

The Dual Nature of Insects: Friends and Foes

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ABSTRACT

Insects are little creatures that cannot be avoided by people or other animals; their effects on the world are so numerous that they cannot be counted. This paper focuses on these little but noticeable organisms (insects), which most humans regard as foes. It reveals some unknown facts about insects and portrays them as both allies and foes. At certain stages of their lives, insects engage in both friendly and dangerous activities, such as honeybees, which are beneficial to people but may be harmful when belligerent. Because of the benefits that friendly insects provide, man conserves them in order to maximize profit. The war on insects began many years ago, but insect pest management appears to be the most effective method of eradicating hazardous insects. Insects are vital to the environment and cannot be completely eradicated; instead, they develop resistance to some of the methods employed to manage them.

INTRODUCTION

Insects are arthropod animals with a head, thorax, and abdomen, six legs, two antennae, and one or two pairs of wings. Insects are the largest phylum arthropoda group in the animal kingdom, containing up to 75% of all known species (Hickman *et al.*, 2008). Insects are by far the largest group of arthropods, whether measured in terms of numbers of species or number of individuals (Johnson, 2003). In the phylum Arthropoda, insects are classified with other animals that have similar characteristics, but they also have specific characteristics that other animals do not exhibit (Pedigo and Rice, 2009). Mader (2001) stated that insects are so numerous and so diverse that the study of this one group is a major specialty in biology called entomology.

Furthermore, Pedigo and Rice (2009) proposed that observing other insect species as we do butterflies would lead people to agree that the advantages of insects greatly outweigh the harm that insects cause. Knowledge and awareness of insects, as well as their importance in our planet's ecology, are also important to this change in perspective. Based on past failures, the most advantageous approach should be to live in as much peace as possible with all aspects of nature, including insects. This study answers the issue, "Are insects our friends or enemies?" It expresses the different ways in which insects are both friends and enemies and concludes that the benefits of insects outweigh the harm they bring humans.

Beneficial Effects of Insects

Most insects play an important role in nature, whereas only a small percentage of insect species - fewer than 0.01% - can become problems to humans (Vanlenteren and Overholt, 1994). Few of the numerous benefits of insects are discussed below.

Insect Products Insects can benefit humans by providing products desired for human consumption, a primary source, or by interacting with elements of our environment to yield benefits, an intermediate resource; probably the most valued primary resources insects provide today are: honey, silk, beeswax, their bodies for human consumption and experimentation, (Pedigo and Rice, 2009). Other vital product of insects includes propolis, royal jelly (bee milk) and gut.



(Source: Themothercooker.com)

Honey

According to Moran (2012), honey is the primary source of energy for bees. Worker bees collect nectar from plants and carry it back to the hive in a special pouch on their gut called a crop before passing it on to the house bees. These bees add enzymes to the nectar and deposit it at the hive's entrance, fanning it with air to dry it off, resulting in sticky sweet honey. The honey is then stored in cells of the honeycomb and covered with wax to preserve it fresh throughout the winter. The strongest colonies can store up to four times as much honey as they need and it is this spare honey that beekeepers harvest and market. Honey is utilized as both a food and a medicine. Before penicillin, honey was used to treat soldiers' wounds and fight infection during the World Wars. It is now also utilized to maintain human eye components for transplants. This is due to honey's antiseptic properties.

Beekeeping for honey production is a valuable agricultural activity in many countries, as well as an important source of foreign cash for those that export honey and bee wax. It is utilized in cosmetics, industrial raw materials, animal feeds, and brewing ingredients (Akunne, 2011). Man uses honey in many kinds of ways, including as the primary source of natural sweetener in the preparation of candies, cakes, and bread.

Silk

True silk is the secretion of silkworm moth caterpillars (*Bombyx mori*). Silk is a fine thread-like secretion generated by caterpillars while creating cocoons for their pupae. Long sac-like silk-glands, which are modified salivary glands, release a thick pasty substance that is expelled via a pair of fine ducts on the lower lip. The caterpillar spins this fluid into fine threads, which harden when exposed to air to form strong and supple silk strands. At a rate of 15.00 cm per minute, the caterpillar larva creates silk threads thousands of meters long (Jordan and Verma, 2010). The market value of silk supports the claim that the silkworm is one of our most important insect species and a valuable resource.

Bees wax

The fluid is secreted between the segments on the underside of the abdomen, and wax scales can be seen as a result of the secretion solidifying. These scales are separated from the body by the setae of tarsi and transported to the mouth, where they are eaten and turned into plastic to be utilized in the construction of the comb walls. A significant amount is used in pressing comb foundations and returned to the bees hive whenever artificial techniques of rearing are used. Bee wax is used in the cosmetics and pharmaceutical industries, as well as in the manufacture of candles, as a lubricant for sewing thread (by shoemakers), and for industrial purposes (Akunne, 2011).

Thousands of mounds of bee wax are utilized in shaving creams, cold creams, polishes, model castings, carbon paper, crayons, electrical devices, and other things (Jordan and Verma, 2010).

Lac

This is a raw material derived from lac scale insects (*Laccifer lacca*) that is used in the production of shellac as well as the coloring of other scale insects to produce red and purple dyes. It is mostly produced in India. Lac is used in many kinds of products, including floor polishes, shoe polishes, insulators, sealants, printing inks, and varnish.

Dyes

Many species of scale insects provide dyes that are used in many products, including cosmetics, and for coloring cakes, medicines, and beverages. Cochineal is a bright red pigment obtained from the bodies of *Coccus cacti*, a scale insect that feeds on cactus plants. The Aztecs utilized cochineal, a scarlet dye obtained from the dried carcasses of female scale insects, *Dactylopius coccus* (native to America), as a dye source. Because synthetic colours were proved to be harmful, natural dyes derived from insects proliferated. Tannin is a dye derived from insect galls that is used in the tanning of skins and the manufacture of long-lasting inks.

Propolis

Bee propolis is used by bees to seal open spaces and cracks. It is comprised of tree sap collected from conifers, pines, flowers, and small buds, as well as bee saliva in small amounts. Bee propolis is beneficial to both humans and bees. It is frequently used as a natural treatment or in traditional medicine. Some documented bee propolis benefits include: use as a topical cream; application to tiny wounds; treatment of ulcers in the mouth and sore throat; treatment of second-degree

burns, aids in inflammation reduction, usage as a mouth wash; and prevention of infection following surgery (Uno, 2011).

Royal Jelly

Moran (2012) studied that honey provides bees with energy, as earlier stated, but it is important for bees to have a source of protein to feed growing larvae. Pollen contains protein, so young nurse bees eat it to help them grow. The royal jelly causes a larva that feeds on it to develop into a queen rather than a worker, increasing its lifespan from 6 weeks to an average of 3–4 years, so it is not surprising some people believe it can benefit our health. Humans harvest the large amounts of royal jelly that can be found in the queen's chamber and use it in various cosmetic products such as hand cream, and shampoo.

Role of Insects in Pollination

Pollination is by far the most beneficial activity carried out by insects for humans. Pollination is the process by which pollen is transmitted in plant reproduction, allowing fertilization and sexual reproduction. Bees, both social and solitary, are the most significant crop pollinators, although small beetles, butterflies, and a variety of flies also visit flowers. Pearlmillet, sesame, cluster bean, clover, Lemon balm, Toadflax, and Willow are examples of bee pollinated plants/crops. Some insects are important in agriculture because they help in the cross-pollination of blooming plants. Most flowering plants require an animal to do the transportation. While other animals are included as pollinators, most of the pollination is done by insects. Because insects usually receive benefit for the pollination in the form of energy rich nectar; it is a grand example of mutualism. The various flower traits (and combinations thereof) that differentially attract one type of pollinator or another are known as pollination syndromes. These arose through complex plant-animal

adaptations. Bright colours, especially UV, and attractant pheromones help pollinators find flowers. Worker honeybees collect pollen grains and place them onto their hind legs in special hair-fringed pockets known as pollen baskets as they fly from blossom to flower.

Role of Insects in Weed Control

Weed populations are frequently maintained or held in balance by insects. Insects from different countries are sometimes introduced to suppress weed plants. *Cactoblastis cactorum*, a South American moth, was imported into Australia to manage a cactus that was destroying cattle range habitat.

Insects as Scavengers

Pedigo and Rice (2009) stated that scavenging is another benefit of insects to humans. Insects in feeding, on dead animals and plant tissues, often carry out the first stage of decomposition by predisposing matter for enhanced decay and ultimate breakdown by microorganisms. Some prominent examples of insect decomposers are termites that breakdown woods, springtails that assist in the decomposition of dead leaves and carrion beetles and many fly maggots that feed on dead animals. The beetles which are scavengers feed on dead animals and fallen trees and thereby recycle biological materials into forms found useful by other organisms. These insects and others are responsible for much of the process by which topsoil is created.

Insects as Experimental Animals

Insects play important roles in biological research. Insects used as experimental animals have been indispensable in such fields as genetics, toxicology, and neurobiology (Pedigo and Rice, 2009). For example, because of insects' small size, short generation time and high fecundity, the common fruit fly, *Drosophila melanogaster* is a model organism for studies in the genetics of higher

eukaryotes. Also, *Drosophila melanogaster* has been an essential part of studies into principles like genetic linkage, interactions between genes, chromosomal genetics, development, behaviour, and evolution. Because genetics systems are well conserved among eukaryotes, understanding basic cellular process like DNA replication or transcription in fruit flies can help to understand those processes in other eukaryotes, including humans (Pierce, 2006).

Role of Insects in Medicine

Insects are also used in medicine, for example fly larvae (maggots) were formerly used to treat wounds to prevent or stop gangrene, as they would only consume dead flesh. This treatment is finding modern usage in some hospitals. Recently insects have also gained attention as potential sources of drugs and other medicinal substances, (Dossey, 2010). Honey bee venom is extracted to produce anti-venom therapy and is being investigated as a treatment for several serious diseases of the muscles, connective tissue, and immune system, including multiple sclerosis and arthritis. According to Ezra (2010), honey can be mixed with some plant products to treat patients with genital weakness, stomach problems, gastroenteritis (burning sensation), cough and cold, night blindness, yellow fever, catarrh, nose bleeding, low sperm count, anemia, boil, quick ejaculation, overflowing menstruation, epilepsy, malaria, typhoid, chest pain, hypertension, and ulcer.

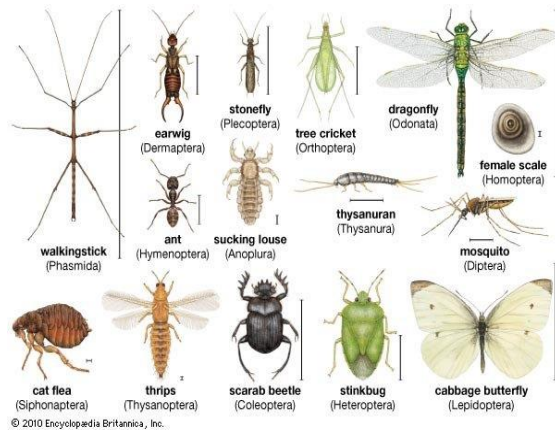
Harmful Effects of Insects

Transmission of diseases

Insects bring about harmful effects by destroying tissues of their hosts, e.g., larvae of a fly *Dermatobia burrow* under the skin and cause cutaneous myiasis. *Dermatophilus*, a flea destroys tissues below the skin and causes sores. The larvae of a fly *Gastrophilus* enter the stomach of horses and cause inflectional

myiasis. Some insects transmit disease producing bacteria and protozoans. The insect which carries the disease organisms from one host to another is called vector. A summary of insects that causes disease as outlined by (Ubachukwu, 2009) is given below;

- Order Dictyoptera (Cockroaches and Mantids): Cockroaches spoil food and are intermediate hosts of some helminthes of humans.
- Order Hemiptera (Bugs, Bed bugs): These give irritating bites. Cone-nose bugs transmit Chagas disease.
- Order Pthiraptera (Anoplura and Mallophaga) (Lice): they cause irritation and skin infections and are vectors of typhus, trench fever and louse-borne relapsing fever.
- Order Coleoptera (Beetles): invasion of alimentary canal and intermediate hosts of helminthes of man. Larvae can cause urticaria.
- Order Lepidoptera (Butterflies and moths): Caterpillars found in alimentary canal. Caterpillar hairs cause urticaria. Moths suck blood from cattle eyes and attack them.
- Order Hymenoptera (Wasps, Bees, and Ants): They give venomous bites and stings.
- Order Diptera (Flies, Mosquitoes, and Gnats): Different types of biting flies cause irritation. They spread diseases such as malaria, dengue fever, yellow fever, filariasis, trypanosomiasis, and others. They cause tissue invasion called myiasis.
- Order Siphonaptera (Fleas including Jigger or Chigoe flea): They cause direct irritation and plague transmission.



(Source: Encyclopaedia Britannica, Inc)

Household pest

Pests in households flourished with the storage of dried organic material in houses, such as grains, flour, dried dog food. Some common insect pests in households include:

Carpet Beetles: These tiny insects are quite destructive in the larval stage on nearly anything organic. Heavily infested food should be discarded. Lightly infested food may be frozen for a few days and then used. They also infest carpets.

Pantry Moths: There are several kinds of moths that appear in pantries to feed on all kinds of stored foods, the Indian meal Moth perhaps being the most common. They may be controlled to some extent by using sticky trap boxes that contain pheromones as attractants.

Cockroaches: There are thousands of cockroach species in the world, but only a handful are pests. Control measures commonly involve sprays or dusts.

Termites: This group of insects is the least commonly seen of all the household pests. They infest wood and must rely on protozoa and bacteria in their guts to break down the cellulose of the wood. Recent studies indicate that termite digestion produces large quantities of methane gas as (flatulence), which, because of the large numbers of termites affects world ecosystems.

Bedbugs: Though not very common in many countries currently, in earlier decades, these blood-suckers were an annoying problem, and would also be found in the seats of trains, trolley cars and theaters.

Carpenter Ants: The Black Carpenter Ant, *Camponotus pennosylvanicus*, is a problem in many households. They originate from large nests in dead or dying trees, and then enter houses to start secondary nests, usually in walls. Sometimes home owners are alerted to their presence by the sight of small piles of sawdust. Blockage of entry places and the use of baits will usually control these large pests.

Cloth Moths: adults of this species do not feed, but damage to clothes is caused by the larvae, which avoid light and live inside silken cases or webs. Wool, hair, fur and feathers are eaten. Dry cleaning kills the larvae, and storage in airtight boxes or bags will protect clothes.

Injurious to domestic animals

Domestic animals are often seriously injured by insects. Many of them live more or less as parasites either externally, such as fleas, lice, bugs, mosquitoes, and others or internally such as larvae of botflies in sheep. The bird lice feeding upon feathers of chicken cause irritation and loss of flesh. The blood-sucking horn-fly is a serious pest to cattle. The grubs of ox warble-fly cut holes in the skin of cattle, thus causing damaging of hide and flesh. The larvae of horse botfly sometimes cause serious disturbances of stomach.

CONCLUSION

Over the years humans refer to insects as outright enemies and pass the same notion to the subsequent generations just because of the few numbers that are harmful. This review revealed many benefits of insects as well as their negative impacts, concluding that insects are more of a friend than an enemy. This is

because their friendly attributes in the ecosystem so far outweighs their little harmful effects. In some way, all the ecosystem's biotic components rely on insects for existence. We should also reconsider our attitude towards insects because their existence cannot be eliminated; rather, we must coexist with them.

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