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Global pollinator decline may lead to human malnutrition

The worldwide decline of pollinators could increase cases of vitamin and micronutrient deficiencies in humans, new research suggests. For instance, pollination is needed for the crops that produce half of all plant-derived vitamin A across much of south-east Asia. Furthermore, areas which depend most on pollination for micronutrient supply tend to be poorer and already at higher risk of deficiencies.

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It is now well established that pollinators provide a vital ecosystem service. Seventy-five per cent of the 115 species that make up the world's major crops depend on, or benefit from, animal pollination. With wild and honeybees in global decline, it is clear that food security is at risk. The problem may be greater than a simple reduction in calories: many crops that depend on pollination also provide important vitamins and other micronutrients. Lower yields of such crops could therefore have serious health implications.

In this study, researchers used a global map of the 115 major food crops, which showed how dependent each crop yield was on pollinators. To show the pollinator dependency, they multiplied crop production by 0.95 if previous research had shown that animal pollination was 'essential', by 0.65 if dependence was 'great', by 0.25 for 'modest' and by 0.05 for 'little'.

The researchers focused on three key micronutrients: vitamin A, iron and folic acid. Vitamin A deficiency can cause blindness, iron is essential for red blood cell production and folic acid is needed by pregnant women as it is essential for the development of the child.

The pollination dependency of these micronutrients was then calculated by dividing the amount of nutrients contained in the pollinator-dependent portion of crop yields by the amount in total yields. For example, if the pollination-dependent portion of the crop contained 12 tonnes of iron and the total yield contained 120 tonnes, pollination dependency would be 10%. This percentage of pollination dependency was calculated for all crops and each 10 km grid square on the map.

The results showed that dependency on pollination was around 50% for vitamin A in Thailand, north-central and south-east India, west Iran, Romania and east and south-west Australia. This was also true for parts of Mexico, the US and Argentina. Pumpkin, melon and mango were important sources of vitamin A in the dependence hotspots, but there were regional variations; for example, okra was particularly important in India.

There were some areas, particularly in China, where there was high vitamin A production but low pollination dependence. This is because crops grown here, such as sweet potato and carrot, provide vitamin A but do not require pollination. However, the researchers stress that although these crops do not need pollination to grow, they do require it for seed production. This was not accounted for in this study but may have important impacts on production.

Iron and folic acid had lower dependencies, around 12-15% in west China, Central African Republic, north-east South Africa, north Mexico and the Yucatan. Pollination-dependent crops that were good sources of iron were pumpkin, avocado and sesame. Coconut and nutmeg were important for folic acid provision.

The authors acknowledge that to fully assess a region's vulnerability to pollinator loss, the effects of trade in crops and purchasing power would need to be accounted for. However, they note that it is often the poorer regions that are more highly dependent on pollination. Furthermore, dependency hotspots often occur in areas already at risk of deficiencies. For example, vitamin A deficiency is nearly three times more likely in areas which have a micronutrient dependence on pollination of 30% or higher.