

Pollinators make critical contribution to healthy diets

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These honeybee hives are placed in a blooming almond orchard in Yolo County, Calif. Almond production heavily depends on pollinators and almonds are rich in energy, protein, lipid and many key nutrients such as calcium, magnesium and vitamin E among others. Credit: AM Klein, Leuphana University of Lüneburg.

Fruits and vegetables that provide the highest levels of vitamins and minerals to the human diet globally depend heavily on bees and other pollinating animals, according to a new study published in the international online journal *PLoS ONE*.

The new study was carried out by an interdisciplinary research team, comprised of [pollination](#) ecologists and a nutrition expert, based at the Leuphana University of Lüneburg, the University of Berlin in Germany, and the University of California at Berkeley and San Francisco. The research team showed that globally "animal-pollinated [crops](#) contain the

majority of the available dietary lipid, vitamin A, C and E, and a large portion of the minerals calcium, fluoride, and iron worldwide. The yield increase attributable to animal-dependent pollination of these crops is significant and could have a potentially drastic effect on [human nutrition](#) if jeopardized."

More specifically, the team showed that in the global crop supply, several key vitamins and other nutrients related to lower risk for cancer and [heart disease](#) are present predominantly in crops propagated by pollinators. These include the carotenoids lycopene and β -cryptoxanthin, which are found in brightly colored red, orange and yellow [fruits and vegetables](#). Other important antioxidants, including several forms of vitamin E and more than 90% of the available vitamin C, are provided by crops that are pollinated by bees and other animals.



Pollination is important for crops producing key nutrients for the human diet. Here a sand bee of the genus *Andrena sp.* forages on a peach flower in a garden around Lüneburg, Germany. Credit: AM Klein, Leuphana University of Lüneburg.

Key minerals for the development of bones and teeth, including more

than 50% of calcium and fluoride available in the global food supply, are present in crops produced with pollinators. Plant sources of calcium, such as sesame seed, almond or spinach, are particularly important in regions of the world where dairy production is often not culturally, environmentally or financially feasible.

The animal-pollinated crops included in this study vary in the extent of their dependence on animal pollinators, with many able to propagate via alternative mechanisms, such as wind or self pollination. Despite this, the researchers estimate that up to 40% of some essential nutrients provided by fruits and vegetables could be lost without pollinators.



Many fruit and vegetable varieties at local markets are pollinated by bees and other animals for either seed or fruit production and are rich in minerals and vitamins. Credit: T. Niemeyer, Leuphana University of Lüneburg.

Bees and other animal pollinators are experiencing declines in many parts of the globe. Many farmers around the world depend on the European honey bee, importing them seasonally to pollinate their fields. However, the European honey bee has suffered massive overwintering losses, proposed causes of which include disease, pesticides and lack of nutritional (floral) resources. Wild pollinators that provide pollination

services "for free" are also declining rapidly as habitat is destroyed by intensive farming practices such as agrochemical-based monoculture. The results of this study demonstrate the potential impact of this pollinator decline on human health.

Provided by Pensoft Publishers

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