynchophorus phoenicis</i> (Fabricius)	36	0.3	30	26	2
<i>Tenebrio molitor</i> L.	23.6	1.4	44.7	24.1	1.5
<i>Antheraea pernyi</i> Guérin-Méneville pupa	2.37	27.81	24.74	24.87	--
<i>Dendrolimus houi</i> Lajonquiere pupa	3.038	4.40	29.77	9.96	22.24
<i>Dendrolimus houi</i> Lajonquiere adult.	36.64	7.84	32.82	6	8.79
<i>Galleria mellonella</i>	-	3.1	47.2	6.5	-
<i>Musca domestica</i> L. larva	12.7	2.3	18.2	32.5	3.3
<i>Polyrhachis dives</i> Smith	21.14	2.29	62.44	1.39	1.21

‡: Frequency of test

Table3. Percentage of Lipid in edible insects(Percentage of dry weight)

Insect order	Lipid		
	Max.	Min.	Avarage
Odonata	41.28	14.23	25.38
Hymenoptera	55.10	7.99	21.42
Homoptera	30.60	24.85	27.73
Hemiptera	44.30	9.73	30.43
Coleoptera	35.86	14.05	27.57
Lepidoptera	49.48	5.02	4.76
Orthoptera	2.2		
Diptera	12.61		

Table4. Percentage of Carbohydrate in edible insects (Percentage of dry weight)

Insect Order	Carbohydrate		
	Max.	Min.	Avarage
Odonata	4.78	2.36	3.75
Hymenoptera	7.15	1.95	3.65
Homoptera	2.80	1.54	2.17
Hemiptera	4.37	2.04	3.23
Coleoptera	2.82	2.79	2.81
Lepidoptera	16.27	3.65	8.20

Table 5. Some eat insects element content ( Percentage of dry weight)

Species	Phosphorus	Magnezium	Iron	Zinc	Copper	Magnesium	Calcium	Sodium	Potassium
<i>Gomphus cuneatus</i> Needham	1470	74.8	728.9	12.9	64.3	880	4180	590	2620
<i>Lestes paraemorsa</i> Selys	2470	58.9	1198	147.7	64.8	970	2160	2020	2930
<i>Crocothemis servilia</i> Drury	1420	27.2	461.6	103.3	50.6	950	1510	2310	3330
<i>Darthula hardwicki</i> (Gray)	-	13.6	100	544.3	56.9	4500	280	610	2120
<i>Ericerus pela</i> Chavaness, egg	6000	26.74	133.1	164.2	23.6	1200	353.7	9.51	6300
<i>Cyclopelta parva</i> Distant	8200	19.9	119.7	155.8	2.4	30.15	480	1680	4720
<i>Eusthenes saevus</i> Stal.	1520	16.3	98.3	78	45.4	260	280	780	610
<i>Cyrtotrachelus buqueti</i>	5190	21	64.7	306.1	38.4	1050	270	650	2620
<i>C. longimanus</i> Fabricius	2920	25.9	66.3	127.1	22.9	480	390	510	1740
<i>Holotrichia oblita</i> (Faldermann)	-	46.50	313.7	01.33	8.86	55.78	97.22	-	-
<i>Anomala corpulenta</i> Motschulsky	-	61.61	299.5	84.51	6.82	97.04	34.94	-	-
<i>Protaetia aerata</i> (Erichson)	-	20.03	38.54	97.48	5.56	03.65	87.47	-	-

<i>Aromia bungii</i> Faldermann	-	15.47	102.5	98.76	3.97	20.54	31.56	-	-
<i>Anoplophora nobilis</i> Ganglbauer	-	9.56	05.33	95.42	0.42	105.2	33.56	-	-
<i>Apriona germari</i> (Hope)	-	20.47	96.56	02.34	5.46	54.36	50.68	-	-
<i>Pectinophora gossypiella</i> (Saunders)	-	.	36.78	87.01	3.40	63.21	13.40	-	-
<i>Corcyra cephalonica</i> Stainton	-	6.87	64.81	78.29	7.13	56.81	48.66	-	-
<i>Ostrinia furnacalis</i> (Gunnée)	-	4.56	70.26	91.78	4.84	84.06	40.53	-	-
<i>Papilio machaon</i> L	457	0.9	18	3.5	1.5	279	384	90.5	1250
<i>Chilo fuscidentalis</i> Hampson	1690	41.8	57.1	109	11.1	1060	880	740	2620
<i>Antheraea pernyi</i>	690	8.73	0.01	141.8	9.01	3800	790	620	13390
<i>Musca domestica</i> L.	17900	406	520	570	59	12300	1200	2700	15600
<i>Polyrhachis dives</i> Smith female adult	-	04.35	78.36	55.42	2.66	72.36	13.34	-	-
<i>Polyrhachis dives</i> Smith male adult	-	01.89	91.56	48.83	7.08	63.78	85.28	-	-

## CONCLUSIONS

Edible insects are full of protein and amino acids, especially the amino acids necessary for human body. Insects are the source of protein. These creatures can be rich in fat, fatty acids, nutrients, vitamins and carbohydrates, especially more unsaturated fatty acids are most in nutritional value are excellent. In addition, the antimicrobial proteins and peptides, enzymes and hormones soften the skin while growing, industrial production will be released.

**CONFLICT OF INTEREST STATEMENT** We declare that we have no conflict of interest.

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