How Pollinators Effects the Biodiversity of Plants

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Abstract: Nowadays Pollinator endangerment is a global issue. During the last decades, worldwide biodiversity has been lost at an unprecedented rate in all the ecosystems, including agro-ecosystems. Homogenization of agricultural production systems, mainly due to intensification of agricultural systems coupled with specialization by plant and animals breeders and the harmonizing effects of globalization, is one of the greatest causes of agricultural biodiversity loss, through genetic erosion and the increasing levels of genetic vulnerability of specialized crops and livestock. Taking pollinators out of the equation will threaten the world with an unprecedented global food crisis. Many scientists feel that we have entered into a new epoch in the development of the Earth. The Anthropogenic epoch is categorized by the significant role human activity is having on the Earth. One of the most harmful factors contributing to the decline of many species of bees is the parasitic Varro mites. These mites were introduced by humans from small areas in Asia to the rest of the world outside of Australia, Hawaii, and central Africa. Other human factors impacting bee populations include pesticide use and climate change in general.

Keywords: Pollinators, Biodiversity, Homogenization, Ecosystem.

Introduction: Pollinators are extremely diverse, with more than 20,000 pollinating bee species and numerous other insect and vertebrate pollinators. It gives us a crucial ecological unit, namely pollination. Pollination is the key factor for providing us with an extensive variety of food, especially horticultural crops. Actually, pollinators such as bees, birds and bats have an effect on thirty five percent of the world's crop production, increasing outputs of ninety of the leading food crops worldwide, as well as many plant-derived medicines. Pollinators support biodiversity: There is a correlation between plant diversity and pollinator diversity. The pollinator population of an area is a great indicator of the overall health of an ecosystem. Some crops, including blueberries and cherries, are 90 percent dependent on honey bee pollination. 90 percent of the nation's apple crop is pollinated by bees. Butterflies and moths need a place to land on the flowers that they visit, so they prefer broad, flat-faced flowers. Worldwide, approximately 1,000 plants grown for food, beverages, fibers, spices, and medicines need to be pollinated by animals in order to produce the goods on

which we depend. Flowers bloom during the day and night, depending on which pollinator they need to attract. *Day-blooming flowers* are often brightly colored, while those that *bloom at night* are often pale, and may produce sweet scents or odors to attract nocturnal pollinators such as moths and bats. In general it is one of the most important mechanisms in the maintenance and promotion of biodiversity and life on Earth. Our ecosystems is thoroughly depends on pollinator diversity to uphold overall biological diversity. Therefore pollinators are essential for diversity in diet and for the maintenance of natural resources. The assumption that pollination is a "free ecological service" is erroneous. It requires resources, such as refuges of natural vegetation. Where these are reduced or lost they become limiting, and adaptive management practices are required to sustain livelihoods.

Nowadays, scientists and agriculturists around the world became concerned by a decline in pollinator diversity. In order to sustain pollinator services associated with agricultural ecosystems, far more understanding is needed of the multiple goods and services provided by pollinator diversity and the factors that influence their decline and activity.

It is necessary to identify adaptive management practices that minimize negative impacts by humans on pollin]ators, promote the conservation and diversity of native pollinators, and conserve and restore natural areas necessary to optimize pollinator services in agricultural and other terrestrial ecosystems.

Diversity of Insect Pollinators: Three groups of insect pollinators were observed, viz., flies/diptera, butterflies/Lepidoptera & bees/Hymenoptera. Bees were rich in rubber and oil palm plantations, whereas syrphid flies were dominant in jungle rubber. In 1985 Bawa et al and similarly Aebi et al in 2011 studied that Bees are the most important pollinator group and essential pollinators for crops and wild plants because of their behavior and flight patterns. In a study conducted by Inoue *et al. in* 1990 reported that 73.5% of flowers were visited by bees. The bees actively visited flowering herb to harvest nectar and pollen.

Liow *et al.* (2001) in their study reported that the abundance of stingless bees increases in accordance with the increasing number of trees. Population of the species decreases with the increasing temperature and flowering intensity of both trees and shrubs.

Brosi, a biologist and ecologist whose research focuses on both managed honeybees and wild bees, was among 77 international experts who worked on the UN's Intergovernmental Panel for

Biodiversity Ecosystem Services (IPBES) pollinator assessment. They spent two years evaluating information from more than 3,000 scientific papers, as well as indigenous and local knowledge from more than 60 locations around the world.

Seventy-five percent of the world's food crops depend on pollination by at least one of the 20,000 species of pollinators, including bees, butterflies, moths, wasps, beetles, birds, bats, and other vertebrates. And yet, the report warns, more than 40 percent of invertebrate pollinator species, particularly bees and butterflies, face extinction—and 16 percent of vertebrate pollinators are also under threat.

"When we lose even one pollinator species from an ecosystem, it can degrade the functioning of the system overall," Brosi says. "Studies have shown this relationship between biodiversity of pollinators and both agricultural productivity and plant reproduction in wild ecosystems."

The report cites diverse pressures on pollinators, many of them human-made, including habitat loss, use of pesticides such as neonicotinoid insecticides, parasites and pathogens, and global warming. "Pollinators are important to many of the foods that are key sources of the vitamins and minerals in our diets, such as fruits, vegetables, nuts, and seeds," Brosi says. "Nutritionally, the pollinator declines will likely have the biggest impact on the poorest people of the world."

Credible impacts on Bio-Network:

Whilst acknowledging the importance of other factors changes in pollination of insect-dependent wild plants and their reproductive success are likely to have serious consequences for the wider ecological community. Based on botanical studies, pollination enhances reproductive success in an estimated 78% of temperate flowering plant species. Pollination processes are relatively resilient to loss of individual species because certain ecological characteristics confer robustness to networks of plant-pollinator interactions. However, some simulation models indicate that if pollinator extinctions continue unabated then sudden crashes in plant diversity may arise when those species that interact frequently with many others in a network are eliminated though the most highly linked pollinators may be the least sensitive to extinction and shifts in the remaining species may compensate for any losses. Plants underpin terrestrial ecosystems by forming the base of many food webs. Consequently, reduced abundance and loss of pollinators could have serious ecological implications not only for individual plant species but also the wider community of organisms associated with plant and pollinator, and ultimately ecosystem function. These ecological consequences might be particularly

felt in temperate regions as recent work has showed that plant-pollinator networks are more specialized in temperate regions and thus are potentially more vulnerable to pollinator extinctions. This is consistent with many of the observations reported across the temperate northern hemisphere.

Insect-Pollinated Wild Plants: Studies have found that losses of wild plant species tend to be greater in species with a dependence on pollinators for their reproduction. One study found that on average out crossing plants totally reliant on insect pollinators for reproduction were declining, wind pollinated species were increasing and plant species reliant on insect pollinators for out crossing, but able to self-pollinate, showed an inter-mediate response. An investigation into changes in the forage plants of bumblebees in northern hemisphere revealed a decline in the distributions of these insect-pollinated plants, relative to other native or long-established species. The most recent analysis also revealed a decline in plant species richness at fine (10 km - 40 km grid) scales comparing data from 1950-1969 with 1970-1989. This study, however, revealed that this rate of decline in wild plant species richness had substantially reduced in more recent decades with no significant change between 1970-1989 and 1990-2009. Furthermore, these plant decline patterns reported in were similar for all recorded plants irrespective of whether they depended on insect pollinators for pollen exchange and reproductive success. This highlights the fact that declines in insect pollinated plants may be due to concomitant losses in pollinators, but they may also or instead reflect other ecological processes governing the distribution of plants. Reductions in the reproductive connectivity between plants can lead to population isolation which, along with lowered population densities, can cause declines in seed production and quality that, if substantial enough, can cause local extinction. However, our understanding of the importance of different factors (e.g. habitat fragmentation, land-use and disturbance) affecting insect mediated pollen transfer in wild plants in Britain and other countries remains incomplete with the breadth and flexibility of plant mating systems adding much complexity to plant species responses. Very few studies have simultaneously evaluated the influence of pollinators on the interaction between ecological effects that may directly affect population persistence and genetic effects that maintain genetic diversity and fitness and drive longer term population processes.

Pollinators Helps in the Vicinity of Forests: The ecological importance of natural pollination by insects to forest, becomes more and more appreciated. The vicinity of a forest or wild grasslands with native pollinators near agricultural crops, such as apples, almonds or coffee can improve their yield by about 20%. The benefits of native pollinators may result in forest owners demanding payment for their contribution in the improved crop results – a simple example of the economic value of ecological services. Farmers can also raise native crops in order to promote native bee

pollinator species. Whereas loss of pollinators, also known as Pollinator decline has been noticed in recent years. Observed losses would have significant economic impacts. Possible explanations for pollinator decline include habitat destruction, pesticide, parasitism/diseases, climate change and others, and many researchers believe it is the synergistic effects of these factors which are ultimately detrimental to pollinator populations.

Impact on Crops: It is predictable that 84% of species we cultivate depend on pollinators. These species give us raw materials, medicines, food for humans, foodstuffs for livestock, bio-fuels. The global value of the services pollinators provides amounts to approximately 153 billion euro a year. Pollinators, contribute to the growth of fruit, vegetables and many nuts, as well as flowering plants. Plants that depend on pollination make up 35 percent of global crop production volume with a value of as much as $577 billion a year. The agricultural system, for which pollinators play a key role, creates millions of jobs worldwide.

Biological value: Pollinators are the lifeblood of ecosystems everywhere. They help plants reproduce, increase biodiversity, facilitate the dispersal of species into new regions, maintain genetic diversity within plant populations, increase fruit yields, and thereby support flora and fauna at every level of the food chain. Bees are amongst the most important pollinators of all—particularly when it comes to supporting humans. In Europe alone, bees pollinate 84% of commercial crops and 4000 vegetable species. Of the 100 crops that provide 90% of human food worldwide, bees pollinate 71. By pollinating commercial crops, bees contribute $1.6 billion USD annually to the EU economy, $52.2 billion each year to the Chinese economy, and $29 billion to the US economy. So farmers throughout the world depend upon bees for productive crops, just as people everywhere rely upon bees for affordable food.

Of course, although research tends to focus on the impact pollinators have on human cultivated crops, the ecological importance of bees extends far beyond commercial species. However, in recent years declining of pollinators populations have lead to decreased floral reproduction, lower fruit yields, and less biodiversity—causing immediate impacts at the lowest levels of the food chain, which in turn radiates out to countless other species.

Conclusion: The efficiency of insects as pollinators would depend on their biological characteristics in relation to the biodiversity and the environment in which they are needed. Each insect species which has been used as a pollinator so far would have its specific characteristics, which might be favorable or unfavorable from the standpoint of the user. Our dependence on a few endangered species that has been bred and managed intensively could give rise to several problems in managing the pollination services. Few species may not provide the same benefits as a rich community of functionally distinct species. It has been shown that greater the diversity of pollinators better the

pollination, emphasizing the need to conserve functional diversity and maintain high biodiversity in agricultural landscapes. There is a need to give a fresh look at our strategies on clean cultivation, multiple cropping, farming systems, conservation of forests, etc. Unfortunately pollination is seen as a 'free ecological service' provided by pollinators, forgetting that nothing is free in nature and every service nature provides demands a cost and we must provide for it in terms of resources like food, shelter, ecology, etc. for the pollinators. The awareness to study, conserve and use other pollinators requires new taxonomic and biological work to determine which species are important as native pollinators of specific crops in different regions. The urgent need to reshape our strategies to address these issues is the need of the hour to make pollination an input in increasing crop and evolutionary traits determine the extent to which a given species is affected by these threats.

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