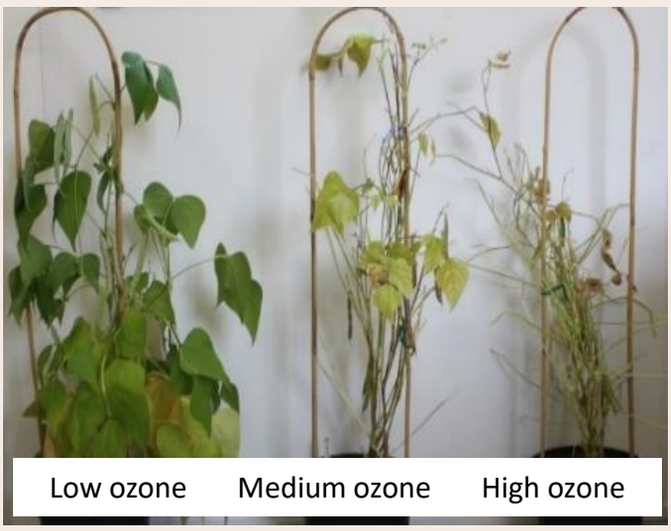
Ozone impacts: legumes

Legumes, including beans, are very sensitive to ozone pollution and often show distinctive visible symptoms of damage. For beans, ozone-induced leaf injury often causes reddish-brown stipples on the leaves, but the leaf veins remain green. Often the leaves will die back and drop off the plant, leaving fewer healthy leaves to provide the energy to grow pods and develop beans.

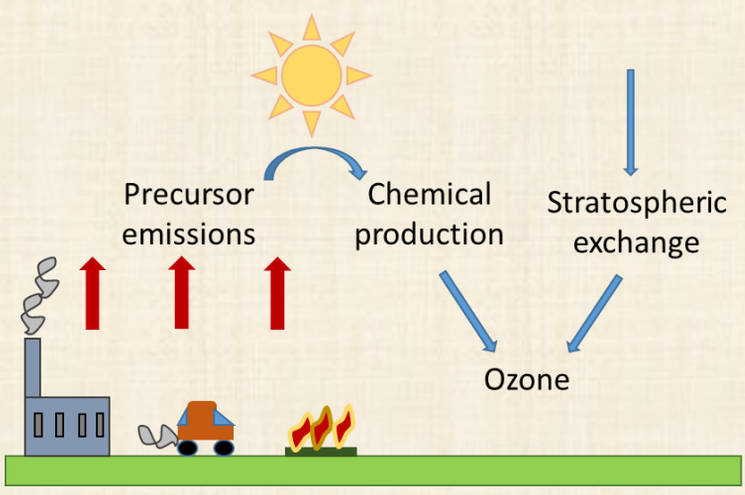
Increased visible leaf injury

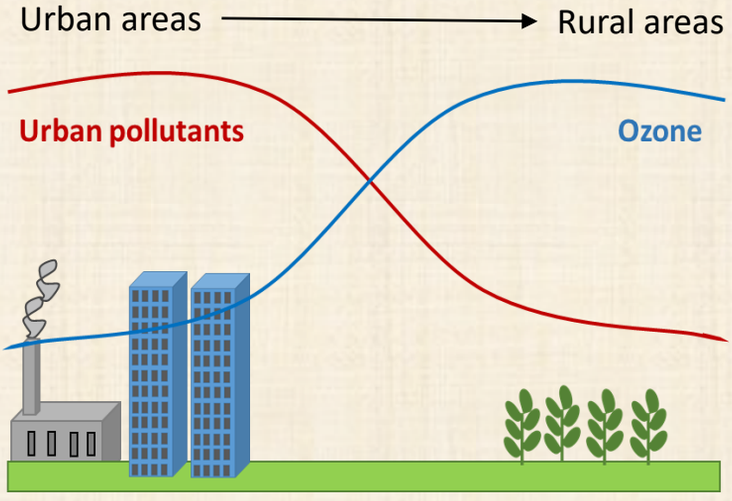
Increased senescence / early die-back



Ozone Formation

In the upper layers of the atmosphere ozone is beneficial and protects us from harmful UV light from the sun. At ground level ozone is a harmful pollutant. There are natural sources of ozone, but it is also formed in sunlight from precursor pollutants emitted from anthropogenic sources including vehicles, industry and biomass burning. Ozone concentrations tend to be high in agricultural areas downwind of large cities as ozone is broken down more quickly in urban areas. Ozone levels are increasing rapidly in developing regions due to increasing emissions of precursor pollutants.

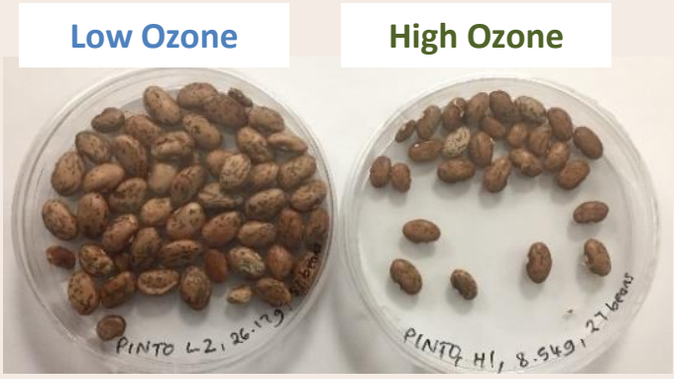




Examples of impacts of ozone on legumes

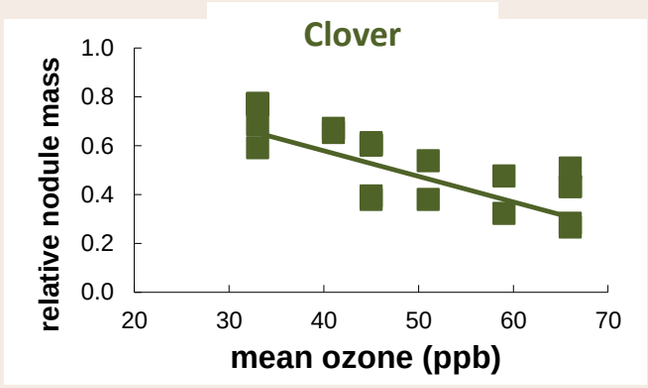
Reduced yield and bean size

Ozone pollution can reduce the number of pods per plant and the number of beans per pod. These combine to give a reduced bean yield. The size of individual beans can also be smaller for plants exposed to ozone pollution, which may affect both nutrition and viability of stored seed.



Reduced nitrogen fixation

Legumes are important nitrogen-fixing plants. They convert nitrogen in the air into a form that can be used by the plants using associated bacteria, often in nodules on the roots. Numbers and activity of nodules can be reduced by ozone, reducing nitrogen availability to subsistence agricultural systems.



Visible leaf-injury

Ozone induced visible leaf-injury has also been demonstrated for other legumes including cowpea, pea, soybean, peanut, chickpea, clover, alfalfa and trefoil.

For further information please contact:
Felicity Hayes, Katrina Sharps

ICP Vegetation Coordination Centre
Centre for Ecology & Hydrology
Deiniol Road, Bangor
Gwynedd, LL57 2UW, UK
Tel: +44 (0) 1248 374500

Email: fhay@ceh.ac.uk; katshar@ceh.ac.uk

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